darden
architects

6790 N. West Avenue
Fresno, California 93711
Tel: 559.448.8051
Fax: 559.446.1765
www.dardenarchitects.com

ADDENDUM NO. 1 DATE: 02/20/23

PROJECT:
McKinley/ Fowler Elementary School- Increment 2
Fresno, CA
CUSD Bid No.: 2923

OWNER:
Clovis Unified School District
1450 E. Herndon Ave.
Clovis, CA 93611

ARCHITECT:
DARDEN ARCHITECTS, INC.
Attention: Andrew Corral/ Mike Fennacy
6790 N. West Avenue
Fresno, California 93711
T. (559) 448-8051
F. (559) 446-1765

DARDEN PROJECT NO. 2116
DSA File Nos. 10-48
DSA APPL. NO. 02-120543

It will be the responsibility of the General Contractor to submit the information contained in this addendum to all its subcontractors and suppliers. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject Bidder to disqualification.

The following additions, deletions, and revisions to the SHEETS and Project Manual are hereby made and do become a part of these Contract Documents.

PROJECT: McKinley/ Fowler Elementary School- Increment 2

INDEX OF ADDENDA TRANSMITTED HEREWITH

PROJECT MANUAL:

BIDDING AND CONTRACT REQUIREMENTS:

CHANGES TO INTRODUCTORY INFORMATION ..... AD_-CII01

CHANGES TO CONDITIONS OF THE CONTRACT ..... AD_-CCC01 THRU CCC02

SPECIFICATIONS:

CHANGES TO SPECIFICATIONS ..... AD1-SP01 THRU SP10

SHEETS:

CHANGES TO SHEETS:

ARCHITECTURAL ..... AD1-A01 THRU A14
STRUCTURAL ..... AD1-S01 THRU S04
PLUMBING AD1-P01

ATTACHMENTS:

DOCUMENTS OR SPECIFICATIONS:

BID SUMMARY PACKAGE ..... (Pages 1 thru 480)
01 45 23 TESTING AND INSPECTIONS ..... (Pages 1 thru 23)
01 57 24 STORM WATER POLLUTION PREVENTION PLAN (SWPP) ..... (Pages 1 thru 6)
01 57 24 INDIRET SOURCE REVIEW(ISR) ..... (Pages 1 thru 3)
27 70 00 INTERCOM, CLOCK, PUBLIC ADDRESS SYSTEM ..... (Pages 1 thru 16)
APPENDIX 'A'- STORM WATER POLLUTION PREVENTION PLAN ..... (Pages 1 thru 416)
APPENDIX 'B'- INTERIOR COLOR SCHEDULE ..... (Pages 1 thru 5)

SHEETS:

ARCHITECTURAL ..... AD01-AX01 thru AD01-AX 11.

PROJECT MANUAL:

BIDDING AND CONTRACT REQUIREMENTS:

CHANGES TO INTRODUCTORY INFORMATION:

AD1-CII01 Geotechnical Report:

1. A copy of the geotechnical report has been included as identified with an AD-1 in the upper right-hand corner. This document is for reference only, refer to the Specifications and Drawings for the requirements of this contract.

CHANGES TO CONDITIONS OF THE CONTRACT:

AD1-CCC01 Refer to General Conditions:

1. Refer to the Insurance rating requirement change described in the attached letter from the District as indicated with an AD-1 in the upper right-hand corner.

AD1-CCC02 Refer to the attached Owner Controlled Insurance Program (OCIP) criteria as Indicated with the AD1 in the upper-right-hand corner.

SPECIFICATIONS:

CHANGES TO SPECIFICATIONS:

AD1-SP01 Refer to Specification Section 01 11 13- SUMMARY OF WORK:

1. Add the attached BID PACKAGES document to the end of this section as indicated with an AD-1 in the upper right-hand corner.
2. Add the attached BID SCHEDULE document to the end of this section as identified with an AD-1 in the upper right-hand corner.
3. Add the attached TEMPORARY FENCE, TOILETS, AND STAGING AREA SITE PLAN document to the end of this section as identified with an AD-1 in the upper right-hand corner.

AD1-SP02 Refer to Specification Section 01 45 23- TESTING AND INSPECTIONS SERVICES:

1. Add the attached DSA 103 form to the end of this section as identified with an AD-1 in the upper right-hand corner.
2. This document is provided for reference only, a DSA-approved version can be provided after the contract award.

PROJECT: McKinley/ Fowler Elementary School- Increment 2

AD1-SP03 Refer to Specification Section 01 57 23- STORM WATER POLLUTION PREVENTION PLAN:

1. Add the attached section 01 57 23- STORM WATER POLLUTION PREVENTION PLAN as identified with an AD-1 in the upper right-hand corner.

AD1-SP04 Refer to Specification Section 01 57 24- INDIRECT SOURCE REVIEW:

1. Add the attached section 01 57 24- INDIRECT SOURCE REVIEW as identified with an AD-1 in the upper right-hand corner.

AD1-SP05 Refer to Specification Section 06 41 23, MODULAR CASEWORK:

1. Refer to Section 2.3.G Fabrication, Accessories replace with the following :
   1. *1/4" Post Reveal*
      a. *As manufactured by FRY REGLET, Model #MWP2550*
      b. *Description: Provides a 1/4" thick, straight and uniform post vertically between panels*
      c. *Material: Extruded Aluminum Alloy 6063 T5, clear anodized finish*
      d. *Return key: 3" wide return key*
   2. *1/4" Post Termination*
      a. *As manufactured by FRY REGLET, Model #MWPT2550*
      b. *Description: Provides a straight and uniform 1/4" post at edges of panels*
      c. *Material: Extruded Aluminum Alloy 6063 T5, clear anodized finish*
      d. *Return key" 1 9/16" wide return key*
   3. *1/4" Outer Corner Post*
      a. *As manufactured by FRY REGLET, Model #MWPOSC2550*
      b. *Description: Outside corner post for installation between millworks panels at 90 degrees, provides a straight and uniform 1/4" exposed post*
      c. *Material: Extruded Aluminum Alloy 6063 T5, clear anodized finish*
      Return key: 1 3/8" wide return key

AD1-SP06 Refer to Specification Section 07 72 00, ROOF ACCESSORIES:

2. Refer to Section 2.2.C. 4. e Smoke Vents, Hardware Materials, Automatic Opener, remove and replace with the following :
   a. *Smoke vent to be operated automatically by operation of a replaceable fusible link. Power and Fire alarm connections will not be required for this equipment.*

AD1-SP07 Refer to Specification Section 08 70 00, HARDWARE:

1. Refer to Section 2.1 Keyways, insert the following:
   a. *The Keyway will be "G"*

b. Contact Roy Straughter for CUSD's registration Numbering before ordering key system.

AD1-SP08 Refer to Specification Section 27 70 00, INTERCOM, CLOCK, PUBLIC ADDRESS SYSTEM:

1. Remove and replace section with the attached 27 70 00, INTERCOM, CLOCK, PUBLIC ADDRESS SYSTEM as indicated with AD-1 in the upper right-hand corner.

AD1-SP09 Add APPENDIX 'A'- STORM WATER PROTECTION PLAN:

1. Add the attached STORM WATER PROTECTION PLAN (SWPP) document to the end of this Project Manual as identified with an AD-1 in the upper right-hand corner.

AD1-SP10 Refer to Specification Section APPENDIX 'B'- INTERIOR COLOR SCHEDULE:

1. Remove and replace section with the attached APPENDIX 'B'- INTERIOR COLOR SCHEDULE as indicated with AD-1 in the upper right-hand corner.

SHEETS:

CHANGES TO SHEETS:

ARCHITECTURAL:

AD1-A01 Refer to Sheet X/A101, WALL ASSEMBLIES:

1. Remove and Replace Sheet X/A101, WALL ASSEMBLIES, with the attached sheet indicated as AD1-AX01.

AD1-A02 Refer to Sheet X/A201, INTERIOR FINISH SCHEDULE- BUILDING A, B, C & D:

1. Remove and Replace Sheet X/A201, INTERIOR FINISH SCHEDULE- BUILDING A, B, C & D, with the attached sheet indicated as AD1-AX02.

AD1-A03 Refer to Sheet X/A202, INTERIOR FINISH SCHEDULE- BUILDING E, K1, K2 & P:

1. Remove and Replace Sheet X/A202, INTERIOR FINISH SCHEDULE- BUILDING E, K1, K2 & P & D, with the attached sheet indicated as AD1-AX03.

AD1-A04 Refer to Sheet X/A310, MODULAR CASEWORK DETAILS:

1. Refer to Sheet X/A310- MODULAR CASEWORK DETAILS, Insert the attached detail N11 on the attached sheet indicated as AD1-AX04.

PROJECT: McKinley/ Fowler Elementary School- Increment 2

AD1-A05 **Refer to Sheet X/A313, CUSTOM CASEWORK- BUILDING A- a 100:**

1. Remove and Replace Sheet X/A313, CUSTOM CASEWORK- BUILDING A- a 100, with the attached sheet indicated as AD1-AX05.

AD1-A06 **Refer to Sheet X/A314, CUSTOM CASEWORK- BUILDING A- b 113:**

1. Remove and Replace Sheet X/A314, CUSTOM CASEWORK- BUILDING A- b 113, with the attached sheet indicated as AD1-AX06.

AD1-A07 **Refer to Sheet X/A511, EXTERIOR DETAILS- METAL WALL PANELS:**

1. Remove and Replace Sheet X/A511, EXTERIOR DETAILS- METAL WALL PANELS, with the attached sheet indicated as AD1-AX07.

AD1-A08 **Refer to Sheet X/A513 EXTERIOR DETAILS- STANDING SEAM ROOF:**

1. Remove and Replace Sheet X/A513 EXTERIOR DETAILS- STANDING SEAM ROOF, with the attached sheet indicated as AD1-AX08.

AD1-A09 **Refer to Sheet A/A201, REFLECTED CEILING PLAN:**

1. Remove and Replace Sheet A/A201- REFLECTED CEILING PLAN, with the attached sheet indicated as AD1-AX09.

AD1-A10 **Refer to Sheet A/A504, WALL SECTIONS:**

1. Remove and Replace Sheet A/A504, WALL SECTIONS, with the attached sheet indicated as AD1-AX10.

AD1-A11 **Refer to Sheet A/A603, INTERIOR ELEVATIONS:**

1. Remove and Replace Sheet A/A603- INTERIOR ELEVATIONS, with the attached sheet indicated as AD1-AX11.

AD1-A12 **Refer to Sheet A/A602, INTERIOR ELEVATIONS:**

1. Refer to Room 109- Storage, Where Safe is indicated provide the following:
    i. Casework Cabinet No. 402, 30”Wx 30”Dx 84”T, Refer To Detail AD1-AX04 for installation around safe and concrete pedestal. Safe indicated shall be Contractor furnished contractor installed.

AD1-A13 **Refer to Sheet D/A201, PARTIAL REFLECTED CEILING PLAN- WEST:**

1. Refer to Room 116- Field Storage, Omit Cement Plaster Ceiling and Framing in this location. Exposed Metal Deck shall be painted.
2. Refer to 115a- Storage , Gypsum Board Ceiling shall be set at 9’-6”.

PROJECT: McKinley/ Fowler Elementary School- Increment 2

AD1-A14 **Refer to Sheet E/A101, FLOOR PLAN:**

1. Refer to Room 103- Stage, Locate Smoke Vent Testing Winch on wall adjacent to Column on Gridlines 14 & D Provide backing per detail N14-X/A601 .

STRUCTURAL:

AD1-S01 **Refer to Sheet B/S402, BUILDING B -CLASSROOM BRACED FRAME ELEVATIONS,**

1. Refer to Brace Frame Elevation A7, The brace frames not labeled shall be HSS5x5x5/16.

AD1-S02 **Refer to Sheet B/S403, BUILDING B -CLASSROOM BRACED FRAME ELEVATIONS,**

1. Refer to Brace Frame Elevation A4, The brace frames not labeled shall be HSS5x5x5/16.

AD1-S03 **Refer to Sheet C/S403, BUILDING C -CLASSROOM BRACED FRAME ELEVATIONS,**

1. Refer to Brace Frame Elevation A11, The brace frames not labeled shall be HSS7x7x1/2.

AD1-S04 **Refer to Sheet D/S402, BUILDING D -CLASSROOM BRACED FRAME ELEVATIONS,**

1. Refer to Brace Frame Elevation A7, The brace frames not labeled shall be HSS5x5x5/16.

PLUMBING:

AD1-P01 **Refer to Sheets A/P101, B/P101, C/P101, D/P101, E/P101, & K/P101:**

1. All Cleanouts indicated shall be located within 2'-0" of the building.

END OF ADDENDUM NO. 1

RMA GeoScience
Every Project Matters | www.rmacompanies.com

August 12, 2022 Project No. 22G-0308-0

Mr. Chris Smith
Clovis Unified School District
1470 Herndon Avenue
Clovis, CA 93611

Subject: Geotechnical Investigation and Geohazards Study Report
New Elementary School for Clovis Unified School District
Southeast Corner of North Fowler Avenue & East Weldon Avenue
Fresno, CA 93727

Dear Mr. Smith:

In accordance with your request, we have performed a geohazards study for the subject project. This work was performed in accordance with Section 1803*A.6* of the 2019 California Building Code (CBC). The results of our geohazards study are presented in the accompanying report, which includes a description of site conditions and potential geologic hazards, conclusions, and recommendations.

We appreciate this opportunity to be of service to you. If you have any questions regarding this report, please do not hesitate to contact us at your convenience.

Respectfully submitted,

RMA GeoScience, Inc.

Megan J. Stewart, GIT
Staff Geologist

Josue A. Montes, PE|GE
Principal Geotechnical Engineer
GE 2904

Mark A. Swiatek, PG|CEG
President
EG 1781

Distribution: Addressee (1 Original and a pdf copy to *ChristopherSmith@clovisusd.k12.ca.us*)
Mr. Andrew Corral, Darden Architects (3 Originals and pdf to *andrewc@dardenarchitects.com*)

RMA GeoScience
Every Project Matters | www.rmacompanies.com

GEOTECHNICAL CONSULTANTS

GEOTECHNICAL INVESTIGATION AND GEOHAZARDS STUDY REPORT
NEW ELEMENTARY SCHOOL FOR CLOVIS UNIFIED SCHOOL DISTRICT
SOUTHEAST CORNER OF NORTH FOWLER AVENUE & EAST WELDON AVENUE
FRESNO, CALIFORNIA 93727

for

Clovis Unified School District
1470 Herndon Avenue
Clovis, California 93611

August 12, 2022

Project No. 22G-0308-0

RMA GeoScience
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GEOTECHNICAL CONSULTANTS

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1.00 INTRODUCTION

1.01 Purpose

This geotechnical investigation and geohazards study report has been completed for the site of the proposed New Elementary School for the Clovis Unified School District. The site is located in an area bounded by North Fowler Avenue to the west, East Weldon Avenue to the north, respectively, North Millard Avenue to the east, and a vacant field to the south, in Fresno, California. The purpose of the investigation was to summarize geotechnical and geologic conditions at the site, to assess their potential impact on the proposed development, and to develop geotechnical engineering design parameters for the project.

1.02 Scope of the Investigation

The general scope of this investigation included the following:

- Review of published and unpublished geologic, seismic, groundwater and geotechnical literature.
- Examination of aerial photographs and topographic maps.
- Contacting of Underground Service Alert to locate onsite utility lines.
- Logging, sampling, and backfilling of a total of twenty (20) exploratory borings drilled with a CME-45 and a SIMCO 2800 to a maximum depth of approximately 51 feet.
- Laboratory testing of representative soil samples.
- Geotechnical evaluation of the compiled data.
- Preparation of this report presenting our findings, conclusions and preliminary recommendations.

As part of the geohazards study associated with our geotechnical investigation, our scope of services included addressing applicable items in California Geological Survey – Note 48, Checklist for the review of engineering Geology and Seismology Reports for California Public School, Hospitals, and Essential Service Buildings, October 2013.

Our scope of work did not include assessment for the potential of hazardous materials onsite.

1.03 Site Location and Description

The project site lies between North Fowler Avenue and North Millard Avenue, and East Weldon Avenue and a vacant field, in Fresno, California. The location of the site relative to nearby streets is indicated on Figure 1, Site Vicinity Map. The geographic position for the site is 36.7678° north latitude and 119.6810° west longitude. The existing ground surface is relatively flat and the elevations above mean sea level across the project site ranged approximately between 338 to 340 feet according to the 2018 USGS Clovis 7.5 Minute Quadrangle (see Figure 2). According to Google Earth, the northern portion was occupied with residential homes and outbuildings since at least 1998 and until 2020. The southern portion was occupied by an orchard from sometime between 1998 and 2002 and by row crops until at least 2018. After 2018, the row crops were removed and the residential

buildings were removed soon after in 2020. At the time of our field exploration, the site was vacant and tilled in preparation for development.

1.04 Planned Improvements

Based on our review of information provided by, and telephone call with, Mr. Corral, including review of a site plan (undated), prepared by Darden Architects, it is our understanding that the project will primarily consist of construction presented in the table below:

Building Identification	Approximate Building Footprint Area (Sq. Ft.)	Anticipated Maximum Foundation Design Load
Bldg. A, Administration	7,800	2.5 kips per lineal foot, 150 kips
Bldg. B, Lower Grade Classrooms	11,500	2.5 klf, 150 kips
Bldg. C, Upper Grade Classrooms	12,000	2.5 klf, 150 kips
Bldg. D, Upper/Lower Grade Classrooms	16,500	2.5 klf, 150 kips
Bldg. E, MPR	11,000	2.5 klf, 150 kips
Bldg. K, TK/K	7,500	2.5 klf, 150 kips

All the buildings will be single-story and will consist of primarily steel frame construction. It is anticipated that construction will include parking areas, an open plaza, play courts, and a soccer field. Finished grade elevation of proposed buildings will be at or near existing grade. No grading plan is available at the time of preparation of this proposal. Appurtenant improvements will include various underground utilities, new concrete flatwork, and landscaping. We have prepared this proposal to outline the scope of work required to provide a geotechnical engineering investigation to support the planned development, in accordance with the project requirements.

1.05 Investigation Methods

Our investigation consisted of office research, review of the compiled data, and preparation of this report. It has been performed in a manner consistent with generally accepted engineering and geologic principles and practices and has incorporated applicable requirements of California Building Code. Definitions of technical terms and symbols used in this report include those of the ASTM International, the California Building Code, and commonly used geologic nomenclature. Technical supporting data are presented in the attached appendices. Appendix A presents a description of the methods and equipment used in performing the field exploration and logs of our subsurface exploration. Appendix B presents a description of our laboratory testing and the test results. Results of our liquefaction and seismic settlement analysis are provided in Appendix C. Finally, references are presented in Appendix D.

2.00 FINDINGS

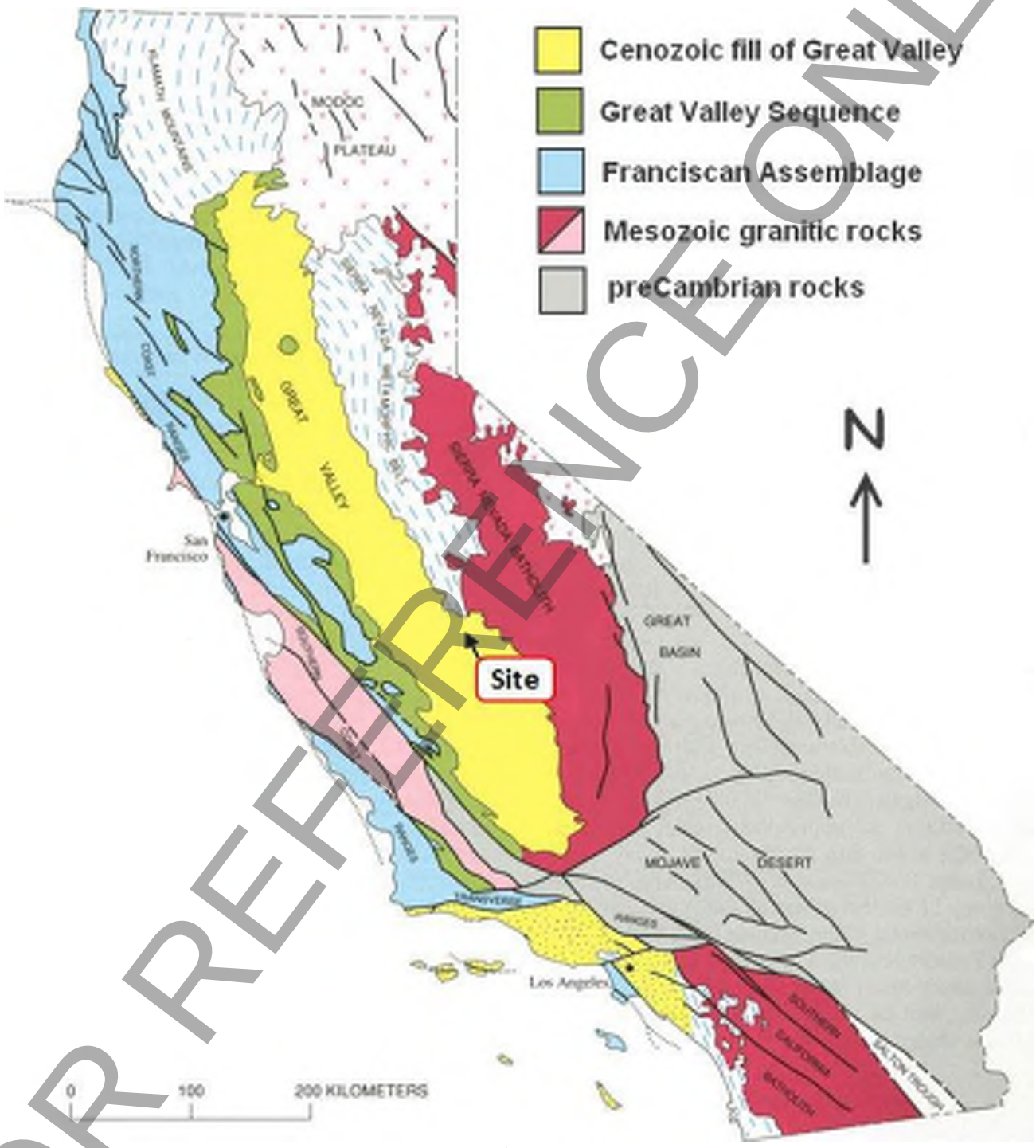
2.01 Geologic Setting

The subject site is located in the east-central San Joaquin Valley, which comprises the southern half of the Great Valley geomorphic province. The valley is a westward-titling trough which forms a broad alluvial fan, approximately 200 miles long and 50 to 70 miles wide, where the eastern flank is broad and gently inclined, as opposed to the western flank which is relatively narrow (Bartow, 1991; Page, 1968). The Central Valley consists of the Great Valley Sequence, overlain by Cenozoic alluvium. Underlying the Great Valley Sequence are the Franciscan Assemblage to the west and the Sierra Nevada batholith to the east (Bailey, Irwin, and Jones, 1964).

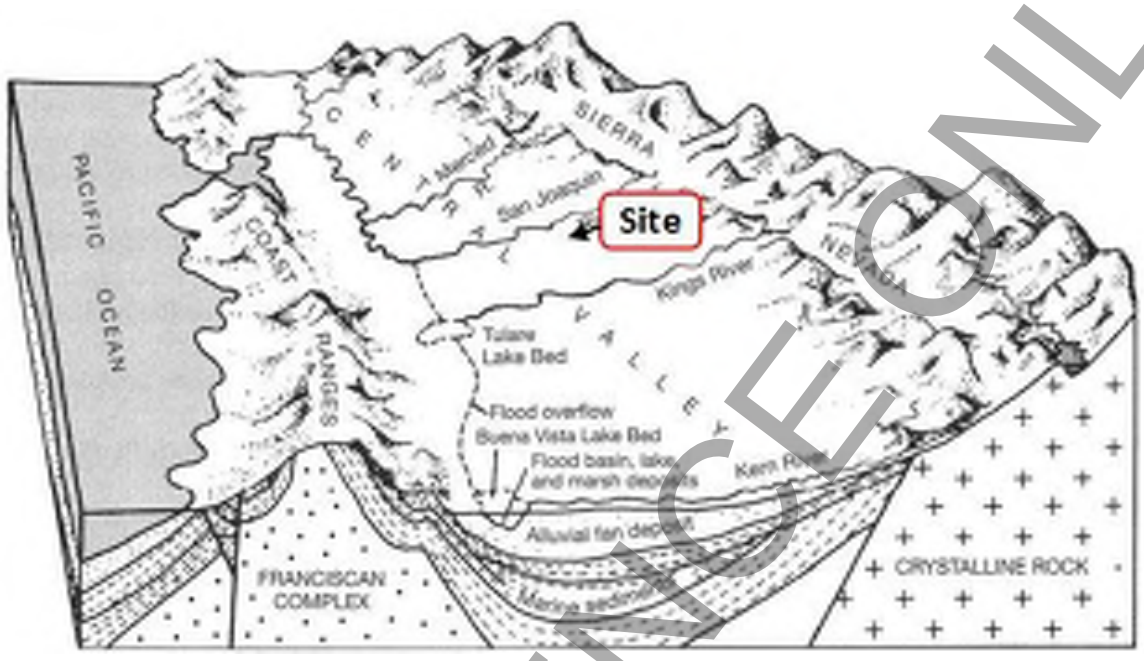
The Franciscan Assemblage, made up of deformed and high pressure and low temperature metamorphosed mafic and ultramafic rocks, was formed around the Late Jurassic through the Miocene (160 to about 20 million years ago) by the offscraping of rocks from a subducting plate dipping to the east (Wakabayashi, 1992; Wakabayashi, 2010).

The Sierra Nevada started to form during the Early Jurassic (around 200 million years ago) when the Farallon Plate began subducting under the North American Plate. This subduction resulted in several orogenies, or mountain building events, that created the granitic Sierra Nevada Batholith deep below the surface. During the Miocene (around 10 million years ago), vertical movement along the Sierra Nevada Frontal Fault Zone (part of the Eastern California Shear Zone) began to uplift the Sierra Nevada. This uplift and erosion exposed the batholiths to the surface. From the Pleistocene (commonly known as the most recent Ice Age) to the present, glaciers have been carving out many parts of the Sierras. The current uplift of the Sierra Nevada is 1 - 2mm per year (Hammond, et al. 2012).

The Great Valley Sequence is a 40,000 foot sequence of marine shale, sandstone, and conglomerate beds, deposited in a deep marine environment during the Late Jurassic through the Cretaceous (150 – 65 million years ago). Overlying the Great Valley Sequence is several thousand feet of Cenozoic alluvium, deposited by: streams and rivers draining from the mountains and creating alluvial fans; by lakes that covered parts of the valley floor from time to time; flooding; and marsh environments (Page, 1986). In some places, it is thousands of feet thick, and more than half of this thickness is composed of fine grained fluvial and lacustrine deposits. Holocene deposition consists mainly of episodic deposition of alluvial sediments (Bartow, 1991; Page, 1986). A generalized geologic map for the State of California is shown below and Figure 3A illustrates the geologic setting within the regional area of the project site. As shown on Figure 3A, the project site is situated on Quaternary deposits of "older alluvium" that are estimated to be several hundred feet deep.



Geologic map showing the locations of Cenozoic alluvium/fill (yellow) overlying the Great Valley Sequence (green), the Franciscan Assemblage (blue), and the Sierra Nevada Batholith (red). Modified from: Irwin (1990).



Geologic block diagram of California. From: Harden (2004). Not to scale.

2.02 Earth Materials

The soils encountered in our test borings consisted of silty sand with varying amounts of clay, sandy silt with varying amounts of clay, clayey sand, relatively clean sand, and clayey silt to the maximum depth explored of approximately 51 feet below ground surface. These layers varied in thicknesses and did not appear to be horizontally continuous across the project site. The granular soils generally had a relative density of loose to very dense, with the fine grained soils had a relative consistency of stiff to hard, including soils locally termed "hardpan". Excavation in the very dense soils with high blowcount can be difficult to excavate. As indicated above, the soils encountered in the test borings are related to deep alluvial deposits that have been deposited over the past several thousand years.

A Boring Location Map showing the locations of the referenced test borings is presented as Figure 5. The logs of our recent exploratory borings are presented in Appendix A, which provide more detailed information of the soils that were encountered to a depth of approximately 51 feet at the project site.

2.03 Expansive Soils

Our field exploration and expansion index test results indicate that the near surface soils at the project site have a very low expansion potential (Expansion Index, EI, in the range of 16 and Plasticity Index of 9). Results of the current EI and PI tests are presented in Appendix B.

2.04 Surface and Groundwater Conditions

No areas of ponding or standing water were present at the time of our study. Further, no springs or areas of natural seepage were observed at the project site. In addition, no groundwater was encountered in the test borings within the maximum depth explored of approximately 51 feet.

According to the Groundwater Information Center Interactive Map Application for Fall 2021, the depth to groundwater in the vicinity of the project site is approximately 92 feet. Historical data derived from wells (State Well Number 13S21E27M001M, 13S21E34L001M, 13S21E34H002M, and 13S21E34J002M) located approximately 0.16 miles north-northeast, 0.78 miles south-southwest, 1.0 miles southeast, and 1.18 miles southeast, respectively, of the project site indicates the depth to ground water on average was approximately 19.8 feet deep during the 1940's, then declined to a depth of approximately 40 feet during the 1970's, and further declined to 66.7 feet deep in the 2000's, with a historical high of 17.4 feet in April of 1949. Over the subsequent years, the data indicates that the groundwater elevation has declined an additional 25.3 feet.

Since the 1940's (the earliest well data available), the depth to groundwater has increased significantly, falling approximately 75 feet in 80 years. Some recovery in the groundwater could occur, especially following a period of wet years. However, in consideration of the demand for groundwater related to domestic and agricultural purposes, it is highly unlikely that the groundwater table will recover much above the levels observed during, or prior to, the 1990's. Thus, although the "historical high" groundwater table is approximately 17.4 feet at the project site, a design "high" groundwater table of 68 feet is recommended for Civil Engineering purposes.

2.05 Faults

The site is not located within the boundaries of an Earthquake Fault Zone for fault-rupture hazard as defined by the Alquist-Priolo Earthquake Fault Zoning Act and no faults are known to pass through the property. The nearest active earthquake fault zones are the Nunez Fault, the Ortigalita Fault Zone, the Round Valley Fault, and the San Andres Fault Zone located approximately 56.2 miles southwest, 66.4 miles west, 67.2 miles east-northeast, and 71.5 miles southwest, respectively, of the project site. The location of the project site relative to these and other fault zones is illustrated on Figure 4a.

Our research of regional geologic and seismic data did not reveal any known instances of ground failure in the vicinity of the site associated with regional seismic activity. Seismic design parameters relative to the requirements of the 2019 California Building Code (CBC) are presented in Section 3.10.

2.06 Historic Seismicity

According to the California Historical Earthquakes Online Database maintained by the California Geological Survey and the United Stated Geological Survey (USGS) database, large historic earthquakes in California with an epicenter of less than 100 miles away from the site are summarized in the table below.

Large Historic Earthquakes

Event	Date	Magnitude	Distance from Site (Miles)
E of King City	September 2, 1853	6.3	72
W of Coalinga	January 9, 1857	6.1	71
Fort Tejon	January 9, 1857	7.9	82
NE of King City	April 17, 1860	6.0	76
Owens Valley	March 26, 1872	7.4	88
N of Independence	March 26, 1872	6.8	83
S of Big Pine	April 3, 1872	6.3	84
NW of Bishop	April 11, 1872	6.8	83
NW of Parkfield	February 2, 1881	6.0	69
SW of Patterson	April 10, 1881	6.3	97
E of King City	April 12, 1885	6.5	74
SW of Bishop	September 30, 1889	6.0	62
SW of Independence	August 17, 1896	6.3	77
NW of Parkfield	March 3, 1901	6.4	70
SE of Mammoth Lakes	May 25, 1980	6.1	74
E of Mammoth Lakes	May 25, 1980	6.0	76
SE of Mammoth Lakes	May 25, 1980	6.1	73
SE of Mammoth Lakes	May 27, 1980	6.2	70
NE of Coalinga	May 2, 1983	6.7	51
NW of Bishop	November 23, 1984	6.1	76
N of Bishop	July 21, 1986	6.4	86
SE of Parkfield	September 28, 2004	6.0	76

2.07 Flooding Potential

According to the Federal Emergency Management Agency (Flood Insurance Rate Map #06019C1595H, effective February 18, 2009), most of the site is located within the shaded area of Flood Zone X, which is defined as “areas of 0.2% annual chance flood, areas of 1% chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood”.

Controlling surface runoff originating from within and outside of the site must be included in design of the project in accordance with the 2019 CBC.

2.08 Landslides

Since there are no natural or manmade slopes in the vicinity of the project site, landsliding is not a hazard at this site.

2.09 Other Geologic Hazards

California Geologic Survey Note 48 (2011) identifies a number of exceptional geologic hazards that can occur at individual sites, but do not occur statewide. Evaluation of these exceptional conditions is referred as a conditional geologic assessment by Note 48. Specific assessment items listed in Note 48 are addressed in the table below.

Conditional Geologic Assessment

Hazard	Assessment	Reference
Methane gas, hydrogen-sulfide gas, tar seeps	Not applicable; site is not located within an oil field identified as a high risk area for hazardous gas accumulations.	See Section 1.03.
Volcanic eruption	Not applicable; site is not located in a known hazard area for volcanic eruptions.	Miller, 1989 (U.S.G.S. Bulletin 1847)
Flooding	The proposed development area is located within the boundaries of a 100-year, but not within the boundaries of a 500-year flood zone.	See Section 2.07.
Tsunami and seiches inundation	Not applicable.	See Section 3.12.
Radon-222 gas	Not applicable; typically a concern in the California Coast Ranges.	See Section 2.01 and CGS Note 48.
Naturally occurring asbestos	Not applicable; site is not located in an area likely to contain naturally occurring asbestos.	Churchill and Hill, 2000 (DMG OFR 2000-19)
Hydrocollapse due to anthropic use of water	Due to the density of the underlying soils, hydrocollapse due to anthropic use of water is unlikely.	See Sections 2.01, 2.02, and Appendix A.
Regional land subsidence	The site is not identified in an area of large historic subsidence within the California Central Valley (although there is major subsidence 41 miles to the west and 47 miles to the south). Control of subsidence will dependent upon proper jurisdictional management of groundwater resources.	City of Fresno Master Environmental Impact Report, 2014; County of Fresno General Plan Background Report, October, 2000; and Borches and Carpenter, 2014.
Clays and cyclic softening	Soils within the upper 50 feet of the ground surface are primarily granular rather than clays. Expansive properties of near-surface soils have been considered in foundation design.	See Sections 3.04 and 3.11.

3.00 CONCLUSIONS AND RECOMMENDATIONS

3.01 General Conclusions

Based on specific data and information contained in this report, our understanding of the project, and our geotechnical engineering experience, it is our professional judgment that the proposed development is geologically and geotechnically feasible. Our review of geological literature and the field exploration performed for this project did not indicate any unusual conditions at the site that would entail special design considerations or construction procedures. Specific geotechnical recommendations and guidelines are presented below to provide information for other members of the design team that can be used to prepare the project plans and specifications for the planned improvements to the administration building.

3.02 General Earthwork and Grading

All grading should be performed in accordance with the recommendations provided below, the project plans and specifications, Appendix J of the 2019 California Building Code and all applicable governmental agency requirements. In the event of conflicts between this report and the other referenced documents, this report shall govern. It should be noted that all references to maximum dry density, optimum moisture content, and relative compaction are based on ASTM D 1557 laboratory test procedures.

3.03 Rippability and Rock Disposal

Exploratory borings that have been done at the project site were advanced without difficulty and no oversize materials were encountered. Accordingly, we expect that all earth materials will be rippable with conventional grading equipment and oversized materials are not expected.

3.04 Earthwork Recommendations

All vegetation, organic rich soils (soils containing more than 2 percent organics by weight), trash, debris, existing pavement sections and underground utilities, should be cleared from the grading area and removed from the site. After the removal of deleterious materials and the stripping of organic-rich soils, the following over-excavation must be done within the area of the planned improvements:

- Within the area of the planned building improvements plus at least 3 feet horizontally beyond the perimeter of these improvements, the subgrade must be over-excavated at least 12 inches below the stripped subgrade surface or at least to the bottom of footings, whichever is lower. The bottom of the over-excavation within each building area must be level and at a uniform depth below the finished pad elevation.
- Outside of the “building pad” area indicated above, no over-excavation should be required unless loose or unstable soils are present that will require some over-excavation prior to the scarification, moisture conditioning, and compaction as recommended below.

Following the over-excavation indicated above, a designated representative for the Project Geotechnical Engineer must review the exposed ground surface and determine if any additional over-excavation is required.

The over-excavated ground surface in all areas determined to be satisfactory for the support of fills must be scarified to a minimum depth of 8 inches. Scarification should continue until the soils are broken down and free from lumps or clods and until the scarified zone is uniform. The moisture content of the scarified zone shall be adjusted to at least optimum moisture content. The scarified zone must then be uniformly compacted to at least 90 percent relative compaction within the building pad area and concrete flatwork and to at least 95 percent relative compaction within paved areas that will be subject to vehicular traffic.

Removed and/or over-excavated soils, free of organics and other deleterious material, may be used as engineered fill. Fill material should be placed in nearly horizontal layers, uniformly moisture conditioned to at least optimum moisture content, and then compacted in layers that do not exceed approximately 8 inches in thickness. Thicker lifts may be placed if testing indicates the compaction procedures are such that the required compaction is being achieved and the geotechnical consultant approves their use. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to insure uniformity of material in each layer. Engineered fill must be compacted to achieve a relative compaction of at least 90 percent, except for the upper 12 inches of subgrade below asphalt or concrete pavement sections subject to vehicular traffic, which must be compacted to at least 95 percent. Based on our observations of the existing field conditions and lab testing data, a shrinkage factor (decrease in volume of soil upon removal and recompaction) in the range of 5 to 10 percent is considered applicable for this project.

The above recommendations are based on the assumption that soils encountered during field exploration are representative of soils throughout the site. However, there can be unforeseen and unanticipated variations in soils between points of subsurface exploration. Hence, over-excavation depths must be verified, and adjusted if necessary, at the time of grading. In addition, any contaminated soils within three (3) feet of the finished subgrade surface, must be removed and properly disposed of outside the area the planned improvements.

3.05 Imported Fill Material

If required, imported fill materials that will be placed within building or concrete flatwork areas must be non-hazardous and be obtained from a single, uniform source that meets the following criteria:

Gradation	
Sieve Size	**Percent Passing**
3-inch	100%
3/4-inch	90% - 100%
#4	60% - 100%
#200	20% - 50%

Maximum Expansion Index		Maximum Plasticity Index	
20		10	
Minimum R-Value (in paved areas)			
50			
Maximum Organic Content			
< 2% by weight			
Corrosivity			
pH	**Minimum Resistivity (ohm-cm)**	**Soluble Sulfates (mg/kg)**	**Soluble Chlorides (mg/kg)**
6.0 to 8.5	> 5,000*	< 1,000	< 200

*unless other requirement established by the Design Engineer

3.06 Temporary Slopes and Shoring

Our geotechnical investigation indicates that excavations less than 4 feet in depth may generally be constructed with vertical sidewalls without shoring or shielding. Temporary excavations in existing alluvial soils that are deeper than 4 feet may be safely made at an inclination of 1:1 or flatter. If vertical sidewalls are required in excavations greater than 4 feet in depth, the use of cantilevered or braced shoring is recommended. The following geotechnical parameters can be used to design a shoring system:

Moist Unit Weight of Soils: 130 pcf
Angle of Internal Friction (ø): 30°
Cohesion: 200 psf

Unless vehicles, equipment, materials, etc., are kept a minimum distance equal to the height of the excavation away from the edge of the excavation, a surcharge load equal to a uniform lateral pressure of 72 psf should be assumed to act on the shoring in addition to the earth pressure calculated using the above geotechnical parameters.

Vehicles, equipment, materials, etc. should be set back a minimum distance of 10 feet from the top edge of sloped or vertical excavations. Surface waters should be diverted away from temporary excavations and prevented from draining over the top of the excavation and down the slope face. During periods of heavy rain, the slope face should be protected with sandbags to prevent drainage over the edge of the slope, and a visqueen liner placed on the slope face to prevent erosion of the slope face.

Periodic observations of the excavations should be made by the geotechnical consultant to verify that the soil conditions have not varied from those anticipated and to monitor the overall condition of the temporary excavations over time. If at any time during construction conditions are encountered which differ from those

anticipated, the geotechnical consultant should be contacted and allowed to analyze the field conditions prior to commencing work within the excavation. In any case, Cal/OSHA construction safety orders should be observed during all underground work.

3.07 Fill and Cut Slopes

Due to the low gradient of the property, it appears that construction of cut and fill slopes will not be required. If such slopes are proposed, they should be inclined no steeper than 2 horizontal to 1 vertical. In addition, appropriate landscaping measures should be taken to protect the face of slopes from erosion.

3.08 Utility Trench Backfill

The existing onsite soils will generally not be suitable for use as pipe bedding for buried utilities. All pipes should be bedded in sand or other suitable material as specified by the Project Civil Engineer and/or as specified by the pipe/conduit manufacturer. We recommend the bedding material have a Sand Equivalent (SE) of at least 30 and have less than 8 percent, by weight, passing the #200 Sieve. The geotechnical consultant should review and approve proposed bedding materials prior to use. Bedding materials should be compacted to at least 90% relative compaction (ASTM D1557) by mechanical methods.

The on-site soils are expected to be suitable as trench backfill provided they are screened of organic matter and other deleterious material. Trench backfill must be compacted to at least 90% relative compaction (ASTM D1557) and the upper 12 inches of trench backfill beneath pavement sections should be compacted to at least 95% relative compaction. Trench backfill should be compacted using mechanical methods; no jetting of backfill should be allowed. A minimum trench width of 24 inches or 18 inches plus the diameter of the utility line, whichever is greater, should be provided to permit uniform compaction on both sides of utility line and allow for a technician to perform in-place density tests. If narrower trenches are desired, a sand-cement slurry should be used to backfill the trenches to within 8 inches of the top of trench. The sand-cement slurry should contain at least 2 sacks of cement per yard of mix and have a 4- to 6-inch slump. In addition, slurry should be consolidated using a suitable vibratory or mechanical method.

All utility trench backfill within street right of ways, utility easements, under or adjacent to sidewalks, driveways, or building pads should be observed and tested by the geotechnical consultant to verify proper compaction. Trenches excavated adjacent to foundations should not extend within the footing influence zone defined as the area within a line projected at a 1:1 drawn from the bottom edge of the footing. Trenches crossing perpendicular to foundations should be excavated and backfilled prior to the construction of the foundations. The excavations should be backfilled in the presence of the geotechnical engineer and tested to verify adequate compaction beneath the proposed footing. Where utility crossings are located within 12 inches of bottoms of footings, conduits should be wrapped with polystyrene foam or other suitable material with a minimum thickness of one inch. Conduits extending through footings shall be “sleeved” as determined by the Project Structural Engineer.

3.09 Faulting

Since the site is not located within the boundaries of an Earthquake Fault Zone and no faults are known to pass through or near the property, surface fault rupture within the site is considered unlikely.

3.10 Seismic Design Parameters

Seismic design parameters have been developed in accordance with Section 1613*A* of the 2019 California Building Code (CBC) using the online SEAOC and OSHPD Seismic Design Maps Calculator (ASCE 7-16 Standard) and a site location based on latitude and longitude. The calculator generates probabilistic and deterministic maximum considered earthquake spectral parameters represented by a 5-percent damped acceleration response spectrum having a 2-percent probability of exceedance in 50 years. The deterministic response accelerations are calculated as 150 percent of the largest median 5-percent damped spectral response acceleration computed on active faults within a region, where the deterministic values govern. The calculator does not, however, produce separate probabilistic and deterministic results. The parameters generated for the subject site are presented below:

2019 California Building Code (CBC) Seismic Parameters

Parameter	Value
Site Location	Latitude = 36.7678 degrees Longitude = -119.6810 degrees
Site Class	Site Class = D* Soil Profile Name = "Stiff Soil"
Mapped Spectral Accelerations	S_s (0.2-second period) = 0.548g S_1 (1-second period) = 0.217g
Site Coefficients (Site Class D)	F_a = 1.362 F_V = Null - Section 11.4.8
Maximum Considered Earthquake Spectral Accelerations (Site Class D)	S_{MS} (0.2-second period) = 0.746g S_{M1} (1-second period) = Null - Section 11.4.8
Design Earthquake Spectral Accelerations (Site Class D)	S_{DS} (0.2-second period) = 0.497g S_{D1} (1-second period) = Null - Section 11.4.8

*As defined in Chapter 20 of ASCE 7-16, a Site Class D is applicable to predominantly cohesionless soils with an **average** standard penetration resistance of 15 to 50 within the upper 100 feet. Based on the geologic setting, our 50-foot deep test boring (see Appendix A), and other historical geotechnical data (see Section 1.02), the soil profile at the project site meets these criteria.

As the Site Class is D and the S_1 value is greater than 0.20g, then per ASCE 7-16 Section 11.4.8 a site-specific ground motions procedure is required with several exceptions. We assume that Exception 2 is applicable to this site, and hence the seismic parameters indicated in the table above have been calculated. If Exception 2 does not apply, the structural engineer should contact us so we develop the site-specific seismic parameters.

The above table shows that the mapped spectral response acceleration parameter for a 1-second period (S_1) is

less than 0.75g. The new elementary school is in Risk Category IV in accordance with CBC Section 1604A.5. Therefore, the Seismic Design Category using 2019 CBC Tables 1613.2.5(1) and 1613.2.5(2) is D for all Occupancy Categories (2019 CBC Section 1613.2.5). Consequently, as required for Seismic Design Categories C through F by CBC Section 1803.5.12, slope instability, liquefaction, total and differential settlement, and surface displacement by faulting or seismically lateral spreading or lateral flow have been evaluated.

Peak earthquake ground acceleration adjusted for site class effects (PGA_M) has been determined in accordance with ASCE 7-16 Section 11.8.3 as follows: $PGA_M = F_{PGA} \times PGA = 1.363 \times 0.237 = 0.323g$.

3.11 Liquefaction and Secondary Earthquake Hazards

Potential secondary seismic hazards that can affect land development projects include liquefaction, tsunamis, seiches, and seismically induced settlement.

Liquefaction

Liquefaction is a phenomenon where earthquake-induced ground vibrations increase the pore pressure in saturated, granular soils until it is equal to the confining, overburden pressure. When this occurs, the soil can completely lose its shear strength and enter a liquefied state. The possibility of liquefaction is dependent upon grain size, relative density, confining pressure, saturation of the soils, and intensity and duration of ground shaking. In order for liquefaction to occur, three criteria must be met: “low density”, coarse-grained (sandy) soils, a groundwater depth of less than about 50 feet, and a potential for seismic shaking from nearby large-magnitude earthquake.

Research has shown that saturated, loose sands with a silt content less than about 25 percent are most susceptible to liquefaction, whereas other soil types are generally considered to have a low susceptibility. According to the California Geologic Survey (CGS) Special Publication SP-117A (2008), "Guidelines for Evaluating and Mitigating Seismic Hazards in California," any materials with a PI > 12 and moisture content < 85% of the liquid limit were considered not subject to liquefaction. Liquefaction susceptibility is related to numerous factors, and the following conditions must exist for liquefaction to occur:

- Sediments must be relatively young in age and must not have developed large amounts of cementation
- Sediments must consist mainly of cohesionless sands and silts
- The sediment must not have a high relative density
- Free groundwater must exist in the sediment; and
- The site must be exposed to seismic events of a magnitude large enough to induce straining of soils particles

The soils in the upper 51 feet at the project site consist primarily of sandy silt with varying amounts of clay, silty sand with varying amounts of clay, clayey sand, and clayey silt. In addition, the corrected SPT value [$(N_1)_{60}$] was less than 20 in a sandy silt surface layer that extends to a depth of approximately 4 feet, a silty sand layer

between a depth of approximately 4 and 7.5 feet, and a silty sand layer between a depth of approximately 42.5 and 47.5 feet in Boring B-11. Based on this, a liquefaction analysis was performed using the sampler blowcount and soil data from the deep boring that was performed at the project site (Boring B-11). The analysis was performed using LiquefyPro Version 5 (2015 edition) for two groundwater conditions: at a depth of 17.4 feet (historical high groundwater condition as required by CGS) and at a depth of 68 feet (representative of a recommended design "high groundwater condition" based on historical DWR data in the past 30 years). The analysis also took into account that the (PGA_M) is 0.323g and the Modal Magnitude (M_M) for the design level earthquake is 5.5 (based on the PSH Deaggregation tool on the USGS website at https://earthquake.usgs.gov/hazards/interactive/) for a 2-percent probability for exceedance in 50 years (a return period of 2,475 years). A summary of the input data and the results of this liquefaction analysis are provided in Appendix C of this report. Based on this analysis, there appears to be a very low risk of liquefaction occurring at the project site during a design level earthquake (Factor-of-Safety against liquefaction is greater than 1.2).

It should be noted that the California Geological Survey has not yet prepared a Seismic Hazard Zone Map of potential liquefaction hazards for the quadrangle in which the site is located. In addition, there are no liquefaction hazard zones near the site according to the City of Fresno and the County of Fresno General Plans. Because there are no mapped liquefaction hazard zones near the site, a map depicting such a zone relative to the site has not been prepared.

Tsunamis and Seiches

Tsunamis are sea waves that are generated in response to large-magnitude earthquakes. When these waves reach shorelines, they sometimes produce coastal flooding. Seiches are the oscillation of large bodies of standing water, such as lakes, that can occur in response to ground shaking. Tsunamis and seiches do not pose hazards due to the inland location of the site and lack of nearby bodies of standing water.

Seismically Induced Settlement

Seismically induced settlement occurs most frequently in areas underlain by loose, granular sediments. Damage as a result of seismically induced settlement is most dramatic when differential settlement occurs in areas with large variations in the thickness of underlying sediments. Settlement caused by ground shaking is often non-uniformly distributed, which can result in differential settlement.

A seismic settlement analysis was performed using LiquefyPro Version 5 (2015 edition) in conjunction with the liquefaction analysis that was performed for this project as indicated above. A summary of the input data and the results of the seismic settlement analysis are provided in Appendix C of this report. Based on this analysis, a seismic settlement of less than 1/4 inch is expected to occur at the project site during a design level earthquake.

Seismically Induced Flooding

According to the City of Fresno and the County of Fresno General Plans, the site is not located within a potential dam inundation area.

Seismically Induced Landsliding

There are no cut or fill slopes that currently exist or are planned at the project site; therefore, the potential for seismically induced landsliding is nil.

3.12 Foundations

Isolated spread footings and/or continuous wall footings are recommended to support the proposed new building. New footings should be embedded at least 12 inches below the lowest adjacent grade and must be constructed on properly compacted fill as recommended in Section 3.04 of this report. Continuous and isolated spread footings with a minimum width of 12 and 24 inches, respectively, may be designed using an allowable bearing capacity of 3,000 pounds per square foot (psf). An allowable increase of 750 psf per additional 12 inches of embedment, and an allowable increase of 500 psf per additional 12 inches of width, can be used in design, up to a maximum allowable bearing capacity of 5,000 psf. This allowable bearing capacity represents an allowable net increase in soil pressure over existing soil pressure and may be increased by one-third for short-term wind or seismic loads. The maximum expected settlement of footings is expected to be less than 3/4 inch with a differential settlement of less than 1/4 inch between similarly sized and loaded footings or less than 1/4 inch over a distance of 30 feet for continuous footings. This assumes that the maximum column and wall loads (dead plus live, not including wind or seismic) associated with new building improvements will not exceed 40 kips and 2.0 kips per foot, respectively.

Our lab testing indicates that the upper 5 feet of soils at the site should have a very low expansion potential (Expansion Index ≤ 20). The type and dimensions of concrete, and the size and location of reinforcing steel, used in foundations should be specified by the Project Structural Engineer. As a minimum, reinforcement for continuous footings should include at least one #4 bar located near both the top and bottom of continuous footings.

It will be very important for all footing excavations to be observed by the geotechnical engineer to verify that they have been excavated into the recommended bearing material. Where zones of relatively loose or disturbed soils are present at the bottom of foundation excavations, these soils should be properly compacted to provide a uniform bearing surface that meets the approval of the geotechnical engineer (refer to Section 3.04).

3.13 Lateral Load Resistance and Earth Pressures

Lateral loads may be resisted by soil friction and the passive resistance of the soil. The following parameters are recommended.

- Allowable Passive Earth Pressure = 350 psf (equivalent fluid weight, includes a factor of safety = 2.0)
- Allowable Coefficient of Friction (soil to footing) = 0.35 (includes a factor of safety = 1.5)
- Retaining structures should be designed to resist a lateral active earth pressure of 35 pcf (equivalent fluid weight) for a level, non-expansive granular backfill with drainage provided.

The active earth pressure provided above is only applicable if the retained earth is allowed to strain sufficiently to achieve the active state. The required minimum horizontal strain to achieve the active state is approximately 0.0025H. Retaining structures should be designed to resist an at-rest lateral earth pressure of 55 pcf (equivalent fluid weight) if this horizontal strain cannot be achieved.

The Mononobe-Okabe method is commonly utilized for calculating seismically induced active and passive lateral earth pressures and is based on the limit equilibrium Coulomb theory for static stress conditions. This method entails three fundamental assumptions (e.g., Seed and Whitman, 1970): Wall movement is sufficient to ensure either active or passive conditions, the driving soil wedge inducing the lateral earth pressures is formed by a planar failure surface starting at the heel of the wall and extending to the free surface of the backfill, and the driving soil wedge and the retaining structure act as rigid bodies, and therefore, experiences uniform accelerations throughout the respective bodies (U.S. Army Corps of Engineers, 2003, Engineering and Design - Stability Analysis of Concrete Structures).

- Seismic Lateral Earth Pressure for level backfill = 18 pcf (equivalent fluid weight)

The seismic lateral earth pressure given above is a triangular distribution increasing with depth, and the resultant of this pressure is an increment of force which should be applied to the back of the wall at 1/3 of the wall height from the wall base. The seismic increment of earth pressure should be added to the static active pressure. Even for the at-rest (K_o) condition, the seismic increment of earth pressure should be added to the static active soil pressure, not to the at-rest (SEAOC Seismology Committee 2019). Per CBC Section 1803.5.12 dynamic seismic lateral earth pressures shall be applied to foundation walls and retaining walls supporting more than 6 feet of backfill. Dynamic seismic lateral earth pressures may also be applied to shorter walls at the discretion of the structural engineer.

3.14 Pole Type Foundations

It is anticipated that light poles, signs, or canopies may be supported on pole-type foundations or drilled piers. This type of foundation should be designed in accordance with Section 1807.3 of the 2019 CBC. It is recommended that an allowable lateral soil bearing pressure of 300 psf per foot of embedment be used to develop parameters S1 and S3 rather than one of the values given in Table 1806.2. This value includes a factor of safety of 2 and may be increased as indicated in Section 1806.3.4. In landscape areas, the upper 12 inches of soil should be ignored when calculating the minimum depth of embedment.

An allowable end bearing pressure of 3,000 psf (includes a factor of safety of 3.0) and an allowable average skin friction of 300 psf (includes a factor of safety of 2.0) may be used to support compressive vertical loads applied to pier foundations that are embedded at least 5 feet. The end bearing should be ignored if the drilled pier excavation

is not properly cleaned out prior to installing the reinforcing steel and placing concrete. The uplift capacity of drilled piers can be calculated using an allowable skin friction of 190 psf plus the weight of the pier. In landscape areas, the skin friction within the upper 12 inches of embedded length should be ignored for compressive or uplift loads. The total settlement of pier foundations designed in accordance with these recommendations should not exceed one-half inch.

Prior to placing reinforcing steel or concrete, loose or disturbed soils should be removed from drilled pier excavations. A representative of the Geotechnical Engineer should observe the drilling and clean-out associated with the construction of pier foundations in order to assess whether the actual bearing conditions are compatible with the conditions anticipated during the preparation of this report. Therefore, for drilled piers that extend to depths of sandy soils, the contractor should be prepared to take measures to prevent caving or significant sloughing in drilled holes (such as temporary casing) from occurring during the drilling and installation of reinforcing steel and concrete. In any case, reinforcing steel and concrete should be installed in an expeditious manner after each drilled hole is cleaned out. The contractor must take responsibility for staging the installation of drilled piers so that significant amounts of sloughing or caving do not occur prior to installing the reinforcing steel and concrete. The annular space around the pole must be backfilled using approved CLSM (controlled low strength material).

3.15 Interior Slabs on Grade

Concrete floors with a minimum thickness of 4 inches are recommended for interior slabs on grade. Existing on-site soils within 5 feet of the ground surface may be considered to have a very low expansion potential for design purposes (Expansion Index of ≤ 20). However, to reduce the potential for excessive cracks as a result of differential movement, consideration should be given to reinforcing concrete slab-on-grade floors with at least #3 bars spaced 24 inches on-center in both directions. Reinforcement consisting of welded or woven wire mesh should not be used, due to the difficulty of keeping it centered in the slab during the construction process. If heavy concentrated or moving loads are anticipated, slabs should be designed using a modulus of subgrade reaction (k) of 180 pci. The concrete mix, reinforcement of slabs, and the location of construction and control joints should be specified by the Design Engineer.

Special care should be taken on floors slabs to be covered with thin-set tile or other inflexible coverings. These areas should have suitable reinforcement that is placed at the mid-height of the slab, to mitigate drying shrinkage cracks. Alternatively, inflexible flooring may be installed with unbonded fabric or liners to prevent reflection of slab cracks through the flooring.

A moisture vapor retarder/barrier is recommended beneath all slabs-on-grade that will be covered by moisture-sensitive flooring materials such as vinyl, linoleum, wood, carpet, rubber, rubber-backed carpet, tile, impermeable floor coatings, adhesives, or where moisture-sensitive equipment, products, or environments will exist. We recommend that design and construction of the moisture vapor retarder/barrier conform to Section 1805 of the 2019 California Building Code and pertinent sections of American Concrete Institute (ACI) guidance documents 302.1R-04, 302.2R-06 and 360R-10.

The moisture vapor retarder/barrier should consist of a minimum 10 mils thick polyethylene with a maximum perm rating of 0.3 in accordance with ASTM E 1745. Seams in the moisture vapor retarder/barrier should be overlapped no less than 6 inches or in accordance with the manufacturer's recommendations. Joints and penetrations should be sealed with the manufacturer's recommended adhesives, pressure-sensitive tape, or both. The contractor must avoid damaging or puncturing the moisture vapor retarder/barrier and repair any punctures with additional polyethylene properly lapped and sealed.

The moisture vapor retarder/barrier may be placed directly beneath the floor slab with no intermediate granular fill layer. The vapor barrier should be placed directly on a smooth compacted subgrade surface consistent with the recommendations provided in Section 3.02 of this report. This method of construction will provide improved curing of the slab bottom and will eliminate potential problems caused by water being trapped in a granular fill layer. However, concrete slabs poured directly on a moisture vapor retarder/barrier can experience shrinkage cracking and curling due to differential rates of curing through the thickness of the slab. Therefore, for concrete placed directly on the moisture vapor retarder/barrier, we recommend a maximum water to cement ratio of 0.45 and the use of water-reducing admixtures to increase workability and decrease bleeding.

Alternatively, the slabs may be constructed over 2 inches of sand that is placed on the moisture vapor retarder/barrier. Granular fill should consist of clean, fine-graded materials with 100% passing the No. 4 sieve, 10% to 30% passing the No. 100 sieve, and less than 5% passing the No. 200 sieve. The granular layer should be moist but not saturated and uniformly compacted by making at least one pass with a vibratory base compactor or some other mechanical method that is approved by the Project Geotechnical Engineer. If uneven, the surface of the sand should be trimmed to provide the full design thickness of the proposed slab. The granular fill layer should not be left exposed to rain or other sources of water such as wet-grinding, power washing, pipe leaks or other processes, and should be damp but not saturated at the time of concrete placement. Granular fill layers that become saturated should be removed and replaced prior to concrete placement.

3.16 Miscellaneous Concrete Flatwork

Miscellaneous concrete flatwork and walkways may be designed with a minimum thickness of 4 inches. Large slabs (greater than 6 feet in width) should be reinforced with a minimum of #3 rebar placed 24 inches on-center in both directions. The reinforcement must be placed at mid-height in the slab. Control joints should be constructed to create squares or rectangles with a maximum spacing of 12 feet. The Project Civil Engineer should provide design details and specifications for all exterior concrete flatwork include walkways. In addition, walkways should be separated from foundations with a thick expansion joint filler.

The subgrade beneath all miscellaneous concrete flatwork and equipment pads should be constructed in accordance with Section 3.04 of this report. The geotechnical engineer should monitor the moisture conditioning and compaction of the subgrade soils in order to verify compliance with our recommendations.

3.17 Footing Excavations and Concrete Subgrade

All footing excavations should be observed by the geotechnical consultant to verify that they have been excavated into competent soils. The foundation excavations should be observed prior to the placement of forms, reinforcement steel, or concrete. These excavations should be evenly trimmed and level. Prior to concrete placement, any loose or soft soils should be removed. Excavated soils should not be placed within slab or footing areas unless properly compacted (see Section 3.04).

Prior to the placement of the moisture barrier and sand, the subgrade soils underlying the slab should be observed by the geotechnical consultant to verify that all under-slab utility trenches have been properly backfilled and compacted, that no loose or soft soils are present, and that the slab subgrade has been properly compacted to a minimum of 90 percent relative compaction within the upper 12 inches.

Footings may experience an overall loss in bearing capacity or an increased potential to settle where located in close proximity to existing or future utility trenches. Furthermore, stresses imposed by the footings on the utility lines may cause cracking, collapse and/or a loss of serviceability. To reduce this risk, footings should extend below a 1:1 plane projected upward from the closest bottom of a parallel utility trench.

The subgrade below slabs on grade and walkways should be brought to a minimum of 0% and a maximum of 4% above the optimum moisture content for a depth of 6 inches prior to the placement of concrete or a moisture barrier. The geotechnical consultant should perform insitu moisture tests to verify that the appropriate moisture content has been achieve a maximum of 72 hours prior to the placement of concrete or moisture barriers.

3.18 Drainage and Moisture Proofing

Surface drainage should be directed away from the proposed improvements into suitable drainage devices (see Section 1804.4 of the 2019 CBC). Neither excess irrigation nor rainwater should be allowed to collect or pond against building foundations or within low-lying or level areas of the lot. Surface waters should be diverted away from the tops of slopes and prevented from draining over the top of slopes and down the slope face.

Walls and portions thereof that retain soil and enclose interior spaces and floors below grade should be waterproofed and damp-proofed in accordance with Section 1805 of the 2019 CBC.

Retaining structures should be drained to prevent the accumulation of subsurface water behind the walls. Backdrains should be installed behind all retaining walls exceeding 3 feet in height. All backdrains should be outlet to suitable drainage devices. Retaining walls less than 3 feet in height should be provided with backdrains or weep holes. Damp-proofing and/or waterproofing should also be provided on all retaining walls exceeding 3 feet in height.

3.19 Cement Type and Corrosion Potential

Soluble sulfate tests performed on a near-surface soil sample indicate soluble sulfate content in the range of 14.2 to 20.7 mg/kg (0.00142 to 0.00207 percent by weight). Thus, below-grade concrete at the subject site should have a negligible exposure to water-soluble sulfate in the soil. Our recommendations for concrete exposed to sulfate-containing soils are presented in the table below.

Recommendations for Concrete Exposed to Soils Containing Soluble Sulfate

Sulfate Exposure	Water Soluble Sulfate (SO_4) in Soil (% by Weight)	Sulfate (SO_4) in Water (ppm)	Cement Type (ASTM C150)	Maximum Water-Cement Ratio (by Weight)	Minimum Compressive Strength (psi)
Negligible	0.00 - 0.10	0-150	--	--	2,500
Moderate	0.10 - 0.20	150-1,500	II	0.50	4,000
Severe	0.20 - 2.00	1,500-10,000	V	0.45	4,500
Very Severe	Over 2.00	Over 10,000	V plus pozzolan or slag	0.45	4,500

Use of alternate combinations of cementitious materials may be permitted if the combinations meet design recommendations contained in American Concrete Institute guideline ACI 318-11.

Our testing also indicates that there is a low to high concentration of soluble chloride (12.1 to 230.0 mg/kg) in the onsite soils; therefore, no special protection of reinforcing steel should be required due to soil conditions.

The soils were also tested for soil reactivity (pH) and electrical resistivity (ohm-cm). The test results indicate that the on-site soils have a pH in the range of 6.22 to 6.91and a minimum electrical resistivity in the range of 1,940 to 3,310 ohm-cm. A neutral or non-corrosive soil has a value ranging from 6.0 to 8.5; thus, the onsite soils can be considered pH neutral. Generally, soils that could be considered moderately corrosive to ferrous metals have minimum resistivity values of about 3,000 ohm-cm to 10,000 ohm-cm. Soils with resistivity values less than 3,000 ohm-cm can be considered corrosive and soils with resistivity values less than 1,000 ohm-cm can be considered extremely corrosive. In any case, buried metal conduits should have a protective coating in accordance with the manufacturer's specifications. A corrosion specialist should be consulted if more detailed recommendations are required.

3.20 Pavement Sections

Current plans indicate that site improvements will include constructing new asphalt concrete (AC) driveways and parking areas. A Traffic Index (TI) in the range of 5.0 to 10.0 is expected to be applicable for the traffic conditions

at the project site. These traffic design assumptions should be reviewed for compatibility with the actual development, and revised pavement sections developed, as necessary. Based on the laboratory testing that has been performed (see Figures B11 and B14 in Appendix B), the subgrade R-Values considered applicable for design purposes and have been used to develop the pavement sections are given below.

Boring Number	Parking Lot	Recommended R-Value
B-17	Northern Parking Lot	15
B-18		
B-19	Western Parking Lot	
B-20		

The asphalt concrete (AC) structural section recommendations given herein were developed using the procedures outlined in Chapter 630 of the California Highway Design Manual. The design procedure is based on the principle that the pavement structural section must be of adequate thickness to distribute the load from the design TI to the subgrade soils in such a manner that the stresses from the applied loads do not exceed the strength of the soil (R-Value). Recommended minimum structural sections the planned pavement sections are given below:

Northern & Western Parking Lots

Design TI	Recommended Minimum Pavement Section
≤ 5.0	2.5” AC over 9.0” Class 2 AB
5.5	3.0” AC over 9.5” Class 2 AB
6.0	3.0” AC over 11.5” Class 2 AB
7.0	4.0” AC over 13.0” Class 2 AB
8.0	4.5” AC over 15.5” Class 2 AB
9.0	5.5” AC over 17.5” Class 2 AB
10.0	6.0” AC over 20.0” Class 2 AB

Prior to paving, the subgrade should be prepared in accordance with the Earthwork Recommendations Section of this report. At a minimum, the upper 12 inches of subgrade soils should be compacted to at least 95% relative compaction. All aggregate base (AB) courses should be moisture conditioned to within 2% of optimum moisture content and compacted to a minimum of 95% relative compaction. The AC mix design(s) and installation requirements should be specified by the Project Civil Engineer.

3.21 Plan Review

Once formal grading and foundation plans are prepared for the subject project, this office should review the plans from a geotechnical viewpoint, comment on changes from the plan used during preparation of this report and revise the recommendations of this report where necessary.

3.22 Geotechnical Observation and Testing During Grading

The geotechnical engineer should be contacted to provide observation and testing during the following stages of grading:

- During the clearing and grubbing of the site.
- During the demolition of any existing structures, buried utilities or other existing improvements.
- During excavation and over-excavation of existing subgrade.
- During all phases of grading including ground preparation and filling operations.
- When any unusual conditions are encountered during grading.

A grading and compaction report summarizing conditions encountered during grading and the in-place density testing that was performed should be submitted upon completion of the earthwork construction.

3.23 Post-Grading Geotechnical Observation and Testing

After the completion of grading the geotechnical engineer should be contacted to provide additional observation and testing during the following construction activities:

- During trenching and backfilling operations of buried improvements and utilities to verify proper backfill and compaction of the utility trenches.
- After excavation and prior to placement of reinforcing steel or concrete within footing excavations to verify that footings are properly founded in competent materials.
- During fine or precise grading involving the placement of any fills underlying driveways, sidewalks, walkways, or other miscellaneous concrete flatwork to verify proper placement, mixing and compaction of fills.
- When any unusual ground or soil conditions are encountered during construction.

4.00 CLOSURE

The findings, conclusions and recommendations in this report were prepared in accordance with generally accepted engineering and geologic principles and practices. No other warranty, either express or implied, is made. This report has been prepared for the Clovis Unified School District and other members of the Project Design Team to be used for the design and construction of improvements at the project site. Anyone using this report for any other purpose must draw their own conclusions regarding required construction procedures and subsurface conditions.

RMA GeoScience should be retained during the earthwork and foundation phases of construction to monitor compliance with the design concepts and recommendations and to provide additional recommendations as needed. Should subsurface conditions be encountered during construction that are different from those described in this report, this office should be notified immediately so that our recommendations may be re-evaluated.

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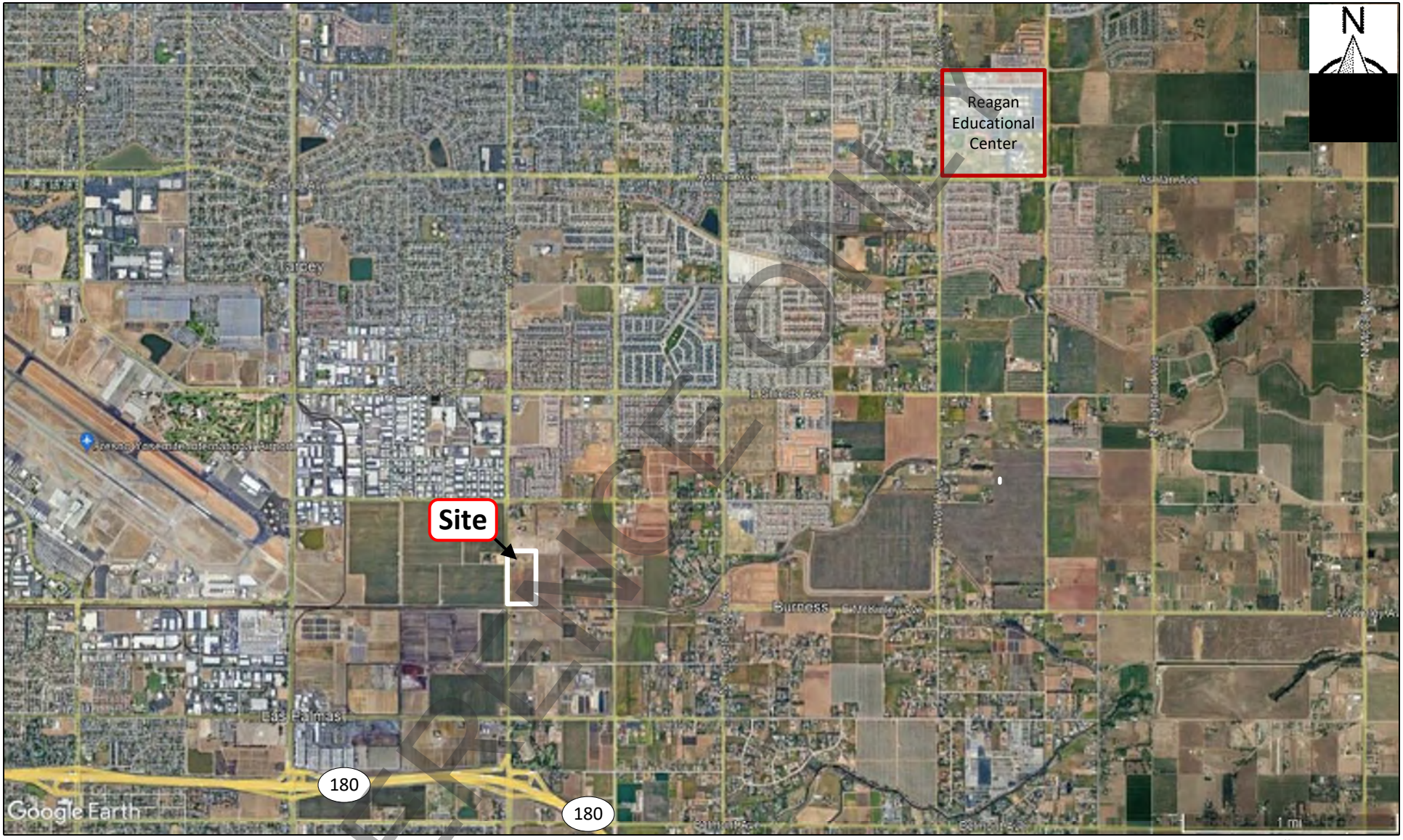
FIGURES



Reference: Google Earth Pro, 2022

Scale: 1" ≈ 0.66 miles

FIGURE 1

SITE VICINITY MAP

New Elementary School for Clovis Unified School District
Southeast Corner of North Fowler Avenue
& East Weldon Avenue
Fresno, California 93727
Project #22G-0308-0

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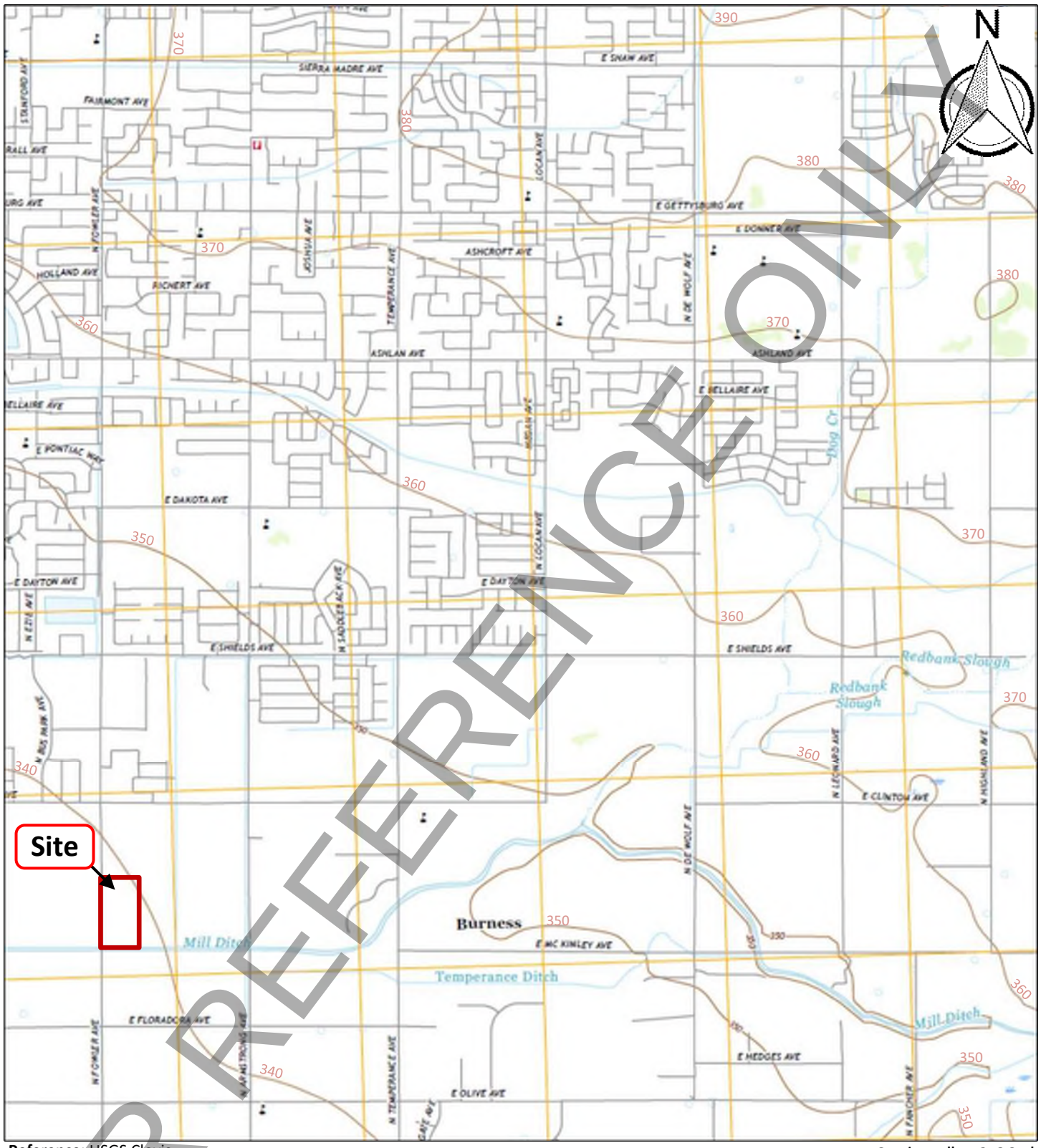

Reference: USGS Clovis Quadrangle, California 7.5-Minute Series, 2018

Scale: 1" ≈ 2,395'

FIGURE 2

USGS CONTOUR MAP

New Elementary School for Clovis Unified School District
Southeast Corner of North Fowler Avenue & East Weldon Avenue
Fresno, California 93727
Project #22G-0308-0

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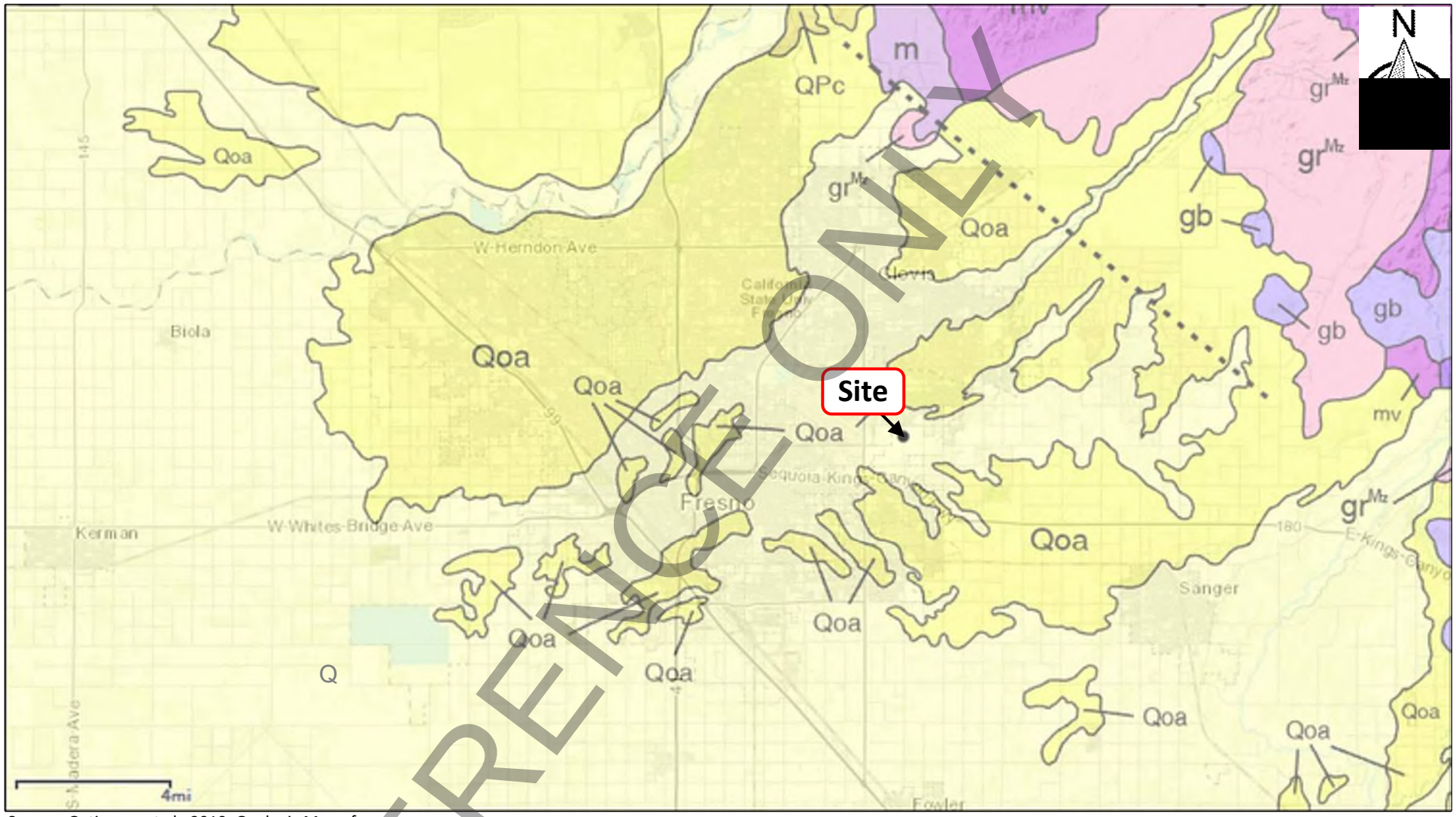

Source: Gutierrez, et al., 2010, Geologic Map of California, California Geologic Survey Map No. 2

FIGURE 3A

REGIONAL GEOLOGIC MAP

New Elementary School for Clovis Unified School District
Southeast Corner of North Fowler Avenue
& East Weldon Avenue
Fresno, California 93727
Project #22G-0308-0

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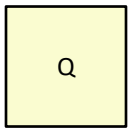
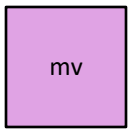


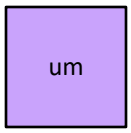
Alluvium, lake, playa, and terrace deposits; consolidated and unconsolidated

Older alluvium, lake, playa, and terrace deposits

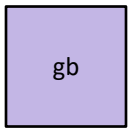


Undivided pre-Cenozoic metavolcanic rocks. Includes latite, dacite, tuff, and greenstone; commonly schistose

Mesozoic granite, quartz monzonite, granodiorite, and quartz diorite



Ultramafic rocks, mostly serpentine. Minor peridotite, gabbro, and diabase; chiefly Mesozoic



Gabbro and dark dioritic rocks; chiefly Mesozoic.

Undivided pre-Cenozoic metasedimentary and metavolcanic rocks of great variety. Mostly slate, quartzite, hornfels, chert, phyllite, mylonite, schist, gneiss, and minor marble

Source: Gutierrez, et al., 2010, Geologic Map of California, California Geologic Survey Map No. 2

FIGURE 3B
LEGEND FOR REGIONAL GEOLOGIC MAP
New Elementary School for Clovis Unified School District
Southeast Corner of North Fowler Avenue
& East Weldon Avenue
Fresno, California 93727
Project #22G-0308-0

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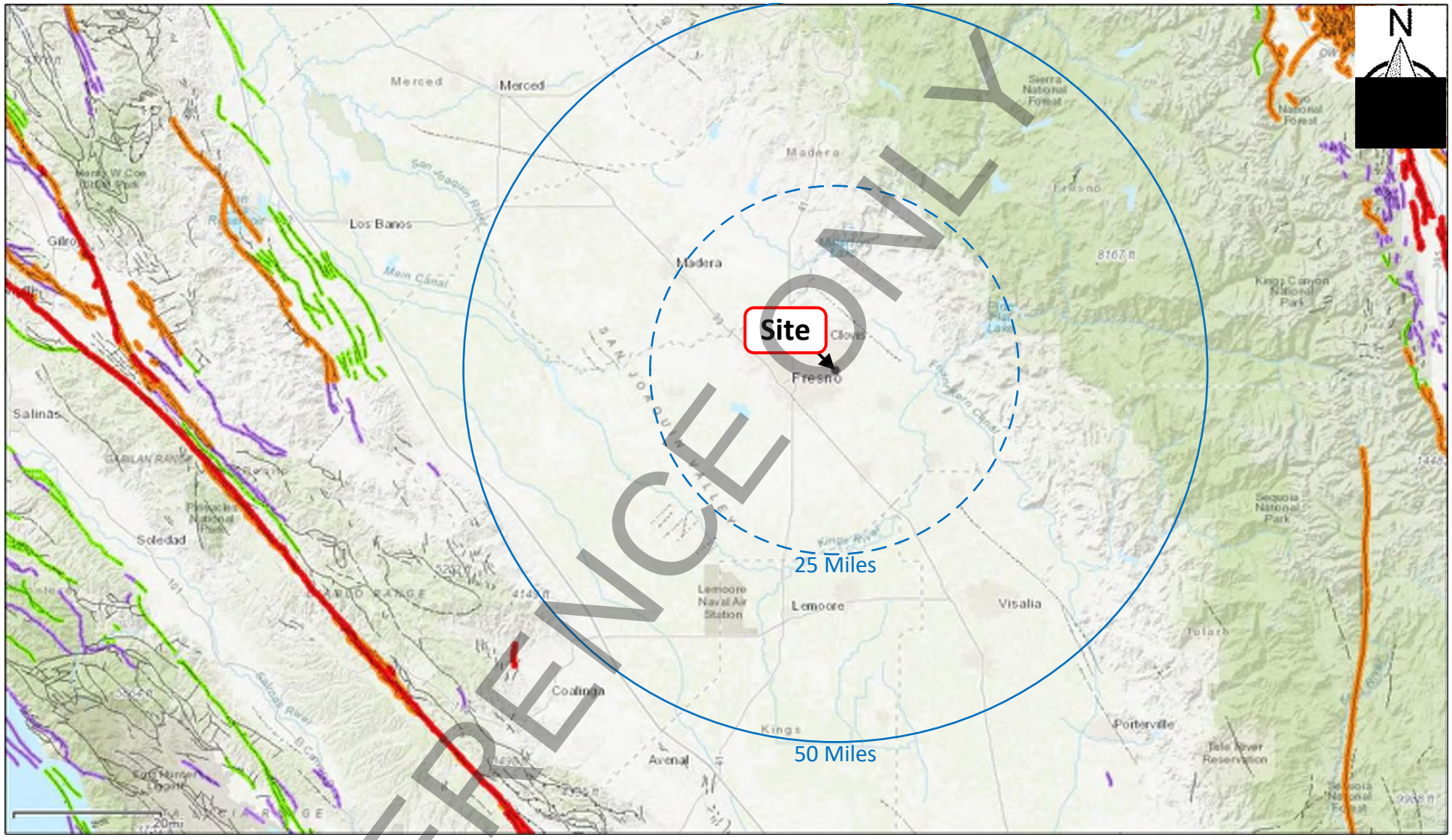

Source: Jennings, C. W., and Bryant, W. A., 2010, Fault Activity Map of California, California Geological Survey, Geologic Data Map No. 6.

Scale: 1" ≈ 19.5 miles

FIGURE 4A

FAULT ACTIVITY MAP

New Elementary School for Clovis Unified School District
Southeast Corner of North Fowler Avenue
& East Weldon Avenue
Fresno, California 93727
Project #22G-0308-0

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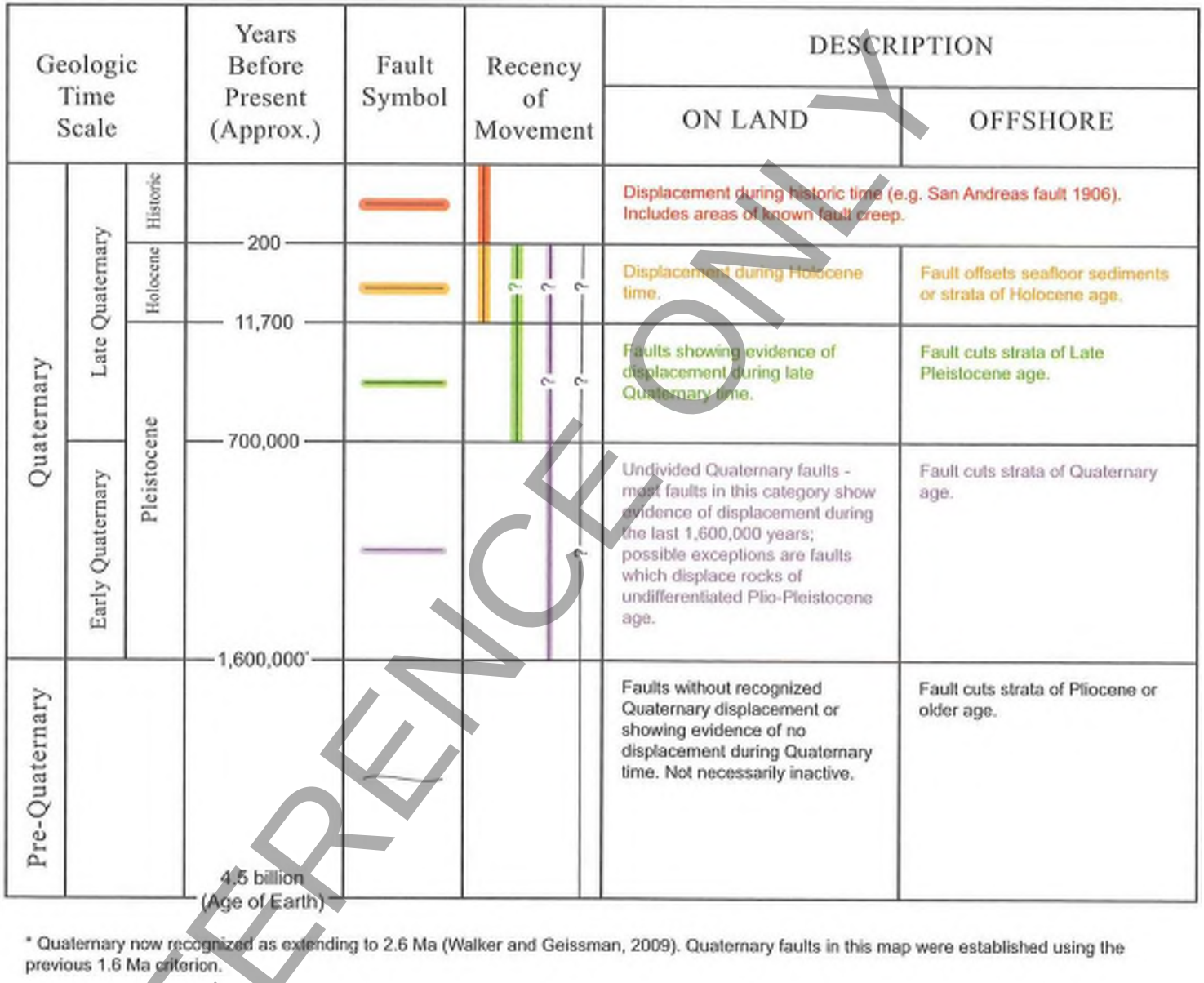

Source: Jennings, C. W., and Bryant, W. A., 2010, Fault Activity Map of California, California Geologic Survey, Geologic Data Map No. 6.

FIGURE 4B
Legend for Fault Activity Map
New Elementary School for Clovis Unified School District
Southeast Corner of North Fowler Avenue
& East Weldon Avenue
Fresno, California 93727
Project #22G-0308-0

Reference: Site Plan prepared by Darden Architects

Scale: 1" ≈ 128'

FIGURE 5

BORING LOCATION MAP

New Elementary School for Clovis Unified School District
Southeast Corner of North Fowler Avenue
& East Weldon Avenue
Fresno, California 93727
Project #22G-0308-0

B-2 Approximate Boring Location

A ——— A' Cross Section Line

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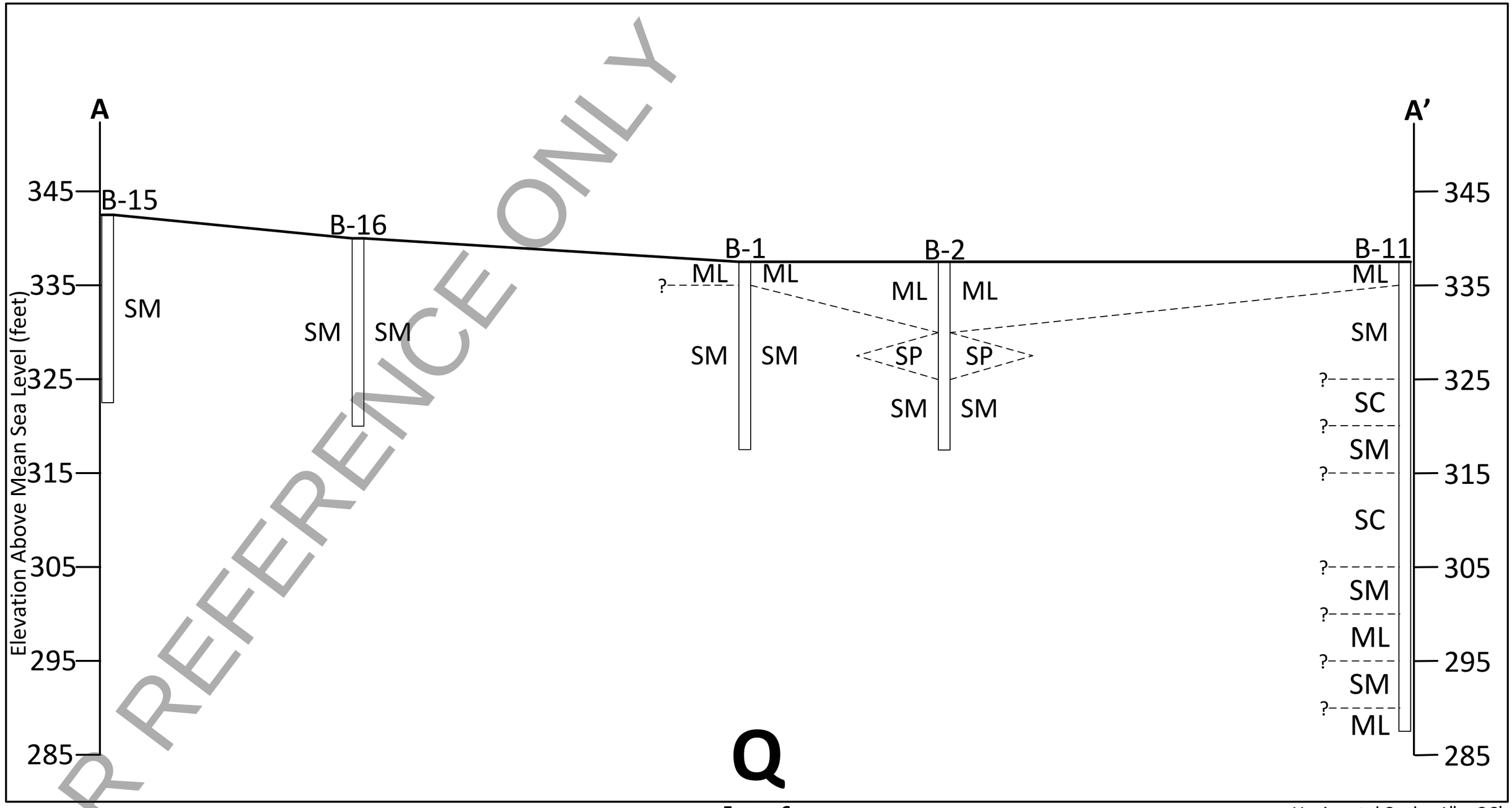

FIGURE 6
CROSS SECTION A TO A'
New Elementary School for Clovis Unified School District
Southeast Corner of North Fowler Avenue & East Weldon Avenue
Fresno, California 93727
Project #22G-0308-0

Horizontal Scale: 1" = 36'
Vertical Scale: 1" = 10'

S33E

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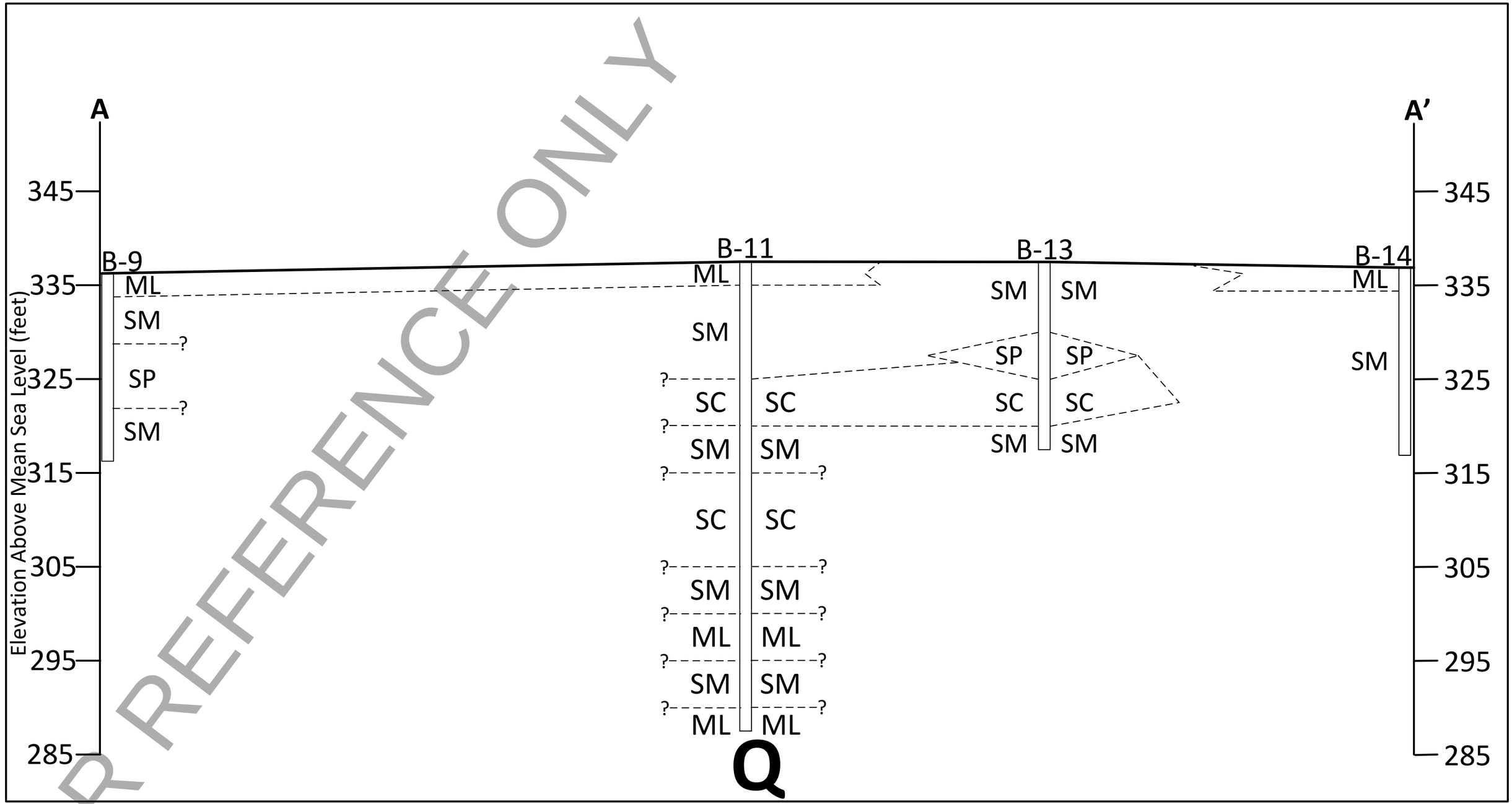

FIGURE 7

CROSS SECTION B TO B'

New Elementary School for Clovis Unified School District
Southeast Corner of North Fowler Avenue & East Weldon Avenue
Fresno, California 93727
Project #22G-0308-0

Horizontal Scale: 1" = 24'
Vertical Scale: 1" = 10'

N37E

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APPENDIX A

FIELD INVESTIGATION

APPENDIX A

FIELD INVESTIGATION

A-1.00 FIELD EXPLORATION

A-1.01 Number of Borings

Our subsurface investigation consisted of excavating a total of twenty (20) test borings to a maximum depth of approximately 51 feet below existing grade. The test borings were excavated with a CME 45 and a SIMCO 2800 drill rigs equipped with a 4-inch solid stem auger and a 140-pound auto-hammer between June 24 and July 28, 2022.

A-1.02 Location of Borings

The approximate locations of the borings are shown on Figure 5, Boring Location Map. GPS coordinates indicated on the logs are based on information provided by Google Earth Pro.

A-1.03 Logging Borings

Boring logs were prepared by one of our staff and are included in this appendix. The log contains factual information and interpretation of subsurface conditions between samples. The stratum indicated on the boring logs represents the approximate boundary between earth units and the transition may be gradual. The logs show subsurface conditions at the dates and locations indicated and may not be representative of subsurface conditions at other locations and times.

Identification of the soils encountered during the subsurface exploration was made using the field identification procedure of the Unified Soils Classification System (ASTM D2488). A legend defining the terms used in describing the relative compaction, consistency or firmness of the soil, and moisture level is provided on the following page. Bag, ring, or tube samples of the major earth units were obtained for laboratory inspection and testing.

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I. SOIL STRENGTH/DENSITY

BASED ON STANDARD PENETRATION TESTS

Compactness of sand		Consistency of clay	
Penetration Resistance N (blows/Ft)	Compactness	Penetration Resistance N (blows/ft)	Consistency
0-4	Very Loose	<2	Very Soft
4-10	Loose	2-4	Soft
10-30	Medium Dense	4-8	Medium Stiff
30-50	Dense	8-15	Stiff
>50	Very Dense	15-30	Very Stiff
		>30	Hard

N = Number of blows of 140 lb. weight falling 30 in. to drive 2-in OD sampler 1 ft. (corrected)

BASED ON RELATIVE COMPACTION

Compactness of sand		Consistency of clay	
% Compaction	Compactness	% Compaction	Consistency
<75	Loose	<80	Soft
75-83	Medium Dense	80-85	Medium Stiff
83-90	Dense	85-90	Stiff
>90	Very Dense	>90	Very Stiff

II. SOIL MOISTURE

Moisture of sands		Moisture of clays	
% Moisture	Description	% Moisture	Description
<5%	Dry	<12%	Dry
5-12%	Moist	12-20%	Moist
>12%	Very Moist, wet	>20%	Very Moist, wet

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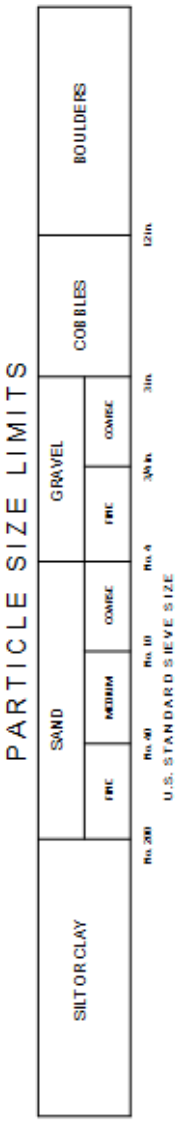

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravel, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravel or gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amt. of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS (More than 50% of material is SMALLER than No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)		ML	Inorganic silts and very fine sands, rock flour silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

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Exploratory Boring Log

Boring No. B-1
Sheet 1 of 1

Date Drilled:	July 27th, 2022	Drilling Equipment:	SIMCO 2800, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.767771°, -119.681370°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0	R	13		14.1	120.7	ML		**ALLUVIUM:** brown, fine to medium SANDY SILT with CLAY, moist, stiff
5	R	75		6.4	124.4	SM		Light brown, fine to medium SILTY SAND, moist, very dense
10	S	42						. . .dense
15	S	24						. . .brown, minor CLAY, medium dense
20	S	26						. . .dark green brown, fine to coarse grained
25								
30								
35								

Notes:
1. Boring terminated at approximately 21'
2. No groundwater encountered
3. Boring backfilled with soil cuttings

***Note**
All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-2
Sheet 1 of 1

Date Drilled:	July 27th, 2022	Drilling Equipment:	SIMCO 2800, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.767818°, -119.681001°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0	R	10		14.2	115.8	ML		**ALLUVIUM:** brown, fine to medium SANDY SILT minor CLAY, moist, stiff
5	R	53		21.1	113.5			. . .red brown, with CLAY, very moist, hard
10	S	15				SP		Red brown, fine to medium SAND, dry, medium dense
15	S	28				SM		Brown, fine to medium SILTY SAND minor CLAY, moist, medium dense
20	S	30						. . .dense
25								Notes: 1. Boring terminated at approximately 21' 2. No groundwater encountered 3. Boring backfilled with soil cuttings
30								
35								

***Note**
All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-3
Sheet 1 of 1

Date Drilled:	July 27th, 2022	Drilling Equipment:	SIMCO 2800, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.768018°, -119.680920°	Drop Height:	30"

Depth (ft)	Sample Type	Blows (blows/ft)	Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0	R	9		7.6	113.7	SM		**ALLUVIUM:** brown, fine to medium SILTY SAND, moist, loose, upper 2 feet recently tilled
5	R	22		9.4	117.2			. . .minor CLAY, medium dense
10	S	22				SP		Red brown, fine to medium SAND, dry, medium dense
15	S	27				SM		Brown, fine to medium SILTY SAND minor CLAY, moist, dense
20	S	30						. . .dark green brown, with CLAY, dense
25								
30								
35								

Notes:
1. Boring terminated at approximately 21'
2. No groundwater encountered
3. Boring backfilled with soil cuttings

***Note**
All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-4
Sheet 1 of 1

Date Drilled:	July 28th, 2022	Drilling Equipment:	SIMCO 2800, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.768050°, -119.680617°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0	R	8		5.7	118.8	SM		**ALLUVIUM:** brown, fine to medium SILTY SAND, moist, loose, upper 2 feet recently tilled
5	R	22		5.7	109.0			. . .light brown, fine grained, medium dense
10	S	14				SP		Red brown, fine to coarse SAND minor fine GRAVEL, dry, medium dense
15	S	37				SM		Brown, fine to medium SILTY SAND minor CLAY, moist, dense
20	S	26						. . .red brown, fine to coarse grained, medium dense
25								Notes: 1. Boring terminated at approximately 21' 2. No groundwater encountered 3. Boring backfilled with soil cuttings
30								
35								

***Note**
All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
- Groundwater
- End of Boring

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GEOTECHNICAL CONSULTANTS

Exploratory Boring Log

Boring No. B-5
Sheet 1 of 1

Date Drilled:	July 28th, 2022	Drilling Equipment:	SIMCO 2800, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.768022°, -119.680289°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0	R	13		5.4	118.3	SM		**ALLUVIUM:** brown, fine to medium SILTY SAND, moist, medium dense, upper 2 feet recently tilled
5	R	9						. . .loose
10	S	21				SP		Red brown, fine to medium SAND, dry, medium dense
15	S	18				SM		Brown, fine SILTY SAND with CLAY, moist, medium dense
20	S	26						. . .fine to medium grained
25								
30								
35								

Notes:
1. Boring terminated at approximately 21'
2. No groundwater encountered
3. Boring backfilled with soil cuttings

***Note**
All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-6

Sheet 1 of 1

Date Drilled:	July 27th, 2022	Drilling Equipment:	SIMCO 2800, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.767613°, -119.681450°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
	R	13		6.8	118.5	ML		**ALLUVIUM:** brown, fine to medium SANDY SILT minor CLAY, dry, stiff
5	R	50/5"		6.6	111.9			. . .light brown, with CLAY, hard, partially cemented
						SM		Dark green brown, fine to medium SILTY SAND minor CLAY, moist, dense
10	S	39						
15	S	18						. . .brown, medium dense
20	S	30						. . .dark green brown, fine to coarse grained, dense
25								
30								
35								

Notes:
1. Boring terminated at approximately 21'
2. No groundwater encountered
3. Boring backfilled with soil cuttings

***Note**

All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
- S - SPT Sample
- Bulk Sample
- T - Modified California Tube Sample
- R - Modified California Ring Sample

Symbols:
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-7

Sheet 1 of 1

Date Drilled:	July 27th, 2022	Drilling Equipment:	SIMCO 2800, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.767376°, -119.681467°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
	R	10		6.6	123.9	ML		**ALLUVIUM:** brown, fine to medium SANDY SILT minor CLAY, moist, stiff
5	R	23		5.4	114.2			Brown, fine SILTY SAND, moist, medium dense
10	S	46				SM		. . .fine to medium grained, with CLAY, dense
15	S	27						. . .medium dense
						SC		Brown, fine to coarse CLAYEY SAND, moist, dense
20	S	41						
25								Notes: 1. Boring terminated at approximately 21' 2. No groundwater encountered 3. Boring backfilled with soil cuttings
30								
35								

***Note**

All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-8
Sheet 1 of 1

Date Drilled:	July 27th, 2022	Drilling Equipment:	CME 45, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.767148°, -119.681445°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0	R	6		4.4	111.5	SM		**ALLUVIUM:** brown, fine to medium SILTY SAND, dry, loose, upper 2 feet recently tilled
5	R	15						. . .light brown, fine to coarse grained, medium dense
10	S	17						. . .brown, with interlayers of fine to medium SAND
15	S	21						. . .fine to medium grained, with CLAY, moist
20	S	27				SC		Red brown, fine to medium CLAYEY SAND, moist, medium dense
25								
30								
35								

Notes:
1. Boring terminated at approximately 21'
2. No groundwater encountered
3. Boring backfilled with soil cuttings

***Note**
All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-9
Sheet 1 of 1

Date Drilled:	June 24th, 2022	Drilling Equipment:	CME 45, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.767088°, -119.680893°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0	R	12	▨	6.4	125.4	ML		**ALLUIVUM:** brown, fine to medium SANDY SILT minor CLAY, dry, stiff
5	R	16		3.5	122.7	SM		Light brown, fine to coarse SILTY SAND minor fine GRAVEL, dry, medium dense
10	S	25				SP		Red brown, fine to medium SAND, dry, medium dense
15	S	31				SM		Brown, fine to coarse SILTY SAND, moist, dense
20	S	30						. . .red brown, with CLAY
25								Notes: 1. Boring terminated at approximately 21' 2. No groundwater encountered 3. Boring backfilled with soil cuttings
30								
35								

***Note**
All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
▨ - Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
▽ - Groundwater
◣ - End of Boring

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Exploratory Boring Log

Boring No. B-10
Sheet 1 of 1

Date Drilled:	June 24th, 2022	Drilling Equipment:	CME 45, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.767118°, -119.680570°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0	R	10	▨	7.9	114.0	ML		**ALLUIVUM:** brown, fine to medium SANDY SILT minor CLAY, dry, stiff
5	R	21		7.4	118.7			. . .light brown, decreasing SILT and CLAY, very stiff
10	S	12				SP		Red brown, fine to medium SAND, dry, medium dense
15	S	23				SM		Brown, fine to coarse SILTY SAND with CLAY, moist, medium dense
20	S	31						. . .minor CLAY, dense
25								Notes: 1. Boring terminated at approximately 21' 2. No groundwater encountered 3. Boring backfilled with soil cuttings
30								
35								

***Note**
All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
▨ - Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
▽ - Groundwater
◣ - End of Boring

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Exploratory Boring Log

Boring No. B-11
Sheet 1 of 2

Date Drilled:	June 24th, 2022	Drilling Equipment:	CME 45, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.767387°, -119.680454°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
	R	8		8.2	108.8	ML		**ALLUIVUM:** brown, fine to medium SANDY SILT minor CLAY, dry, stiff
5	R	17		3.0	109.7	SM		Light brown, fine to medium SILTY SAND, dry, medium dense
10	S	33						. . .red brown, fine to coarse grained, with interlayers of fine to coarse SAND, dense
15	R	68		8.2	130.1	SC		Red brown, fine to coarse CLAYEY SAND, moist, very dense
20	S	29				SM		Brown, fine to medium SILTY SAND, moist, medium dense
25	R	50/5"		17.0	118.1	SC		Red brown, fine to medium CLAYEY SAND, very moist, very dense, partially cemented
								. . .with interlayers of fine to medium SANDY CLAY
30	S	42						. . .dense
35	R	66		13.0	114.8	SM		Brown, fine to medium SILTY SAND, very moist, very dense
	S					ML		Gray, CLAYEY SILT minor fine SAND, moist, hard

***Note**
All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-11
Sheet 2 of 2

Date Drilled:	June 24th, 2022	Drilling Equipment:	CME 45, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.767387°, -119.680454°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
	S	40				ML		. . .with interlayers of gray brown SILTY CLAY
45	R	21		9.2	116.5	SM		Brown, fine to medium SILTY SAND, moist, medium dense
						ML		Brown, fine to medium SANDY SILT with CLAY, moist, very stiff
50	S	23						
55								
60								
65								
70								
75								

This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Notes:
1. Boring terminated at approximately 51'
2. No groundwater encountered
3. Boring backfilled with soil cuttings

***Note**
All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-12
Sheet 1 of 1

Date Drilled:	June 24th, 2022	Drilling Equipment:	CME 45, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.767443°, -119.680222°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
0	R	8		10.3	119.9	ML		**ALLUVIUM:** brown, fine to medium SANDY SILT with CLAY, dry, stiff
5	R	10						. . .with interlayers of dark brown CLAYEY SAND, moist
10	S	22				SP		Red brown, fine to medium SAND, dry, medium dense
15	S	36				SM		Red brown, fine to coarse SILTY SAND, moist, dense
20	S	22						. . .brown, fine to medium grained, medium dense
25								
30								
35								

Notes:
1. Boring terminated at approximately 21'
2. No groundwater encountered
3. Boring backfilled with soil cuttings

***Note**
All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-13
Sheet 1 of 1

Date Drilled:	July 28th, 2022	Drilling Equipment:	SIMCO 2800, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.767577°, -119.680282°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
								This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.
	R	6		3.4	131.1	SM		**ALLUVIUM:** brown, fine to medium SILTY SAND, dry, loose, upper 2 feet recently tilled
5	R	16		12.0	107.1			. . .fine grained, moist, medium dense
						SP		Red brown, fine to medium SAND, dry, medium dense
10	S	19						. . .with interlayers of fine to medium SILTY SAND
						SC		Brown, fine to coarse CLAYEY SAND, moist, medium dense
15	S	17						
						SM		Brown, fine to medium SILTY SAND with CLAY, moist, medium dense
20	S	16						
25								
30								
35								

Notes:
1. Boring terminated at approximately 21'
2. No groundwater encountered
3. Boring backfilled with soil cuttings

***Note**
All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-14
Sheet 1 of 1

Date Drilled:	July 28th, 2022	Drilling Equipment:	SIMCO 2800, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.767848°, -119.680163°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
	R	18	▨	5.6	120.5	ML		**ALLUVIUM:** brown, fine to medium SANDY SILT, dry, very stiff
5	R	18		3.8	113.7			Brown, fine to medium SILTY SAND minor CLAY, dry, medium dense
10	S	14				SM		. . .moist
15	S	27						. . .fine to coarse grained
20	S	30						. . .fine to medium grained, dense
25								
30								
35								

This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Notes:
1. Boring terminated at approximately 21'
2. No groundwater encountered
3. Boring backfilled with soil cuttings

***Note**
All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
▨ - Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
▽ - Groundwater
◣ - End of Boring

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Exploratory Boring Log

Boring No. B-15
Sheet 1 of 1

Date Drilled:	July 22nd, 2022	Drilling Equipment:	CME 45, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.768193°, -119.681997°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
	R	25	▨	5.6	117.2			**ALLUVIUM:** light brown, fine to medium SILTY SAND minor CLAY, moist, medium dense
5	R	50/5"		5.8	124.9			. . .brown, very dense, partially cemented
10	S	65				SM		
15	S	50/3"						. . .fine to coarse grained
20	S	25						. . .dark green brown, medium dense
25								
30								
35								

This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Notes:
1. Boring terminated at approximately 21'
2. No groundwater encountered
3. Boring backfilled with soil cuttings

***Note**
All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
▨ - Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
▽ - Groundwater
◣ - End of Boring

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Exploratory Boring Log

Boring No. B-16
Sheet 1 of 1

Date Drilled:	July 22nd, 2022	Drilling Equipment:	CME 45, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.768174°, -119.681621°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
	R	8		9.3	116.3	SM		**ALLUVIUM:** brown, fine to medium SILTY SAND with CLAY, moist, loose, upper 2 feet recently tilled
5	R	40						. . .dense
10	S	44						. . .dark green brown
15	S	50						. . .brown, very dense
20	S	32						. . .minor CLAY, dense
25								
30								
35								

This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

Notes:
1. Boring terminated at approximately 21'
2. No groundwater encountered
3. Boring backfilled with soil cuttings

***Note**
All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-17
Sheet 1 of 1

Date Drilled:	June 24th, 2022	Drilling Equipment:	CME 45, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.767741°, -119.681944°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
0	S	9		5.0		ML		**ALLUVIUM:** brown, fine to medium SANDY SILT minor CLAY, dry, loose
5								Notes: 1. Boring terminated at approximately 5' 2. No groundwater encountered 3. Boring backfilled with soil cuttings
10								
15								
20								
25								
30								
35								

This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

***Note**
All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-18

Sheet 1 of 1

Date Drilled:	June 24th, 2022	Drilling Equipment:	CME 45, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.766989°, -119.681948°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
0	S	6		9.6		SM		**ALLUVIUM:** brown, fine to medium SILTY SAND, moist, loose
5								Notes: 1. Boring terminated at approximately 5' 2. No groundwater encountered 3. Boring backfilled with soil cuttings
10								
15								
20								
25								
30								
35								

Material Description

This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

***Note**

All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-19
Sheet 1 of 1

Date Drilled:	June 24th, 2022	Drilling Equipment:	CME 45, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.768356°, -119.680907°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
0	S	26		6.8		SM		**ALLUVIUM:** brown, fine to medium SILTY SAND minor CLAY, moist, medium dense
5								Notes: 1. Boring terminated at approximately 5' 2. No groundwater encountered 3. Boring backfilled with soil cuttings
10								
15								
20								
25								
30								
35								

This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

***Note**
All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:
ID = 2.5" OD = 3"

Sample Types:
S - SPT Sample
Bulk Sample
T - Modified California Tube Sample
R - Modified California Ring Sample

Symbols:
- Groundwater
- End of Boring

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Exploratory Boring Log

Boring No. B-20

Sheet 1 of 1

Date Drilled:	June 24th, 2022	Drilling Equipment:	CME 45, Solid Stem Auger
Logged By:	GJV	Borehole Diameter:	4"
Location:	See Boring Location Map	Drive Weights:	140 lbs. (Autohammer)
Geographic Position:	36.768204°, -119.680056°	Drop Height:	30"

Depth (ft)	Samples: Sample Type	Samples: Blows (blows/ft)	Samples: Bulk Sample	Moisture Content (%)	Dry Density (pcf)	USCS	Graphic Symbol	Material Description
0	S	8		8.2		SM		**ALLUVIUM:** brown, fine to medium SILTY SAND minor CLAY, moist, loose
5								Notes: 1. Boring terminated at approximately 5' 2. No groundwater encountered 3. Boring backfilled with soil cuttings
10								
15								
20								
25								
30								
35								

Material Description

This log contains factual information and interpretation of the subsurface conditions between the samples. The stratum indicated on this log represent the approximate boundary between earth units and the transition may be gradual. The log show subsurface conditions at the date and location indicated, and may not be representative of subsurface conditions at other locations and times.

***Note**

All blow counts associated with Modified California Sample are uncorrected. The sampler dimensions are as follows:

ID = 2.5" OD = 3"

Sample Types:

S - SPT Sample

Bulk Sample

T - Modified California Tube Sample

R - Modified California Ring Sample

Symbols:

- Groundwater

- End of Boring

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APPENDIX B

LABORATORY TESTS

APPENDIX B

B-1.00 LABORATORY TESTS

B-1.01 Moisture Determination

The moisture content of tube and ring samples obtained from the test borings was determined in accordance with ASTM D2216, the standard method for determining the water content of soil using a drying oven. The mass of material remaining after oven drying is used as the mass of the solid particles. The results of these tests are provided on the boring logs in Appendix A.

B-1.02 Density of Split-Barrel Samples

The densities of ring and tube samples, which were obtained using a split-barrel sampler, were determined in accordance with ASTM D2937. The results of these tests are provided on the boring logs in Appendix A.

B-1.03 Soluble Sulfates and Chlorides

Tests were performed in accordance with California Test Methods 417 and 422 on three near-surface soil samples obtained during the field exploration. These tests were performed by Dellavalle Laboratory, Inc. located in Fresno, California (see Table B1 for results).

B-1.04 Soil Reactivity (pH) and Minimum Electrical Resistivity

Three near-surface soil samples were tested for soil reactivity (pH) and minimum electrical resistivity using California Test Method 643 (see Table B1). The pH measurement determines the degree of acidity or alkalinity in the soils. The minimum electrical resistivity is used as an indicator of how corrosive the soil is relative to buried metallic items.

TABLE B1: SUMMARY OF CORROSIVITY TESTS

Sample Location	Soluble Sulfates (mg/kg)	Soluble Chlorides (mg/kg)	pH	Minimum Resistivity (ohm-cm)
B-2 @ 1' – 3'	--	--	6.91	1,940
B-10 @ 1' – 3'	20.7	12.1	6.22	3,310
B-15 @ 1' – 3'	14.2	230.0	6.85	3,080

B-1.05 Percent Passing #200 Sieve

Eight soil samples were tested in accordance with ASTM D1140 to determine the percent passing the #200 sieve (see Table B2). This represents the amount of silt and clay that is present in the soil.

TABLE B2: PERCENT PASSING #200 SIEVE TEST RESULTS

Sample Location	Dry Weight Before Wash (grams)	Dry Weight After Wash (grams)	Percent Passing #200 Sieve
B-2 @ 1ft - 3ft	270.9	88.7	67
B-4 @ 1ft - 3ft	290.3	168.9	42
B-6 @ 1ft - 3ft	288.4	126.6	56
B-8 @ 1ft - 3ft	294.4	187.7	36
B-10 @ 1ft - 3ft	289.3	135.3	53
B-12 @ 1ft - 3ft	269.4	102.0	62
B-14 @ 1ft - 3ft	292.2	143.9	51
B-16 @ 1ft - 3ft	281.2	146.2	48

B-1.06 Atterberg Limits

The liquid limit, plastic limit, and the plasticity index of a near-surface soil sample were determined using the standard test methods of ASTM D4318 (See Figure B1).

B-1.07 Expansion Index

Expansion index testing was performed on a near-surface sample of the on-site soils in accordance with the standard test methods of ASTM D4829. The results of this test are shown on Figure B2.

B-1.08 Direct Shear

Four 3-point direct shear tests were performed on representative near-surface samples of soil using the standard test method of ASTM D3080 (consolidated and drained). The shear tests were performed on a direct shear machine of the strain-controlled type. To simulate possible adverse field conditions, the samples were saturated prior to shearing. Three soil specimens were sheared at varying normal loads for the test and the results plotted to establish the angle of the internal friction and cohesion of the tested sample. The results of this test are shown on Figures B3 through B6.

B-1.09 One-Dimensional Consolidation Properties

The magnitude and rate of consolidation of soils obtained from test borings, when it is restrained laterally and drained axially while subjected to incrementally applied controlled-stress loading, was determined using the standard test methods of ASTM D2435. The results of these tests are shown on Figures B7 through B10.

B-1.10 Resistance Value

Four Resistance Value (R-Value) tests were performed on representative samples of subgrade obtained from a planned paved areas using test methods outlined in ASTM D2844 (see Figures B11 through B14).

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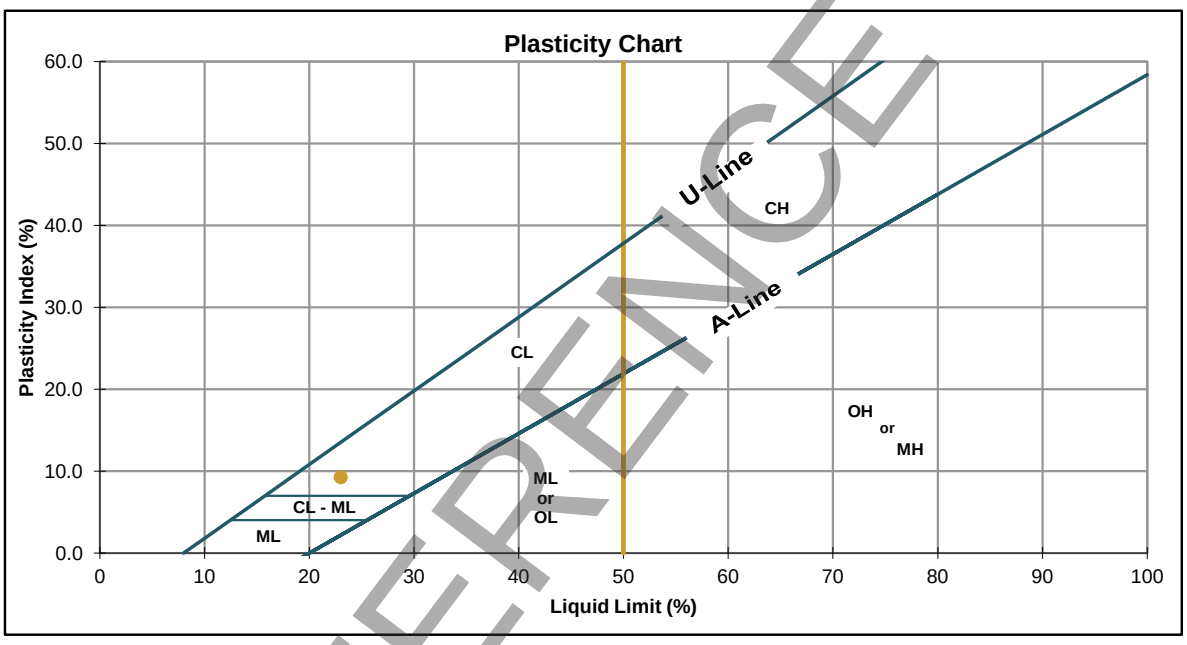
Figure B1
Laboratory Test Form | ASTM D4318
Plasticity Index (PI) of Soils

Project Number:	22G-0308-0/02	Lab ID:	22-010760
Project Name:	New Elementary School for CUSD	Date Tested:	8/4/2022
Sampled By:	Gabe V.	Tested By:	Jason M.
Sample Date:	7/22/2022		
Sample Location:	B-15 @ 1ft - 3ft		
Sample Description:	Silty SAND minor Clay, fine to medium grained, light brown		

Plasticity Index Results

Liquid Limit:	23
Average Plastic Limit :	14
Plasticity Index:	9



Liquid Limit Data

	Trial 1	Trial 2	Trial 3
Wet Weight (gm.)	22.60	22.85	21.39
Dry Weight (gm.)	20.21	20.47	19.37
Tare Weight (gm.)	10.35	10.32	10.38
Number of Blows	17	22	29
Moisture Content (%)	24.2	23.4	22.5

Plastic Limit Data

	Trial 1	Trial 2
Wet Weight (gm.)	31.25	31.40
Dry Weight (gm.)	30.28	30.43
Tare Weight (gm.)	23.32	23.27
Moisture Content (%)	13.9	13.5

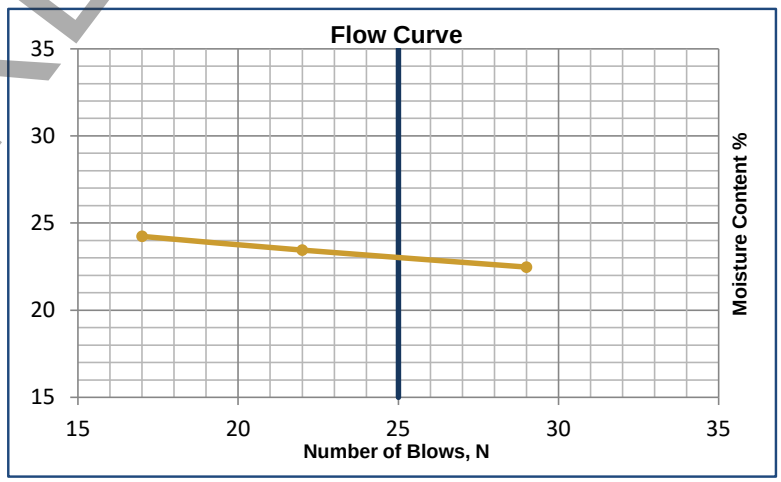


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Figure B2
Laboratory Test Form | ASTM D4829
Expansion Index of Soils

Project Number:	22G-0308-0/02	Lab ID:	22-010529
Project Name:	New Elementary School for CUSD	Date Sampled:	6/24/2022
Sampled By:	Gabe V.	Date Tested:	8/7/2022
Tested By:	Jason M.		
Sample Location:	B-9 @ 1ft - 3ft		
Sample Description:	Sandy SILT minor Clay, fine to medium grained, brown		

Expansion Readings

Initial Sample Height (in):	0.0271
Final Sample Height (in):	0.0435
Expansion (in):	**0.0164**
Expansion Index, EI:	16

Classification of Expansive Soil

EI	Potential Expansion
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
>130	Very High

Expansion Index Data

Initial Set-Up Data		Final Data	
Sample + Tare Weight (gm):	819.7	Sample + Tare Weight (gm):	845.1
Tare Weight (gm):	365.6	Tare Weight (gm):	365.9
Initial Gauge Reading (in):	0.0271	Final Gauge Reading (in):	0.0435
Moisture Content And Density Data			
Wet Weight + Tare (gm):	100.0	Wet Weight + Tare (gm):	833.8
Dry Weight + Tare (gm):	94.3	Dry Weight + Tare (gm):	794.1
Tare Weight (gm):	0	Tare Weight (gm):	365.9
Moisture Content:	6.0%	Moisture Content:	9.3%
Initial Volume (ft^3):	0.007345	Final Volume (ft^3):	0.007391
Remolded Wet Density (pcf):	136.3	Final Wet Density (pcf):	142.9
Remolded Dry Density (pcf):	128.5	Final Dry Density (pcf):	130.8
Degree of Saturation:	**53**	Assumed Specific Gravity:	2.7

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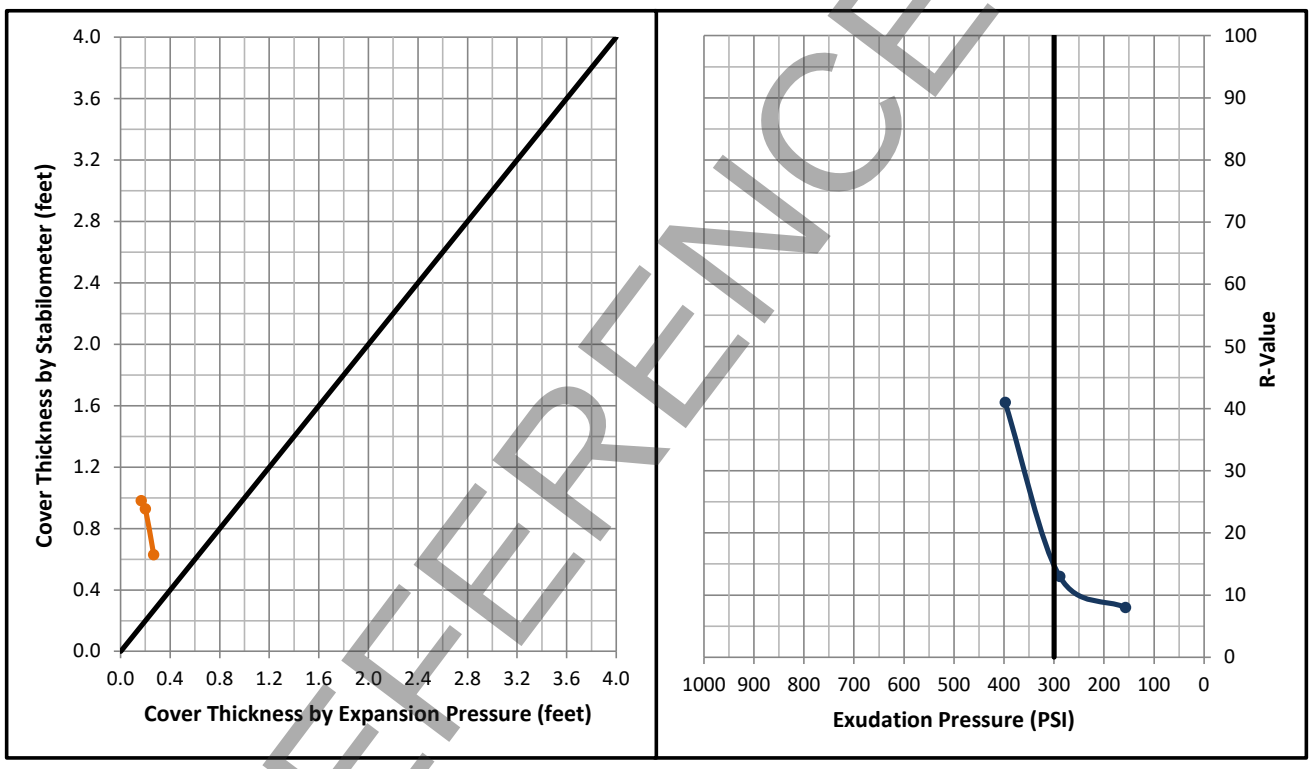
Figure B11
Laboratory Test Form | ASTM D2844
Resistance "R-Value" and Expansion Pressure of Compacted Soil

Project Number:	22G-0308-0/02		
Project Name:	New Elementary School for CUSD	Lab ID:	22-010545
Sampled By:	Gabe V.	Date Sampled:	6/24/2022
Tested By:	Jason M.	Date Tested:	7/21/2022
Sample Location:	B-17 @ 1ft - 3ft		
Description:	Sandy SILT minor Clay, fine to medium grained, brown		

"R" Value at 300psi Exudation Pressure:	15
"R" Value by Expansion Pressure:	N/A



Specimen:	1	2	3
Exudation Pressure Load (lbs):	1972	3623	4992
Exudation Pressure (psi):	157	288	397
Expansion * (0.0001 in):	5	6	8
Expansion Pressure (psf):	22	26	35
Stabilometer Value at 2000 lbs:	136	123	70
Displacement:	4.51	4.81	4.24
Resistance "R" Value:	9	14	43
"R" Value Corrected for Height:	8	13	41
Percent Moisture at Test:	10.3	9.4	8.5
Dry Density at Test (pcf):	128.9	131.9	130.4

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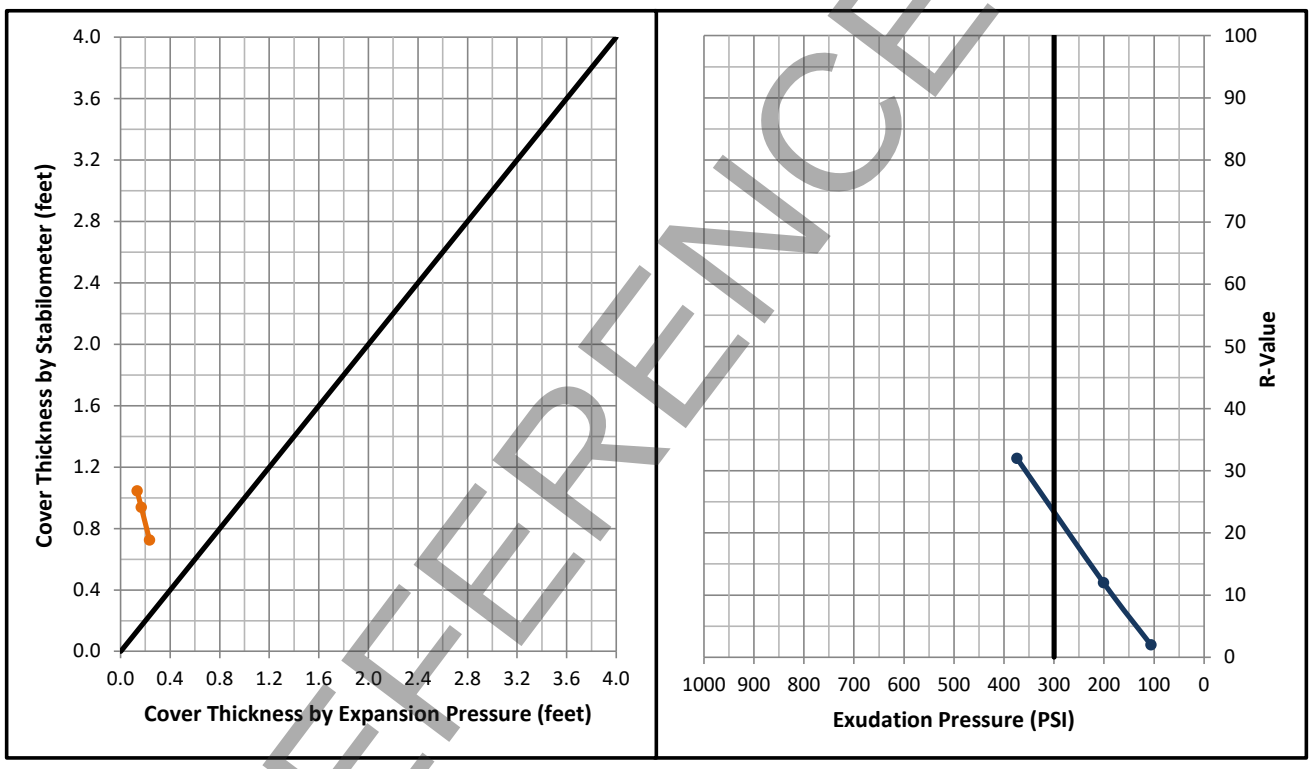
Figure B12
Laboratory Test Form | ASTM D2844
Resistance "R-Value" and Expansion Pressure of Compacted Soil

Project Number:	22G-0308-0/02		
Project Name:	New Elementary School for CUSD	Lab ID:	22-010546
Sampled By:	Gabe V.	Date Sampled:	6/24/2022
Tested By:	Jason M.	Date Tested:	7/21/2022
Sample Location:	B-18 @ 1ft - 3ft		
Description:	Silty SAND, fine to medium grained, brown		

"R" Value at 300psi Exudation Pressure:	23
"R" Value by Expansion Pressure:	N/A



Specimen:	1	2	3
Exudation Pressure Load (lbs):	1333	2525	4700
Exudation Pressure (psi):	106	201	374
Expansion * (0.0001 in):	4	5	7
Expansion Pressure (psf):	17	22	30
Stabilometer Value at 2000 lbs:	154	128	85
Displacement:	5.01	4.4	4.19
Resistance "R" Value:	2	12	34
"R" Value Corrected for Height:	2	12	32
Percent Moisture at Test:	14.2	12.8	11.5
Dry Density at Test (pcf):	128.4	125.8	121.4

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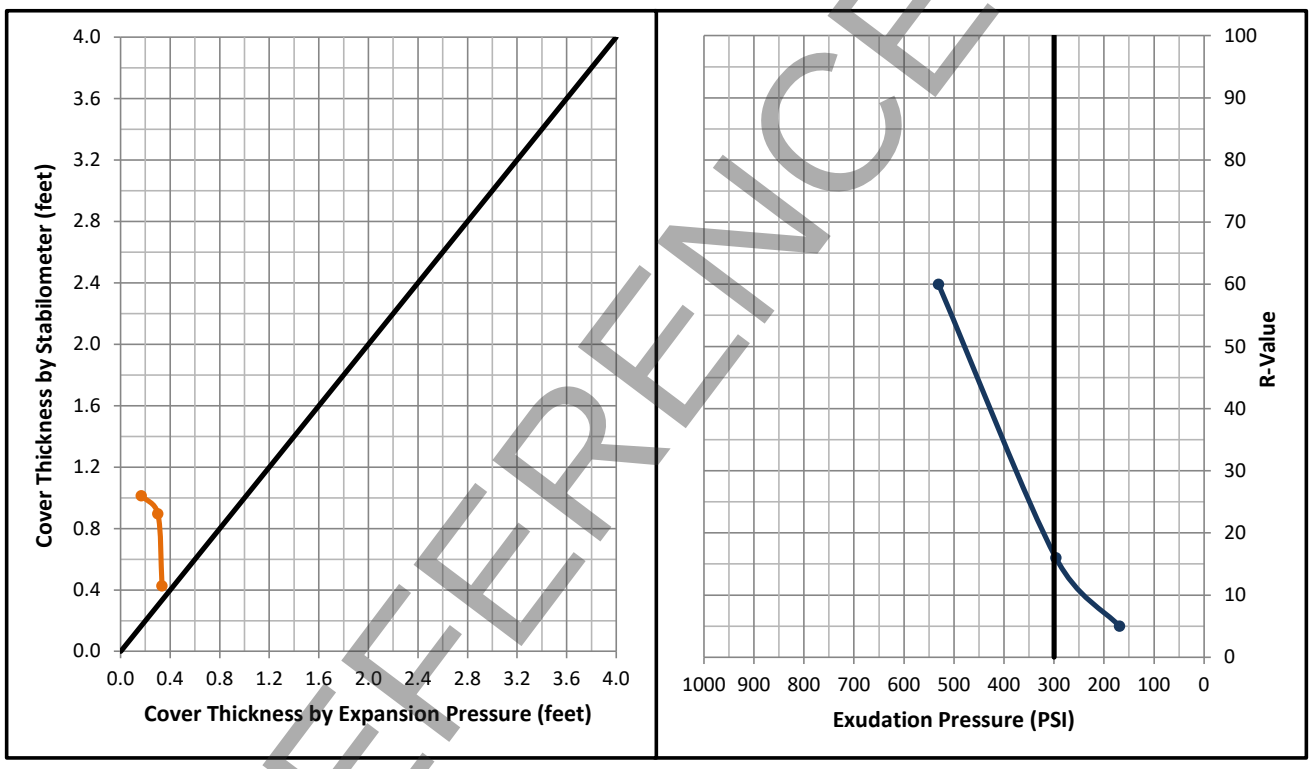
Figure B13
Laboratory Test Form | ASTM D2844
Resistance "R-Value" and Expansion Pressure of Compacted Soil

Project Number:	22G-0308-0/02		
Project Name:	New Elementary School for CUSD	Lab ID:	22-010547
Sampled By:	Gabe V.	Date Sampled:	6/24/2022
Tested By:	Jason M.	Date Tested:	7/22/2022
Sample Location:	B-19 @ 1ft - 3ft		
Description:	Silty SAND minor Clay, fine to medium grained, brown		

"R" Value at 300psi Exudation Pressure:	17
"R" Value by Expansion Pressure:	N/A



Specimen:	1	2	3
Exudation Pressure Load (lbs):	2123	3721	6669
Exudation Pressure (psi):	169	296	531
Expansion * (0.0001 in):	5	9	10
Expansion Pressure (psf):	22	39	43
Stabilometer Value at 2000 lbs:	146	116	45
Displacement:	4.94	4.61	3.98
Resistance "R" Value:	5	17	62
"R" Value Corrected for Height:	5	16	60
Percent Moisture at Test:	12.5	11.5	10.4
Dry Density at Test (pcf):	128.4	129.0	125.6

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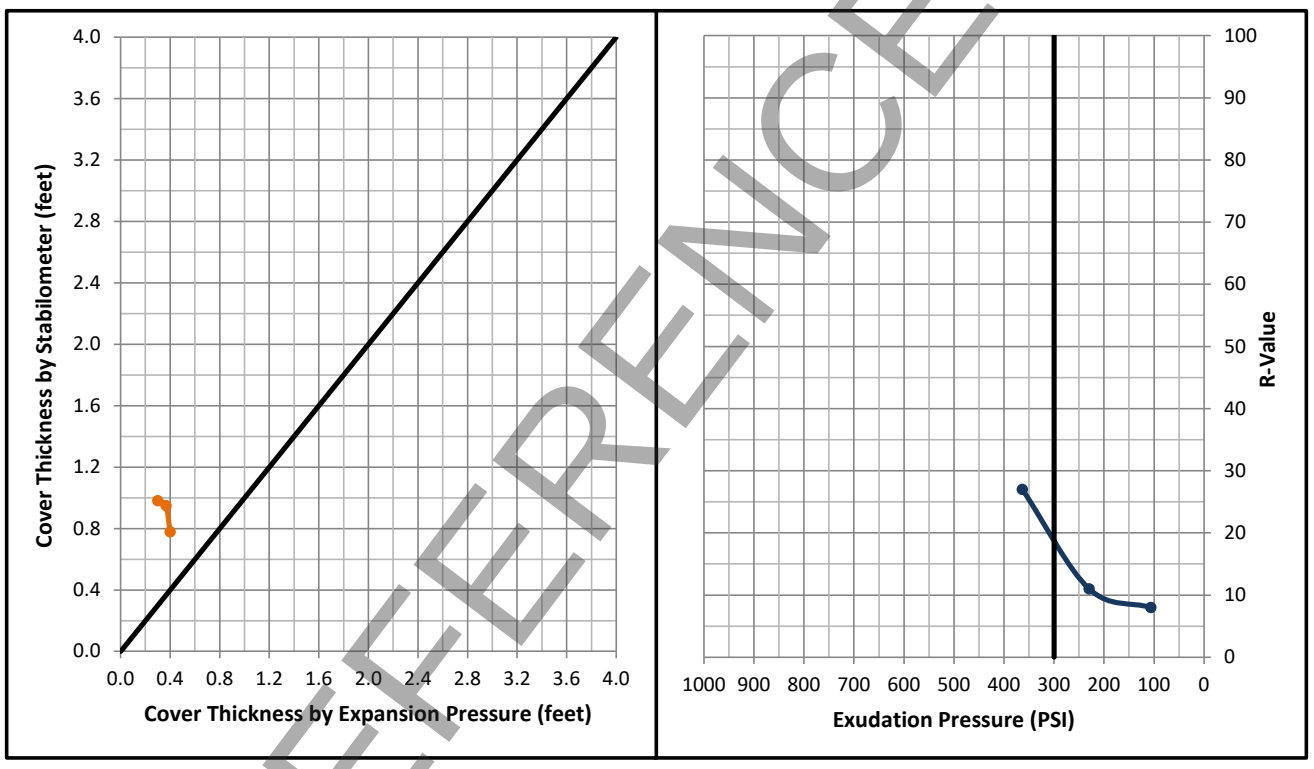
Figure B14
Laboratory Test Form | ASTM D2844
Resistance "R-Value" and Expansion Pressure of Compacted Soil

Project Number:	22G-0308-0/02		
Project Name:	New Elementary School for CUSD	Lab ID:	22-010548
Sampled By:	Gabe V.	Date Sampled:	6/24/2022
Tested By:	Jason M.	Date Tested:	7/22/2022
Sample Location:	B-20 @ 1ft - 3ft		
Description:	Silty SAND minor Clay, fine to medium grained, brown		

"R" Value at 300psi Exudation Pressure:	18
"R" Value by Expansion Pressure:	N/A



Specimen:	1	2	3
Exudation Pressure Load (lbs):	1336	2887	4564
Exudation Pressure (psi):	106	230	363
Expansion * (0.0001 in):	9	11	12
Expansion Pressure (psf):	39	48	52
Stabilometer Value at 2000 lbs:	139	128	94
Displacement:	4.39	4.82	4.61
Resistance "R" Value:	8	11	28
"R" Value Corrected for Height:	8	11	27
Percent Moisture at Test:	12.7	11.8	10.9
Dry Density at Test (pcf):	126.9	128.5	126.2

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APPENDIX C

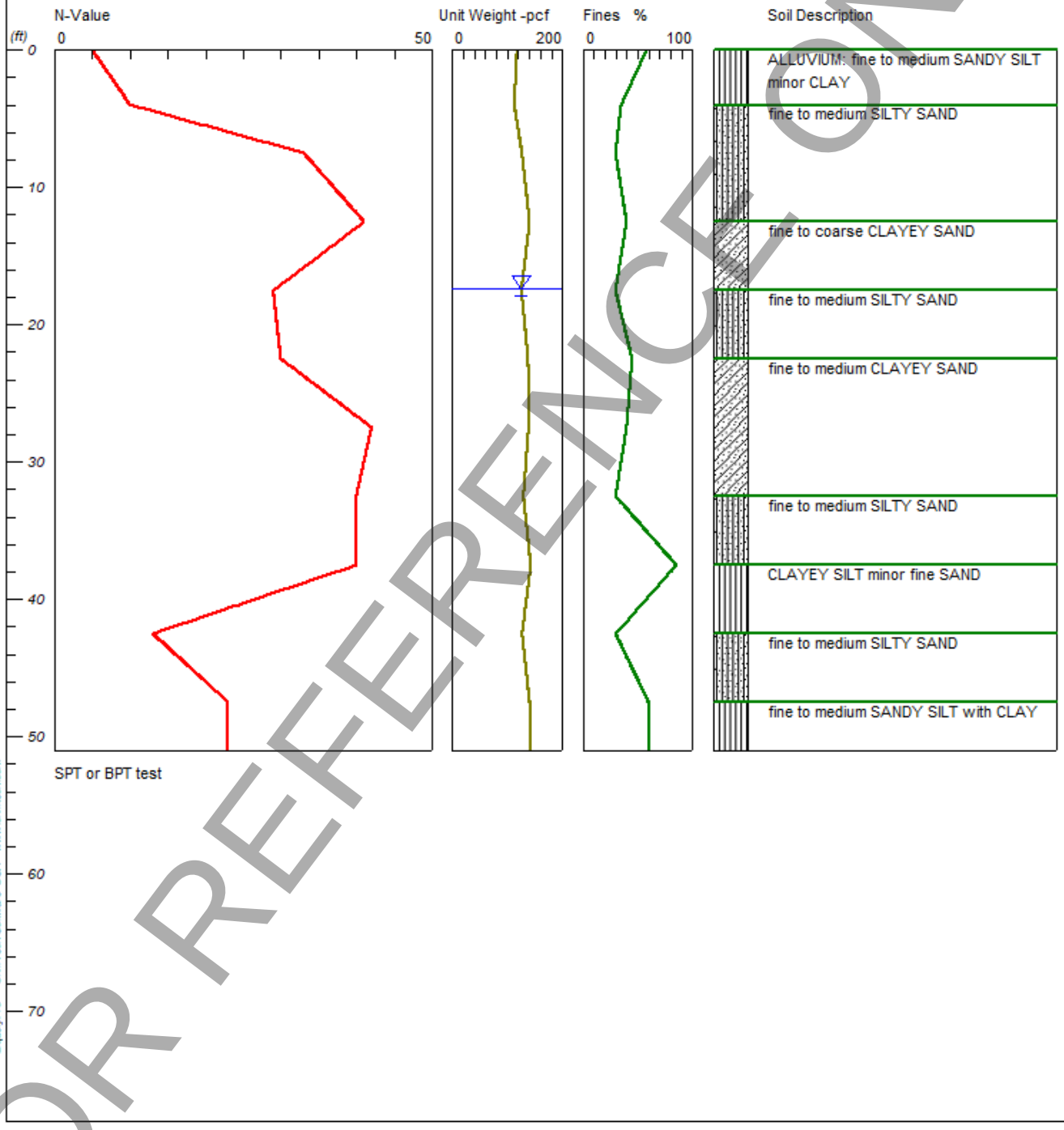
LIQUIFACTION AND SEISMIC SETTLEMENT ANALYSIS
(Figures and Analysis Summary)

LIQUEFACTION ANALYSIS

New Elementary School for CUSD

Hole No.=B-11 Water Depth=17.4 ft Surface Elev.=338

Magnitude=5.5
Acceleration=0.323g

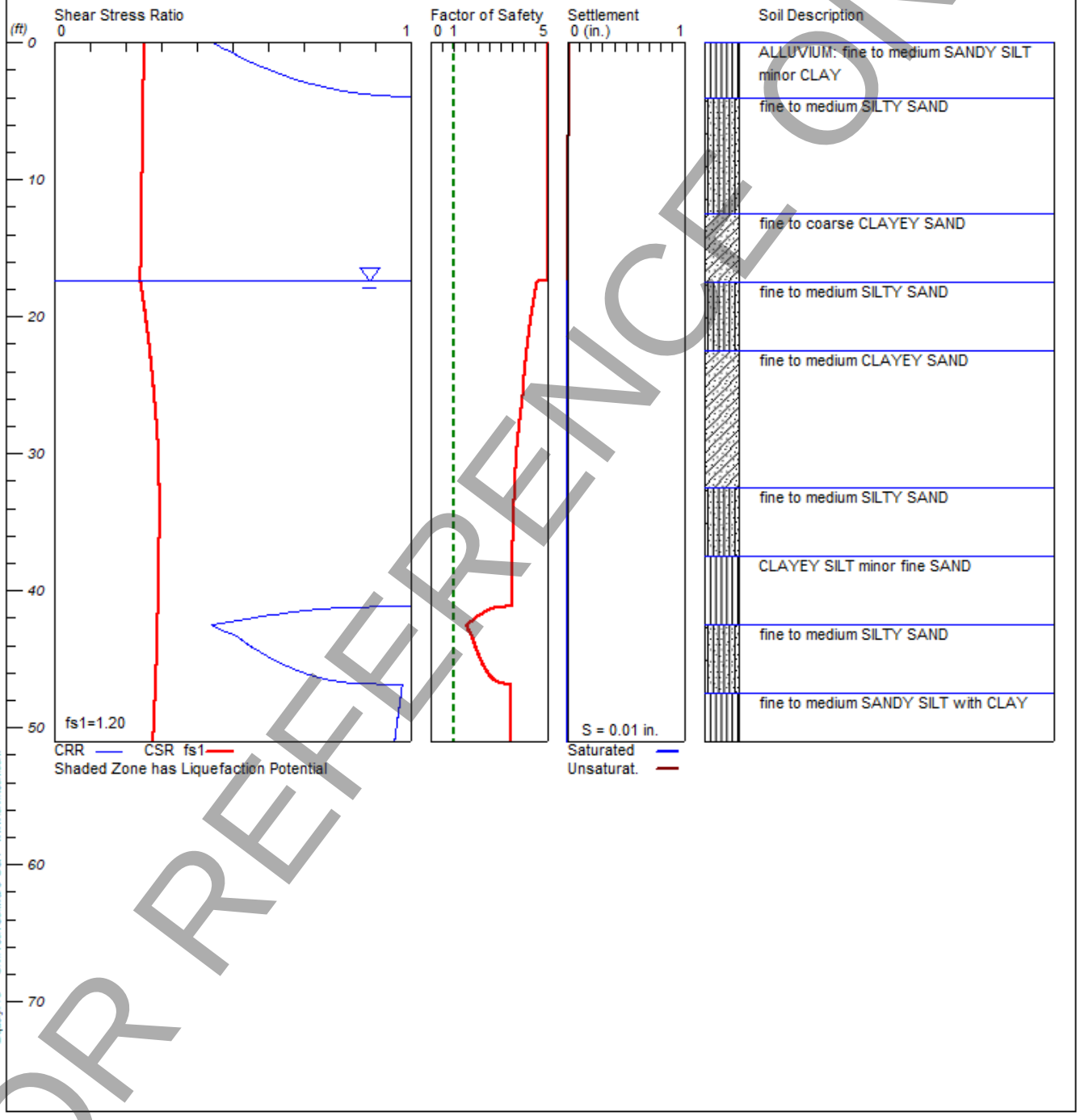


LIQUEFACTION ANALYSIS

New Elementary School for CUSD

Hole No.=B-11 Water Depth=17.4 ft Surface Elev.=338

Magnitude=5.5
Acceleration=0.323g



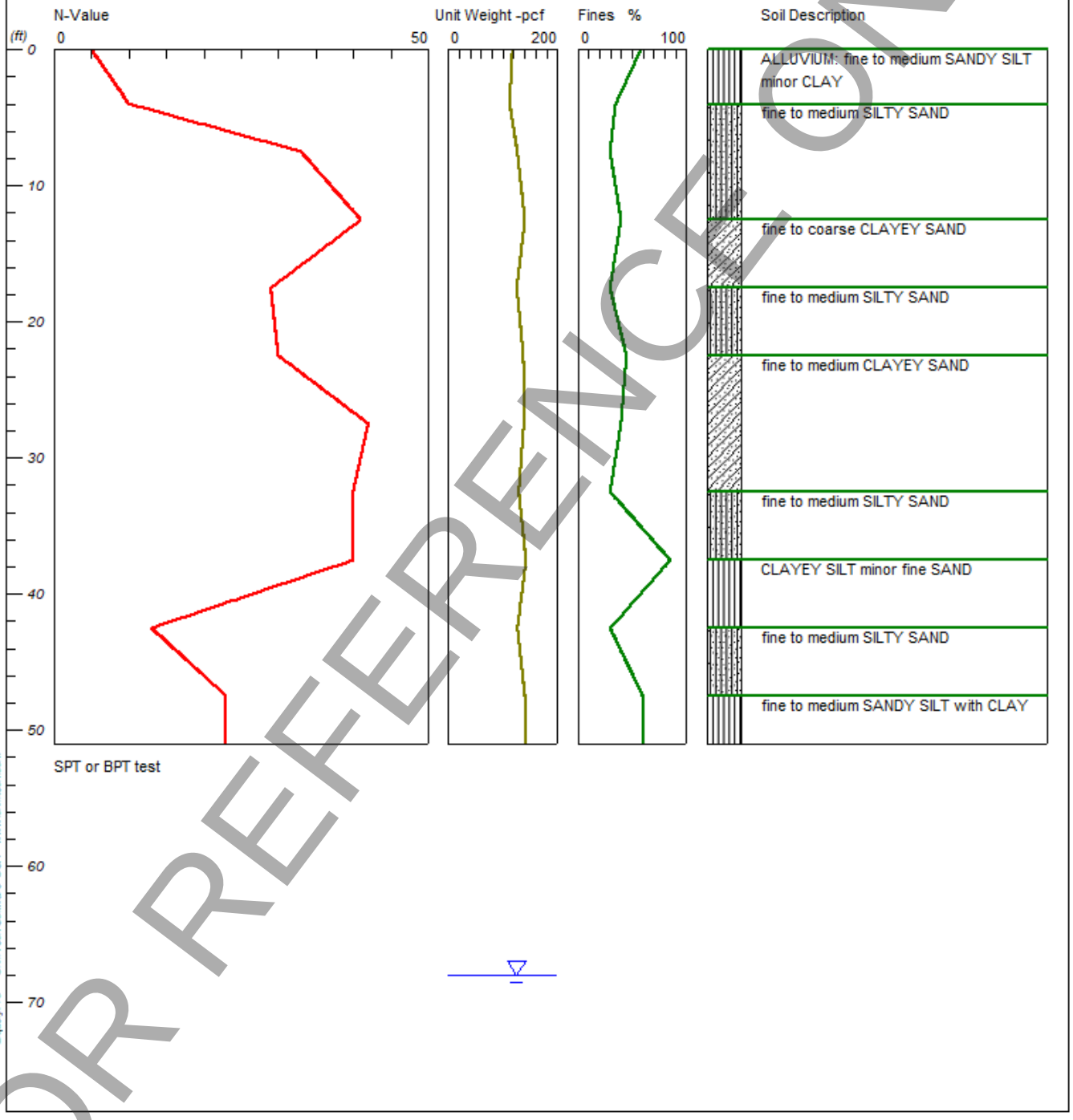
CivilTech Corporation **22G-0308-0** **C-2**

LIQUEFACTION ANALYSIS

New Elementary School for CUSD

Hole No.=B-11 Water Depth=68 ft Surface Elev.=338

Magnitude=5.5
Acceleration=0.323g

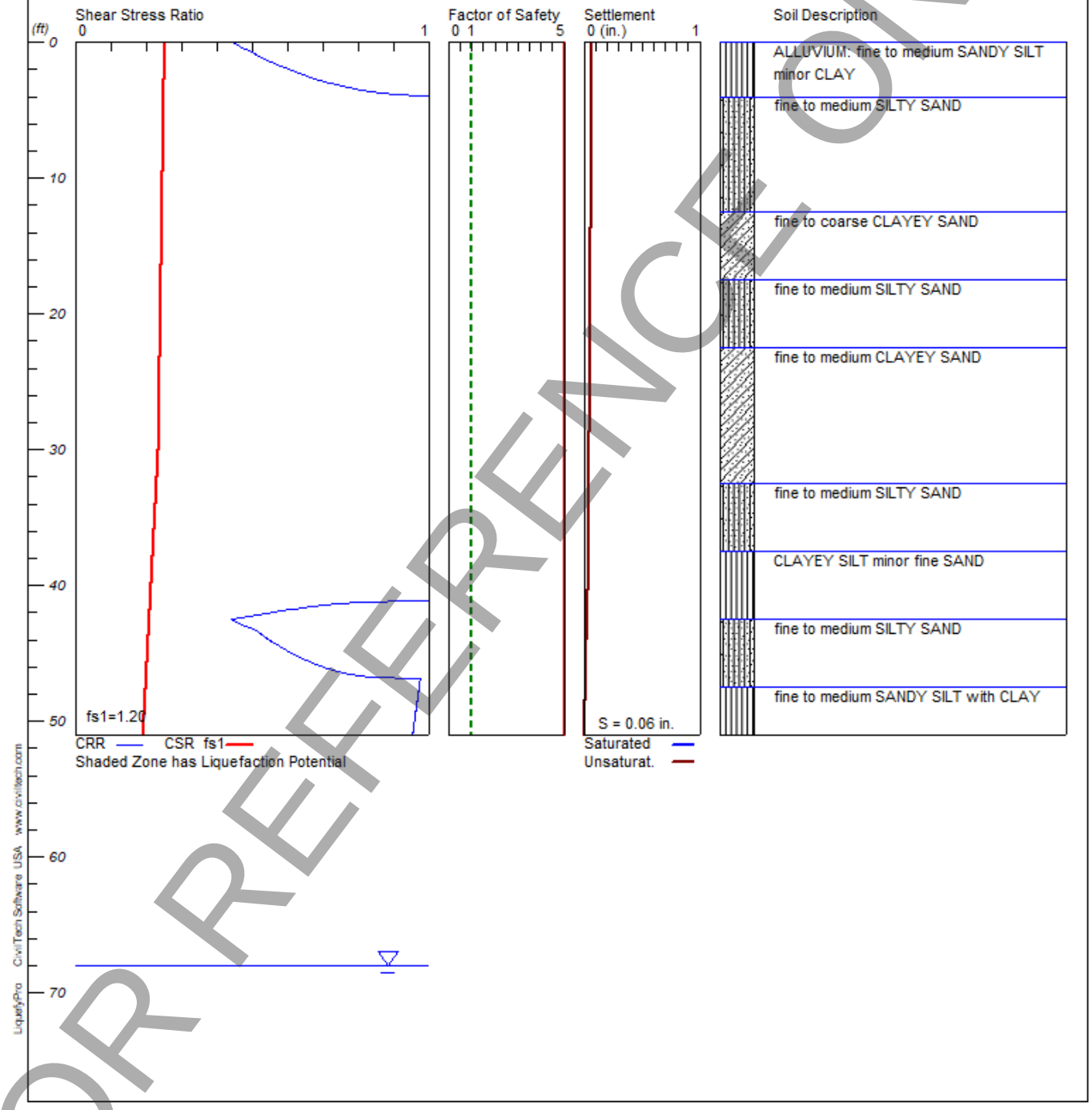


LIQUEFACTION ANALYSIS

New Elementary School for CUSD

Hole No.=B-11 Water Depth=68 ft Surface Elev.=338

Magnitude=5.5
Acceleration=0.323g



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LIQUEFACTION ANALYSIS SUMMARY
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Input File Name: \\tsclient\G_Projects\2022\22G-0308\Originals\Liquifaction\22G-0308-0 Boring B-11.liq
Title: New Elementary School for CUSD
Subtitle: 22G-0308-0

Surface Elev.=338
Hole No.=B-11
Depth of Hole= 51.00 ft
Water Table during Earthquake= 17.40 ft
Water Table during In-Situ Testing= 92.00 ft
Max. Acceleration= 0.32 g
Earthquake Magnitude= 5.50

Input Data:
Surface Elev.=338
Hole No.=B-11
Depth of Hole=51.00 ft
Water Table during Earthquake= 17.40 ft
Water Table during In-Situ Testing= 92.00 ft
Max. Acceleration=0.32 g
Earthquake Magnitude=5.50
No-Liquefiable Soils: Based on Analysis

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Tokimatsu, M-correction
3. Fines Correction for Liquefaction: Stark/Olson et al.*
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1.5
7. Borehole Diameter, Cb= 1
8. Sampling Method, Cs= 1.2
9. User request factor of safety (apply to CSR) , User= 1.2
Plot one CSR curve (fs1=User)
10. Use Curve Smoothing: Yes*
* Recommended Options

In-Situ Test Data:

Depth		SPT	gamma	Fines
ft			pcf	%
0.00	5.00	117.70		58.00
4.00	10.00		113.00	35.00

7.50	33.00	127.00	30.00
12.50	41.00	140.80	40.00
17.50	29.00	126.00	30.00
22.50	30.00	138.20	45.00
27.50	42.00	139.00	40.00
32.50	40.00	129.70	30.00
37.50	40.00	143.00	85.00
42.50	13.00	127.20	30.00
47.50	23.00	141.00	60.00

Output Results:

Settlement of Saturated Sands=0.00 in.
Settlement of Unsaturated Sands=0.01 in.
Total Settlement of Saturated and Unsaturated Sands=0.01 in.
Differential Settlement=0.005 to 0.007 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
0.00	0.45	0.25	5.00	0.00	0.01	0.01
0.05	0.45	0.25	5.00	0.00	0.01	0.01
0.10	0.45	0.25	5.00	0.00	0.01	0.01
0.15	0.46	0.25	5.00	0.00	0.01	0.01
0.20	0.46	0.25	5.00	0.00	0.01	0.01
0.25	0.46	0.25	5.00	0.00	0.01	0.01
0.30	0.47	0.25	5.00	0.00	0.01	0.01
0.35	0.47	0.25	5.00	0.00	0.01	0.01
0.40	0.47	0.25	5.00	0.00	0.01	0.01
0.45	0.48	0.25	5.00	0.00	0.01	0.01
0.50	0.48	0.25	5.00	0.00	0.01	0.01
0.55	0.48	0.25	5.00	0.00	0.01	0.01
0.60	0.49	0.25	5.00	0.00	0.01	0.01
0.65	0.49	0.25	5.00	0.00	0.01	0.01
0.70	0.50	0.25	5.00	0.00	0.01	0.01
0.75	0.50	0.25	5.00	0.00	0.01	0.01
0.80	0.50	0.25	5.00	0.00	0.01	0.01
0.85	0.51	0.25	5.00	0.00	0.01	0.01
0.90	0.51	0.25	5.00	0.00	0.01	0.01
0.95	0.51	0.25	5.00	0.00	0.01	0.01
1.00	0.52	0.25	5.00	0.00	0.01	0.01
1.05	0.52	0.25	5.00	0.00	0.01	0.01
1.10	0.53	0.25	5.00	0.00	0.01	0.01
1.15	0.53	0.25	5.00	0.00	0.01	0.01
1.20	0.53	0.25	5.00	0.00	0.01	0.01
1.25	0.54	0.25	5.00	0.00	0.01	0.01
1.30	0.54	0.25	5.00	0.00	0.01	0.01
1.35	0.55	0.25	5.00	0.00	0.01	0.01
1.40	0.55	0.25	5.00	0.00	0.01	0.01
1.45	0.55	0.25	5.00	0.00	0.01	0.01
1.50	0.56	0.25	5.00	0.00	0.01	0.01
1.55	0.56	0.25	5.00	0.00	0.01	0.01
1.60	0.57	0.25	5.00	0.00	0.01	0.01
1.65	0.57	0.25	5.00	0.00	0.01	0.01

1.70 0.58 0.25 5.00 0.00 0.01 0.01
1.75 0.58 0.25 5.00 0.00 0.01 0.01
1.80 0.59 0.25 5.00 0.00 0.01 0.01
1.85 0.59 0.25 5.00 0.00 0.01 0.01
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12.50	1.11	0.24	5.00	0.00	0.00	0.00
12.55	1.11	0.24	5.00	0.00	0.00	0.00
12.60	1.11	0.24	5.00	0.00	0.00	0.00
12.65	1.11	0.24	5.00	0.00	0.00	0.00
12.70	1.11	0.24	5.00	0.00	0.00	0.00
12.75	1.11	0.24	5.00	0.00	0.00	0.00
12.80	1.11	0.24	5.00	0.00	0.00	0.00
12.85	1.11	0.24	5.00	0.00	0.00	0.00
12.90	1.11	0.24	5.00	0.00	0.00	0.00
12.95	1.11	0.24	5.00	0.00	0.00	0.00
13.00	1.11	0.24	5.00	0.00	0.00	0.00
13.05	1.11	0.24	5.00	0.00	0.00	0.00
13.10	1.11	0.24	5.00	0.00	0.00	0.00
13.15	1.11	0.24	5.00	0.00	0.00	0.00
13.20	1.11	0.24	5.00	0.00	0.00	0.00
13.25	1.11	0.24	5.00	0.00	0.00	0.00
13.30	1.11	0.24	5.00	0.00	0.00	0.00
13.35	1.11	0.24	5.00	0.00	0.00	0.00
13.40	1.11	0.24	5.00	0.00	0.00	0.00
13.45	1.11	0.24	5.00	0.00	0.00	0.00
13.50	1.11	0.24	5.00	0.00	0.00	0.00
13.55	1.11	0.24	5.00	0.00	0.00	0.00
13.60	1.11	0.24	5.00	0.00	0.00	0.00
13.65	1.11	0.24	5.00	0.00	0.00	0.00
13.70	1.11	0.24	5.00	0.00	0.00	0.00
13.75	1.11	0.24	5.00	0.00	0.00	0.00
13.80	1.11	0.24	5.00	0.00	0.00	0.00
13.85	1.11	0.24	5.00	0.00	0.00	0.00
13.90	1.11	0.24	5.00	0.00	0.00	0.00
13.95	1.11	0.24	5.00	0.00	0.00	0.00
14.00	1.11	0.24	5.00	0.00	0.00	0.00
14.05	1.11	0.24	5.00	0.00	0.00	0.00
14.10	1.11	0.24	5.00	0.00	0.00	0.00
14.15	1.11	0.24	5.00	0.00	0.00	0.00
14.20	1.11	0.24	5.00	0.00	0.00	0.00
14.25	1.11	0.24	5.00	0.00	0.00	0.00
14.30	1.11	0.24	5.00	0.00	0.00	0.00
14.35	1.11	0.24	5.00	0.00	0.00	0.00
14.40	1.11	0.24	5.00	0.00	0.00	0.00
14.45	1.11	0.24	5.00	0.00	0.00	0.00
14.50	1.11	0.24	5.00	0.00	0.00	0.00
14.55	1.11	0.24	5.00	0.00	0.00	0.00
14.60	1.11	0.24	5.00	0.00	0.00	0.00
14.65	1.11	0.24	5.00	0.00	0.00	0.00
14.70	1.11	0.24	5.00	0.00	0.00	0.00
14.75	1.11	0.24	5.00	0.00	0.00	0.00
14.80	1.11	0.24	5.00	0.00	0.00	0.00
14.85	1.11	0.24	5.00	0.00	0.00	0.00
14.90	1.11	0.24	5.00	0.00	0.00	0.00
14.95	1.11	0.24	5.00	0.00	0.00	0.00
15.00	1.11	0.24	5.00	0.00	0.00	0.00
15.05	1.11	0.24	5.00	0.00	0.00	0.00
15.10	1.11	0.24	5.00	0.00	0.00	0.00
15.15	1.11	0.24	5.00	0.00	0.00	0.00

15.20	1.11	0.24	5.00	0.00	0.00	0.00
15.25	1.11	0.24	5.00	0.00	0.00	0.00
15.30	1.11	0.24	5.00	0.00	0.00	0.00
15.35	1.11	0.24	5.00	0.00	0.00	0.00
15.40	1.11	0.24	5.00	0.00	0.00	0.00
15.45	1.11	0.24	5.00	0.00	0.00	0.00
15.50	1.11	0.24	5.00	0.00	0.00	0.00
15.55	1.11	0.24	5.00	0.00	0.00	0.00
15.60	1.11	0.24	5.00	0.00	0.00	0.00
15.65	1.11	0.24	5.00	0.00	0.00	0.00
15.70	1.11	0.24	5.00	0.00	0.00	0.00
15.75	1.11	0.24	5.00	0.00	0.00	0.00
15.80	1.11	0.24	5.00	0.00	0.00	0.00
15.85	1.11	0.24	5.00	0.00	0.00	0.00
15.90	1.11	0.24	5.00	0.00	0.00	0.00
15.95	1.11	0.24	5.00	0.00	0.00	0.00
16.00	1.11	0.24	5.00	0.00	0.00	0.00
16.05	1.11	0.24	5.00	0.00	0.00	0.00
16.10	1.11	0.24	5.00	0.00	0.00	0.00
16.15	1.11	0.24	5.00	0.00	0.00	0.00
16.20	1.11	0.24	5.00	0.00	0.00	0.00
16.25	1.11	0.24	5.00	0.00	0.00	0.00
16.30	1.11	0.24	5.00	0.00	0.00	0.00
16.35	1.11	0.24	5.00	0.00	0.00	0.00
16.40	1.11	0.24	5.00	0.00	0.00	0.00
16.45	1.11	0.24	5.00	0.00	0.00	0.00
16.50	1.11	0.24	5.00	0.00	0.00	0.00
16.55	1.11	0.24	5.00	0.00	0.00	0.00
16.60	1.11	0.24	5.00	0.00	0.00	0.00
16.65	1.11	0.24	5.00	0.00	0.00	0.00
16.70	1.11	0.24	5.00	0.00	0.00	0.00
16.75	1.11	0.24	5.00	0.00	0.00	0.00
16.80	1.11	0.24	5.00	0.00	0.00	0.00
16.85	1.11	0.24	5.00	0.00	0.00	0.00
16.90	1.11	0.24	5.00	0.00	0.00	0.00
16.95	1.11	0.24	5.00	0.00	0.00	0.00
17.00	1.11	0.24	5.00	0.00	0.00	0.00
17.05	1.11	0.24	5.00	0.00	0.00	0.00
17.10	1.11	0.24	5.00	0.00	0.00	0.00
17.15	1.11	0.24	5.00	0.00	0.00	0.00
17.20	1.11	0.24	5.00	0.00	0.00	0.00
17.25	1.11	0.24	5.00	0.00	0.00	0.00
17.30	1.11	0.24	5.00	0.00	0.00	0.00
17.35	1.11	0.24	5.00	0.00	0.00	0.00
17.40	1.11	0.24	4.57	0.00	0.00	0.00
17.45	1.11	0.24	4.57	0.00	0.00	0.00
17.50	1.11	0.24	4.56	0.00	0.00	0.00
17.55	1.11	0.24	4.56	0.00	0.00	0.00
17.60	1.11	0.24	4.55	0.00	0.00	0.00
17.65	1.11	0.24	4.55	0.00	0.00	0.00
17.70	1.11	0.24	4.54	0.00	0.00	0.00
17.75	1.11	0.24	4.53	0.00	0.00	0.00
17.80	1.11	0.24	4.53	0.00	0.00	0.00
17.85	1.11	0.24	4.52	0.00	0.00	0.00

17.90	1.11	0.24	4.52	0.00	0.00	0.00
17.95	1.11	0.25	4.51	0.00	0.00	0.00
18.00	1.11	0.25	4.51	0.00	0.00	0.00
18.05	1.11	0.25	4.50	0.00	0.00	0.00
18.10	1.11	0.25	4.49	0.00	0.00	0.00
18.15	1.11	0.25	4.49	0.00	0.00	0.00
18.20	1.11	0.25	4.48	0.00	0.00	0.00
18.25	1.11	0.25	4.48	0.00	0.00	0.00
18.30	1.11	0.25	4.47	0.00	0.00	0.00
18.35	1.11	0.25	4.47	0.00	0.00	0.00
18.40	1.11	0.25	4.46	0.00	0.00	0.00
18.45	1.11	0.25	4.46	0.00	0.00	0.00
18.50	1.11	0.25	4.45	0.00	0.00	0.00
18.55	1.11	0.25	4.45	0.00	0.00	0.00
18.60	1.11	0.25	4.44	0.00	0.00	0.00
18.65	1.11	0.25	4.44	0.00	0.00	0.00
18.70	1.11	0.25	4.43	0.00	0.00	0.00
18.75	1.11	0.25	4.43	0.00	0.00	0.00
18.80	1.11	0.25	4.42	0.00	0.00	0.00
18.85	1.11	0.25	4.42	0.00	0.00	0.00
18.90	1.11	0.25	4.41	0.00	0.00	0.00
18.95	1.11	0.25	4.41	0.00	0.00	0.00
19.00	1.11	0.25	4.40	0.00	0.00	0.00
19.05	1.11	0.25	4.40	0.00	0.00	0.00
19.10	1.11	0.25	4.39	0.00	0.00	0.00
19.15	1.11	0.25	4.39	0.00	0.00	0.00
19.20	1.11	0.25	4.38	0.00	0.00	0.00
19.25	1.11	0.25	4.38	0.00	0.00	0.00
19.30	1.11	0.25	4.37	0.00	0.00	0.00
19.35	1.11	0.25	4.37	0.00	0.00	0.00
19.40	1.11	0.25	4.36	0.00	0.00	0.00
19.45	1.11	0.25	4.36	0.00	0.00	0.00
19.50	1.11	0.25	4.35	0.00	0.00	0.00
19.55	1.11	0.25	4.35	0.00	0.00	0.00
19.60	1.11	0.25	4.35	0.00	0.00	0.00
19.65	1.11	0.25	4.34	0.00	0.00	0.00
19.70	1.11	0.26	4.34	0.00	0.00	0.00
19.75	1.11	0.26	4.33	0.00	0.00	0.00
19.80	1.11	0.26	4.33	0.00	0.00	0.00
19.85	1.11	0.26	4.32	0.00	0.00	0.00
19.90	1.11	0.26	4.32	0.00	0.00	0.00
19.95	1.11	0.26	4.31	0.00	0.00	0.00
20.00	1.11	0.26	4.31	0.00	0.00	0.00
20.05	1.11	0.26	4.31	0.00	0.00	0.00
20.10	1.11	0.26	4.30	0.00	0.00	0.00
20.15	1.11	0.26	4.30	0.00	0.00	0.00
20.20	1.11	0.26	4.29	0.00	0.00	0.00
20.25	1.11	0.26	4.29	0.00	0.00	0.00
20.30	1.11	0.26	4.28	0.00	0.00	0.00
20.35	1.11	0.26	4.28	0.00	0.00	0.00
20.40	1.11	0.26	4.28	0.00	0.00	0.00
20.45	1.11	0.26	4.27	0.00	0.00	0.00
20.50	1.11	0.26	4.27	0.00	0.00	0.00
20.55	1.11	0.26	4.26	0.00	0.00	0.00

20.60	1.11	0.26	4.26	0.00	0.00	0.00
20.65	1.11	0.26	4.25	0.00	0.00	0.00
20.70	1.11	0.26	4.25	0.00	0.00	0.00
20.75	1.11	0.26	4.25	0.00	0.00	0.00
20.80	1.11	0.26	4.24	0.00	0.00	0.00
20.85	1.11	0.26	4.24	0.00	0.00	0.00
20.90	1.11	0.26	4.23	0.00	0.00	0.00
20.95	1.11	0.26	4.23	0.00	0.00	0.00
21.00	1.11	0.26	4.23	0.00	0.00	0.00
21.05	1.11	0.26	4.22	0.00	0.00	0.00
21.10	1.11	0.26	4.22	0.00	0.00	0.00
21.15	1.11	0.26	4.22	0.00	0.00	0.00
21.20	1.11	0.26	4.21	0.00	0.00	0.00
21.25	1.11	0.26	4.21	0.00	0.00	0.00
21.30	1.11	0.26	4.20	0.00	0.00	0.00
21.35	1.11	0.26	4.20	0.00	0.00	0.00
21.40	1.11	0.26	4.20	0.00	0.00	0.00
21.45	1.11	0.26	4.19	0.00	0.00	0.00
21.50	1.11	0.26	4.19	0.00	0.00	0.00
21.55	1.11	0.26	4.19	0.00	0.00	0.00
21.60	1.11	0.26	4.18	0.00	0.00	0.00
21.65	1.11	0.26	4.18	0.00	0.00	0.00
21.70	1.11	0.26	4.17	0.00	0.00	0.00
21.75	1.11	0.27	4.17	0.00	0.00	0.00
21.80	1.11	0.27	4.17	0.00	0.00	0.00
21.85	1.11	0.27	4.16	0.00	0.00	0.00
21.90	1.11	0.27	4.16	0.00	0.00	0.00
21.95	1.11	0.27	4.16	0.00	0.00	0.00
22.00	1.11	0.27	4.15	0.00	0.00	0.00
22.05	1.11	0.27	4.15	0.00	0.00	0.00
22.10	1.11	0.27	4.15	0.00	0.00	0.00
22.15	1.11	0.27	4.14	0.00	0.00	0.00
22.20	1.11	0.27	4.14	0.00	0.00	0.00
22.25	1.11	0.27	4.14	0.00	0.00	0.00
22.30	1.11	0.27	4.13	0.00	0.00	0.00
22.35	1.11	0.27	4.13	0.00	0.00	0.00
22.40	1.11	0.27	4.13	0.00	0.00	0.00
22.45	1.11	0.27	4.12	0.00	0.00	0.00
22.50	1.11	0.27	4.12	0.00	0.00	0.00
22.55	1.11	0.27	4.12	0.00	0.00	0.00
22.60	1.11	0.27	4.11	0.00	0.00	0.00
22.65	1.11	0.27	4.11	0.00	0.00	0.00
22.70	1.11	0.27	4.11	0.00	0.00	0.00
22.75	1.11	0.27	4.10	0.00	0.00	0.00
22.80	1.11	0.27	4.10	0.00	0.00	0.00
22.85	1.11	0.27	4.10	0.00	0.00	0.00
22.90	1.11	0.27	4.09	0.00	0.00	0.00
22.95	1.11	0.27	4.09	0.00	0.00	0.00
23.00	1.11	0.27	4.09	0.00	0.00	0.00
23.05	1.11	0.27	4.08	0.00	0.00	0.00
23.10	1.11	0.27	4.08	0.00	0.00	0.00
23.15	1.11	0.27	4.08	0.00	0.00	0.00
23.20	1.11	0.27	4.08	0.00	0.00	0.00
23.25	1.11	0.27	4.07	0.00	0.00	0.00

23.30	1.11	0.27	4.07	0.00	0.00	0.00
23.35	1.11	0.27	4.07	0.00	0.00	0.00
23.40	1.11	0.27	4.06	0.00	0.00	0.00
23.45	1.11	0.27	4.06	0.00	0.00	0.00
23.50	1.11	0.27	4.06	0.00	0.00	0.00
23.55	1.11	0.27	4.05	0.00	0.00	0.00
23.60	1.11	0.27	4.05	0.00	0.00	0.00
23.65	1.11	0.27	4.05	0.00	0.00	0.00
23.70	1.11	0.27	4.05	0.00	0.00	0.00
23.75	1.11	0.27	4.04	0.00	0.00	0.00
23.80	1.11	0.27	4.04	0.00	0.00	0.00
23.85	1.11	0.27	4.04	0.00	0.00	0.00
23.90	1.11	0.27	4.03	0.00	0.00	0.00
23.95	1.11	0.27	4.03	0.00	0.00	0.00
24.00	1.11	0.27	4.03	0.00	0.00	0.00
24.05	1.11	0.27	4.03	0.00	0.00	0.00
24.10	1.11	0.27	4.02	0.00	0.00	0.00
24.15	1.11	0.28	4.02	0.00	0.00	0.00
24.20	1.11	0.28	4.02	0.00	0.00	0.00
24.25	1.11	0.28	4.01	0.00	0.00	0.00
24.30	1.11	0.28	4.01	0.00	0.00	0.00
24.35	1.11	0.28	4.01	0.00	0.00	0.00
24.40	1.11	0.28	4.01	0.00	0.00	0.00
24.45	1.11	0.28	4.00	0.00	0.00	0.00
24.50	1.11	0.28	4.00	0.00	0.00	0.00
24.55	1.11	0.28	4.00	0.00	0.00	0.00
24.60	1.11	0.28	4.00	0.00	0.00	0.00
24.65	1.11	0.28	3.99	0.00	0.00	0.00
24.70	1.11	0.28	3.99	0.00	0.00	0.00
24.75	1.11	0.28	3.99	0.00	0.00	0.00
24.80	1.11	0.28	3.99	0.00	0.00	0.00
24.85	1.11	0.28	3.98	0.00	0.00	0.00
24.90	1.11	0.28	3.98	0.00	0.00	0.00
24.95	1.11	0.28	3.98	0.00	0.00	0.00
25.00	1.11	0.28	3.97	0.00	0.00	0.00
25.05	1.11	0.28	3.97	0.00	0.00	0.00
25.10	1.11	0.28	3.97	0.00	0.00	0.00
25.15	1.11	0.28	3.97	0.00	0.00	0.00
25.20	1.11	0.28	3.96	0.00	0.00	0.00
25.25	1.11	0.28	3.99	0.00	0.00	0.00
25.30	1.11	0.28	3.98	0.00	0.00	0.00
25.35	1.11	0.28	3.98	0.00	0.00	0.00
25.40	1.11	0.28	3.97	0.00	0.00	0.00
25.45	1.11	0.28	3.97	0.00	0.00	0.00
25.50	1.11	0.28	3.97	0.00	0.00	0.00
25.55	1.11	0.28	3.96	0.00	0.00	0.00
25.60	1.11	0.28	3.96	0.00	0.00	0.00
25.65	1.11	0.28	3.96	0.00	0.00	0.00
25.70	1.11	0.28	3.95	0.00	0.00	0.00
25.75	1.11	0.28	3.95	0.00	0.00	0.00
25.80	1.11	0.28	3.94	0.00	0.00	0.00
25.85	1.11	0.28	3.94	0.00	0.00	0.00
25.90	1.11	0.28	3.94	0.00	0.00	0.00
25.95	1.11	0.28	3.93	0.00	0.00	0.00

26.00	1.11	0.28	3.93	0.00	0.00	0.00
26.05	1.11	0.28	3.93	0.00	0.00	0.00
26.10	1.11	0.28	3.92	0.00	0.00	0.00
26.15	1.11	0.28	3.92	0.00	0.00	0.00
26.20	1.11	0.28	3.92	0.00	0.00	0.00
26.25	1.10	0.28	3.91	0.00	0.00	0.00
26.30	1.10	0.28	3.91	0.00	0.00	0.00
26.35	1.10	0.28	3.91	0.00	0.00	0.00
26.40	1.10	0.28	3.90	0.00	0.00	0.00
26.45	1.10	0.28	3.90	0.00	0.00	0.00
26.50	1.10	0.28	3.89	0.00	0.00	0.00
26.55	1.10	0.28	3.89	0.00	0.00	0.00
26.60	1.10	0.28	3.89	0.00	0.00	0.00
26.65	1.10	0.28	3.88	0.00	0.00	0.00
26.70	1.10	0.28	3.88	0.00	0.00	0.00
26.75	1.10	0.28	3.88	0.00	0.00	0.00
26.80	1.10	0.28	3.87	0.00	0.00	0.00
26.85	1.10	0.28	3.87	0.00	0.00	0.00
26.90	1.10	0.28	3.87	0.00	0.00	0.00
26.95	1.10	0.28	3.86	0.00	0.00	0.00
27.00	1.10	0.28	3.86	0.00	0.00	0.00
27.05	1.10	0.28	3.86	0.00	0.00	0.00
27.10	1.10	0.29	3.85	0.00	0.00	0.00
27.15	1.10	0.29	3.85	0.00	0.00	0.00
27.20	1.10	0.29	3.85	0.00	0.00	0.00
27.25	1.10	0.29	3.84	0.00	0.00	0.00
27.30	1.10	0.29	3.84	0.00	0.00	0.00
27.35	1.10	0.29	3.84	0.00	0.00	0.00
27.40	1.10	0.29	3.83	0.00	0.00	0.00
27.45	1.10	0.29	3.83	0.00	0.00	0.00
27.50	1.10	0.29	3.83	0.00	0.00	0.00
27.55	1.10	0.29	3.82	0.00	0.00	0.00
27.60	1.09	0.29	3.82	0.00	0.00	0.00
27.65	1.09	0.29	3.82	0.00	0.00	0.00
27.70	1.09	0.29	3.81	0.00	0.00	0.00
27.75	1.09	0.29	3.81	0.00	0.00	0.00
27.80	1.09	0.29	3.81	0.00	0.00	0.00
27.85	1.09	0.29	3.80	0.00	0.00	0.00
27.90	1.09	0.29	3.80	0.00	0.00	0.00
27.95	1.09	0.29	3.80	0.00	0.00	0.00
28.00	1.09	0.29	3.79	0.00	0.00	0.00
28.05	1.09	0.29	3.79	0.00	0.00	0.00
28.10	1.09	0.29	3.79	0.00	0.00	0.00
28.15	1.09	0.29	3.79	0.00	0.00	0.00
28.20	1.09	0.29	3.78	0.00	0.00	0.00
28.25	1.09	0.29	3.78	0.00	0.00	0.00
28.30	1.09	0.29	3.78	0.00	0.00	0.00
28.35	1.09	0.29	3.77	0.00	0.00	0.00
28.40	1.09	0.29	3.77	0.00	0.00	0.00
28.45	1.09	0.29	3.77	0.00	0.00	0.00
28.50	1.09	0.29	3.76	0.00	0.00	0.00
28.55	1.09	0.29	3.76	0.00	0.00	0.00
28.60	1.09	0.29	3.76	0.00	0.00	0.00
28.65	1.09	0.29	3.75	0.00	0.00	0.00

28.70	1.09	0.29	3.75	0.00	0.00	0.00
28.75	1.09	0.29	3.75	0.00	0.00	0.00
28.80	1.09	0.29	3.75	0.00	0.00	0.00
28.85	1.09	0.29	3.74	0.00	0.00	0.00
28.90	1.09	0.29	3.74	0.00	0.00	0.00
28.95	1.09	0.29	3.74	0.00	0.00	0.00
29.00	1.08	0.29	3.73	0.00	0.00	0.00
29.05	1.08	0.29	3.73	0.00	0.00	0.00
29.10	1.08	0.29	3.73	0.00	0.00	0.00
29.15	1.08	0.29	3.72	0.00	0.00	0.00
29.20	1.08	0.29	3.72	0.00	0.00	0.00
29.25	1.08	0.29	3.72	0.00	0.00	0.00
29.30	1.08	0.29	3.72	0.00	0.00	0.00
29.35	1.08	0.29	3.71	0.00	0.00	0.00
29.40	1.08	0.29	3.71	0.00	0.00	0.00
29.45	1.08	0.29	3.71	0.00	0.00	0.00
29.50	1.08	0.29	3.70	0.00	0.00	0.00
29.55	1.08	0.29	3.70	0.00	0.00	0.00
29.60	1.08	0.29	3.70	0.00	0.00	0.00
29.65	1.08	0.29	3.70	0.00	0.00	0.00
29.70	1.08	0.29	3.69	0.00	0.00	0.00
29.75	1.08	0.29	3.69	0.00	0.00	0.00
29.80	1.08	0.29	3.69	0.00	0.00	0.00
29.85	1.08	0.29	3.68	0.00	0.00	0.00
29.90	1.08	0.29	3.68	0.00	0.00	0.00
29.95	1.08	0.29	3.68	0.00	0.00	0.00
30.00	1.08	0.29	3.68	0.00	0.00	0.00
30.05	1.08	0.29	3.68	0.00	0.00	0.00
30.10	1.08	0.29	3.67	0.00	0.00	0.00
30.15	1.08	0.29	3.67	0.00	0.00	0.00
30.20	1.08	0.29	3.67	0.00	0.00	0.00
30.25	1.08	0.29	3.67	0.00	0.00	0.00
30.30	1.08	0.29	3.67	0.00	0.00	0.00
30.35	1.08	0.29	3.67	0.00	0.00	0.00
30.40	1.08	0.29	3.66	0.00	0.00	0.00
30.45	1.08	0.29	3.66	0.00	0.00	0.00
30.50	1.07	0.29	3.66	0.00	0.00	0.00
30.55	1.07	0.29	3.66	0.00	0.00	0.00
30.60	1.07	0.29	3.66	0.00	0.00	0.00
30.65	1.07	0.29	3.66	0.00	0.00	0.00
30.70	1.07	0.29	3.65	0.00	0.00	0.00
30.75	1.07	0.29	3.65	0.00	0.00	0.00
30.80	1.07	0.29	3.65	0.00	0.00	0.00
30.85	1.07	0.29	3.65	0.00	0.00	0.00
30.90	1.07	0.29	3.65	0.00	0.00	0.00
30.95	1.07	0.29	3.65	0.00	0.00	0.00
31.00	1.07	0.29	3.65	0.00	0.00	0.00
31.05	1.07	0.29	3.64	0.00	0.00	0.00
31.10	1.07	0.29	3.64	0.00	0.00	0.00
31.15	1.07	0.29	3.64	0.00	0.00	0.00
31.20	1.07	0.29	3.64	0.00	0.00	0.00
31.25	1.07	0.29	3.64	0.00	0.00	0.00
31.30	1.07	0.29	3.64	0.00	0.00	0.00
31.35	1.07	0.29	3.64	0.00	0.00	0.00

31.40	1.07	0.29	3.63	0.00	0.00	0.00
31.45	1.07	0.29	3.63	0.00	0.00	0.00
31.50	1.07	0.29	3.63	0.00	0.00	0.00
31.55	1.07	0.29	3.63	0.00	0.00	0.00
31.60	1.07	0.29	3.63	0.00	0.00	0.00
31.65	1.07	0.29	3.63	0.00	0.00	0.00
31.70	1.07	0.29	3.63	0.00	0.00	0.00
31.75	1.07	0.29	3.62	0.00	0.00	0.00
31.80	1.07	0.29	3.62	0.00	0.00	0.00
31.85	1.07	0.29	3.62	0.00	0.00	0.00
31.90	1.07	0.29	3.62	0.00	0.00	0.00
31.95	1.07	0.29	3.62	0.00	0.00	0.00
32.00	1.06	0.29	3.62	0.00	0.00	0.00
32.05	1.06	0.29	3.62	0.00	0.00	0.00
32.10	1.06	0.29	3.61	0.00	0.00	0.00
32.15	1.06	0.29	3.61	0.00	0.00	0.00
32.20	1.06	0.29	3.61	0.00	0.00	0.00
32.25	1.06	0.29	3.61	0.00	0.00	0.00
32.30	1.06	0.29	3.61	0.00	0.00	0.00
32.35	1.06	0.29	3.61	0.00	0.00	0.00
32.40	1.06	0.29	3.61	0.00	0.00	0.00
32.45	1.06	0.29	3.61	0.00	0.00	0.00
32.50	1.06	0.29	3.60	0.00	0.00	0.00
32.55	1.06	0.29	3.60	0.00	0.00	0.00
32.60	1.06	0.29	3.60	0.00	0.00	0.00
32.65	1.06	0.29	3.60	0.00	0.00	0.00
32.70	1.06	0.29	3.60	0.00	0.00	0.00
32.75	1.06	0.29	3.60	0.00	0.00	0.00
32.80	1.06	0.29	3.60	0.00	0.00	0.00
32.85	1.06	0.29	3.60	0.00	0.00	0.00
32.90	1.06	0.29	3.59	0.00	0.00	0.00
32.95	1.06	0.29	3.59	0.00	0.00	0.00
33.00	1.06	0.29	3.59	0.00	0.00	0.00
33.05	1.06	0.29	3.59	0.00	0.00	0.00
33.10	1.06	0.29	3.59	0.00	0.00	0.00
33.15	1.06	0.29	3.59	0.00	0.00	0.00
33.20	1.06	0.29	3.59	0.00	0.00	0.00
33.25	1.06	0.29	3.59	0.00	0.00	0.00
33.30	1.06	0.29	3.58	0.00	0.00	0.00
33.35	1.06	0.29	3.58	0.00	0.00	0.00
33.40	1.06	0.29	3.58	0.00	0.00	0.00
33.45	1.06	0.29	3.58	0.00	0.00	0.00
33.50	1.06	0.29	3.58	0.00	0.00	0.00
33.55	1.05	0.29	3.58	0.00	0.00	0.00
33.60	1.05	0.29	3.58	0.00	0.00	0.00
33.65	1.05	0.29	3.58	0.00	0.00	0.00
33.70	1.05	0.29	3.57	0.00	0.00	0.00
33.75	1.05	0.29	3.57	0.00	0.00	0.00
33.80	1.05	0.29	3.57	0.00	0.00	0.00
33.85	1.05	0.29	3.57	0.00	0.00	0.00
33.90	1.05	0.29	3.57	0.00	0.00	0.00
33.95	1.05	0.29	3.57	0.00	0.00	0.00
34.00	1.05	0.29	3.57	0.00	0.00	0.00
34.05	1.05	0.29	3.57	0.00	0.00	0.00

34.10	1.05	0.29	3.57	0.00	0.00	0.00
34.15	1.05	0.29	3.56	0.00	0.00	0.00
34.20	1.05	0.29	3.56	0.00	0.00	0.00
34.25	1.05	0.29	3.56	0.00	0.00	0.00
34.30	1.05	0.29	3.56	0.00	0.00	0.00
34.35	1.05	0.29	3.56	0.00	0.00	0.00
34.40	1.05	0.29	3.56	0.00	0.00	0.00
34.45	1.05	0.29	3.56	0.00	0.00	0.00
34.50	1.05	0.29	3.56	0.00	0.00	0.00
34.55	1.05	0.29	3.56	0.00	0.00	0.00
34.60	1.05	0.29	3.56	0.00	0.00	0.00
34.65	1.05	0.29	3.55	0.00	0.00	0.00
34.70	1.05	0.29	3.55	0.00	0.00	0.00
34.75	1.05	0.29	3.55	0.00	0.00	0.00
34.80	1.05	0.29	3.55	0.00	0.00	0.00
34.85	1.05	0.29	3.55	0.00	0.00	0.00
34.90	1.05	0.29	3.55	0.00	0.00	0.00
34.95	1.05	0.29	3.55	0.00	0.00	0.00
35.00	1.05	0.29	3.55	0.00	0.00	0.00
35.05	1.05	0.29	3.55	0.00	0.00	0.00
35.10	1.05	0.29	3.55	0.00	0.00	0.00
35.15	1.04	0.29	3.54	0.00	0.00	0.00
35.20	1.04	0.29	3.54	0.00	0.00	0.00
35.25	1.04	0.29	3.54	0.00	0.00	0.00
35.30	1.04	0.29	3.54	0.00	0.00	0.00
35.35	1.04	0.29	3.54	0.00	0.00	0.00
35.40	1.04	0.29	3.54	0.00	0.00	0.00
35.45	1.04	0.29	3.54	0.00	0.00	0.00
35.50	1.04	0.29	3.54	0.00	0.00	0.00
35.55	1.04	0.29	3.54	0.00	0.00	0.00
35.60	1.04	0.29	3.54	0.00	0.00	0.00
35.65	1.04	0.29	3.54	0.00	0.00	0.00
35.70	1.04	0.29	3.53	0.00	0.00	0.00
35.75	1.04	0.29	3.53	0.00	0.00	0.00
35.80	1.04	0.29	3.53	0.00	0.00	0.00
35.85	1.04	0.29	3.53	0.00	0.00	0.00
35.90	1.04	0.29	3.53	0.00	0.00	0.00
35.95	1.04	0.29	3.53	0.00	0.00	0.00
36.00	1.04	0.29	3.53	0.00	0.00	0.00
36.05	1.04	0.29	3.53	0.00	0.00	0.00
36.10	1.04	0.29	3.53	0.00	0.00	0.00
36.15	1.04	0.29	3.53	0.00	0.00	0.00
36.20	1.04	0.29	3.53	0.00	0.00	0.00
36.25	1.04	0.29	3.52	0.00	0.00	0.00
36.30	1.04	0.29	3.52	0.00	0.00	0.00
36.35	1.04	0.29	3.52	0.00	0.00	0.00
36.40	1.04	0.29	3.52	0.00	0.00	0.00
36.45	1.04	0.29	3.52	0.00	0.00	0.00
36.50	1.04	0.29	3.52	0.00	0.00	0.00
36.55	1.04	0.29	3.52	0.00	0.00	0.00
36.60	1.04	0.29	3.52	0.00	0.00	0.00
36.65	1.04	0.29	3.52	0.00	0.00	0.00
36.70	1.03	0.29	3.52	0.00	0.00	0.00
36.75	1.03	0.29	3.52	0.00	0.00	0.00

36.80	1.03	0.29	3.52	0.00	0.00	0.00
36.85	1.03	0.29	3.52	0.00	0.00	0.00
36.90	1.03	0.29	3.51	0.00	0.00	0.00
36.95	1.03	0.29	3.51	0.00	0.00	0.00
37.00	1.03	0.29	3.51	0.00	0.00	0.00
37.05	1.03	0.29	3.51	0.00	0.00	0.00
37.10	1.03	0.29	3.51	0.00	0.00	0.00
37.15	1.03	0.29	3.51	0.00	0.00	0.00
37.20	1.03	0.29	3.51	0.00	0.00	0.00
37.25	1.03	0.29	3.51	0.00	0.00	0.00
37.30	1.03	0.29	3.51	0.00	0.00	0.00
37.35	1.03	0.29	3.51	0.00	0.00	0.00
37.40	1.03	0.29	3.51	0.00	0.00	0.00
37.45	1.03	0.29	3.51	0.00	0.00	0.00
37.50	1.03	0.29	3.51	0.00	0.00	0.00
37.55	1.03	0.29	3.50	0.00	0.00	0.00
37.60	1.03	0.29	3.50	0.00	0.00	0.00
37.65	1.03	0.29	3.50	0.00	0.00	0.00
37.70	1.03	0.29	3.50	0.00	0.00	0.00
37.75	1.03	0.29	3.50	0.00	0.00	0.00
37.80	1.03	0.29	3.50	0.00	0.00	0.00
37.85	1.03	0.29	3.50	0.00	0.00	0.00
37.90	1.03	0.29	3.50	0.00	0.00	0.00
37.95	1.03	0.29	3.50	0.00	0.00	0.00
38.00	1.03	0.29	3.50	0.00	0.00	0.00
38.05	1.03	0.29	3.50	0.00	0.00	0.00
38.10	1.03	0.29	3.50	0.00	0.00	0.00
38.15	1.03	0.29	3.50	0.00	0.00	0.00
38.20	1.03	0.29	3.50	0.00	0.00	0.00
38.25	1.02	0.29	3.50	0.00	0.00	0.00
38.30	1.02	0.29	3.49	0.00	0.00	0.00
38.35	1.02	0.29	3.49	0.00	0.00	0.00
38.40	1.02	0.29	3.49	0.00	0.00	0.00
38.45	1.02	0.29	3.49	0.00	0.00	0.00
38.50	1.02	0.29	3.49	0.00	0.00	0.00
38.55	1.02	0.29	3.49	0.00	0.00	0.00
38.60	1.02	0.29	3.49	0.00	0.00	0.00
38.65	1.02	0.29	3.49	0.00	0.00	0.00
38.70	1.02	0.29	3.49	0.00	0.00	0.00
38.75	1.02	0.29	3.49	0.00	0.00	0.00
38.80	1.02	0.29	3.49	0.00	0.00	0.00
38.85	1.02	0.29	3.49	0.00	0.00	0.00
38.90	1.02	0.29	3.49	0.00	0.00	0.00
38.95	1.02	0.29	3.49	0.00	0.00	0.00
39.00	1.02	0.29	3.49	0.00	0.00	0.00
39.05	1.02	0.29	3.49	0.00	0.00	0.00
39.10	1.02	0.29	3.49	0.00	0.00	0.00
39.15	1.02	0.29	3.48	0.00	0.00	0.00
39.20	1.02	0.29	3.48	0.00	0.00	0.00
39.25	1.02	0.29	3.48	0.00	0.00	0.00
39.30	1.02	0.29	3.48	0.00	0.00	0.00
39.35	1.02	0.29	3.48	0.00	0.00	0.00
39.40	1.02	0.29	3.48	0.00	0.00	0.00
39.45	1.02	0.29	3.48	0.00	0.00	0.00

39.50	1.02	0.29	3.48	0.00	0.00	0.00
39.55	1.02	0.29	3.48	0.00	0.00	0.00
39.60	1.02	0.29	3.48	0.00	0.00	0.00
39.65	1.02	0.29	3.48	0.00	0.00	0.00
39.70	1.02	0.29	3.48	0.00	0.00	0.00
39.75	1.02	0.29	3.48	0.00	0.00	0.00
39.80	1.02	0.29	3.48	0.00	0.00	0.00
39.85	1.02	0.29	3.48	0.00	0.00	0.00
39.90	1.01	0.29	3.48	0.00	0.00	0.00
39.95	1.01	0.29	3.48	0.00	0.00	0.00
40.00	1.01	0.29	3.48	0.00	0.00	0.00
40.05	1.01	0.29	3.47	0.00	0.00	0.00
40.10	1.01	0.29	3.47	0.00	0.00	0.00
40.15	1.01	0.29	3.47	0.00	0.00	0.00
40.20	1.01	0.29	3.47	0.00	0.00	0.00
40.25	1.01	0.29	3.47	0.00	0.00	0.00
40.30	1.01	0.29	3.47	0.00	0.00	0.00
40.35	1.01	0.29	3.47	0.00	0.00	0.00
40.40	1.01	0.29	3.47	0.00	0.00	0.00
40.45	1.01	0.29	3.47	0.00	0.00	0.00
40.50	1.01	0.29	3.47	0.00	0.00	0.00
40.55	1.01	0.29	3.47	0.00	0.00	0.00
40.60	1.01	0.29	3.47	0.00	0.00	0.00
40.65	1.01	0.29	3.47	0.00	0.00	0.00
40.70	1.01	0.29	3.47	0.00	0.00	0.00
40.75	1.01	0.29	3.47	0.00	0.00	0.00
40.80	1.01	0.29	3.47	0.00	0.00	0.00
40.85	1.01	0.29	3.47	0.00	0.00	0.00
40.90	1.01	0.29	3.47	0.00	0.00	0.00
40.95	1.01	0.29	3.47	0.00	0.00	0.00
41.00	1.01	0.29	3.47	0.00	0.00	0.00
41.05	1.01	0.29	3.46	0.00	0.00	0.00
41.10	1.01	0.29	3.46	0.00	0.00	0.00
41.15	0.93	0.29	3.20	0.00	0.00	0.00
41.20	0.84	0.29	2.88	0.00	0.00	0.00
41.25	0.79	0.29	2.72	0.00	0.00	0.00
41.30	0.76	0.29	2.61	0.00	0.00	0.00
41.35	0.74	0.29	2.53	0.00	0.00	0.00
41.40	0.71	0.29	2.46	0.00	0.00	0.00
41.45	0.70	0.29	2.40	0.00	0.00	0.00
41.50	0.68	0.29	2.34	0.00	0.00	0.00
41.55	0.66	0.29	2.29	0.00	0.00	0.00
41.60	0.65	0.29	2.24	0.00	0.00	0.00
41.65	0.64	0.29	2.19	0.00	0.00	0.00
41.70	0.62	0.29	2.15	0.00	0.00	0.00
41.75	0.61	0.29	2.10	0.00	0.00	0.00
41.80	0.60	0.29	2.06	0.00	0.00	0.00
41.85	0.59	0.29	2.03	0.00	0.00	0.00
41.90	0.58	0.29	1.99	0.00	0.00	0.00
41.95	0.57	0.29	1.95	0.00	0.00	0.00
42.00	0.56	0.29	1.92	0.00	0.00	0.00
42.05	0.55	0.29	1.88	0.00	0.00	0.00
42.10	0.53	0.29	1.84	0.00	0.00	0.00
42.15	0.52	0.29	1.79	0.00	0.00	0.00

42.20	0.51	0.29	1.75	0.00	0.00	0.00
42.25	0.50	0.29	1.71	0.00	0.00	0.00
42.30	0.48	0.29	1.67	0.00	0.00	0.00
42.35	0.47	0.29	1.63	0.00	0.00	0.00
42.40	0.46	0.29	1.60	0.00	0.00	0.00
42.45	0.45	0.29	1.56	0.00	0.00	0.00
42.50	0.44	0.29	1.52	0.00	0.00	0.00
42.55	0.45	0.29	1.54	0.00	0.00	0.00
42.60	0.45	0.29	1.55	0.00	0.00	0.00
42.65	0.45	0.29	1.57	0.00	0.00	0.00
42.70	0.46	0.29	1.58	0.00	0.00	0.00
42.75	0.46	0.29	1.59	0.00	0.00	0.00
42.80	0.47	0.29	1.61	0.00	0.00	0.00
42.85	0.47	0.29	1.62	0.00	0.00	0.00
42.90	0.47	0.29	1.64	0.00	0.00	0.00
42.95	0.48	0.29	1.65	0.00	0.00	0.00
43.00	0.48	0.29	1.67	0.00	0.00	0.00
43.05	0.49	0.29	1.68	0.00	0.00	0.00
43.10	0.49	0.29	1.70	0.00	0.00	0.00
43.15	0.50	0.29	1.71	0.00	0.00	0.00
43.20	0.50	0.29	1.73	0.00	0.00	0.00
43.25	0.50	0.29	1.74	0.00	0.00	0.00
43.30	0.51	0.29	1.76	0.00	0.00	0.00
43.35	0.51	0.29	1.77	0.00	0.00	0.00
43.40	0.52	0.29	1.78	0.00	0.00	0.00
43.45	0.52	0.29	1.79	0.00	0.00	0.00
43.50	0.52	0.29	1.80	0.00	0.00	0.00
43.55	0.52	0.29	1.81	0.00	0.00	0.00
43.60	0.53	0.29	1.82	0.00	0.00	0.00
43.65	0.53	0.29	1.83	0.00	0.00	0.00
43.70	0.53	0.29	1.84	0.00	0.00	0.00
43.75	0.53	0.29	1.85	0.00	0.00	0.00
43.80	0.54	0.29	1.86	0.00	0.00	0.00
43.85	0.54	0.29	1.87	0.00	0.00	0.00
43.90	0.54	0.29	1.88	0.00	0.00	0.00
43.95	0.55	0.29	1.89	0.00	0.00	0.00
44.00	0.55	0.29	1.90	0.00	0.00	0.00
44.05	0.55	0.29	1.91	0.00	0.00	0.00
44.10	0.55	0.29	1.92	0.00	0.00	0.00
44.15	0.56	0.29	1.94	0.00	0.00	0.00
44.20	0.56	0.29	1.95	0.00	0.00	0.00
44.25	0.56	0.29	1.96	0.00	0.00	0.00
44.30	0.57	0.29	1.97	0.00	0.00	0.00
44.35	0.57	0.29	1.98	0.00	0.00	0.00
44.40	0.57	0.29	1.99	0.00	0.00	0.00
44.45	0.58	0.29	2.00	0.00	0.00	0.00
44.50	0.58	0.29	2.01	0.00	0.00	0.00
44.55	0.58	0.29	2.02	0.00	0.00	0.00
44.60	0.59	0.29	2.04	0.00	0.00	0.00
44.65	0.59	0.29	2.05	0.00	0.00	0.00
44.70	0.59	0.29	2.06	0.00	0.00	0.00
44.75	0.60	0.29	2.07	0.00	0.00	0.00
44.80	0.60	0.29	2.08	0.00	0.00	0.00
44.85	0.60	0.29	2.10	0.00	0.00	0.00

44.90	0.61	0.29	2.11	0.00	0.00	0.00
44.95	0.61	0.29	2.12	0.00	0.00	0.00
45.00	0.61	0.29	2.14	0.00	0.00	0.00
45.05	0.62	0.29	2.15	0.00	0.00	0.00
45.10	0.62	0.29	2.16	0.00	0.00	0.00
45.15	0.62	0.29	2.18	0.00	0.00	0.00
45.20	0.63	0.29	2.19	0.00	0.00	0.00
45.25	0.63	0.29	2.20	0.00	0.00	0.00
45.30	0.64	0.29	2.22	0.00	0.00	0.00
45.35	0.64	0.29	2.23	0.00	0.00	0.00
45.40	0.64	0.29	2.25	0.00	0.00	0.00
45.45	0.65	0.29	2.26	0.00	0.00	0.00
45.50	0.65	0.29	2.28	0.00	0.00	0.00
45.55	0.66	0.29	2.29	0.00	0.00	0.00
45.60	0.66	0.29	2.31	0.00	0.00	0.00
45.65	0.66	0.29	2.32	0.00	0.00	0.00
45.70	0.67	0.29	2.34	0.00	0.00	0.00
45.75	0.67	0.29	2.36	0.00	0.00	0.00
45.80	0.68	0.29	2.37	0.00	0.00	0.00
45.85	0.68	0.29	2.39	0.00	0.00	0.00
45.90	0.69	0.29	2.41	0.00	0.00	0.00
45.95	0.69	0.29	2.43	0.00	0.00	0.00
46.00	0.70	0.29	2.45	0.00	0.00	0.00
46.05	0.70	0.29	2.47	0.00	0.00	0.00
46.10	0.71	0.29	2.49	0.00	0.00	0.00
46.15	0.72	0.29	2.51	0.00	0.00	0.00
46.20	0.72	0.29	2.54	0.00	0.00	0.00
46.25	0.73	0.29	2.56	0.00	0.00	0.00
46.30	0.74	0.29	2.59	0.00	0.00	0.00
46.35	0.74	0.29	2.61	0.00	0.00	0.00
46.40	0.75	0.28	2.64	0.00	0.00	0.00
46.45	0.76	0.28	2.68	0.00	0.00	0.00
46.50	0.77	0.28	2.71	0.00	0.00	0.00
46.55	0.78	0.28	2.75	0.00	0.00	0.00
46.60	0.80	0.28	2.80	0.00	0.00	0.00
46.65	0.81	0.28	2.85	0.00	0.00	0.00
46.70	0.83	0.28	2.91	0.00	0.00	0.00
46.75	0.85	0.28	2.99	0.00	0.00	0.00
46.80	0.88	0.28	3.10	0.00	0.00	0.00
46.85	0.93	0.28	3.25	0.00	0.00	0.00
46.90	0.98	0.28	3.44	0.00	0.00	0.00
46.95	0.98	0.28	3.44	0.00	0.00	0.00
47.00	0.98	0.28	3.44	0.00	0.00	0.00
47.05	0.98	0.28	3.44	0.00	0.00	0.00
47.10	0.98	0.28	3.44	0.00	0.00	0.00
47.15	0.98	0.28	3.44	0.00	0.00	0.00
47.20	0.97	0.28	3.44	0.00	0.00	0.00
47.25	0.97	0.28	3.44	0.00	0.00	0.00
47.30	0.97	0.28	3.44	0.00	0.00	0.00
47.35	0.97	0.28	3.44	0.00	0.00	0.00
47.40	0.97	0.28	3.44	0.00	0.00	0.00
47.45	0.97	0.28	3.44	0.00	0.00	0.00
47.50	0.97	0.28	3.44	0.00	0.00	0.00
47.55	0.97	0.28	3.44	0.00	0.00	0.00

47.60	0.97	0.28	3.44	0.00	0.00	0.00
47.65	0.97	0.28	3.44	0.00	0.00	0.00
47.70	0.97	0.28	3.44	0.00	0.00	0.00
47.75	0.97	0.28	3.44	0.00	0.00	0.00
47.80	0.97	0.28	3.44	0.00	0.00	0.00
47.85	0.97	0.28	3.44	0.00	0.00	0.00
47.90	0.97	0.28	3.44	0.00	0.00	0.00
47.95	0.97	0.28	3.44	0.00	0.00	0.00
48.00	0.97	0.28	3.44	0.00	0.00	0.00
48.05	0.97	0.28	3.44	0.00	0.00	0.00
48.10	0.97	0.28	3.44	0.00	0.00	0.00
48.15	0.97	0.28	3.44	0.00	0.00	0.00
48.20	0.97	0.28	3.44	0.00	0.00	0.00
48.25	0.97	0.28	3.44	0.00	0.00	0.00
48.30	0.97	0.28	3.44	0.00	0.00	0.00
48.35	0.97	0.28	3.44	0.00	0.00	0.00
48.40	0.97	0.28	3.44	0.00	0.00	0.00
48.45	0.97	0.28	3.44	0.00	0.00	0.00
48.50	0.97	0.28	3.44	0.00	0.00	0.00
48.55	0.97	0.28	3.44	0.00	0.00	0.00
48.60	0.97	0.28	3.44	0.00	0.00	0.00
48.65	0.97	0.28	3.44	0.00	0.00	0.00
48.70	0.97	0.28	3.44	0.00	0.00	0.00
48.75	0.97	0.28	3.44	0.00	0.00	0.00
48.80	0.97	0.28	3.44	0.00	0.00	0.00
48.85	0.97	0.28	3.44	0.00	0.00	0.00
48.90	0.97	0.28	3.44	0.00	0.00	0.00
48.95	0.97	0.28	3.44	0.00	0.00	0.00
49.00	0.97	0.28	3.44	0.00	0.00	0.00
49.05	0.96	0.28	3.44	0.00	0.00	0.00
49.10	0.96	0.28	3.44	0.00	0.00	0.00
49.15	0.96	0.28	3.44	0.00	0.00	0.00
49.20	0.96	0.28	3.44	0.00	0.00	0.00
49.25	0.96	0.28	3.44	0.00	0.00	0.00
49.30	0.96	0.28	3.44	0.00	0.00	0.00
49.35	0.96	0.28	3.44	0.00	0.00	0.00
49.40	0.96	0.28	3.44	0.00	0.00	0.00
49.45	0.96	0.28	3.44	0.00	0.00	0.00
49.50	0.96	0.28	3.44	0.00	0.00	0.00
49.55	0.96	0.28	3.44	0.00	0.00	0.00
49.60	0.96	0.28	3.44	0.00	0.00	0.00
49.65	0.96	0.28	3.44	0.00	0.00	0.00
49.70	0.96	0.28	3.44	0.00	0.00	0.00
49.75	0.96	0.28	3.44	0.00	0.00	0.00
49.80	0.96	0.28	3.44	0.00	0.00	0.00
49.85	0.96	0.28	3.44	0.00	0.00	0.00
49.90	0.96	0.28	3.44	0.00	0.00	0.00
49.95	0.96	0.28	3.44	0.00	0.00	0.00
50.00	0.96	0.28	3.44	0.00	0.00	0.00
50.05	0.96	0.28	3.44	0.00	0.00	0.00
50.10	0.96	0.28	3.44	0.00	0.00	0.00
50.15	0.96	0.28	3.44	0.00	0.00	0.00
50.20	0.96	0.28	3.44	0.00	0.00	0.00
50.25	0.96	0.28	3.44	0.00	0.00	0.00

50.30	0.96	0.28	3.44	0.00	0.00	0.00
50.35	0.96	0.28	3.44	0.00	0.00	0.00
50.40	0.96	0.28	3.44	0.00	0.00	0.00
50.45	0.96	0.28	3.44	0.00	0.00	0.00
50.50	0.96	0.28	3.44	0.00	0.00	0.00
50.55	0.96	0.28	3.44	0.00	0.00	0.00
50.60	0.96	0.28	3.44	0.00	0.00	0.00
50.65	0.96	0.28	3.44	0.00	0.00	0.00
50.70	0.96	0.28	3.44	0.00	0.00	0.00
50.75	0.96	0.28	3.44	0.00	0.00	0.00
50.80	0.96	0.28	3.44	0.00	0.00	0.00
50.85	0.96	0.28	3.44	0.00	0.00	0.00
50.90	0.96	0.28	3.44	0.00	0.00	0.00
50.95	0.95	0.28	3.44	0.00	0.00	0.00
51.00	0.95	0.28	3.44	0.00	0.00	0.00

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* F.S.<1, Liquefaction Potential Zone
(F.S. is limited to 5,CRR is limited to 2, CSR is limited to 2)

Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

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1 atm (atmosphere) = 1 tsf (ton/ft2)

CRRm	Cyclic resistance ratio from soils
CSRsf	Cyclic stress ratio induced by a given earthquake (with user request factor of safety)
F.S.	Factor of Safety against liquefaction, F.S.=CRRm/CSRsf
S_sat	Settlement from saturated sands
S_dry	Settlement from Unsaturated Sands
S_all	Total Settlement from Saturated and Unsaturated Sands
NoLiq	No-Liquefy Soils

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LIQUEFACTION ANALYSIS SUMMARY
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Input File Name: \\tsclient\G_Projects\2022\22G-0308\Originals\Liquifaction\22G-0308-0 Boring B-11.liq
Title: New Elementary School for CUSD
Subtitle: 22G-0308-0

Surface Elev.=338
Hole No.=B-11
Depth of Hole= 51.00 ft
Water Table during Earthquake= 68.00 ft
Water Table during In-Situ Testing= 92.00 ft
Max. Acceleration= 0.32 g
Earthquake Magnitude= 5.50

Input Data:
Surface Elev.=338
Hole No.=B-11
Depth of Hole=51.00 ft
Water Table during Earthquake= 68.00 ft
Water Table during In-Situ Testing= 92.00 ft
Max. Acceleration=0.32 g
Earthquake Magnitude=5.50
No-Liquefiable Soils: Based on Analysis

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Tokimatsu, M-correction
3. Fines Correction for Liquefaction: Stark/Olson et al.*
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1.5
7. Borehole Diameter, Cb= 1
8. Sampling Method, Cs= 1.2
9. User request factor of safety (apply to CSR) , User= 1.2
Plot one CSR curve (fs1=User)
10. Use Curve Smoothing: Yes*
* Recommended Options

In-Situ Test Data:

Depth		SPT	gamma	Fines
ft			pcf	%
0.00	5.00	117.70		58.00
4.00	10.00		113.00	35.00

7.50	33.00	127.00	30.00
12.50	41.00	140.80	40.00
17.50	29.00	126.00	30.00
22.50	30.00	138.20	45.00
27.50	42.00	139.00	40.00
32.50	40.00	129.70	30.00
37.50	40.00	143.00	85.00
42.50	13.00	127.20	30.00
47.50	23.00	141.00	60.00

Output Results:

Settlement of Saturated Sands=0.00 in.
Settlement of Unsaturated Sands=0.06 in.
Total Settlement of Saturated and Unsaturated Sands=0.06 in.
Differential Settlement=0.032 to 0.042 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
0.00	0.45	0.25	5.00	0.00	0.06	0.06
0.05	0.45	0.25	5.00	0.00	0.06	0.06
0.10	0.45	0.25	5.00	0.00	0.06	0.06
0.15	0.46	0.25	5.00	0.00	0.06	0.06
0.20	0.46	0.25	5.00	0.00	0.06	0.06
0.25	0.46	0.25	5.00	0.00	0.06	0.06
0.30	0.47	0.25	5.00	0.00	0.06	0.06
0.35	0.47	0.25	5.00	0.00	0.06	0.06
0.40	0.47	0.25	5.00	0.00	0.06	0.06
0.45	0.48	0.25	5.00	0.00	0.06	0.06
0.50	0.48	0.25	5.00	0.00	0.06	0.06
0.55	0.48	0.25	5.00	0.00	0.06	0.06
0.60	0.49	0.25	5.00	0.00	0.06	0.06
0.65	0.49	0.25	5.00	0.00	0.06	0.06
0.70	0.50	0.25	5.00	0.00	0.06	0.06
0.75	0.50	0.25	5.00	0.00	0.06	0.06
0.80	0.50	0.25	5.00	0.00	0.06	0.06
0.85	0.51	0.25	5.00	0.00	0.06	0.06
0.90	0.51	0.25	5.00	0.00	0.06	0.06
0.95	0.51	0.25	5.00	0.00	0.06	0.06
1.00	0.52	0.25	5.00	0.00	0.06	0.06
1.05	0.52	0.25	5.00	0.00	0.06	0.06
1.10	0.53	0.25	5.00	0.00	0.06	0.06
1.15	0.53	0.25	5.00	0.00	0.06	0.06
1.20	0.53	0.25	5.00	0.00	0.06	0.06
1.25	0.54	0.25	5.00	0.00	0.06	0.06
1.30	0.54	0.25	5.00	0.00	0.06	0.06
1.35	0.55	0.25	5.00	0.00	0.06	0.06
1.40	0.55	0.25	5.00	0.00	0.06	0.06
1.45	0.55	0.25	5.00	0.00	0.06	0.06
1.50	0.56	0.25	5.00	0.00	0.06	0.06
1.55	0.56	0.25	5.00	0.00	0.06	0.06
1.60	0.57	0.25	5.00	0.00	0.06	0.06
1.65	0.57	0.25	5.00	0.00	0.06	0.06

1.70 0.58 0.25 5.00 0.00 0.06 0.06
1.75 0.58 0.25 5.00 0.00 0.06 0.06
1.80 0.59 0.25 5.00 0.00 0.06 0.06
1.85 0.59 0.25 5.00 0.00 0.06 0.06
1.90 0.60 0.25 5.00 0.00 0.06 0.06
1.95 0.60 0.25 5.00 0.00 0.06 0.06
2.00 0.60 0.25 5.00 0.00 0.06 0.06
2.05 0.61 0.25 5.00 0.00 0.06 0.06
2.10 0.61 0.25 5.00 0.00 0.06 0.06
2.15 0.62 0.25 5.00 0.00 0.06 0.06
2.20 0.62 0.25 5.00 0.00 0.06 0.06
2.25 0.63 0.25 5.00 0.00 0.06 0.06
2.30 0.63 0.25 5.00 0.00 0.06 0.06
2.35 0.64 0.25 5.00 0.00 0.06 0.06
2.40 0.65 0.25 5.00 0.00 0.06 0.06
2.45 0.65 0.25 5.00 0.00 0.06 0.06
2.50 0.66 0.25 5.00 0.00 0.06 0.06
2.55 0.66 0.25 5.00 0.00 0.06 0.06
2.60 0.67 0.25 5.00 0.00 0.06 0.06
2.65 0.67 0.25 5.00 0.00 0.06 0.06
2.70 0.68 0.25 5.00 0.00 0.06 0.06
2.75 0.69 0.25 5.00 0.00 0.06 0.06
2.80 0.69 0.25 5.00 0.00 0.06 0.06
2.85 0.70 0.25 5.00 0.00 0.06 0.06
2.90 0.71 0.25 5.00 0.00 0.06 0.06
2.95 0.71 0.25 5.00 0.00 0.06 0.06
3.00 0.72 0.25 5.00 0.00 0.06 0.06
3.05 0.73 0.25 5.00 0.00 0.06 0.06
3.10 0.73 0.25 5.00 0.00 0.06 0.06
3.15 0.74 0.25 5.00 0.00 0.06 0.06
3.20 0.75 0.25 5.00 0.00 0.06 0.06
3.25 0.76 0.25 5.00 0.00 0.06 0.06
3.30 0.77 0.25 5.00 0.00 0.06 0.06
3.35 0.78 0.25 5.00 0.00 0.06 0.06
3.40 0.79 0.25 5.00 0.00 0.06 0.06
3.45 0.80 0.25 5.00 0.00 0.06 0.06
3.50 0.81 0.25 5.00 0.00 0.06 0.06
3.55 0.82 0.25 5.00 0.00 0.06 0.06
3.60 0.83 0.25 5.00 0.00 0.06 0.06
3.65 0.84 0.25 5.00 0.00 0.06 0.06
3.70 0.86 0.25 5.00 0.00 0.06 0.06
3.75 0.88 0.25 5.00 0.00 0.06 0.06
3.80 0.90 0.25 5.00 0.00 0.06 0.06
3.85 0.92 0.25 5.00 0.00 0.06 0.06
3.90 0.96 0.25 5.00 0.00 0.06 0.06
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11.70 1.11 0.25 5.00 0.00 0.06 0.06
11.75 1.11 0.25 5.00 0.00 0.06 0.06
11.80 1.11 0.25 5.00 0.00 0.06 0.06
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12.25 1.11 0.24 5.00 0.00 0.06 0.06
12.30 1.11 0.24 5.00 0.00 0.06 0.06
12.35 1.11 0.24 5.00 0.00 0.06 0.06
12.40 1.11 0.24 5.00 0.00 0.06 0.06
12.45 1.11 0.24 5.00 0.00 0.06 0.06

12.50	1.11	0.24	5.00	0.00	0.06	0.06
12.55	1.11	0.24	5.00	0.00	0.06	0.06
12.60	1.11	0.24	5.00	0.00	0.06	0.06
12.65	1.11	0.24	5.00	0.00	0.06	0.06
12.70	1.11	0.24	5.00	0.00	0.06	0.06
12.75	1.11	0.24	5.00	0.00	0.06	0.06
12.80	1.11	0.24	5.00	0.00	0.06	0.06
12.85	1.11	0.24	5.00	0.00	0.06	0.06
12.90	1.11	0.24	5.00	0.00	0.06	0.06
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13.45	1.11	0.24	5.00	0.00	0.06	0.06
13.50	1.11	0.24	5.00	0.00	0.06	0.06
13.55	1.11	0.24	5.00	0.00	0.06	0.06
13.60	1.11	0.24	5.00	0.00	0.06	0.06
13.65	1.11	0.24	5.00	0.00	0.06	0.06
13.70	1.11	0.24	5.00	0.00	0.06	0.06
13.75	1.11	0.24	5.00	0.00	0.06	0.06
13.80	1.11	0.24	5.00	0.00	0.06	0.06
13.85	1.11	0.24	5.00	0.00	0.05	0.05
13.90	1.11	0.24	5.00	0.00	0.05	0.05
13.95	1.11	0.24	5.00	0.00	0.05	0.05
14.00	1.11	0.24	5.00	0.00	0.05	0.05
14.05	1.11	0.24	5.00	0.00	0.05	0.05
14.10	1.11	0.24	5.00	0.00	0.05	0.05
14.15	1.11	0.24	5.00	0.00	0.05	0.05
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14.40	1.11	0.24	5.00	0.00	0.05	0.05
14.45	1.11	0.24	5.00	0.00	0.05	0.05
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14.55	1.11	0.24	5.00	0.00	0.05	0.05
14.60	1.11	0.24	5.00	0.00	0.05	0.05
14.65	1.11	0.24	5.00	0.00	0.05	0.05
14.70	1.11	0.24	5.00	0.00	0.05	0.05
14.75	1.11	0.24	5.00	0.00	0.05	0.05
14.80	1.11	0.24	5.00	0.00	0.05	0.05
14.85	1.11	0.24	5.00	0.00	0.05	0.05
14.90	1.11	0.24	5.00	0.00	0.05	0.05
14.95	1.11	0.24	5.00	0.00	0.05	0.05
15.00	1.11	0.24	5.00	0.00	0.05	0.05
15.05	1.11	0.24	5.00	0.00	0.05	0.05
15.10	1.11	0.24	5.00	0.00	0.05	0.05
15.15	1.11	0.24	5.00	0.00	0.05	0.05

15.20	1.11 0.24 5.00 0.00 0.05 0.05
15.25	1.11 0.24 5.00 0.00 0.05 0.05
15.30	1.11 0.24 5.00 0.00 0.05 0.05
15.35	1.11 0.24 5.00 0.00 0.05 0.05
15.40	1.11 0.24 5.00 0.00 0.05 0.05
15.45	1.11 0.24 5.00 0.00 0.05 0.05
15.50	1.11 0.24 5.00 0.00 0.05 0.05
15.55	1.11 0.24 5.00 0.00 0.05 0.05
15.60	1.11 0.24 5.00 0.00 0.05 0.05
15.65	1.11 0.24 5.00 0.00 0.05 0.05
15.70	1.11 0.24 5.00 0.00 0.05 0.05
15.75	1.11 0.24 5.00 0.00 0.05 0.05
15.80	1.11 0.24 5.00 0.00 0.05 0.05
15.85	1.11 0.24 5.00 0.00 0.05 0.05
15.90	1.11 0.24 5.00 0.00 0.05 0.05
15.95	1.11 0.24 5.00 0.00 0.05 0.05
16.00	1.11 0.24 5.00 0.00 0.05 0.05
16.05	1.11 0.24 5.00 0.00 0.05 0.05
16.10	1.11 0.24 5.00 0.00 0.05 0.05
16.15	1.11 0.24 5.00 0.00 0.05 0.05
16.20	1.11 0.24 5.00 0.00 0.05 0.05
16.25	1.11 0.24 5.00 0.00 0.05 0.05
16.30	1.11 0.24 5.00 0.00 0.05 0.05
16.35	1.11 0.24 5.00 0.00 0.05 0.05
16.40	1.11 0.24 5.00 0.00 0.05 0.05
16.45	1.11 0.24 5.00 0.00 0.05 0.05
16.50	1.11 0.24 5.00 0.00 0.05 0.05
16.55	1.11 0.24 5.00 0.00 0.05 0.05
16.60	1.11 0.24 5.00 0.00 0.05 0.05
16.65	1.11 0.24 5.00 0.00 0.05 0.05
16.70	1.11 0.24 5.00 0.00 0.05 0.05
16.75	1.11 0.24 5.00 0.00 0.05 0.05
16.80	1.11 0.24 5.00 0.00 0.05 0.05
16.85	1.11 0.24 5.00 0.00 0.05 0.05
16.90	1.11 0.24 5.00 0.00 0.05 0.05
16.95	1.11 0.24 5.00 0.00 0.05 0.05
17.00	1.11 0.24 5.00 0.00 0.05 0.05
17.05	1.11 0.24 5.00 0.00 0.05 0.05
17.10	1.11 0.24 5.00 0.00 0.05 0.05
17.15	1.11 0.24 5.00 0.00 0.05 0.05
17.20	1.11 0.24 5.00 0.00 0.05 0.05
17.25	1.11 0.24 5.00 0.00 0.05 0.05
17.30	1.11 0.24 5.00 0.00 0.05 0.05
17.35	1.11 0.24 5.00 0.00 0.05 0.05
17.40	1.11 0.24 5.00 0.00 0.05 0.05
17.45	1.11 0.24 5.00 0.00 0.05 0.05
17.50	1.11 0.24 5.00 0.00 0.05 0.05
17.55	1.11 0.24 5.00 0.00 0.05 0.05
17.60	1.11 0.24 5.00 0.00 0.05 0.05
17.65	1.11 0.24 5.00 0.00 0.05 0.05
17.70	1.11 0.24 5.00 0.00 0.05 0.05
17.75	1.11 0.24 5.00 0.00 0.05 0.05
17.80	1.11 0.24 5.00 0.00 0.05 0.05
17.85	1.11 0.24 5.00 0.00 0.05 0.05

17.90	1.11	0.24	5.00	0.00	0.05	0.05
17.95	1.11	0.24	5.00	0.00	0.05	0.05
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18.20	1.11	0.24	5.00	0.00	0.05	0.05
18.25	1.11	0.24	5.00	0.00	0.05	0.05
18.30	1.11	0.24	5.00	0.00	0.05	0.05
18.35	1.11	0.24	5.00	0.00	0.05	0.05
18.40	1.11	0.24	5.00	0.00	0.05	0.05
18.45	1.11	0.24	5.00	0.00	0.05	0.05
18.50	1.11	0.24	5.00	0.00	0.05	0.05
18.55	1.11	0.24	5.00	0.00	0.05	0.05
18.60	1.11	0.24	5.00	0.00	0.05	0.05
18.65	1.11	0.24	5.00	0.00	0.05	0.05
18.70	1.11	0.24	5.00	0.00	0.05	0.05
18.75	1.11	0.24	5.00	0.00	0.05	0.05
18.80	1.11	0.24	5.00	0.00	0.05	0.05
18.85	1.11	0.24	5.00	0.00	0.05	0.05
18.90	1.11	0.24	5.00	0.00	0.05	0.05
18.95	1.11	0.24	5.00	0.00	0.05	0.05
19.00	1.11	0.24	5.00	0.00	0.05	0.05
19.05	1.11	0.24	5.00	0.00	0.05	0.05
19.10	1.11	0.24	5.00	0.00	0.05	0.05
19.15	1.11	0.24	5.00	0.00	0.05	0.05
19.20	1.11	0.24	5.00	0.00	0.05	0.05
19.25	1.11	0.24	5.00	0.00	0.05	0.05
19.30	1.11	0.24	5.00	0.00	0.05	0.05
19.35	1.11	0.24	5.00	0.00	0.05	0.05
19.40	1.11	0.24	5.00	0.00	0.05	0.05
19.45	1.11	0.24	5.00	0.00	0.05	0.05
19.50	1.11	0.24	5.00	0.00	0.05	0.05
19.55	1.11	0.24	5.00	0.00	0.05	0.05
19.60	1.11	0.24	5.00	0.00	0.05	0.05
19.65	1.11	0.24	5.00	0.00	0.05	0.05
19.70	1.11	0.24	5.00	0.00	0.05	0.05
19.75	1.11	0.24	5.00	0.00	0.05	0.05
19.80	1.11	0.24	5.00	0.00	0.05	0.05
19.85	1.11	0.24	5.00	0.00	0.05	0.05
19.90	1.11	0.24	5.00	0.00	0.05	0.05
19.95	1.11	0.24	5.00	0.00	0.05	0.05
20.00	1.11	0.24	5.00	0.00	0.05	0.05
20.05	1.11	0.24	5.00	0.00	0.05	0.05
20.10	1.11	0.24	5.00	0.00	0.05	0.05
20.15	1.11	0.24	5.00	0.00	0.05	0.05
20.20	1.11	0.24	5.00	0.00	0.05	0.05
20.25	1.11	0.24	5.00	0.00	0.05	0.05
20.30	1.11	0.24	5.00	0.00	0.05	0.05
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20.40	1.11	0.24	5.00	0.00	0.05	0.05
20.45	1.11	0.24	5.00	0.00	0.05	0.05
20.50	1.11	0.24	5.00	0.00	0.05	0.05
20.55	1.11	0.24	5.00	0.00	0.05	0.05

20.60	1.11	0.24	5.00	0.00	0.05	0.05
20.65	1.11	0.24	5.00	0.00	0.05	0.05
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20.80	1.11	0.24	5.00	0.00	0.05	0.05
20.85	1.11	0.24	5.00	0.00	0.05	0.05
20.90	1.11	0.24	5.00	0.00	0.05	0.05
20.95	1.11	0.24	5.00	0.00	0.05	0.05
21.00	1.11	0.24	5.00	0.00	0.05	0.05
21.05	1.11	0.24	5.00	0.00	0.05	0.05
21.10	1.11	0.24	5.00	0.00	0.05	0.05
21.15	1.11	0.24	5.00	0.00	0.05	0.05
21.20	1.11	0.24	5.00	0.00	0.05	0.05
21.25	1.11	0.24	5.00	0.00	0.05	0.05
21.30	1.11	0.24	5.00	0.00	0.05	0.05
21.35	1.11	0.24	5.00	0.00	0.05	0.05
21.40	1.11	0.24	5.00	0.00	0.05	0.05
21.45	1.11	0.24	5.00	0.00	0.05	0.05
21.50	1.11	0.24	5.00	0.00	0.05	0.05
21.55	1.11	0.24	5.00	0.00	0.05	0.05
21.60	1.11	0.24	5.00	0.00	0.05	0.05
21.65	1.11	0.24	5.00	0.00	0.05	0.05
21.70	1.11	0.24	5.00	0.00	0.05	0.05
21.75	1.11	0.24	5.00	0.00	0.05	0.05
21.80	1.11	0.24	5.00	0.00	0.05	0.05
21.85	1.11	0.24	5.00	0.00	0.05	0.05
21.90	1.11	0.24	5.00	0.00	0.05	0.05
21.95	1.11	0.24	5.00	0.00	0.05	0.05
22.00	1.11	0.24	5.00	0.00	0.05	0.05
22.05	1.11	0.24	5.00	0.00	0.05	0.05
22.10	1.11	0.24	5.00	0.00	0.05	0.05
22.15	1.11	0.24	5.00	0.00	0.05	0.05
22.20	1.11	0.24	5.00	0.00	0.05	0.05
22.25	1.11	0.24	5.00	0.00	0.05	0.05
22.30	1.11	0.24	5.00	0.00	0.05	0.05
22.35	1.11	0.24	5.00	0.00	0.05	0.05
22.40	1.11	0.24	5.00	0.00	0.05	0.05
22.45	1.11	0.24	5.00	0.00	0.05	0.05
22.50	1.11	0.24	5.00	0.00	0.05	0.05
22.55	1.11	0.24	5.00	0.00	0.05	0.05
22.60	1.11	0.24	5.00	0.00	0.05	0.05
22.65	1.11	0.24	5.00	0.00	0.05	0.05
22.70	1.11	0.24	5.00	0.00	0.05	0.05
22.75	1.11	0.24	5.00	0.00	0.05	0.05
22.80	1.11	0.24	5.00	0.00	0.05	0.05
22.85	1.11	0.24	5.00	0.00	0.05	0.05
22.90	1.11	0.24	5.00	0.00	0.05	0.05
22.95	1.11	0.24	5.00	0.00	0.05	0.05
23.00	1.11	0.24	5.00	0.00	0.05	0.05
23.05	1.11	0.24	5.00	0.00	0.05	0.05
23.10	1.11	0.24	5.00	0.00	0.05	0.05
23.15	1.11	0.24	5.00	0.00	0.05	0.05
23.20	1.11	0.24	5.00	0.00	0.05	0.05
23.25	1.11	0.24	5.00	0.00	0.05	0.05

23.30	1.11	0.24	5.00	0.00	0.05	0.05
23.35	1.11	0.24	5.00	0.00	0.05	0.05
23.40	1.11	0.24	5.00	0.00	0.05	0.05
23.45	1.11	0.24	5.00	0.00	0.05	0.05
23.50	1.11	0.24	5.00	0.00	0.05	0.05
23.55	1.11	0.24	5.00	0.00	0.05	0.05
23.60	1.11	0.24	5.00	0.00	0.05	0.05
23.65	1.11	0.24	5.00	0.00	0.05	0.05
23.70	1.11	0.24	5.00	0.00	0.05	0.05
23.75	1.11	0.24	5.00	0.00	0.05	0.05
23.80	1.11	0.24	5.00	0.00	0.05	0.05
23.85	1.11	0.24	5.00	0.00	0.05	0.05
23.90	1.11	0.24	5.00	0.00	0.05	0.05
23.95	1.11	0.24	5.00	0.00	0.05	0.05
24.00	1.11	0.24	5.00	0.00	0.05	0.05
24.05	1.11	0.24	5.00	0.00	0.05	0.05
24.10	1.11	0.24	5.00	0.00	0.05	0.05
24.15	1.11	0.24	5.00	0.00	0.05	0.05
24.20	1.11	0.24	5.00	0.00	0.05	0.05
24.25	1.11	0.24	5.00	0.00	0.05	0.05
24.30	1.11	0.24	5.00	0.00	0.05	0.05
24.35	1.11	0.24	5.00	0.00	0.05	0.05
24.40	1.11	0.24	5.00	0.00	0.05	0.05
24.45	1.11	0.24	5.00	0.00	0.05	0.05
24.50	1.11	0.24	5.00	0.00	0.05	0.05
24.55	1.11	0.24	5.00	0.00	0.05	0.05
24.60	1.11	0.24	5.00	0.00	0.05	0.05
24.65	1.11	0.24	5.00	0.00	0.05	0.05
24.70	1.11	0.24	5.00	0.00	0.05	0.05
24.75	1.11	0.24	5.00	0.00	0.05	0.05
24.80	1.11	0.24	5.00	0.00	0.05	0.05
24.85	1.11	0.24	5.00	0.00	0.05	0.05
24.90	1.11	0.24	5.00	0.00	0.05	0.05
24.95	1.11	0.24	5.00	0.00	0.05	0.05
25.00	1.11	0.24	5.00	0.00	0.05	0.05
25.05	1.11	0.24	5.00	0.00	0.05	0.05
25.10	1.11	0.24	5.00	0.00	0.05	0.05
25.15	1.11	0.24	5.00	0.00	0.05	0.05
25.20	1.11	0.24	5.00	0.00	0.05	0.05
25.25	1.11	0.24	5.00	0.00	0.05	0.05
25.30	1.11	0.24	5.00	0.00	0.05	0.05
25.35	1.11	0.24	5.00	0.00	0.05	0.05
25.40	1.11	0.24	5.00	0.00	0.05	0.05
25.45	1.11	0.24	5.00	0.00	0.05	0.05
25.50	1.11	0.24	5.00	0.00	0.05	0.05
25.55	1.11	0.24	5.00	0.00	0.05	0.05
25.60	1.11	0.24	5.00	0.00	0.05	0.05
25.65	1.11	0.24	5.00	0.00	0.05	0.05
25.70	1.11	0.24	5.00	0.00	0.05	0.05
25.75	1.11	0.24	5.00	0.00	0.05	0.05
25.80	1.11	0.24	5.00	0.00	0.05	0.05
25.85	1.11	0.24	5.00	0.00	0.05	0.05
25.90	1.11	0.24	5.00	0.00	0.05	0.05
25.95	1.11	0.24	5.00	0.00	0.05	0.05

26.00	1.11	0.24	5.00	0.00	0.05	0.05
26.05	1.11	0.24	5.00	0.00	0.05	0.05
26.10	1.11	0.24	5.00	0.00	0.05	0.05
26.15	1.11	0.24	5.00	0.00	0.05	0.05
26.20	1.11	0.24	5.00	0.00	0.05	0.05
26.25	1.10	0.24	5.00	0.00	0.05	0.05
26.30	1.10	0.24	5.00	0.00	0.05	0.05
26.35	1.10	0.24	5.00	0.00	0.04	0.04
26.40	1.10	0.24	5.00	0.00	0.04	0.04
26.45	1.10	0.24	5.00	0.00	0.04	0.04
26.50	1.10	0.24	5.00	0.00	0.04	0.04
26.55	1.10	0.24	5.00	0.00	0.04	0.04
26.60	1.10	0.24	5.00	0.00	0.04	0.04
26.65	1.10	0.24	5.00	0.00	0.04	0.04
26.70	1.10	0.24	5.00	0.00	0.04	0.04
26.75	1.10	0.24	5.00	0.00	0.04	0.04
26.80	1.10	0.24	5.00	0.00	0.04	0.04
26.85	1.10	0.24	5.00	0.00	0.04	0.04
26.90	1.10	0.24	5.00	0.00	0.04	0.04
26.95	1.10	0.24	5.00	0.00	0.04	0.04
27.00	1.10	0.24	5.00	0.00	0.04	0.04
27.05	1.10	0.24	5.00	0.00	0.04	0.04
27.10	1.10	0.24	5.00	0.00	0.04	0.04
27.15	1.10	0.24	5.00	0.00	0.04	0.04
27.20	1.10	0.24	5.00	0.00	0.04	0.04
27.25	1.10	0.24	5.00	0.00	0.04	0.04
27.30	1.10	0.24	5.00	0.00	0.04	0.04
27.35	1.10	0.24	5.00	0.00	0.04	0.04
27.40	1.10	0.24	5.00	0.00	0.04	0.04
27.45	1.10	0.24	5.00	0.00	0.04	0.04
27.50	1.10	0.24	5.00	0.00	0.04	0.04
27.55	1.10	0.24	5.00	0.00	0.04	0.04
27.60	1.09	0.24	5.00	0.00	0.04	0.04
27.65	1.09	0.24	5.00	0.00	0.04	0.04
27.70	1.09	0.24	5.00	0.00	0.04	0.04
27.75	1.09	0.24	5.00	0.00	0.04	0.04
27.80	1.09	0.24	5.00	0.00	0.04	0.04
27.85	1.09	0.24	5.00	0.00	0.04	0.04
27.90	1.09	0.24	5.00	0.00	0.04	0.04
27.95	1.09	0.24	5.00	0.00	0.04	0.04
28.00	1.09	0.24	5.00	0.00	0.04	0.04
28.05	1.09	0.24	5.00	0.00	0.04	0.04
28.10	1.09	0.24	5.00	0.00	0.04	0.04
28.15	1.09	0.24	5.00	0.00	0.04	0.04
28.20	1.09	0.24	5.00	0.00	0.04	0.04
28.25	1.09	0.24	5.00	0.00	0.04	0.04
28.30	1.09	0.24	5.00	0.00	0.04	0.04
28.35	1.09	0.24	5.00	0.00	0.04	0.04
28.40	1.09	0.24	5.00	0.00	0.04	0.04
28.45	1.09	0.24	5.00	0.00	0.04	0.04
28.50	1.09	0.24	5.00	0.00	0.04	0.04
28.55	1.09	0.24	5.00	0.00	0.04	0.04
28.60	1.09	0.24	5.00	0.00	0.04	0.04
28.65	1.09	0.24	5.00	0.00	0.04	0.04

28.70	1.09	0.24	5.00	0.00	0.04	0.04
28.75	1.09	0.24	5.00	0.00	0.04	0.04
28.80	1.09	0.24	5.00	0.00	0.04	0.04
28.85	1.09	0.23	5.00	0.00	0.04	0.04
28.90	1.09	0.23	5.00	0.00	0.04	0.04
28.95	1.09	0.23	5.00	0.00	0.04	0.04
29.00	1.08	0.23	5.00	0.00	0.04	0.04
29.05	1.08	0.23	5.00	0.00	0.04	0.04
29.10	1.08	0.23	5.00	0.00	0.04	0.04
29.15	1.08	0.23	5.00	0.00	0.04	0.04
29.20	1.08	0.23	5.00	0.00	0.04	0.04
29.25	1.08	0.23	5.00	0.00	0.04	0.04
29.30	1.08	0.23	5.00	0.00	0.04	0.04
29.35	1.08	0.23	5.00	0.00	0.04	0.04
29.40	1.08	0.23	5.00	0.00	0.04	0.04
29.45	1.08	0.23	5.00	0.00	0.04	0.04
29.50	1.08	0.23	5.00	0.00	0.04	0.04
29.55	1.08	0.23	5.00	0.00	0.04	0.04
29.60	1.08	0.23	5.00	0.00	0.04	0.04
29.65	1.08	0.23	5.00	0.00	0.04	0.04
29.70	1.08	0.23	5.00	0.00	0.04	0.04
29.75	1.08	0.23	5.00	0.00	0.04	0.04
29.80	1.08	0.23	5.00	0.00	0.04	0.04
29.85	1.08	0.23	5.00	0.00	0.04	0.04
29.90	1.08	0.23	5.00	0.00	0.04	0.04
29.95	1.08	0.23	5.00	0.00	0.04	0.04
30.00	1.08	0.23	5.00	0.00	0.04	0.04
30.05	1.08	0.23	5.00	0.00	0.04	0.04
30.10	1.08	0.23	5.00	0.00	0.04	0.04
30.15	1.08	0.23	5.00	0.00	0.04	0.04
30.20	1.08	0.23	5.00	0.00	0.04	0.04
30.25	1.08	0.23	5.00	0.00	0.04	0.04
30.30	1.08	0.23	5.00	0.00	0.04	0.04
30.35	1.08	0.23	5.00	0.00	0.04	0.04
30.40	1.08	0.23	5.00	0.00	0.04	0.04
30.45	1.08	0.23	5.00	0.00	0.04	0.04
30.50	1.07	0.23	5.00	0.00	0.04	0.04
30.55	1.07	0.23	5.00	0.00	0.04	0.04
30.60	1.07	0.23	5.00	0.00	0.04	0.04
30.65	1.07	0.23	5.00	0.00	0.04	0.04
30.70	1.07	0.23	5.00	0.00	0.04	0.04
30.75	1.07	0.23	5.00	0.00	0.04	0.04
30.80	1.07	0.23	5.00	0.00	0.04	0.04
30.85	1.07	0.23	5.00	0.00	0.04	0.04
30.90	1.07	0.23	5.00	0.00	0.04	0.04
30.95	1.07	0.23	5.00	0.00	0.04	0.04
31.00	1.07	0.23	5.00	0.00	0.04	0.04
31.05	1.07	0.23	5.00	0.00	0.04	0.04
31.10	1.07	0.23	5.00	0.00	0.04	0.04
31.15	1.07	0.23	5.00	0.00	0.04	0.04
31.20	1.07	0.23	5.00	0.00	0.04	0.04
31.25	1.07	0.23	5.00	0.00	0.04	0.04
31.30	1.07	0.23	5.00	0.00	0.04	0.04
31.35	1.07	0.23	5.00	0.00	0.04	0.04

31.40	1.07	0.23	5.00	0.00	0.04	0.04
31.45	1.07	0.23	5.00	0.00	0.04	0.04
31.50	1.07	0.23	5.00	0.00	0.04	0.04
31.55	1.07	0.23	5.00	0.00	0.04	0.04
31.60	1.07	0.23	5.00	0.00	0.04	0.04
31.65	1.07	0.23	5.00	0.00	0.04	0.04
31.70	1.07	0.23	5.00	0.00	0.04	0.04
31.75	1.07	0.23	5.00	0.00	0.04	0.04
31.80	1.07	0.23	5.00	0.00	0.04	0.04
31.85	1.07	0.23	5.00	0.00	0.04	0.04
31.90	1.07	0.23	5.00	0.00	0.04	0.04
31.95	1.07	0.23	5.00	0.00	0.04	0.04
32.00	1.06	0.23	5.00	0.00	0.04	0.04
32.05	1.06	0.23	5.00	0.00	0.04	0.04
32.10	1.06	0.23	5.00	0.00	0.04	0.04
32.15	1.06	0.23	5.00	0.00	0.04	0.04
32.20	1.06	0.23	5.00	0.00	0.04	0.04
32.25	1.06	0.23	5.00	0.00	0.04	0.04
32.30	1.06	0.23	5.00	0.00	0.04	0.04
32.35	1.06	0.23	5.00	0.00	0.04	0.04
32.40	1.06	0.23	5.00	0.00	0.04	0.04
32.45	1.06	0.23	5.00	0.00	0.04	0.04
32.50	1.06	0.23	5.00	0.00	0.04	0.04
32.55	1.06	0.23	5.00	0.00	0.04	0.04
32.60	1.06	0.23	5.00	0.00	0.04	0.04
32.65	1.06	0.23	5.00	0.00	0.04	0.04
32.70	1.06	0.23	5.00	0.00	0.04	0.04
32.75	1.06	0.23	5.00	0.00	0.04	0.04
32.80	1.06	0.23	5.00	0.00	0.04	0.04
32.85	1.06	0.23	5.00	0.00	0.04	0.04
32.90	1.06	0.23	5.00	0.00	0.04	0.04
32.95	1.06	0.23	5.00	0.00	0.04	0.04
33.00	1.06	0.23	5.00	0.00	0.04	0.04
33.05	1.06	0.23	5.00	0.00	0.04	0.04
33.10	1.06	0.23	5.00	0.00	0.04	0.04
33.15	1.06	0.23	5.00	0.00	0.04	0.04
33.20	1.06	0.23	5.00	0.00	0.04	0.04
33.25	1.06	0.23	5.00	0.00	0.04	0.04
33.30	1.06	0.23	5.00	0.00	0.04	0.04
33.35	1.06	0.23	5.00	0.00	0.04	0.04
33.40	1.06	0.23	5.00	0.00	0.04	0.04
33.45	1.06	0.23	5.00	0.00	0.04	0.04
33.50	1.06	0.23	5.00	0.00	0.04	0.04
33.55	1.05	0.23	5.00	0.00	0.04	0.04
33.60	1.05	0.23	5.00	0.00	0.04	0.04
33.65	1.05	0.23	5.00	0.00	0.04	0.04
33.70	1.05	0.23	5.00	0.00	0.04	0.04
33.75	1.05	0.23	5.00	0.00	0.04	0.04
33.80	1.05	0.23	5.00	0.00	0.04	0.04
33.85	1.05	0.23	5.00	0.00	0.04	0.04
33.90	1.05	0.23	5.00	0.00	0.04	0.04
33.95	1.05	0.23	5.00	0.00	0.04	0.04
34.00	1.05	0.23	5.00	0.00	0.04	0.04
34.05	1.05	0.23	5.00	0.00	0.04	0.04

34.10	1.05	0.23	5.00	0.00	0.04	0.04
34.15	1.05	0.23	5.00	0.00	0.04	0.04
34.20	1.05	0.23	5.00	0.00	0.04	0.04
34.25	1.05	0.23	5.00	0.00	0.04	0.04
34.30	1.05	0.23	5.00	0.00	0.04	0.04
34.35	1.05	0.23	5.00	0.00	0.04	0.04
34.40	1.05	0.23	5.00	0.00	0.04	0.04
34.45	1.05	0.23	5.00	0.00	0.04	0.04
34.50	1.05	0.23	5.00	0.00	0.04	0.04
34.55	1.05	0.22	5.00	0.00	0.04	0.04
34.60	1.05	0.22	5.00	0.00	0.04	0.04
34.65	1.05	0.22	5.00	0.00	0.04	0.04
34.70	1.05	0.22	5.00	0.00	0.04	0.04
34.75	1.05	0.22	5.00	0.00	0.04	0.04
34.80	1.05	0.22	5.00	0.00	0.04	0.04
34.85	1.05	0.22	5.00	0.00	0.04	0.04
34.90	1.05	0.22	5.00	0.00	0.04	0.04
34.95	1.05	0.22	5.00	0.00	0.04	0.04
35.00	1.05	0.22	5.00	0.00	0.04	0.04
35.05	1.05	0.22	5.00	0.00	0.04	0.04
35.10	1.05	0.22	5.00	0.00	0.04	0.04
35.15	1.04	0.22	5.00	0.00	0.04	0.04
35.20	1.04	0.22	5.00	0.00	0.04	0.04
35.25	1.04	0.22	5.00	0.00	0.04	0.04
35.30	1.04	0.22	5.00	0.00	0.04	0.04
35.35	1.04	0.22	5.00	0.00	0.04	0.04
35.40	1.04	0.22	5.00	0.00	0.04	0.04
35.45	1.04	0.22	5.00	0.00	0.04	0.04
35.50	1.04	0.22	5.00	0.00	0.04	0.04
35.55	1.04	0.22	5.00	0.00	0.04	0.04
35.60	1.04	0.22	5.00	0.00	0.04	0.04
35.65	1.04	0.22	5.00	0.00	0.04	0.04
35.70	1.04	0.22	5.00	0.00	0.04	0.04
35.75	1.04	0.22	5.00	0.00	0.04	0.04
35.80	1.04	0.22	5.00	0.00	0.04	0.04
35.85	1.04	0.22	5.00	0.00	0.04	0.04
35.90	1.04	0.22	5.00	0.00	0.04	0.04
35.95	1.04	0.22	5.00	0.00	0.04	0.04
36.00	1.04	0.22	5.00	0.00	0.04	0.04
36.05	1.04	0.22	5.00	0.00	0.04	0.04
36.10	1.04	0.22	5.00	0.00	0.04	0.04
36.15	1.04	0.22	5.00	0.00	0.04	0.04
36.20	1.04	0.22	5.00	0.00	0.04	0.04
36.25	1.04	0.22	5.00	0.00	0.04	0.04
36.30	1.04	0.22	5.00	0.00	0.04	0.04
36.35	1.04	0.22	5.00	0.00	0.03	0.03
36.40	1.04	0.22	5.00	0.00	0.03	0.03
36.45	1.04	0.22	5.00	0.00	0.03	0.03
36.50	1.04	0.22	5.00	0.00	0.03	0.03
36.55	1.04	0.22	5.00	0.00	0.03	0.03
36.60	1.04	0.22	5.00	0.00	0.03	0.03
36.65	1.04	0.22	5.00	0.00	0.03	0.03
36.70	1.03	0.22	5.00	0.00	0.03	0.03
36.75	1.03	0.22	5.00	0.00	0.03	0.03

36.80	1.03	0.22	5.00	0.00	0.03	0.03
36.85	1.03	0.22	5.00	0.00	0.03	0.03
36.90	1.03	0.22	5.00	0.00	0.03	0.03
36.95	1.03	0.22	5.00	0.00	0.03	0.03
37.00	1.03	0.22	5.00	0.00	0.03	0.03
37.05	1.03	0.22	5.00	0.00	0.03	0.03
37.10	1.03	0.22	5.00	0.00	0.03	0.03
37.15	1.03	0.22	5.00	0.00	0.03	0.03
37.20	1.03	0.22	5.00	0.00	0.03	0.03
37.25	1.03	0.22	5.00	0.00	0.03	0.03
37.30	1.03	0.22	5.00	0.00	0.03	0.03
37.35	1.03	0.22	5.00	0.00	0.03	0.03
37.40	1.03	0.22	5.00	0.00	0.03	0.03
37.45	1.03	0.22	5.00	0.00	0.03	0.03
37.50	1.03	0.22	5.00	0.00	0.03	0.03
37.55	1.03	0.22	5.00	0.00	0.03	0.03
37.60	1.03	0.22	5.00	0.00	0.03	0.03
37.65	1.03	0.22	5.00	0.00	0.03	0.03
37.70	1.03	0.22	5.00	0.00	0.03	0.03
37.75	1.03	0.22	5.00	0.00	0.03	0.03
37.80	1.03	0.22	5.00	0.00	0.03	0.03
37.85	1.03	0.22	5.00	0.00	0.03	0.03
37.90	1.03	0.22	5.00	0.00	0.03	0.03
37.95	1.03	0.22	5.00	0.00	0.03	0.03
38.00	1.03	0.22	5.00	0.00	0.03	0.03
38.05	1.03	0.22	5.00	0.00	0.03	0.03
38.10	1.03	0.22	5.00	0.00	0.03	0.03
38.15	1.03	0.22	5.00	0.00	0.03	0.03
38.20	1.03	0.22	5.00	0.00	0.03	0.03
38.25	1.02	0.22	5.00	0.00	0.03	0.03
38.30	1.02	0.22	5.00	0.00	0.03	0.03
38.35	1.02	0.22	5.00	0.00	0.03	0.03
38.40	1.02	0.22	5.00	0.00	0.03	0.03
38.45	1.02	0.22	5.00	0.00	0.03	0.03
38.50	1.02	0.22	5.00	0.00	0.03	0.03
38.55	1.02	0.22	5.00	0.00	0.03	0.03
38.60	1.02	0.22	5.00	0.00	0.03	0.03
38.65	1.02	0.22	5.00	0.00	0.03	0.03
38.70	1.02	0.22	5.00	0.00	0.03	0.03
38.75	1.02	0.22	5.00	0.00	0.03	0.03
38.80	1.02	0.22	5.00	0.00	0.03	0.03
38.85	1.02	0.22	5.00	0.00	0.03	0.03
38.90	1.02	0.22	5.00	0.00	0.03	0.03
38.95	1.02	0.22	5.00	0.00	0.03	0.03
39.00	1.02	0.22	5.00	0.00	0.03	0.03
39.05	1.02	0.22	5.00	0.00	0.03	0.03
39.10	1.02	0.22	5.00	0.00	0.03	0.03
39.15	1.02	0.22	5.00	0.00	0.03	0.03
39.20	1.02	0.22	5.00	0.00	0.03	0.03
39.25	1.02	0.22	5.00	0.00	0.03	0.03
39.30	1.02	0.22	5.00	0.00	0.03	0.03
39.35	1.02	0.22	5.00	0.00	0.03	0.03
39.40	1.02	0.21	5.00	0.00	0.03	0.03
39.45	1.02	0.21	5.00	0.00	0.03	0.03

39.50	1.02	0.21	5.00	0.00	0.03	0.03
39.55	1.02	0.21	5.00	0.00	0.03	0.03
39.60	1.02	0.21	5.00	0.00	0.03	0.03
39.65	1.02	0.21	5.00	0.00	0.03	0.03
39.70	1.02	0.21	5.00	0.00	0.03	0.03
39.75	1.02	0.21	5.00	0.00	0.03	0.03
39.80	1.02	0.21	5.00	0.00	0.03	0.03
39.85	1.02	0.21	5.00	0.00	0.03	0.03
39.90	1.01	0.21	5.00	0.00	0.03	0.03
39.95	1.01	0.21	5.00	0.00	0.03	0.03
40.00	1.01	0.21	5.00	0.00	0.03	0.03
40.05	1.01	0.21	5.00	0.00	0.03	0.03
40.10	1.01	0.21	5.00	0.00	0.03	0.03
40.15	1.01	0.21	5.00	0.00	0.03	0.03
40.20	1.01	0.21	5.00	0.00	0.03	0.03
40.25	1.01	0.21	5.00	0.00	0.03	0.03
40.30	1.01	0.21	5.00	0.00	0.03	0.03
40.35	1.01	0.21	5.00	0.00	0.03	0.03
40.40	1.01	0.21	5.00	0.00	0.03	0.03
40.45	1.01	0.21	5.00	0.00	0.03	0.03
40.50	1.01	0.21	5.00	0.00	0.03	0.03
40.55	1.01	0.21	5.00	0.00	0.03	0.03
40.60	1.01	0.21	5.00	0.00	0.03	0.03
40.65	1.01	0.21	5.00	0.00	0.03	0.03
40.70	1.01	0.21	5.00	0.00	0.03	0.03
40.75	1.01	0.21	5.00	0.00	0.03	0.03
40.80	1.01	0.21	5.00	0.00	0.03	0.03
40.85	1.01	0.21	5.00	0.00	0.03	0.03
40.90	1.01	0.21	5.00	0.00	0.03	0.03
40.95	1.01	0.21	5.00	0.00	0.03	0.03
41.00	1.01	0.21	5.00	0.00	0.03	0.03
41.05	1.01	0.21	5.00	0.00	0.03	0.03
41.10	1.01	0.21	5.00	0.00	0.03	0.03
41.15	0.93	0.21	5.00	0.00	0.03	0.03
41.20	0.84	0.21	5.00	0.00	0.03	0.03
41.25	0.79	0.21	5.00	0.00	0.03	0.03
41.30	0.76	0.21	5.00	0.00	0.03	0.03
41.35	0.74	0.21	5.00	0.00	0.03	0.03
41.40	0.71	0.21	5.00	0.00	0.03	0.03
41.45	0.70	0.21	5.00	0.00	0.03	0.03
41.50	0.68	0.21	5.00	0.00	0.03	0.03
41.55	0.66	0.21	5.00	0.00	0.03	0.03
41.60	0.65	0.21	5.00	0.00	0.03	0.03
41.65	0.64	0.21	5.00	0.00	0.03	0.03
41.70	0.62	0.21	5.00	0.00	0.03	0.03
41.75	0.61	0.21	5.00	0.00	0.03	0.03
41.80	0.60	0.21	5.00	0.00	0.03	0.03
41.85	0.59	0.21	5.00	0.00	0.03	0.03
41.90	0.58	0.21	5.00	0.00	0.03	0.03
41.95	0.57	0.21	5.00	0.00	0.03	0.03
42.00	0.56	0.21	5.00	0.00	0.03	0.03
42.05	0.55	0.21	5.00	0.00	0.03	0.03
42.10	0.53	0.21	5.00	0.00	0.03	0.03
42.15	0.52	0.21	5.00	0.00	0.03	0.03

42.20	0.51	0.21	5.00	0.00	0.03	0.03
42.25	0.50	0.21	5.00	0.00	0.03	0.03
42.30	0.48	0.21	5.00	0.00	0.03	0.03
42.35	0.47	0.21	5.00	0.00	0.03	0.03
42.40	0.46	0.21	5.00	0.00	0.02	0.02
42.45	0.45	0.21	5.00	0.00	0.02	0.02
42.50	0.44	0.21	5.00	0.00	0.02	0.02
42.55	0.45	0.21	5.00	0.00	0.02	0.02
42.60	0.45	0.21	5.00	0.00	0.02	0.02
42.65	0.45	0.21	5.00	0.00	0.02	0.02
42.70	0.46	0.21	5.00	0.00	0.02	0.02
42.75	0.46	0.21	5.00	0.00	0.02	0.02
42.80	0.47	0.21	5.00	0.00	0.02	0.02
42.85	0.47	0.21	5.00	0.00	0.02	0.02
42.90	0.47	0.21	5.00	0.00	0.02	0.02
42.95	0.48	0.21	5.00	0.00	0.02	0.02
43.00	0.48	0.21	5.00	0.00	0.02	0.02
43.05	0.49	0.21	5.00	0.00	0.02	0.02
43.10	0.49	0.21	5.00	0.00	0.02	0.02
43.15	0.50	0.21	5.00	0.00	0.02	0.02
43.20	0.50	0.21	5.00	0.00	0.02	0.02
43.25	0.50	0.21	5.00	0.00	0.02	0.02
43.30	0.51	0.21	5.00	0.00	0.02	0.02
43.35	0.51	0.21	5.00	0.00	0.02	0.02
43.40	0.52	0.21	5.00	0.00	0.02	0.02
43.45	0.52	0.21	5.00	0.00	0.02	0.02
43.50	0.52	0.21	5.00	0.00	0.02	0.02
43.55	0.52	0.21	5.00	0.00	0.02	0.02
43.60	0.53	0.21	5.00	0.00	0.02	0.02
43.65	0.53	0.21	5.00	0.00	0.02	0.02
43.70	0.53	0.21	5.00	0.00	0.02	0.02
43.75	0.53	0.21	5.00	0.00	0.02	0.02
43.80	0.54	0.21	5.00	0.00	0.02	0.02
43.85	0.54	0.21	5.00	0.00	0.02	0.02
43.90	0.54	0.21	5.00	0.00	0.02	0.02
43.95	0.55	0.21	5.00	0.00	0.02	0.02
44.00	0.55	0.21	5.00	0.00	0.02	0.02
44.05	0.55	0.21	5.00	0.00	0.02	0.02
44.10	0.55	0.21	5.00	0.00	0.02	0.02
44.15	0.56	0.21	5.00	0.00	0.02	0.02
44.20	0.56	0.21	5.00	0.00	0.02	0.02
44.25	0.56	0.21	5.00	0.00	0.02	0.02
44.30	0.57	0.20	5.00	0.00	0.02	0.02
44.35	0.57	0.20	5.00	0.00	0.02	0.02
44.40	0.57	0.20	5.00	0.00	0.02	0.02
44.45	0.58	0.20	5.00	0.00	0.02	0.02
44.50	0.58	0.20	5.00	0.00	0.02	0.02
44.55	0.58	0.20	5.00	0.00	0.02	0.02
44.60	0.59	0.20	5.00	0.00	0.02	0.02
44.65	0.59	0.20	5.00	0.00	0.02	0.02
44.70	0.59	0.20	5.00	0.00	0.02	0.02
44.75	0.60	0.20	5.00	0.00	0.02	0.02
44.80	0.60	0.20	5.00	0.00	0.02	0.02
44.85	0.60	0.20	5.00	0.00	0.02	0.02

44.90	0.61	0.20	5.00	0.00	0.02	0.02
44.95	0.61	0.20	5.00	0.00	0.01	0.01
45.00	0.61	0.20	5.00	0.00	0.01	0.01
45.05	0.62	0.20	5.00	0.00	0.01	0.01
45.10	0.62	0.20	5.00	0.00	0.01	0.01
45.15	0.62	0.20	5.00	0.00	0.01	0.01
45.20	0.63	0.20	5.00	0.00	0.01	0.01
45.25	0.63	0.20	5.00	0.00	0.01	0.01
45.30	0.64	0.20	5.00	0.00	0.01	0.01
45.35	0.64	0.20	5.00	0.00	0.01	0.01
45.40	0.64	0.20	5.00	0.00	0.01	0.01
45.45	0.65	0.20	5.00	0.00	0.01	0.01
45.50	0.65	0.20	5.00	0.00	0.01	0.01
45.55	0.66	0.20	5.00	0.00	0.01	0.01
45.60	0.66	0.20	5.00	0.00	0.01	0.01
45.65	0.66	0.20	5.00	0.00	0.01	0.01
45.70	0.67	0.20	5.00	0.00	0.01	0.01
45.75	0.67	0.20	5.00	0.00	0.01	0.01
45.80	0.68	0.20	5.00	0.00	0.01	0.01
45.85	0.68	0.20	5.00	0.00	0.01	0.01
45.90	0.69	0.20	5.00	0.00	0.01	0.01
45.95	0.69	0.20	5.00	0.00	0.01	0.01
46.00	0.70	0.20	5.00	0.00	0.01	0.01
46.05	0.70	0.20	5.00	0.00	0.01	0.01
46.10	0.71	0.20	5.00	0.00	0.01	0.01
46.15	0.72	0.20	5.00	0.00	0.01	0.01
46.20	0.72	0.20	5.00	0.00	0.01	0.01
46.25	0.73	0.20	5.00	0.00	0.01	0.01
46.30	0.74	0.20	5.00	0.00	0.01	0.01
46.35	0.74	0.20	5.00	0.00	0.01	0.01
46.40	0.75	0.20	5.00	0.00	0.01	0.01
46.45	0.76	0.20	5.00	0.00	0.01	0.01
46.50	0.77	0.20	5.00	0.00	0.01	0.01
46.55	0.78	0.20	5.00	0.00	0.01	0.01
46.60	0.80	0.20	5.00	0.00	0.01	0.01
46.65	0.81	0.20	5.00	0.00	0.01	0.01
46.70	0.83	0.20	5.00	0.00	0.01	0.01
46.75	0.85	0.20	5.00	0.00	0.01	0.01
46.80	0.88	0.20	5.00	0.00	0.01	0.01
46.85	0.93	0.20	5.00	0.00	0.01	0.01
46.90	0.98	0.20	5.00	0.00	0.01	0.01
46.95	0.98	0.20	5.00	0.00	0.01	0.01
47.00	0.98	0.20	5.00	0.00	0.01	0.01
47.05	0.98	0.20	5.00	0.00	0.01	0.01
47.10	0.98	0.20	5.00	0.00	0.01	0.01
47.15	0.98	0.20	5.00	0.00	0.01	0.01
47.20	0.97	0.20	5.00	0.00	0.01	0.01
47.25	0.97	0.20	5.00	0.00	0.01	0.01
47.30	0.97	0.20	5.00	0.00	0.01	0.01
47.35	0.97	0.20	5.00	0.00	0.01	0.01
47.40	0.97	0.20	5.00	0.00	0.01	0.01
47.45	0.97	0.20	5.00	0.00	0.01	0.01
47.50	0.97	0.20	5.00	0.00	0.01	0.01
47.55	0.97	0.20	5.00	0.00	0.01	0.01

47.60	0.97	0.20	5.00	0.00	0.01	0.01
47.65	0.97	0.20	5.00	0.00	0.01	0.01
47.70	0.97	0.20	5.00	0.00	0.01	0.01
47.75	0.97	0.20	5.00	0.00	0.01	0.01
47.80	0.97	0.20	5.00	0.00	0.01	0.01
47.85	0.97	0.20	5.00	0.00	0.01	0.01
47.90	0.97	0.20	5.00	0.00	0.01	0.01
47.95	0.97	0.20	5.00	0.00	0.01	0.01
48.00	0.97	0.20	5.00	0.00	0.01	0.01
48.05	0.97	0.20	5.00	0.00	0.01	0.01
48.10	0.97	0.20	5.00	0.00	0.01	0.01
48.15	0.97	0.20	5.00	0.00	0.01	0.01
48.20	0.97	0.20	5.00	0.00	0.01	0.01
48.25	0.97	0.20	5.00	0.00	0.01	0.01
48.30	0.97	0.20	5.00	0.00	0.01	0.01
48.35	0.97	0.20	5.00	0.00	0.01	0.01
48.40	0.97	0.20	5.00	0.00	0.01	0.01
48.45	0.97	0.20	5.00	0.00	0.01	0.01
48.50	0.97	0.20	5.00	0.00	0.01	0.01
48.55	0.97	0.20	5.00	0.00	0.01	0.01
48.60	0.97	0.20	5.00	0.00	0.01	0.01
48.65	0.97	0.20	5.00	0.00	0.01	0.01
48.70	0.97	0.20	5.00	0.00	0.01	0.01
48.75	0.97	0.20	5.00	0.00	0.01	0.01
48.80	0.97	0.20	5.00	0.00	0.01	0.01
48.85	0.97	0.20	5.00	0.00	0.01	0.01
48.90	0.97	0.20	5.00	0.00	0.00	0.00
48.95	0.97	0.20	5.00	0.00	0.00	0.00
49.00	0.97	0.20	5.00	0.00	0.00	0.00
49.05	0.96	0.20	5.00	0.00	0.00	0.00
49.10	0.96	0.20	5.00	0.00	0.00	0.00
49.15	0.96	0.20	5.00	0.00	0.00	0.00
49.20	0.96	0.19	5.00	0.00	0.00	0.00
49.25	0.96	0.19	5.00	0.00	0.00	0.00
49.30	0.96	0.19	5.00	0.00	0.00	0.00
49.35	0.96	0.19	5.00	0.00	0.00	0.00
49.40	0.96	0.19	5.00	0.00	0.00	0.00
49.45	0.96	0.19	5.00	0.00	0.00	0.00
49.50	0.96	0.19	5.00	0.00	0.00	0.00
49.55	0.96	0.19	5.00	0.00	0.00	0.00
49.60	0.96	0.19	5.00	0.00	0.00	0.00
49.65	0.96	0.19	5.00	0.00	0.00	0.00
49.70	0.96	0.19	5.00	0.00	0.00	0.00
49.75	0.96	0.19	5.00	0.00	0.00	0.00
49.80	0.96	0.19	5.00	0.00	0.00	0.00
49.85	0.96	0.19	5.00	0.00	0.00	0.00
49.90	0.96	0.19	5.00	0.00	0.00	0.00
49.95	0.96	0.19	5.00	0.00	0.00	0.00
50.00	0.96	0.19	5.00	0.00	0.00	0.00
50.05	0.96	0.19	5.00	0.00	0.00	0.00
50.10	0.96	0.19	5.00	0.00	0.00	0.00
50.15	0.96	0.19	5.00	0.00	0.00	0.00
50.20	0.96	0.19	5.00	0.00	0.00	0.00
50.25	0.96	0.19	5.00	0.00	0.00	0.00

50.30	0.96	0.19	5.00	0.00	0.00	0.00
50.35	0.96	0.19	5.00	0.00	0.00	0.00
50.40	0.96	0.19	5.00	0.00	0.00	0.00
50.45	0.96	0.19	5.00	0.00	0.00	0.00
50.50	0.96	0.19	5.00	0.00	0.00	0.00
50.55	0.96	0.19	5.00	0.00	0.00	0.00
50.60	0.96	0.19	5.00	0.00	0.00	0.00
50.65	0.96	0.19	5.00	0.00	0.00	0.00
50.70	0.96	0.19	5.00	0.00	0.00	0.00
50.75	0.96	0.19	5.00	0.00	0.00	0.00
50.80	0.96	0.19	5.00	0.00	0.00	0.00
50.85	0.96	0.19	5.00	0.00	0.00	0.00
50.90	0.96	0.19	5.00	0.00	0.00	0.00
50.95	0.95	0.19	5.00	0.00	0.00	0.00
51.00	0.95	0.19	5.00	0.00	0.00	0.00

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* F.S.<1, Liquefaction Potential Zone
(F.S. is limited to 5,CRR is limited to 2, CSR is limited to 2)

Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

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1 atm (atmosphere) = 1 tsf (ton/ft2)

CRRm	Cyclic resistance ratio from soils
CSRsf	Cyclic stress ratio induced by a given earthquake (with user request factor of safety)
F.S.	Factor of Safety against liquefaction, F.S.=CRRm/CSRsf
S_sat	Settlement from saturated sands
S_dry	Settlement from Unsaturated Sands
S_all	Total Settlement from Saturated and Unsaturated Sands
NoLiq	No-Liquefy Soils

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GEOTECHNICAL CONSULTANTS

APPENDIX D

REFERENCES

APPENDIX D

REFERENCES

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FEBRUARY 9, 2023

CLOVIS UNIFIED SCHOOL DISTRICT
BID 2923 FOWLER MCKINLEY ELEMENTARY SCHOOL - PHASE 2

ADDENDUM NO. 1

This addendum forms a part of the bid/contract documents. It modifies the original project plans, specifications and instructions. Bidders are required to acknowledge receipt of this addendum on the sheet included with the bid package. Failure to acknowledge receipt of this addendum may subject the bidder to disqualification.

Revisions:
Due to COVID and California Wildfire impact on the insurance industry, the AM Best rating requirement on this project is now **A- rated or better**. Please provide and sign all needed AM Best verification paperwork outlined in bid packet with your sealed bid at time of bid submittal.

Clarification:
AM Best rating requirement of A or better has been reduced to A- or better.
Rating Report information to be obtained from A.M. Best Company –http://www.ambest.com

RFI DEADLINE – FEBRUARY 23, 2023 – 2:00 PM
Submit RFI to Tyler Thomas – Bush Construction
tthomas@bushconstruction.net

If you have any questions, please feel free to contact my office at 559-327-9479.

Leeann Errotabere
Director of Purchasing

Clovis Unified School District, LLC

Owner Controlled Insurance Program (OCIP)

Project: **Fowler McKinley Elementary School**

Project #: **Clovis-02**

IMPORTANT: When enrolling online insert project number above as project code!!

PRESENTED BY:
Gallagher Construction Services

Gallagher
Insurance | Risk Management | Consulting

Table of Contents

An Introduction to the OCIP Program

This manual outlines the details and instructions for all parties for this Owner Controlled Insurance Program ("OCIP"). **Clovis Unified School District** ("Owner") provides Commercial General Liability, and Umbrella Liability coverage for the Construction Manager **Bush Construction** ("CM"), and all enrolled subcontractors of any tier while working on the **Fowler McKinley Elementary School** project.

Major benefits

- Uniformity of coverage terms and conditions
- Reduced Administrative burden
- Insurance costs will not increase for subcontractors during the project
- Reduces coverage disputes, litigation and subrogation
- Immediate Insurer response for subcontractors' accidents
- One Insurer for all completed operations claims
- Project Specific Limits of Liability

Coverage provided

General Liability and Umbrella Liabilty Insurance

The OCIP program provides $100,000,000 of liability limits during construction, and a separate $100,000,000 completed operations limit during for the State Statute of Repose or Ten (10) years following substantial completion, whichever is less. Limits apply to the Owner, Construction Manager and all subcontractors with one $100,000,000 general aggregate and a $100,000,000 limit for products/completed operations.

Subcontractor Enrollment

All subcontractors and lower tier subcontractors MUST enroll online through the Gallagher Contractor Portal http://ajg.vuewrapup.com/contractorportal. Each subcontractor will receive a Certificate of Insurance listing them as a Named Insured and specifying the job name and Owner project number. This program is mandatory for all subcontractors of any tier. However, it will not be extended to environmental subcontractors, subcontractors working under a Professional Services Agreement (PSA), Construction Staking and Surveying Agreement, or other similar professional services only agreement. Failure to comply with enrollment requirement may result in a 2% charge against your contract value until compliant.

Subcontractor Bid Deduction

Subcontractors will **exclude** in their bids their normal costs of insurance for general liability and excess liability. Change Orders are also to be processed **without** the cost of the same insurance coverages.

Project Term

February 14, 2023 to February 1, 2027

Insurance Carriers:

General Liability: Everest Indemnity Insurance Company
1st Excess Liability: Everest Indemnity Insurance Company
2nd Excess Liability: Crum & Forster Specialty Insurance Company
3rd Excess Liability: Arch Specialty Insurance Company (Quota Share)
3rd Excess Liability: Ascot Specialty Insurance Company (Quota Share)

4th Excess Liability: Great American Assurance Company (Quota Share)
6th Excess Liability: Scottsdale Insurance Company (Quota Share)

Deductible Charge for Losses

Subcontractors shall be responsible for the first $5,000 of any General Liability losses within the deductible amount for such insurance to the extent such loss results from the fault or neglect of a subcontractor of any tier, or someone for whom either may be responsible.

Subcontractor Off-site Coverage

Owner will still require Certificates of Insurance for Workers' Compensation, Automobile, and off-site General Liability and Excess Liability and Professional Liability where applicable coverages as required by subcontract.

Subcontractor Excess Limits

Each insured subcontractor should discuss this program with its own insurance advisor to see if additional coverages are recommended. Any such additional coverage will be at the subcontractors' own expense. Should Owner purchase additional limits of liability for any specific project, those will be disclosed.

Claims Management

Claims will be reported to Owner, Construction Manager and Gallagher Construction Services as required by this Manual. Gallagher Construction Services maintains full service claims departments experienced in handling construction related claims. Our claim professionals will assist you with any claims related questions.

DISCLAIMER - This is a summary of the OCIP Program only. It does not change, alter or modify the policy terms and conditions in any way. Actual policy forms and Endorsements are available upon request.

Insurance Coverages

The Owner provides the following Owner Controlled Insurance Program ("OCIP") to all enrolled subcontractors under the program. Policy copies are available upon request.

a. Commercial General Liability Insurance

(Excluding Workers' Compensation, Automobile, and Professional) applying to all Insureds jointly with the following Bodily Injury and Property Damage combined limits:

Limits	
$2,000,000	Each Occurrence
$2,000,000	Personal and Advertising Liability
$4,000,000	General Aggregate
$4,000,000	Products and Completed Operations Aggregate
Excluded	Damages to Premises Rented to You
Excluded	Medical Expense

Completed Operations coverage is provided for the statute of repose or ten (10) years, whichever is less.

b. Excess Liability Insurance

Limits	
$100,000,000	Each Occurrence
$100,000,000	General Aggregate
$100,000,000	Products and Completed Operations Aggregate

a. General Liability Deductibles: For each contractor per occurrence

Subcontractors shall be responsible for the first $5,000 of any General Liability or Contractors Pollution Liability losses within the deductible amount for such insurance to the extent such loss results from the fault or neglect of the Contractor, a subcontractor of any tier, or someone for whom either may be responsible. It is your responsibility to familiarize yourself with the requirements and responsibilities associated with losses and the assessment of deductibles associated with losses under this program.

b. Defense Costs

Defense costs are in addition to the limits of liability of the OCIP Policies.

The coverages under this program do not include all insurance needed by the Subcontractor and its Subcontractors of any tier. For example, General Liability, Excess coverages apply only to the operations of and for each Insured at the Project Site. They do not apply to the operations of any Insured in their regularly established main or branch office, factory, warehouse, or similar place.

This summary is not intended to amend or alter any provisions of the actual insurance policies. If a conflict should occur, the insurance policies shall govern. Actual policy copies will be provided upon written request.

Program Eligibility

All qualified subcontractors of any tier whose employees perform actual on-site labor are **required** to participate in the **Owner's** OCIP and follow through with the enrollment and participant responsibilities as noted throughout this Manual.

Coverage Trigger

Coverage will begin the date you begin work at the site and is contingent on completing the OCIP Enrollment Online through the **Gallagher Contractor Portal** at http://ajg.veuwrapup.com/contractorportal. Once your enrollment has been completed you will receive a Certificate of Insurance confirming the coverage from Gallagher Construction Services. **It is your responsibility to complete and satisfy all enrollment requirements before you begin work on the project.** Failure to supply all requested insurance documents, will result in a flat 2% charge against your entire contract amount. You are also responsible for ensuring that any lower tier subcontractors you hire complete the **Online Enrollment** before they begin their work at the project site. If you or your lower tier subcontractors have NOT completed the **Online Enrollment** process and have NOT received confirmation of enrollment from Gallagher Construction Services, no coverages will be afforded, and you will not be permitted onsite.

Ineligible Parties

Subcontractors who present an exceptionally hazardous exposure or risk to the job site may not be eligible to participate, at Owner's discretion. It is your responsibility to contact Gallagher and confirm your eligibility before you begin work on the project.

Not everyone will be a participant. For example, the following are ineligible for the program: Subcontractors of any tier that are:

- Architects
- Engineers
- Consultants
- Vendors
- Suppliers
- Material dealers,
- Off-site fabricators with no on-site installation
- Others who merely transport, pick up, deliver or carry materials, personnel, parts or equipment or any other items or persons to or from the project site
- Hazardous material / abatement, or asbestos abatement contractors

If you are uncertain whether your firm will be a participant in this program, or wish confirmation of your eligibility, please contact the administrator at Gallagher Construction Services. Contact information can be found on the personnel page at the end of the manual.

Construction Manager will coordinate the program at the project site. Gallagher Construction Services will be administering the program from their offices. A complete contact list is in the back of this Manual.

Enrollment Responsibilities Flow Chart

#	Action Item	Responsibility
1	Distribute Manual to prospective bidders or subcontractors.	Construction Manager
2	Send Manual to your Insurance Agent/Broker for assistance, if necessary, in completing the **Online Enrollment**.	Subcontractor
3	Distribute Manual to prospective lower tier bidders/subcontractors.	Subcontractor
4	Complete **Online Enrollment** and forward to Gallagher insurance documents from you and your lower tier subcontractors.	Subcontractor
5	Upload off-site Insurance Certificate to Gallagher Contractor Portal in accordance with the Insurance Requirements of the Subcontract Agreement	Subcontractor
6	Confirm all site subcontractors' and/or lower-tier subcontractor(s) enrollment in program. Gallagher will issue written confirmation.	Gallagher
7	Certificate of Insurance, Insurance Cost Worksheet and policy copies upon request.	Gallagher
8	Advise your Insurance Agent/Broker of insurance coverages provided by Construction Manager so that proper notice can be made to your current insurers.	Subcontractor Lower-tier subcontractor

Insurance Required From Contractors of Any Tier

Please note that the coverages provided by **Clovis Unified School District** are designated to cover you only while you are actively engaged in construction activities at the project site. Therefore, it is imperative that you maintain your own insurance coverage for **off-site operations**.

The required insurance of every participant is outlined in detail below. You are required to upload your certificate of insurance to the Gallagher Contractor Portal which shows the following offsite coverages along with the minimum limits as follows:

1. **Statutory Workers' Compensation** Insurance and $1,000,000 Employers' Liability for on & off-site operations, warranty and call-back work.

2. **General Liability** Insurance for off-site operations. The required limits vary depending on the type of work performed by the subcontractor. However, required limits are not less than $1,000,000 per occurrence and $2,000,000 for Products and Completed Operations and General Aggregate.

3. **Excess/Umbrella Liability** Insurance for off-site operations. The required limits vary depending on the type of work performed by the subcontractor. However, required limits are not less than $1,000,000 per occurrence and General Aggregate

4. **Automobile Liability** Insurance with limits not less than $1,000,000 combined single limit covering all owned, non-owned and hired automobiles.

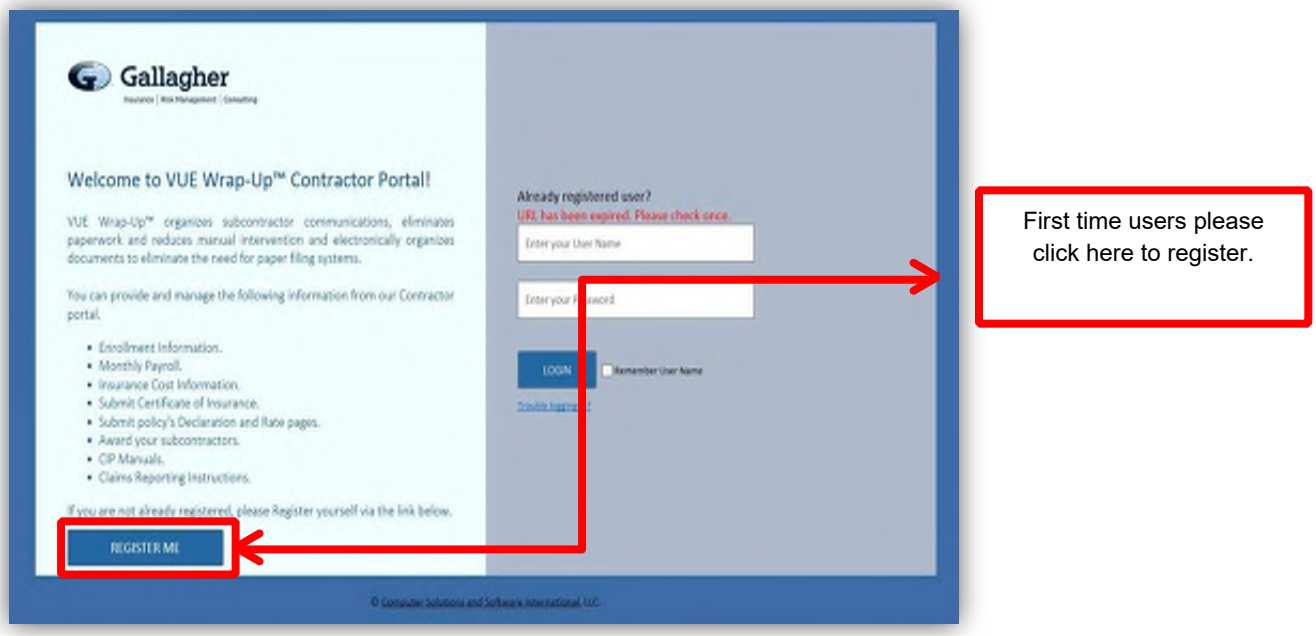
5. **Professional Liability** Insurance with limits not less than $2,000,000 per claim for all subcontractors, consultants, architects, engineers, or surveyors rendering professional services for the **Fowler McKinley Elementary School** project.

6. The Subcontractor of any tier shall require their respective vendors, suppliers, off-site fabricators, material dealers, truckers, drivers and others who merely transport, pick-up, deliver or carry materials, personnel, parts or equipment to or from the project site to maintain insurance in the form and with the limits as specified **in this Insurance Manual.**

The Insurance Manual outlines in detail the required coverages for all participants. It is important to review this document and supply the required Certificate of Insurance prior to the start of work. Please note that progress payments may be withheld if required insurance is not on file. If you have questions regarding any of the required insurance, feel free to contact the administrator at Gallagher Construction Services. Contact information can be found on the personnel page at the end of the manual.

Online Enrollment Instructions – AJG/VUE Online Portal

To start please open your internet browser and go to the AJG Wrap-up Management Portal URL (https://ajg.vuewrapup.com/contractorportal). This will open the portal login screen.



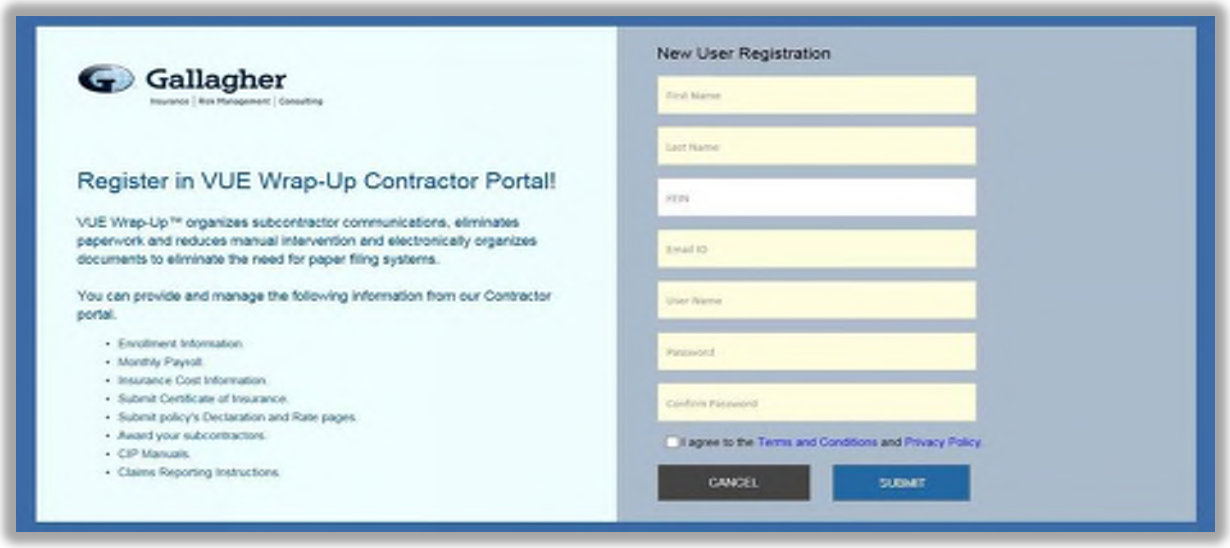
Step1: Registering and Logging In

Click the **Register Me** link at the bottom right hand corner of the login box. **If you are already registered, proceed to Step C.**

A. Fill in the form with your first name, last name, email ID (email address) and enter the user ID you would like to use. Your user ID can be any name or phase you will easily remember, such as your first initial and last name (preferred), your company name, or your email address. Password must contain letters, numbers and symbols.

   a. All fields in yellow are required

   b. FEIN (your company's Federal Tax Identification Number) field is optional, but recommended as it will link your account to any existing contracts linked to your company

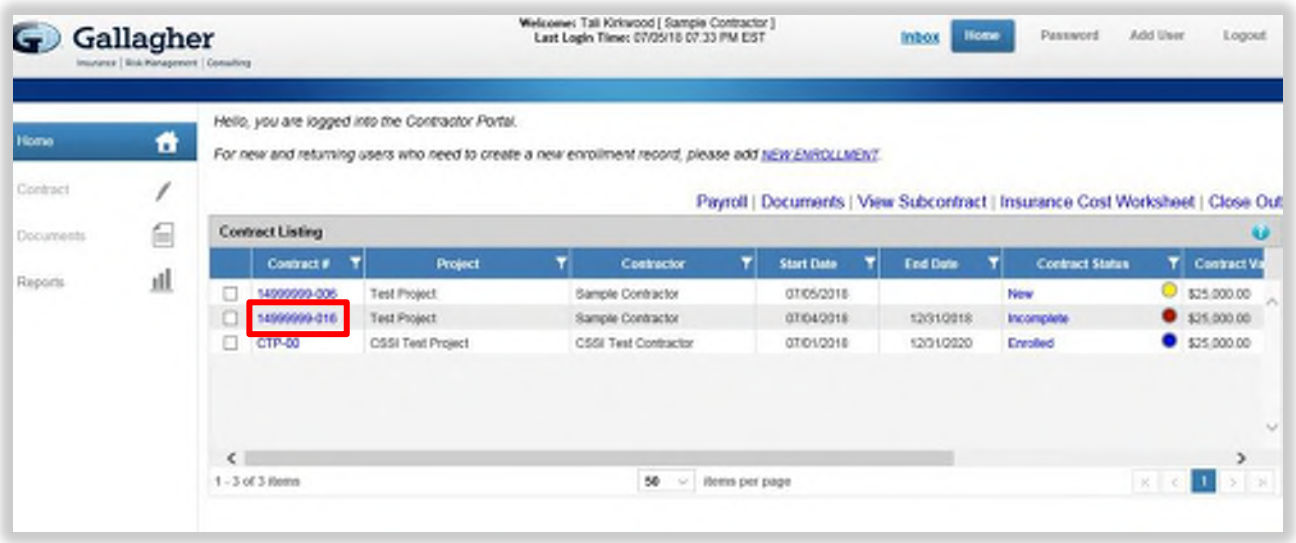


B. When your registration has been completed successfully, you will see the message "User ID and Password are created". Please click here to login to "Contractor Portal". Click the link to be redirected to the login page where you can login to the portal to complete your enrollment. You will also receive an email with your User ID and Password for your records.

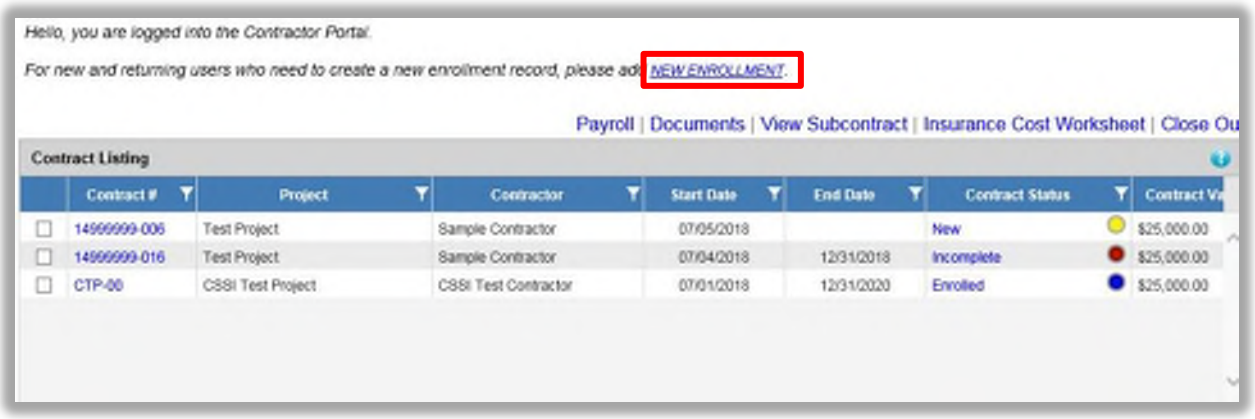
C. Use your provided or created User ID and Password to login. If any error messages appear, contact your AJG Wrap-up Administrator.

Step 2: Completing an Enrollment

A. If your incomplete enrollment already has a contract in the system, you may be required to fill in the missing details. Your contract can be selected by clicking on the contract number hyperlink in the Contract # column.



B. If you do not see a contract for the specific project you are enrolling in, click the "New Enrollment" button.

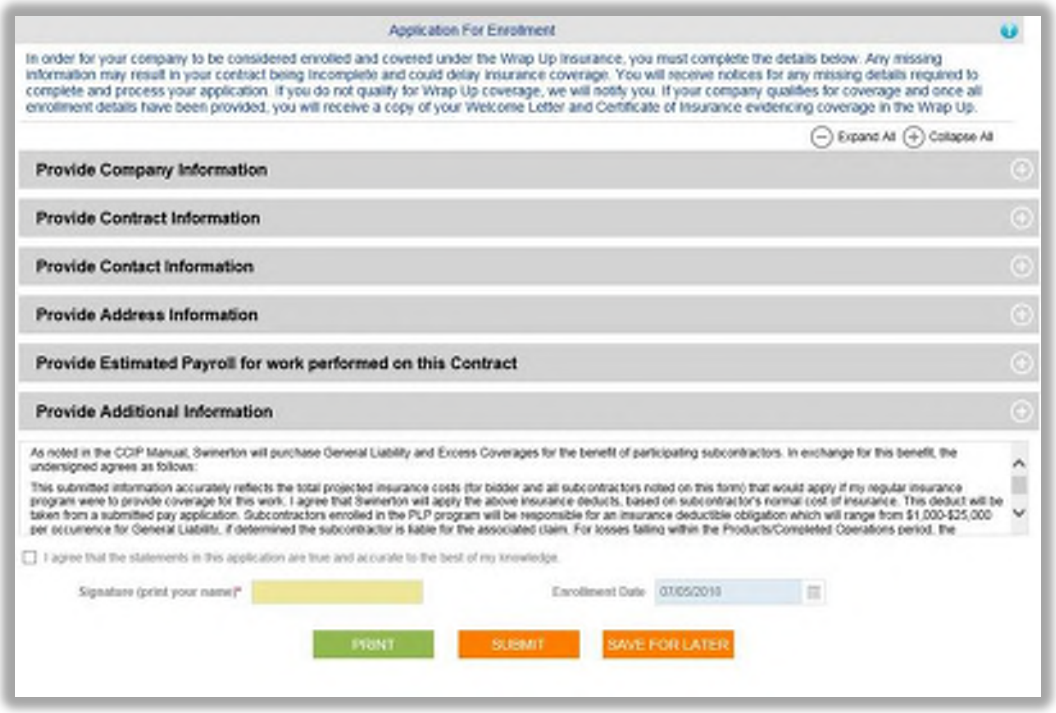


C. When the user clicks on the **New Enrollment** link, a pop up screen will open as shown below. Users should provide the Project Code as listed in their Wrap Up manual or provided by their Wrap Up Administrator.

Step 3: Enrolling

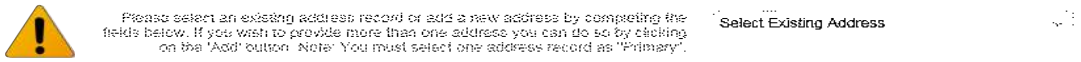
A. The Enrollment Screen includes the following sections, each of which can be expanded or collapsed for ease of review:

   a. Provide Company Information
   b. Provide Contract Information
   c. Provide Contact Information
   d. Provide Address Information
   e. Provide Estimated Payroll for work performed on the Contract
   f. Provide Additional Information
   g. Approval and Signature



B. Fill in each section with your information to the best of your ability. Every section is required to be completed.

   a. For a new enrollment, all fields should be filled in



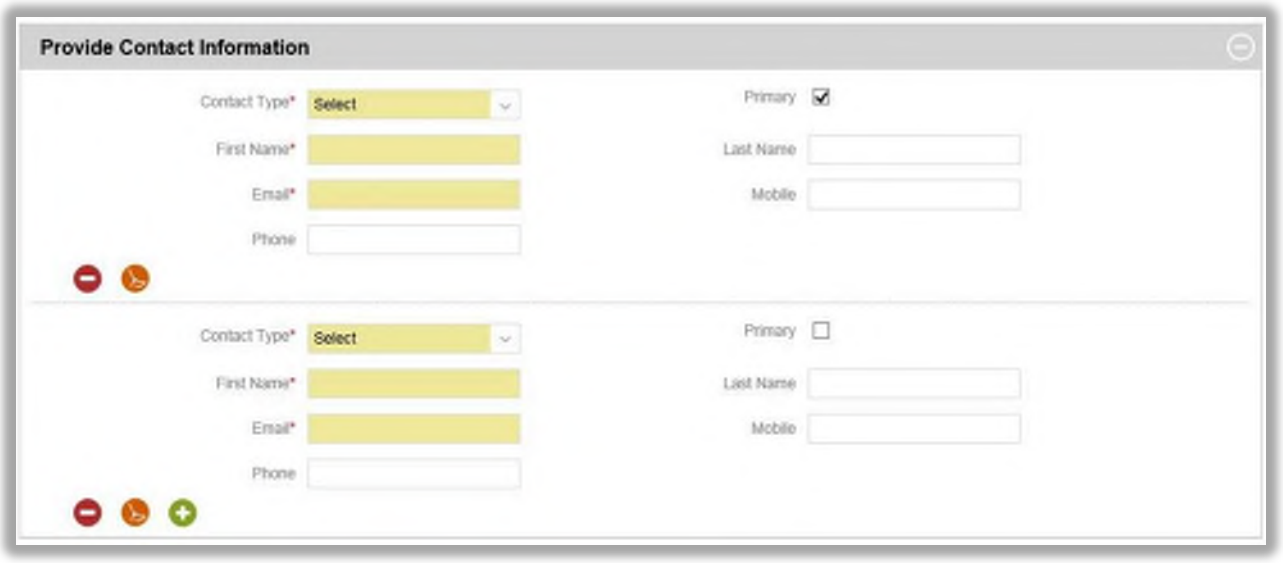
      1. If your company has previously enrolled in a contract on our portal, you will have an option to select previous information in some fields

   b. If a contract has been added to your portal by an AJG Wrap-up Administrator, you may not be able to edit some fields. Move on from those and fill in all the other fields as completely as possible

   c. If you notice a mistake in a non-editable field, contact your AJG Wrap-up Administrator

   d. If you are not sure what a field is requesting, hovering over the field title will show captioned explanations

C. In the Contact section you must enter at least one contact and it must be marked as primary. You may also add additional contacts i.e. Payroll Contact or Worker's Comp Claim Con.



a. You must provide a value for your corresponding preferred mode of contact. For example, if you select email as your preferred method of contact, you must provide an email address.

b. If the enrolling contractor has existing contacts available in our system, they can make a selection from the existing records by selecting contact information from the dropdown available on top of each contact box. Once selected, the contact details will be populated in the respective fields.

c. User can manually enter the new contact by performing these steps: Select contact type, from dropdown menu; enter First Name, Last Name, Email, Phone, and Mobile. By default, the Primary checkbox will be marked for the first contact added. Please note, that the email is mandatory.

d. To add an additional contact, click the ADD button

e. Once a second Contact is added the CLEAR and DELETE button will be available for existing Contact block, allowing the user to clear the details and re-enter or delete the record if needed

A. In the Address section, enter a primary address by filling in all fields and checking the checkbox “Primary”. You must enter at least one address, and if there is only one it must be marked as primary.

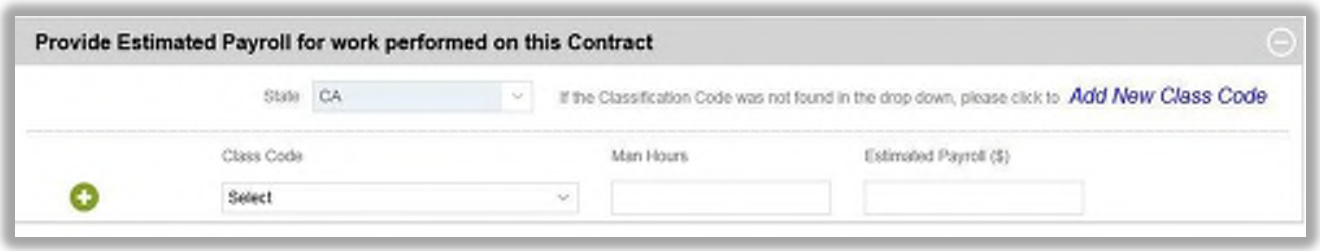
   a. To add a secondary address, click the ADD button in the lower left hand corner of the section containing that address

   b. Once another address is added, the CLEAR and DELETE button will be displayed for the existing Address block, allowing the user to clear the details and re-enter or delete the record if needed

   c. Note: You cannot delete an address that has already been approved by the AJG Wrap-up Administrator. If there is an error in the address approved or entered by the AJG Wrap-up Administrator, please contact them directly.

B. In the Estimated Payroll section, you must enter your best estimate of payroll for entirety of the project.

   a. You must submit estimated payroll for **all** General Liability Class Codes you will be working under on the project. To add estimated payroll for additional codes, please press the Add button on the lower right hand corner of the section.



C. Before you submit your enrollment information, you must check the confirmation checkbox. (Note: The text in your portal may differ from what is shown in the screenshot.) Once you have verified that all information entered is correct, please check the checkbox, and type your name in the Signature box.

Gallagher

D. If you do not have all the necessary information needed for your enrollment, you are now allowed to save the information that you have input and come back to finish at a later time.

After pressing the Save for Later or Submit button be sure to confirm your selection before leaving the page. If you do not, your enrollment will not be saved or submitted in any way.

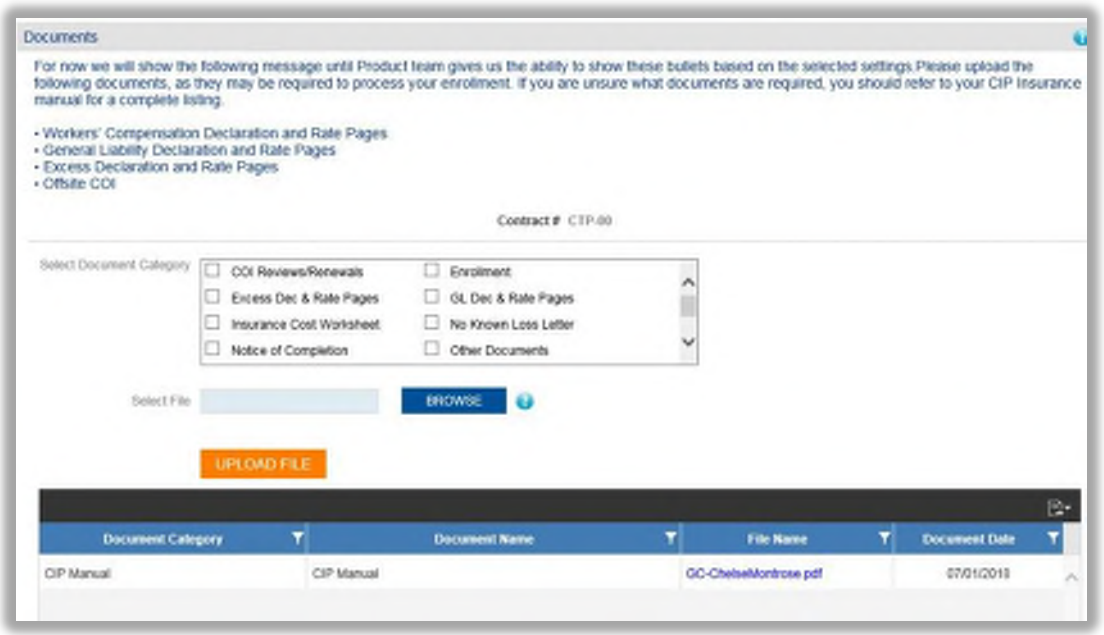
E. Once your Contract is submitted, you cannot make changes to the enrollment.

Step 4: Uploading Documentation

A. As part of your enrollment, you **may** be required to submit supporting documentation such as:

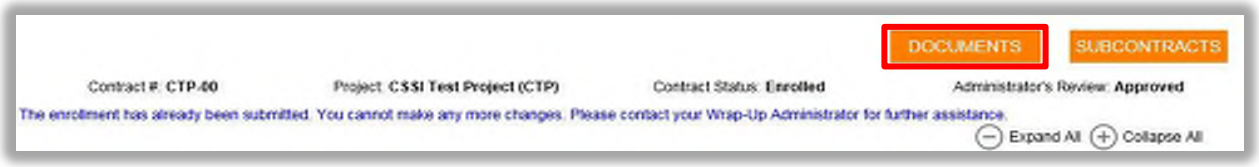
a. Insurance Policy Rate and Declaration Pages
b. Certificates of Insurance
c. NKLL (No Known Loss Letters)
d. Other Documents

The system will prompt you as to which documents are required.

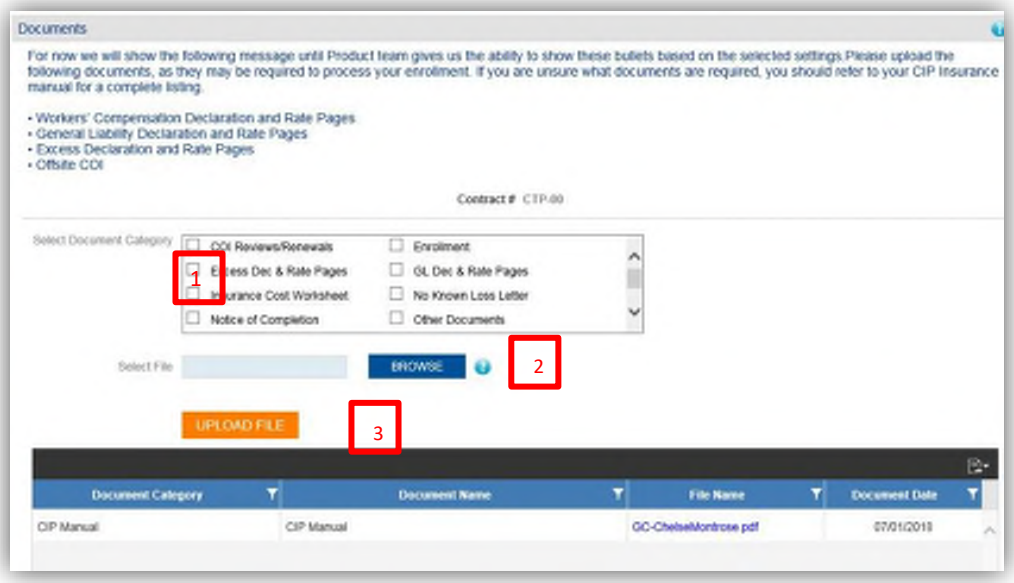


B. Accessing the Documents screen

a. Once you have submitted your enrollment you can press the Documents button on the top Right



On the Documents screen you must choose from the Select Document Category and Select File to upload the document. Refer to the image below. If there are existing document(s) for the selected Contract, the system will display those under Documents section.



C. To add the documents to the selected Contract, follow the steps below:

a. Select the Document Category from the available options. Note: A user can select multiple Categories, i.e. “GL Dec and Rate Pages” and “Excess Rate and Dec Pages”

b. To locate the file to upload, browse your local drive by clicking on the Browse button. The file must be available on your device or computer from which you are currently accessing the portal.

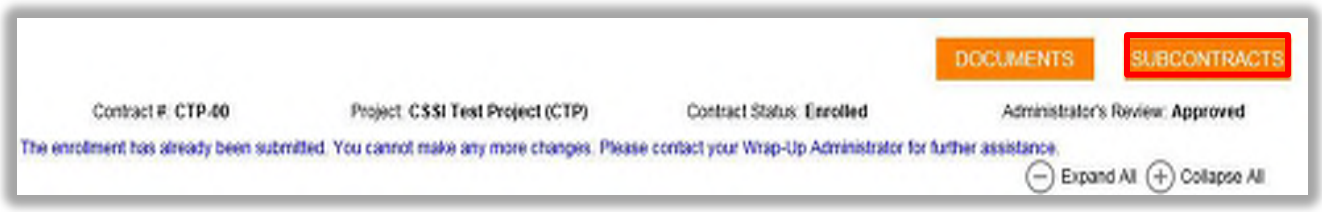
c. Once the file is successfully uploaded, the document(s) will be listed in the Documents section of the Documents Screen

Notes: Only PDF, DOC, DOCX or TIFF documents can be uploaded and all files must be 10MB or under.

Step 5: Adding a Subcontract

If you need to add a Lower Tier Subcontractor please follow the below instructions.

A. From the Enrollment Screen select the Subcontract button on the top right hand corner.



B. This will bring you to the Sub Contract Screen. Begin by pressing the Add Subcontract button.

A. This will open a Subcontract enrollment Screen

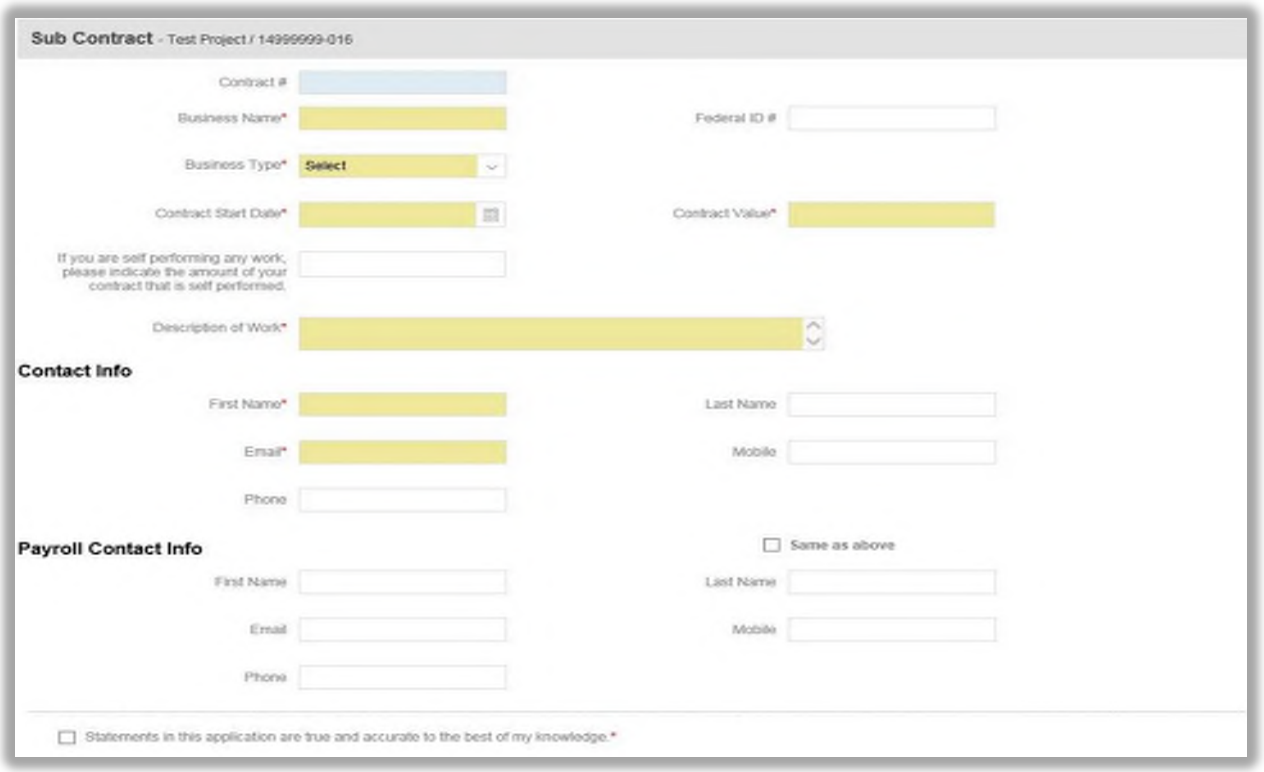
   a. Please fill out all information to the best of your ability

   b. Business Name, FEIN # (If known),Subcontract Value, Expected Start Date

   c. Contract # is a read only field

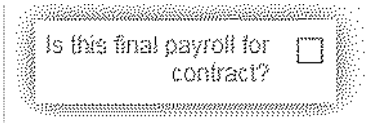
   d. Verify the information and check the checkbox next to the statement “Statements in this application are true and accurate to the best of my knowledge”

   e. Press Submit and confirm



B. To add an additional subcontracts; click on the Add Sub Contract button again the first Sub Contract screen.

G. If you are entering Final Payroll, please check box next to “Is Final Payroll for contract?”



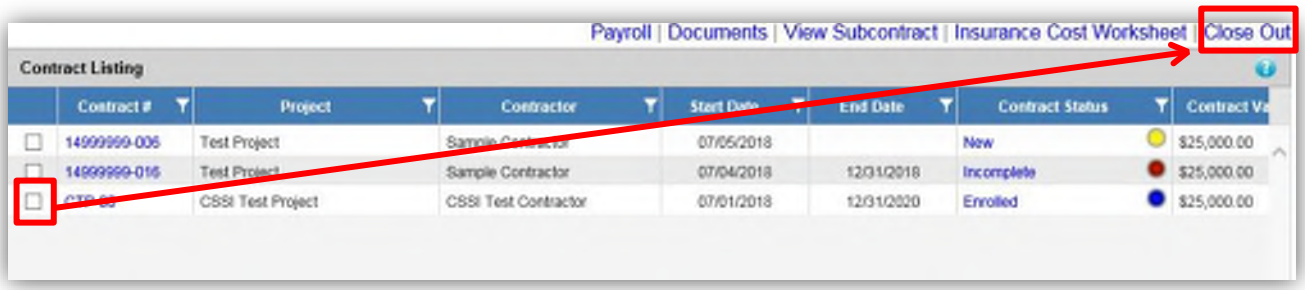
H. After all required information has been entered, click the Submit button. **Please note:** Once the payroll information has been submitted it is still editable and can be resubmitted as needed. If you are unable to edit please contact the AJG Wrap-up AJG Wrap-up Administrator for changes.

To print, click Print button on the top right corner of Actual Payroll screen. A PDF file will open displaying the details of the submitted Actual Payroll.

Step 6: Close Out

A. Once logged in to the portal site select the Contract # listed on the Home Screen, then Click on the Close Out button.

   a. Note: If any of your Contract #’s are not listed, please contact your AJG Wrap-up AJG Wrap-up Administrator to check the status of enrollment



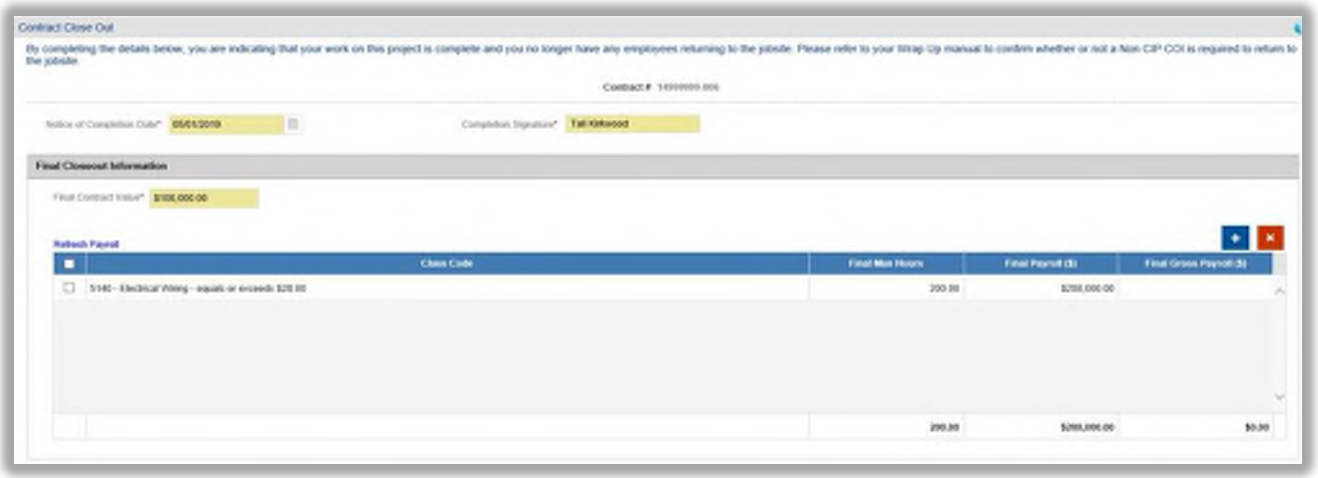
B. Please fill out all fields

a. Notice of Completion Date: the day your company finished work on site

b. Completion Signature: The name of whomever is completing the form

c. Final Contract Value: Your final contract value with you Prime Contractor

d. Payroll Information: The final payroll amount for all Class Codes from your enrollment, for the entire project. Once all information is completed, please press the Submit button. You will see the message “Data Saved Successfully”.



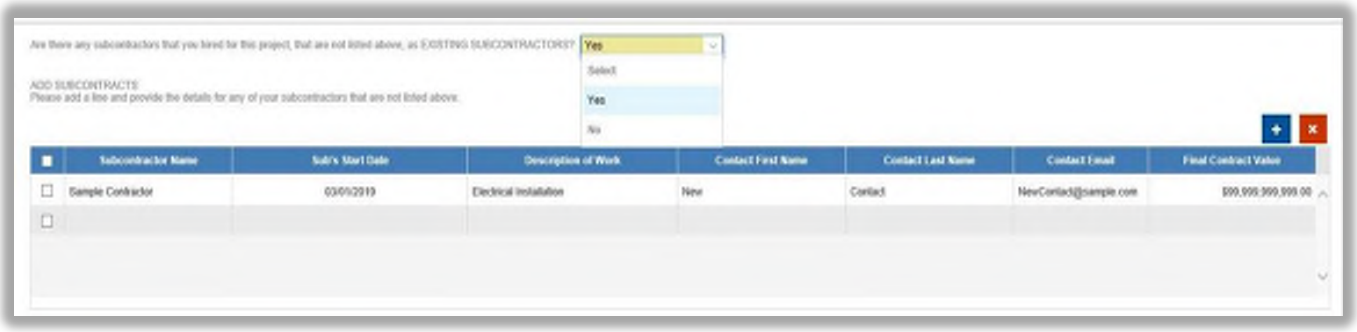
e. Subcontractor Details: (if you did not hire any subcontractors please move to step 2) Any contractors you have hired that have already enrolled in our program will appear in the Existing Subcontracts Chart

Final CV (Reported by Sub)

Gallagher

1. Your subcontractors' reported final Contract Value will populate in the column. To confirm or correct the Final Contract Value, you must fill in the **Final CV (Reported by Parent)** column.

2. If you did not hire any subcontractors select No, and press SUBMIT
   If you did hire subcontractors and they are listed above select No, and press SUBMIT
   If you did hire subcontractors and they are NOT listed above select Yes and add subcontracts in the Add Subcontracts chart by pressing the + button and filling in requested details.



3. Once all hired subcontracts are reported, please review your Close out and press SUBMIT

Accident Reporting for General Liability Claims

If an injury is involved, the Subcontractor's superintendent must immediately arrange for first aid or other required medical treatment for the injured party.

All Incidents, regardless of severity, shall be reported immediately to the Job Site Contact and On-site Safety Coordinator and **reported to the Insurer by telephone**.

The Subcontractor's superintendent must complete a General Liability Loss Notice for each accident with the following distribution:

Karen Durley
Gallagher
Direct: (949) 349-9632
karen_durely@ajg.com

Denver Stairs
Clovis Unified School District
Direct: (559) 327-9260
denverstairs@cusd.com

Jasmine Cooper
Bush Construction
Direct: (559) 267-6010
jasmine@bushconstruction.net

Any Court Summons, legal documents or other correspondence must be immediately referred to Gallagher Construction Services by registered mail. Additional questions concerning suit papers should be referred to Gallagher Construction Services.

Definitions for Purposes of This Manual

Owner	**Clovis Unified School District**
Construction Manager	**Bush Construction**
Project	**Fowler McKinley Elementary School** Between N. Highland Ave. & Leonard Ave. between Princeton Ave. & Weldon Ave.
Project Site	The areas designated in writing by Construction Manager in a contract document for performance of the Work and such additional areas as may be designated in writing by Construction Manager for Contractor's use in performance of the Work. The Project Site shall also include (1) field offices, (2) property used for bonded storage of material for the Project approved by Construction Manager, (3) staging areas dedicated to the Project. **Items 1 through 3 must be approved by the OCIP Insurer and listed in the OCIP Policy**
Off-Site Exposures	Offices, shops, warehouses, factories, or similar locations away from the designated project site that have not been approved by the OCIP Insurer and listed on the OCIP Policy **ARE NOT COVERED.**
Contract	The agreement between Construction Manager and the Subcontractor. The terms "Contract" and "Agreement" are used interchangeably.
Subcontractor of Any Tier	The person, firm or corporation with whom Construction Manager has entered into Agreement to perform the Work; or the Person or entity who has a contract with Construction Manager Subcontractor to perform any of the Work at the Site.
Work	Operations, as fully described in the Contract, performed at or emanating directly from the **Fowler McKinley Elementary School** project.
Insured	Subcontractors of any tier which have an executed subcontract agreement and which have received written confirmation of coverage by Gallagher Construction Services. The following are not Insureds under this WRAP-UP - Architects, engineers, consultants, vendors, suppliers, material dealers, off-site fabricators and others who merely transport, pick up, deliver or carry materials, personnel, parts or equipment or any other items or persons to or from the Project Site, et al.

Personnel Directory

Clovis Unified School District **(Owner) Contacts**

Associate Superintendent, Administrative Services	**Michael Johnston** Clovis Unified School District Direct: (559) 327-9110 michaeljohnston@cusd.com	**Project Administrator**	**Veronica Gutierrez** Bush Construction Direct: (559) 584-1575 vgutierrez@bushconstruction.net
Assistant Superintendent, Facility Services	**Denver Stairs** Clovis Unified School District Direct: (559) 327-9260 denverstairs@cusd.com	**Project Manager**	**Jasmine Cooper** Bush Construction Direct: (559) 267-6010 jasmine@bushconstruction.net
		Safety Coordinator	**Brockton Wheeler** Bush Construction Direct: (559) 670-2449 bwheeler@bushconstruction.net

Bush Construction (CM) Contacts

Gallagher (Insurance Broker) Contacts

***Enrollment/ Administration**	**Ariana Daniels** Gallagher Direct: (725) 735-3907 ariana_daniels@ajg.com	**Program Director**	**Anthony Carlton** Gallagher Direct: (619) 651-5317 anthony_carlton@ajg.com
Program Manager	**Richard E. Banlowe** Gallagher Direct:: 818-539-1210 Mobile: 805-630-4339 richard_banlowe@ajg.com	**Client Service Supervisor**	**Peggy L. Wylie** Gallagher Direct: (925) 953-5266 peggy_wylie@ajg.com
		General Liability Claims	**Karen Durley** Gallagher Direct: (949) 349-9632 karen_durely@ajg.com

Gallagher at a glance

We help you face your future with confidence. Gallagher has been designing solutions to meet our clients' unique needs for more than 90 years. We pioneered many of the innovations in risk management used by businesses in all industries today.

- A global corporation with a strong heritage and culture
- Divisions specializing in retail insurance brokerage operations, benefits and HR consulting, wholesale distribution, and third-party administration and claims processing.
- More than 850 offices in 49 countries and over $6 billion in brokerage & risk management revenues.
- Client-service capabilities in more than 150 countries around the world through a global network of correspondent brokers and consultants.
- Founded in 1927, publicly traded since 1984.

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INCREMENT NO. 1

Bid Package #	Bid Package Description	Contractor License Requirement (, = or)
CES-01	EARTHWORK, CONCRETE, & CMU	A, B, C-8, C-12
CES-02	SITE UTILITIES PLUMBING: DOMESTIC, SANITARY, STORM, FIRE, & GAS	A, C-36
CES-03	SITE ELECTRICAL & LOW VOLTAGE	C-10
CES-04	LANDSCAPE	C-27

INCREMENT NO. 2

Bid Package #	Bid Package Description	Contractor License Requirement (, = or)
CES-05	BUILDING CONCRETE & REBAR	B, C-8
CES-06	STRUCTURAL STEEL	C-51
CES-07	METAL PANELS, ROOFING, & SHEET METAL	C-39, C-43
CES-08	FINISH CARPENTRY	B, C-6
CES-09	METAL FRAMING, PLASTER, AND GYPSUM BOARD	C-9, C-35
CES-10	WALL MATERIALS AND ACOUSTICAL CEILINGS	C-2
CES-11	PAINTING	C-33
CES-12	GENERAL SPECIALTIES	B
CES-13	FIRE SPRINKLERS	C-16
CES-14	BUILDING PLUMBING & HVAC	C-36, C-20
CES-15	BUILDING ELECTRICAL	C-10
CES-16	OFF-SITE IMPROVEMENTS	A

FOWLER MCKINLEY ELEMENTARY SCHOOL

BID PACKAGES CES-01, CES-02, CES-03, & CES-04 PREVIOUSLY BID IN INCREMENT #1

CES-01 EARTHWORK, SITE CONCRETE, & CMU

Section 01 57 23 Storm Water Pollution Prevention Plan
Section 03 11 01 Concrete Formwork
Section 03 15 14 Drilled Anchors
Section 03 20 00 Reinforcement
Section 03 30 00 Cast-In-Place Concrete
Section 04 22 00 Concrete Masonry Units (CMU)
Section 07 14 16 Fluid-Applied Waterproofing
Section 07 92 00 Sealants
Section 08 70 00 Hardware
Section 08 70 00.01 Hardware schedule
Section 10 05 00 Miscellaneous Specialties (Stair Striping)
Section 10 14 53 Road and Parking Signage
Section 10 75 00 Flagpoles
Section 11 68 13 Play Equipment
Section 12 93 13 Bicycle Racks
Section 31 00 00 Offsite Development
Section 31 10 00 Site Clearing
Section 31 11 00 Clearing and Demolition
Section 31 20 00 Earthwork
Section 31 22 22 Soil Materials
Section 31 23 33 Trench Excavation and Backfill
Section 32 12 00 Pavement
Section 32 12 16 Soil Sterilization (Weed Control)
Section 32 18 16 Playground Surfacing
Section 32 19 19 Ornamental Metal
Section 32 31 13 Chain Link

CES-02 SITE UTILITIES PLUMBING: DOMESTIC, SANITARY, STORM, FIRE, & GAS

Section 03 30 00 Cast in place Concrete (As applicable to storm, sewer, manholes, thrust blocks, etc.)
Section 21 05 23 General Duty Valves for Fire Protection
Section 21 05 53 Identification for Fire Protection
Section 21 11 00 Facility Fire Suppression Water Service Piping
Section 21 11 19 Fire Department Connections
Section 22 00 00 General Plumbing Provisions (Gas, Water, Fire Water, Storm, Sewer)
Section 22 00 50 Plumbing (Gas, Water, Fire Water, Storm, Sewer)
Section 23 01 00 General Mechanical Provisions (As Applicable)
Section 31 23 33 Trench Excavation and Backfill
Section 33 12 00 Water Utilities
Section 33 30 00 Site Sewer Systems
Section 33 40 00 Storm Drainage

CES-03 SITE ELECTRICAL & LOW VOLTAGE

Section 03 15 14 Drilled Anchors
Section 03 30 00 Cast in place Concrete (As applicable to slurry, and light pole bases, and grouting)
Section 26 05 00 Common Work Results for Electrical
Section 26 05 26 Grounding
Section 26 05 53 Electrical Identification
Section 26 20 00 Low Voltage Electrical Transmission
Section 27 00 00 Telecommunication Systems
Section 27 05 28 Communications Infrastructure System
Section 27 10 00 Structured Cabling System

CES-04 LANDSCAPE

Section 03 15 14 Drilled Anchors
Section 32 84 00 Landscape Irrigation System
Section 32 90 00 Landscape Construction

CES-05 BUILDING CONCRETE AND REBAR

Section 03 11 01 Concrete Formwork
Section 03 15 14 Drilled Anchors
Section 03 20 00 Reinforcement
Section 03 30 00 Cast-In-Place Concrete
Section 07 14 16 Fluid Applied Waterproofing
Section 07 92 00 Sealants

CES-06 STRUCTURAL STEEL

Section 05 12 00 Steel and Fabrications
Section 05 30 00 Metal Deck

CES-07 SHEET METALS, MEMBRANE ROOFS, WALL AND ROOF PANEL SYSTEMS

Section 07 21 00 Insulation (As applicable to roof systems)
Section 07 40 00 Metal Panels
Section 07 54 19 Elastomeric Membrane Roofing
Section 07 60 00 Sheet Metal
Section 07 92 00 Sealants

CES-08 FINISH CARPENTRY

Section 06 22 00 Millwork
Section 06 41 23 Modular Casework

CES-09 METAL FRAMING, PLASTER, AND GYPSUM BOARD

Section 03 15 14 Drilled Anchors
Section 07 21 00 Insulation (as applicable to all exterior wall rigid insulation)
Section 09 22 16 Metal Framing
Section 09 24 00 Cement Plaster
Section 09 29 00 Gypsum Board

CES-10 WALL MATERIALS AND ACOUSTICAL CEILINGS

Section 09 50 00 Acoustical Ceilings
Section 09 72 00 Wall Coverings
Section 10 26 00 Wall and Corner Guards

CES-11 PAINTING

Section 03 35 10 Polished Concrete Finishing
Section 07 92 00 Sealants
Section 09 67 23 Resinous Flooring
Section 09 91 00 Painting

CES-12 GENERAL SPECIALTIES

Section 01 74 19 Waste Management
Section 03 15 14 Drilled Anchors
Section 06 10 00 Rough Carpentry
Section 07 18 50 Vapor-Alkalinity Control
Section 07 21 00 Insulation
Section 07 72 00 Roof Accessories
Section 07 92 00 Sealants
Section 08 11 00 Metal Doors and Frames
Section 08 15 13 Laminate-Faced Wood Doors
Section 08 31 13 Access Doors and Frames
Section 08 33 00 Coiling Doors
Section 08 41 00 Storefronts
Section 08 56 59 Service Windows
Section 08 70 00 Hardware
Section 08 70 00.1 Hardware Schedule
Section 08 80 00 Glass
Section 09 30 00 Tile
Section 09 64 66 Resilient Wood Floor
Section 09 65 10 Resilient Base and Accessories
Section 09 65 16 Resilient Sheet
Section 09 68 40 Carpet
Section 10 05 00 Miscellaneous Specialties (Building Plaque, Dimensional Letters)
Section 10 11 00 Visual Display Boards
Section 10 14 00 Identifying Devices
Section 10 21 13 Toilet Partitions
Section 10 28 13 Toilet Accessories
Section 10 44 00 Fire Protection Specialties
Section 10 51 13 Metal Lockers
Section 11 16 16 Safes
Section 11 40 00.01 Food Service Equipment
Section 11 61 43 Platform Curtains
Section 11 68 13 Play Equipment
Section 14 42 00 Wheelchair Lifts

CES-13 FIRE SPRINKLERS

Section 03 15 14 Drilled Anchors
Section 07 92 00 Sealants
Section 21 05 17 Sleeves and Sleeve Seals for Fire-Suppression Piping
Section 21 05 18 Escutcheons for Fire-Suppression Piping
Section 21 05 23 General-Duty Valves for Fire Protection Piping
Section 21 05 29 Hangers and Supports for Fire Suppression Piping and Equipment
Section 21 05 48 Vibration & Seismic Controls for Fire-Suppression Piping & Equipment
Section 21 05 53 Identification for Fire-Suppression Piping and Equipment
Section 21 11 00 Facility Fire-Suppression Water-Service Piping
Section 21 11 19 Fire Department Connections
Section 21 13 13 Wet-Pipe Sprinkler Systems

CES-14 BUILDING PLUMBING and HVAC

Section 03 15 14 Drilled Anchors
Section 05 12 00 Steel and Fabrications (For downspouts/RWL's and support attachments)
Section 07 92 00 Sealants
Section 08 91 00 Louvers
Section 22 00 00 General Plumbing Provisions
Section 22 00 50 Plumbing
Section 23 01 00 General Mechanical Provisions
Section 23 01 00 General Mechanical Provisions
Section 23 05 00 Common Work Results for HVAC
Section 23 05 13 Common Motor Requirements for HVAC Equipment
Section 23 05 29 Hangers and Supports for HVAC Piping and Equipment
Section 23 05 48 Vibration and Seismic Controls for HVAC Piping and Equipment
Section 23 05 53 Identification for HVAC Piping and Equipment
Section 23 05 93 Testing, Adjusting, and Balancing for HVAC
Section 23 07 00 HVAC Insulation
Section 23 08 00 Commissioning of HVAC
Section 23 17 10 Variable Frequency Drives
Section 23 23 00 Refrigerant Piping
Section 23 31 13 Metal Ducts
Section 23 31 16 Nonmetal Ducts
Section 23 33 00 Air Duct Accessories
Section 23 34 23 HVAC Power Ventilators
Section 23 34 33 Air Curtains
Section 23 38 13 Commercial Kitchen Hoods
Section 23 72 00 Air to Air Energy Recovery Equipment
Section 23 74 13 Package Outdoor Central Station Air Handling Units
Section 23 74 33 Packaged Outdoor Heat and Cool Makeup Air Units
Section 23 81 50 Variable Refrigerant Flow Air Conditioners
Section 25 50 00 Direct Digital Control and Energy Management Systems

CES-15 BUILDING ELECTRICAL

Section 03 15 14 Drilled Anchors
Section 07 92 00 Sealants
Section 10 05 00 Miscellaneous Specialties (Projector Support Panel)
Section 26 05 00 Common Work Results for Electrical
Section 26 05 26 Grounding
Section 26 05 53 Electrical Identification
Section 26 20 00 Low Voltage Electrical Transmission
Section 26 50 00 Lighting Fixtures
Section 27 00 00 Telecommunication Systems
Section 27 05 28 Communications Infrastructure System
Section 27 10 00 Structured Cabling System
Section 27 20 10 Uninterruptible Power Supply
Section 27 42 00 Classroom Audio-Visual Systems
Section 27 53 13 Analog Synchronous Clocks
Section 27 70 00 Intercom Clock Public Address System
Section 27 80 00 Video Surveillance
Section 28 31 00 Fire Alarm and Detection

CES-16 OFF SITE IMPROVEMENTS

Section 32 84 00 Landscape Irrigation System (For Backflow Preventor and installation)

SUMMARY OF WORK FOR FOWLER MCKINLEY ELEMENTARY SCHOOL

PART 1 – GENERAL

As the Construction Manager (CM) for this project, David A Bush, Inc. (CM) reserves the right to publish Contractor Information Memos (CIM) prior to bid modifying the contract documents, as necessary. Please acknowledge all CIM on your proposal.

The following bidding instructions shall be adhered to by ALL BIDDERS and all bids shall include cost and time to incorporate all of the instructions noted below.

Please note this is a CM Multiple Prime project with all trades contracted to Clovis Unified School District as in a normal lump sum public works contract. All normal aspects of school construction will apply. All Prime Contracts shall be on the District's form which is included in the Contract Documents. Failure to adhere to these contract requirements and instructions may be grounds for rejection of proposal.

1. All bidders must submit proposals on the form provided in the contract documents.
2. All prime contractors will be responsible for paying the non-refundable fees associated with the use of the Architects project CAD files. Fees, forms, and limitations can be found in the project specifications, 01 33 00.
3. In all cases where the plans and specifications are unclear or conflicting it shall be the responsibility of those submitting a bid to EITHER provide a proposal which includes the greater scope or most expensive option or choice at the time of bid OR provide a timely pre-bid RFI that addresses the question in detail.
4. All salvaged items shall be relocated per the contract documents direction and in the absence of direction to the Owners main yard.
5. Any and all miscellaneous or incidental materials or work normally provided by industry standard shall be provided by the Prime Contractor for their Bid Package.
6. Each Prime Contractor shall be responsible for the Safe performance of all of their work and adhere to all safety requirements required by the contract documents and by law.
7. Proposals will be evaluated first on their conformance to the contract documents as a complete bid. Proposals may be rejected as non-responsive if determined to be inconsistent with the bid documents requirements.
8. All Prime Contractors shall provide insurance in a form and limits as required by the contract documents. Prime Contractors shall require their Subcontractors of every tier to carry insurance in a form and limits as required by the contract documents.
9. If a tentative project construction schedule is published prior to bid, it shall become part of the contract documents.
10. If a RFI LOG and/or responses are published prior to bid it shall become part of the contract documents.
11. If a soils report is published prior to bid it shall become part of the contract documents with limitations as stated therein.
12. If a SWPPP is published prior to bid it shall become part of the project and each Prime Contractor, whose work is affected by the implementation shall be responsible for that cost.
13. Each Prime Contractor shall be responsible for locating roof jacks for their scope of work.
14. Any repairs (if required, due to damage by a Prime Contractor) to existing finishes such as plaster, sheetrock, paint, or concrete must be done between natural breaks such as corner to corner or score line to score line.

15. All Prime Contractors shall provide a contact cell phone number to the Construction Manager for contact.
16. Fire watch, if required, shall be provided by the Electrical Bid Package Prime Contractor.

1.01 SUMMARY

A. General: Construction of BASE BID and Alternate portions of the work for this project, **Clovis Unified School District, Elementary School #35, Increment 1 and 2.** BASE BID and Alternate portions of the work is defined as all material, labor, equipment, and services necessary to do all work shown on the drawings and called for in the Specifications. The following specific trade requirements shall not be excluded from their proposal. Exclusion of any required scope specified shall be grounds for rejection. The scope of work for each trade shall remain as required by the Contract Documents. The specific list of scope herein shall be minimum and shall not limit the scope of that trade where required otherwise.

General Summary of the Project
The following information applies to all Bid Packages and shall be reviewed carefully for inclusion in each bid. Following are critical logistics related to the Project:

1. Hazardous Abatement is required if Hazardous Abatement Report is included in Contract Documents.
2. All work for the project will be performed during the hours of 7:00 a.m. to 3:30 p.m.
3. Submittals and material procurement shall begin immediately upon award or letter of intent from the CM.
4. Material procurement is critical and shall be diligently pursued to meet the contract schedule.
5. Prime Contractors shall review the project completely prior to bidding the work.
6. Coordination of work during the preconstruction period is equally as critical to resolving all issues prior to the start of work. Prime Contractor shall review the project, coordinate, and question any issues to allow resolution prior to the start of work.

In addition to the work noted in each package, the following will apply and become a part of the contract with each respective Prime Contractor.

Contract
All successful bidders will be required to enter into a Prime Contract Agreement with Clovis Unified School District.

Contractor Information Memos
All Addendums and Contractor Information Memo's issued during bidding will be incorporated into the Contract Documents by reference. Submission of proposal shall acknowledge that Prime Contractor has reviewed and accepts these documents as part of the Contract Documents.

Submittals and Material Procurement
1. Submittals and material procurement shall begin immediately upon award or letter of intent from the District.
2. Material procurement is critical and shall be diligently pursued to meet the contract schedule.
3. Substitutions must be noted in each bid with all costs for the specified product included in the bid and the substitution cost noted separately.

Alternates

Additive Alternates for the work are as follows. Please provide a base bid for the project then list all alternates:

1. As shown in the plans and specifications and clarified in any Addendum.

Crew Sizes

Given the tight schedule for the project, it will be necessary to have larger than normal crew sizes to meet the schedule. This is inclusive of all trades. All Prime Contractors shall review the schedule and confirm that they can crew the project accordingly prior to submitting a bid. Include with each bid minimum and maximum crew sizes projected for the project.

Schedule

1. Prime Contractors shall review the project and schedule completely prior to bidding the work.
2. Prime Contractor will be required to provide a schedule and crew sizing showing how the work will be accomplished within the given time frame.

State Agency Requirements

1. Work under each contract shall comply with the Storm Water Pollution Prevention Plan (SWPPP) standards and as set forth in the Contract Documents.
2. All work under each contract shall comply with San Joaquin Air Pollution Control District standards. Provide dust control for own work.
3. All work shall comply with OSHA requirements.

Access Plan

If an access and site logistics plan is included in the Contract Documents, access and restriction shall be enforced as a part of the project. Please advise of any questions regarding the plan prior to bid.

Site Logistics, Work and Coordination (applies to each Prime Contractor):

1. Fingerprinting will be required as called for in the contract documents when contact with students may occur.
2. Review and verify all existing conditions.
3. Power will be provided to within 100’-0” of all buildings. Each Prime will be required to provide all necessary temporary utility distribution from services provided.
4. All Prime Contractors shall attend coordination meetings and provide coordination drawings for underground and above ceiling work for work related to its Bid Package and scope for coordination of utilities, openings and other areas that require interface between trades. Coordinate all drawings with the drawings of this bid package. Note conflicts and provide potential solutions to the CM for Architect review. Coordination and drawing approval must occur prior to excavation and/or overhead work. Prime Contractors shall attend a pre-installation meeting prior to the start of its work onsite. All Prime contractors shall be available for pre-installation meetings of other Bid Packages for coordination of related work.
5. Only company vehicles are allowed onsite. Personal vehicles will not be allowed on-site except for in identified locations shown in contract documents. Prime Contractor to make provisions for transport or tool distribution needs.
6. Lunch and breaks shall be at designated areas. No other areas will be allowed.
7. Protect all work, new and existing from damage until acceptance by owner.

8. Storage areas will be confined to the areas designated by CM. Staging areas around the building shall be coordinated with the CM.
9. Provide written request for information through the CM for layout information from related Bid Packages for all rough-in, embedded items, openings, and block-outs, etc.
10. Request and review all associated shop drawings for coordination and layout purposes prior to installation of related materials.
11. Furnish and install all trims, escutcheons, and sealant for own work abutting other materials.
12. Furnish and install protection of all roofing for own work.
13. Furnish and install all physical layout for own work.
14. There will be one wash out area as designated by the CM. Each Prime Contractor will be responsible for removal from the site of all debris and spoils generated by their scope. All spoils are to be moved to the dedicated location on site.
15. Coordinate all work with mechanical, plumbing, fire sprinkler, and electrical Bid Packages for shut down of services as needed. 48-hour notice is required prior to all shut down activities.
16. Review as-builts and underground locator survey and pothole utilities prior to starting work.
17. All Bid Packages are responsible for cleaning of the street, due to tracking out excess dirt or mud, should the preventative measures set in place in accordance with the SWPPP and Dust Control Plans fail to stop all spoils from escaping the site.
18. Secure all ladders and lifts each evening.
19. Provide caution tape and/or barriers for open area work and traffic control.
20. Protect all work, new and existing, from damage until acceptance by owner.
21. Provide water and shade for own crews.
22. Furnish access to roof for own work. Ladders are to be removed and secured at the end of each shift.
23. Provide fall protection for own work in own Bid Package unless specifically noted otherwise in each Bid Package.
24. Provide caution tape and/or barriers for open area work and traffic control. In accordance with all applicable Federal, State, Local, and District standards.
25. Provide layout and coordinate all demolition and ceiling removal required for your scope of work.
26. Coordinate extent of all demolition with related Prime Contractors prior to starting work.
27. Patch Fireproofing at all utilities for own work.
28. Protect all countertops as required by each trade.
29. Furnish and install fire stop for all required through penetrations for own work.
30. Core penetrations through walls as required for installation of own work and patch as noted on the plans.
31. Furnish and install all access doors necessary to provide access to work included in your respective scope of work.
32. Any deviation from the contract documents resulting in additional design will be at the cost of the Prime Contractor responsible for the additional design, as well as any associated cost for delay of schedule.
33. Each Prime Contractor is to provide all equipment and manpower as necessary to offload all materials required to complete their respective scope of work.
34. Monthly payment applications will not be approved if as-builts are not up to date.
35. Adequate manpower is required by Prime Contractor to maintain the posted construction schedule.
36. Prime Contractor consents to execute District's Prime Contractor Agreement as provided in the Contract documents, without modification.

37. Furnish daily cleanup of all debris generated by your respective scope of work. Prime Contractor must abide by the Waste Management Specification.
38. Water Hydrants are located in development around site. Prime Contractors are responsible for own water meters for construction water needs throughout the project. Methods of delivery and use of water for the work of each trade are the responsibility of the Prime contractor.
39. Coordinate all work to provide access to buildings for other trades as scheduled. Provide a breakout schedule of where and when work will be performed that has been coordinated with other activities in the schedule for other trades.
40. Furnish and install own floor protection (i.e., tarps, plastic, plywood, etc.)
41. Furnish and install covers at all holes in elevated decks created by your work in which debris may fall to the level below, per CAL OSHA regulations.
42. All construction equipment shall meet the requirements of the SJVAPCD ISR report (Air Impact Assessment – AIA) under the Construction Clean Fleet Summary. This shall include reporting requirement as defined within the Monitoring and Reporting Schedule within the ISR for this project.

General Items to be Provided by the CM

1. Toilet and hand wash facilities.
2. Temporary site fencing.

Drawings and Specifications

Drawings and general provisions of Contract, including General and Supplementary Conditions, and Division 00 Bidding and Contract Requirements, and Division 01 General Requirements, apply to the work of each Bid Package. The work under each Bid Package shall include the furnishing and installation of all material, equipment, procedures, methods, items, and labor as required to complete the work described in each Bid Package. The work shall be completed as shown on the Drawings and Specified in any and all applicable Specification Sections.

Completion of Work

The work of each Bid Package must be completed according to the construction schedule included with the Contract Documents.

Note: The term “provide” means to “furnish and install, complete and ready for the intended use.”

The work includes, but is not limited to, the items numerically listed in each Bid Package and in accordance with the applicable Drawings and Specification Section(s). Provide all work specified within each Bid Package and applicable Specification Section(s) with the exception of items listed as “work by others.”

While the ways, means, and methods will be the responsibility of the Prime Contractor, the items in the Bid Package Summary of Work are presented for construction clarifications.

General Items – All Prime Contractors

Furnish and install all work specifically required throughout the project documents to complete the work of this Prime Contractor that specifically includes, but is not limited to the following:

Specification Sections
Division 01
Division 00

Refer to additional related specifications sections for work specifically included in this bid package noted below.

1.03 WORK UNDER OTHER CONTRACTS:

A. General Requirements:
    1. Work under separate contracts may occur throughout the duration of the project. The work being installed under separate contracts will occur adjacent to the Contract project site including offsite work.
    2. Prime Contractor shall be responsible for coordinating access to and from the site throughout the duration of the project. Access points to and from the site may vary, based upon timing and duration of separate contracts.
    3. Prime Contractor shall cooperate and coordinate all work under this Contract with all work under separate contracts.
    4. Should the Prime Contractor damage and/or otherwise alter work installed under separate contracts, Prime Contractor shall be responsible for the correction/repair of work installed under separate contracts.
    5. Prior to the installation of the Work, coordinate the work installed or to be installed by separate contracts relative to own work.
B. Separate Contracts by Owner:
    1. Coordinate as awarded.
C. Separate Contracts by Others:
    1. Adjacent Properties: Residential.
D. Phasing:
    1. Phasing is projected to be as shown on the Bid Schedule. However, the owner reserves the right to revise start times pending the review and award of bids.

1.04 BID PACKAGE'S DUTIES:

A. Except as specifically noted, provide, and pay for:
    1. Labor, material, and equipment. All bid packages will be required to provide full time, qualified, knowledgeable supervision for their self-performed, and sub contracted labor. See General Conditions for Contractors specification 00 07 00, and specifics of Article 4 in this reference.
    2. Tools, construction equipment and machinery
    3. Other facilities and services necessary for proper execution and completion of Work.
    4. Water: See Specification Section – TEMPORARY FACILITIES AND CONTROLS.
B. Pay legally required sales, consumer and use taxes.
C. Give required notices.
D. Comply with codes, ordinances, rules, regulations, orders, and other legal requirements of public authorities which bear on performance of Work.
    1. Prime Contractor shall certify in writing that no materials containing Asbestos are incorporated in the work, in accordance with the Asbestos Hazard Emergency Regulations Act.
E. Promptly submit written notice to CM of observed variance of Contract Documents from legal requirements.

1. Appropriate modifications to Contract Documents will adjust necessary changes.
2. Assume responsibility for work known to be contrary to such requirements and without written notice to Architect of observed variance.

F. Enforce strict discipline and good order among employees. Do not employ on Work:
   1. Unfit persons.
   2. Persons not skilled in assigned task.

G. Provide material, equipment, and manpower to meet Construction Schedule provided in Contract Documents.

H. All Prime Contractors will be responsible for paying the non-refundable fees associated with the use of the Architects project CAD files. Fees, forms, and limitations can be found in the project specifications, 01 33 00.

1.05 BID PACKAGE USE OF PREMISES:

A. Confine operations at sites to areas permitted by:
   1. Laws.
   2. Ordinances.
   3. Permits.
   4. Contract Documents.

B. Do not unreasonably encumber site with materials or equipment.

C. Do not load structure with weight that will endanger structure.

D. Assume full responsibility for protection and safekeeping of Prime Contractor's and Owner's material stored on premises and keep the site and building secure at all times.

E. Obtain and pay for use of additional storage or Work areas needed for operations.

F. Limit use of site for work and storage.

End of Section

BID PACKAGES CES-01, CES-02, CES-03, AND CES-04 PREVIOUSLY BID IN INCREMENT #1

CES-01 – EARTHWORK, SITE CONCRETE & CMU

Earthwork, Grading, Paving, Soil Treatment, Site Concrete, Rebar, Misc. Specialties (Stair Stripping), Flag Pole, CMU, Fencing, Playground Equipment, Site Furnishings.

Furnish and install all work specifically required throughout the project documents to complete the work of this bid package that specifically includes, but is not limited to the following:

Specification Sections

Refer to additional related specifications sections for work specifically included in this bid package noted below.

Division 00
Division 01
Section 01 57 23 Storm Water Pollution Prevention Plan
Section 03 11 01 Concrete Formwork
Section 03 15 14 Drilled Anchors
Section 03 20 00 Reinforcement
Section 03 30 00 Cast-In-Place Concrete
Section 04 22 00 Concrete Masonry Units (CMU)
Section 07 14 16 Fluid-Applied Waterproofing
Section 07 92 00 Sealants
Section 08 70 00 Hardware
Section 08 70 00.01 Hardware schedule
Section 10 05 00 Miscellaneous Specialties (Stair Striping)
Section 10 14 53 Road and Parking Signage
Section 10 75 00 Flagpoles
Section 11 68 13 Play Equipment
Section 12 93 13 Bicycle Racks
Section 31 00 00 Offsite Development
Section 31 10 00 Site Clearing
Section 31 11 00 Clearing and Demolition
Section 31 20 00 Earthwork
Section 31 22 22 Soil Materials
Section 31 23 33 Trench Excavation and Backfill
Section 32 12 00 Pavement
Section 32 12 16 Soil Sterilization (Weed Control)
Section 32 18 16 Playground Surfacing
Section 32 19 19 Ornamental Metal
Section 32 31 13 Chain Link

General Items

1. See General Notes at the beginning of the Summary of Work Specification Section for other items to be included in this Bid Package.

2. Furnish and install all layout for own work from survey provided. Prime Contractor will be responsible for all additional layout not performed by the survey contractor. Prime Contractors are responsible for protection of all requested survey. Any needed re-staking of already provided points will be subject to deductive change order.
3. Provide all backfill of excavations to original sub-grade for work included in this bid package.
4. Obtain all permits required to perform the work specified in the bid package. CM will submit the Dust Control plan to the Air Board. Prime Contractor will be responsible for all other permits required to perform the work identified. Prime Contractor will be responsible for dust control for their own work.
5. Provide daily cleanup to keep site clean and orderly.
6. Protect identified improvements to remain on civil plan sheets.
7. Should the Prime Contractor damage and/or otherwise alter work installed under separate contracts, Prime Contractor shall be responsible for the correction/repair of work installed under separate contracts.
8. Prime Contractor is required to attend all coordination meetings as required by CM
9. Phasing is projected to be as shown on the Bid Schedule. However, the Construction Manager reserves the right to revise the schedule, as necessary.
10. Promptly submit written notice to CM of observed variance of Contract Documents from legal requirements.
    a. Appropriate modifications to Contract Documents will adjust necessary changes.
    b. Assume responsibility for work known to be contrary to such requirements and without written notice to Architect of observed variance.
11. Provide material, equipment, mobilizations, and manpower to meet Construction Schedule provided in Contract Documents.
12. Each bid package is responsible for dewatering as it pertains to their scope of work.
13. Provide trenching plan and permits for excavations over 5’ per OSHA requirements to the Construction Manager.
14. Each Prime Contractor is to provide all equipment and manpower as necessary to offload all materials required to complete their respective scope of work.
15. Monthly pay apps will not be approved if as-builts are not updated monthly.
16. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.
17. Provide daily cleanup to keep site clean and orderly.
18. There will be one wash out area as designated by CM. Bid package will be responsible for removal from the site of all construction debris generated by Prime Contractor’s work. Extra spoils to be stockpiled at the direction of CM.
19. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this project.
20. This contract is to provide temporary power for own work until such time as building temporary power is established.

Coordination with Other Trades

1. This Prime Contractor will be responsible for the initial setup of SWPPP BMP's, as shown in the SWPPP plan drawings, including but not limited to, silt fencing, track outs and fiber rolls surrounding existing drain inlets.
2. Allow for two additional mobilizations for movement or relocation of track outs as required during construction.
3. Hold all turf areas down 2" at concrete walks and mow strips for turf, 1" at planters.
4. Location for trades to stockpile their spoils will be established with CM, and this CES-01 Prime Contractor.
5. Any survey requests require a minimum of 48-hour notice.
6. Coordinate dimensions with other related Prime Contractors of all equipment and housekeeping pads. Pad sizes shall be provided by other Prime Contractors and physically laid out and installed by this contract.
7. Coordinate installation of all sleeves for work passing through concrete work with respective Prime Contractors prior to excavation.
8. Electrical and site utility Prime Contractors shall furnish and install all concrete required for installation of thrust blocks, manholes, vaults, boxes, underground structures for work related to their contract. This contract shall furnish and install all other concrete shown including aprons mow strips and collars.
9. Install and coordinate block-outs at the site concrete to facilitate installation of fine grading by Earthwork Prime contractor and to protect concrete until fine grading is complete. Complete site concrete block-outs once fine grading is complete. Backfill and fine grade once block-outs have been poured.
10. Install and physically layout all embedded items (as provided by other Prime Contractors), holes, sleeves and block outs in concrete as shown in the contract documents, related shop drawings or provided written layout. Coordinate locations with related Prime Contractors prior to installation.
11. Provide layout drawings for all site concrete joints for approval prior to installation of site concrete.
12. Review as-builts prior to starting work.

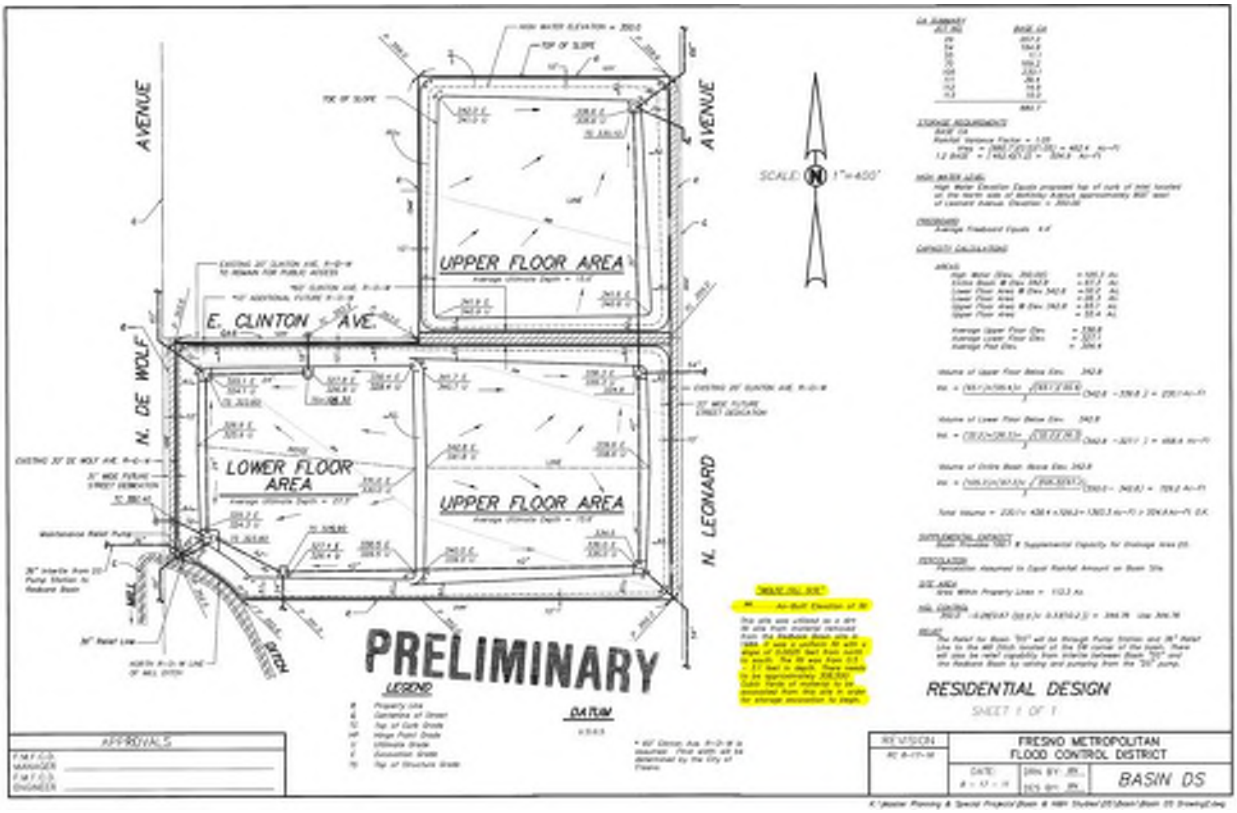
Furnish and Install Items

DEMOLITION – SITE CLEARING

1. Provide all cut, demolition, removal, and off-haul of all items noted to be removed as shown on contract documents.
2. For site clearing and demolition follow recommendations as outlined within the soils report prepared by RMA Geoscience included in the project documents, in association with the contract documents.
3. Investigate and remove the existing 3" steel post that stands approx. 100 feet south of Weldon, and 300 feet east of Fowler. It is believed to be an abandoned fence post.
4. Make provisions to obtain water for own work. Dust control, excavations, backfills, compactions, etc. There are fire hydrants on two sides of the project. Make necessary arrangements with the city of Fresno to acquire a meter and pay for own water usages until such time that the site water has been installed and approved for site usage.

EARTHWORK AND GRADING

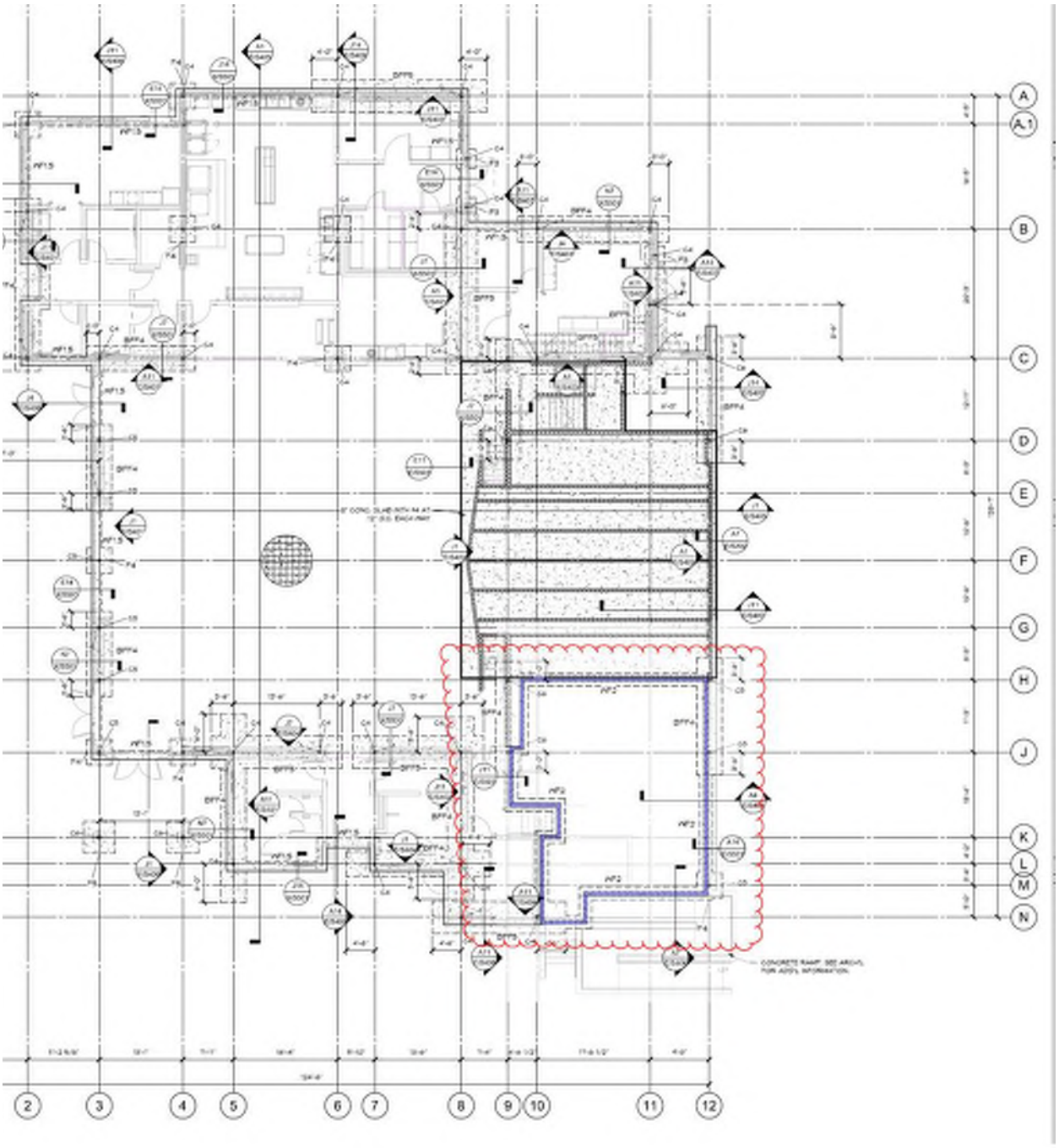
1. Grade all earthwork to within +/-0.05' from a planned elevation.
2. Furnish and install all cut and fill necessary to perform work. Sand to be furnished and installed by the concrete bid package at the buildings only. All other materials shall be provided by this bid package.
3. Clarification: This will be an "Import" project. This bid package will provide and incorporate approximately 35,000 cu yds of soil to the site. The material will be obtained from the CUSD Terry Bradly Ed Center ponding basin, located between DeWolf and Leonard Ave, at East Clinton Ave, where the soils has been previously tested for toxicity and suitability. Provide a per cubic yard Schedule of Values for these import soils, should additional soils, or a reduction of soils be required, other than the estimated 35,000 cu yds. Provide for All loading, hauling, street cleaning, dust controls, or traffic managements required will be provided under this CES-01 Earthwork and Grading bid package. Prior to starting this scope, there will be a required coordination meeting with CES-01 contractor, CUSD, RMA, and Bush Construction to discuss plan, routing, and execution.
4. All areas of planters, or turf are to have a minimum top layer of 1' from existing native soil.



5. Furnish and install all grading of the site on separate move-ins (as scheduled by the CM) to accommodate the site concrete and mow strips installation. Coordinate backfill and final fine grading activities to eliminate damage to new site concrete. Consult, and coordinate all elevations with the Landscape bid package where applicable.
6. Furnish and install over excavations and building pads.
7. Specific to building E, from grid lines H to N, and 9 to 12, the slab is 3'-7" higher than the overall building slab. The earthwork Prime Contractor will build this up as required, then cut the material back to allow adequate work space for the structural concrete bid package to install footings, pour

footings, build formwork, pour walls, strip, clean, and install fluid applied waterproofing. Once cured, the earthwork Prime Contractor will return to backfill and compact up against new walls and fine grade in preparation for elevated slab pour. See plan detail at end of this section for additional reference.

8. Furnish and install temporary ag base roadway on site for construction use, including base at laydown area. After the threat of rain, towards the end of the project, the base will need to be scraped off, final grading established per plans, and the base is to be hauled off under this contract bid package. (See temporary access and yard plan for extent) CLARIFICATION: The depth of the ag base may vary but must be thick enough to hold up during the rains and site traffic. If repairs need to be made to maintain an adequate roadway, it will be performed under this bid package. Spray on dust control/soil stabilizer will also be a suitable alternative for the roadways but may require more frequent maintenance and product applications.
9. Maintain and protect building pads to within tolerance, elevation, moisture, weed free and compaction until accepted/received by the concrete contractor as noted in the schedule.
10. Furnish and install all soil Sterilization as per the contract documents.
11. Furnish and install backfill of mow strips, walks, curb, curb & gutter, planter, and turf areas.
12. Furnish, install, and maintain traffic control for work included in this bid package.
13. Furnish and install engineered shoring at all locations as required.
14. For excavation, backfill and compaction efforts, follow recommendations as outlined within the soils report prepared by RMA Geoscience included in the project documents, in association with the contract documents.
15. Make provisions to obtain water for own work. Dust control, excavations, backfills, compactions, etc. There are fire hydrants on two sides of the project. Make necessary arrangements with the city of Fresno to acquire a meter and pay for own water usages until such time that the site water has been installed and approved for site usage.
16. Furnish and install all SWPPP items as outlined in the SWPPP plan and in spec section 01 50 00. CLARIFICATION: SWPPP installation is to be at and within the perimeter of the project site. All “Off Site” SWPPP to and along the west side of Fowler, and south of McKinley will be bid separately.
17. This package is responsible for setup and implementation of SWPPP plan. This package is also responsible for monitoring, documentation, reporting, teardown, and final cleanup of SWPPP items at completion of the project.



PAVING

1. Furnish and install all On Site paving base rock as identified on plans, including but not limited to under parking areas, basketball courts and drives. CLARIFICATION: All grading, paving associated with the Off-Site improvements will be furnished and installed with that bid package.
2. Furnish and install all compacted base rock as identified in contract documents.
3. Furnish and install parking bumpers and wheel stops where shown.
4. Furnish and install parking striping and/or accessible symbols as shown on contract documents.
5. Furnish and install all parking and road signage as indicated in contract documents, including concrete at posts where indicated.

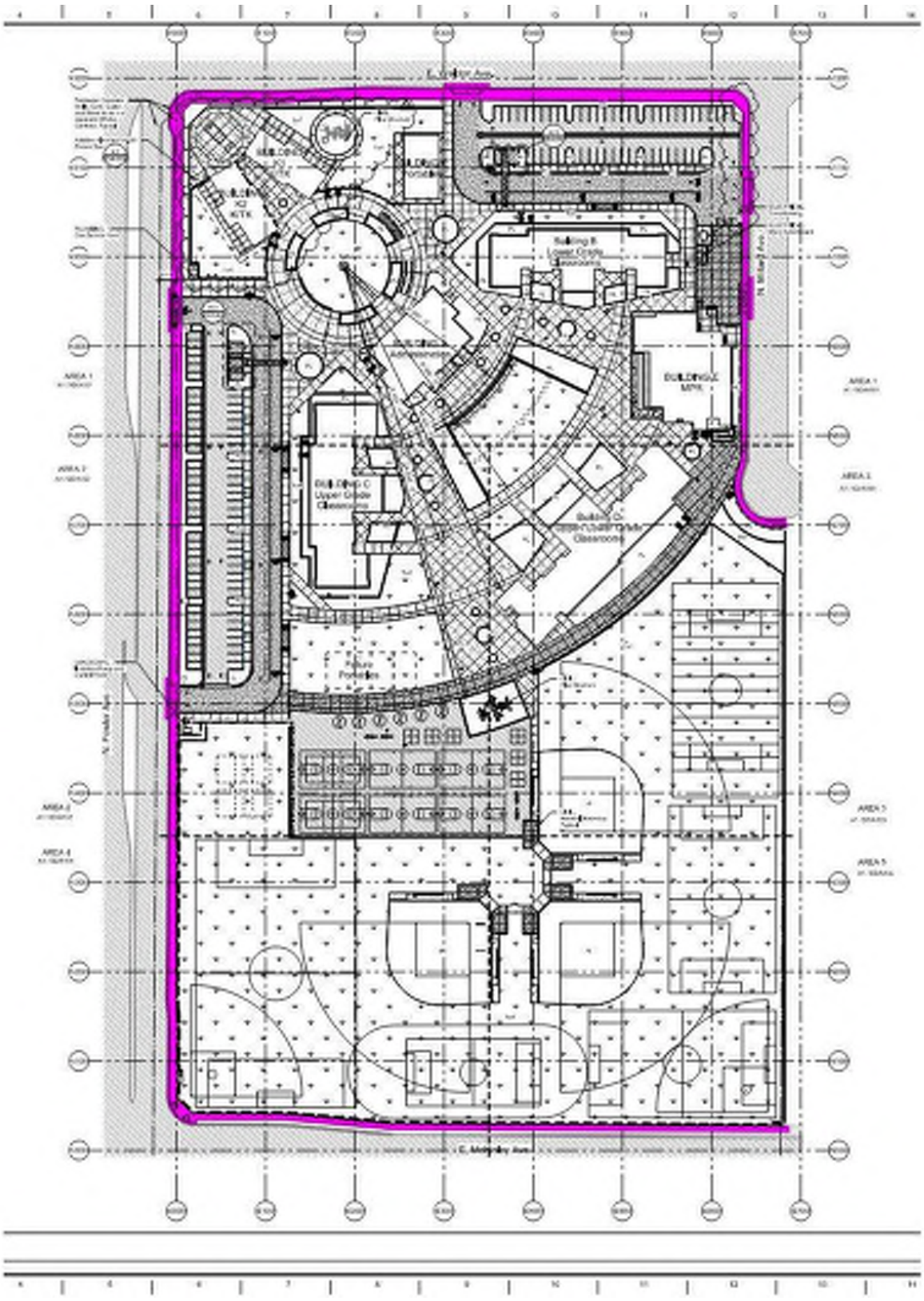
6. Furnish and install all asphalt paving and patch backs.
7. All parking areas are to be scheduled for two separate mobilizations, as the first 1 ½" lift will be placed, and the areas utilized for parking and staging during construction. At a later scheduled time in the project, this package will clean, prep, install tack, remobilize, and place the final finish section of the parking lots and entrance access points.
8. Furnish and install all slurry seal.
9. Furnish and install all play court striping as indicated in the contract documents.
10. Furnish and install pressure treated/redwood 2x4 header form at asphalt edge where unsupported unless noted otherwise.
11. Make provisions to obtain water for own work. Dust control, excavations, backfills, compactions, etc. There are fire hydrants on two sides of the project. Make necessary arrangements with the city of Fresno to acquire a meter and pay for own water usages until such time that the site water has been installed and approved for site usage.

SITE CONCRETE

1. Furnish and install all site concrete, including but not limited to, flatwork, curbs, curb and gutter, planter curbs, planter walls, gutters, valley gutters, mow strips, seat walls, all CMU footings (Site & Maintenance Yard), and amphitheater walls. Clarification of scope limits of work boundaries. See attached sketch at the end of this section.
2. Furnish and install all reinforcing as required for all site concrete per contract documents. Including but not limited to CMU footings, seat walls, fire lane, etc.
3. Furnish and install rebar caps per OSHA for all rebar associated with this contract's scope of work, installed by the reinforcement contractor. Furnish and install concrete stake caps associated with this contract's scope of work. Maintaining of Caps is the responsibility of this Prime Contractor. Safety walks at end of day required to ensure caps are in place, and any missing caps replaced.
4. Furnish any and all excavation necessary for work included in this contract.
5. Furnish and install all mow strips in site and around buildings, including at chain link, and ornamental fencing.
6. Furnish and install all sealants at all site concrete. This includes all sealant where site concrete abuts all buildings and structural concrete or CMU.
7. Furnish and install amphitheater steps, with reinforcing and stair nosing. (N1/SD/A302 & P11/SD/A302)
8. Install bollards (a.k.a. drinking fountain rails - furnished by others) in concrete footing. (J7/X/A531)
9. Furnish and install all parking and walkway accessible concrete ramps per contract documents.
10. Furnish and install all truncated domes.
11. Furnish and install all play access and play access perimeter curbs (B/SD/X107, C/SD/X107)
12. Install steel anchor plates, steel keeper plates and welded straps at thickened concrete walk at cane bolt locations. (N13/SD/A402) – Steel anchor plates, keeper plates and welded straps to be provided by fencing contractor F.O.B.
13. Install Flagpole in concrete base with reinforcing – see detail (A1/SD/A301)
14. Furnish and Install Concrete Monument Sign with reinforcing, V groove, chamfer, etc. Refer to details.
15. Furnish and install footings and sleeves/inserts for volleyball, tetherball, and basketball posts.
16. Furnish and install footings and sleeves/inserts for bicycle racks and any hand railing. Rails and racks to be supplied by others. Note: Bike racks provided by this bid package, Bike Lockers are owner furnished, owner installed.
17. Furnish and install fibrous expansion joint, and sealant where required.
18. Install three sets of handrails at amphitheater.
19. Furnish and install concrete for all site housekeeping pads. Including but not limited to,

transformer, and electrical pads. Coordinate dimensions and layout with Prime Contractors.

20. Furnish and install concrete for all irrigation equipment/devices. Including, but not limited to, backflow pad, and booster pump pad. Coordinate dimensions and layout with site plumber and site landscape Prime Contractors.
21. Physically layout and install all block outs, openings, backing, etc. from written layout provided by other Prime Contractors for installation of their work.
22. This contract is to provide temporary power for own work until such time as building temporary power is established.
23. Make provisions to obtain water for own work. Dust control, excavations, backfills, compactions, etc. There are fire hydrants on two sides of the project. Make necessary arrangements with the city of Fresno to acquire a meter and pay for own water usages until such time that the site water has been installed and approved for site usage.
24. Install steel angles, and vent grating at portables, as supplied by Struct Steel bid package. See P/a101
25. CLARIFICATION: The perimeter sidewalks, including all drive access approaches are to be furnished and installed by the “Off-Site” bid package as highlighted site sketch below. Sidewalks will pour to the CMU, and chain link fence mow strip poured within this CES-01 bid package.
26. Furnish and install removable bollards for vehicular access per plans.



FENCING

1. Furnish and install all chain link fences, gates, and hardware, including those embedded or attached to CMU. Include new padlocks as noted in site drawings.
2. Furnish and install all backstop fencing including any horizontal backboards.
3. Furnish and install all ornamental iron fence, gates, and hardware, including those embedded or attached to CMU.
4. Provide Steel Anchor Plate, Steel Welded Straps and Steel Keeper plate F.O.B. jobsite (N13/SD/A402) for placement with site concrete.
5. Make provisions to obtain water for own work. Dust control, excavations, backfills, compactions, etc. There are fire hydrants on two sides of the project. Make necessary arrangements with the city of Fresno to acquire a meter and pay for own water usages until such time that the site water has been installed and approved for site usage.

CONCRETE MASONRY UNIT (CMU)

1. Provide and install all CMU block walls as identified in contract documents.
2. Furnish and install all rebar associated and shown to be installed in CMU, with exception of the rebar which is to be installed with the CMU footings.
3. Provide and install all smooth dowels, or other reinforcement and expansion components associated with CMU installation.
4. Coordinate and confirm reinforcement layout in footings with concrete contractor.
5. Make provisions to obtain water for own work. Dust control, excavations, backfills, compactions, etc. There are fire hydrants on two sides of the project. Make necessary arrangements with the city of Fresno to acquire a meter and pay for own water usages until such time that the site water has been installed and approved for site usage.

PLAY EQUIPMENT AND SITE FURNISHINGS

1. Play Structures are Owner Furnished, Owner Supplied (Kindergarten Structure & Upper Grades Structure)
2. Bike lockers are Owner Furnished, Owner Installed.
3. Provide and install all playfield and court equipment as shown in contract documents. Including, but not limited to; basketball backboards (single & double), volleyball posts, volleyball nets, tether balls and tetherball posts, dugout benches etc. Furnish all sleeves as required for proper installation of equipment.
4. Provide and install EPDM wearing surface and SBR Rubber over concrete at play structure basins.
5. Provide and install loose engineered wood fiber at play structure basins.
6. Furnish and install bicycle racks per contract documents (six total).
7. Furnish and install flagpole per detail A1/SD/A301.
8. Make provisions to obtain water for own work. Dust control, excavations, backfills, compactions, etc. There are fire hydrants on two sides of the project. Make necessary arrangements with the city of Fresno to acquire a meter and pay for own water usages until such time that the site water has been installed and approved for site usage.

9. Furnish and install all drainage fabric, felt, and drainage matrix material, to storm drain pipe stub, that will be coordinated and provided by the site utilities contractor.

FOB Items

Installation of FOB Items

Note: Coordinate all deliveries to jobsite with CM. Prime Contractor to Unload, inventory, store and notify CM of any deficiencies for all items delivered to the jobsite FOB.

1. Install all items embedded in concrete provided FOB Jobsite by other Prime Contractors from written layout provided by those Prime Contractors.
2. Install all bolt templates provided by other trades.
3. Install angle iron embeds at rolling gates.

End of Bid Package

BID PACKAGES CES-01, CES-02, CES-03, AND CES-04 PREVIOUSLY BID IN INCREMENT #1

CES-02 SITE UTILITIES PLUMBING: DOMESTIC, SANITARY, STORM, FIRE, & GAS

Furnish and install all work specifically required throughout the project documents to complete the work of this bid package that specifically includes, but is not limited to the following:

Specification Sections

Division 00
Division 01
Section 03 30 00 Cast in place Concrete (As applicable to storm, sewer, manholes, thrust blocks, etc.)
Section 21 05 23 General Duty Valves for Fire Protection
Section 21 05 53 Identification for Fire Protection
Section 21 11 00 Facility Fire Suppression Water Service Piping
Section 21 11 19 Fire Department Connections
Section 22 00 00 General Plumbing Provisions (Gas, Water, Fire Water, Storm, Sewer)
Section 22 00 50 Plumbing (Gas, Water, Fire Water, Storm, Sewer)
Section 23 01 00 General Mechanical Provisions (As Applicable)
Section 31 23 33 Trench Excavation and Backfill
Section 33 12 00 Water Utilities
Section 33 30 00 Site Sewer Systems
Section 33 40 00 Storm Drainage

Refer to additional related specifications sections for work specifically included in this bid package noted below.

General Items

1. See General Notes at the beginning of the Summary of Work Specification Section for other items to be included in this Bid Package.
2. Furnish and install all layout for own work from survey provided. Prime Contractor will be responsible for all additional layout not performed by the survey contractor. Prime Contractors are responsible for protection of all requested survey. Any needed re-staking of already provided points will be subject to deductive change order.
3. Provide all backfill of excavations to original sub-grade for work included in this bid package.
4. Obtain all permits required to perform the work specified in the bid package. CM will submit the Dust Control plan to the Air Board. Prime Contractor will be responsible for all other permits required to perform the work identified. Prime Contractor will be responsible for dust control for their own work.
5. Provide daily cleanup to keep site clean and orderly.
6. Protect identified improvements to remain on civil plan sheets.
7. Should the Prime Contractor damage and/or otherwise alter work installed under separate contracts, Prime Contractor shall be responsible for the correction/repair of work installed under separate contracts.
8. Prime Contractor is required to attend all coordination meetings as required by CM.
9. Phasing is projected to be as shown on the Bid Schedule. However, the Construction Manager reserves the right to revise the schedule, as necessary.

10. Promptly submit written notice to CM of observed variance of Contract Documents from legal requirements.
    a. Appropriate modifications to Contract Documents will adjust necessary changes.
    b. Assume responsibility for work known to be contrary to such requirements and without written notice to Architect of observed variance.
11. Provide material, equipment, mobilizations, and manpower to meet Construction Schedule provided in Contract Documents.
12. Each bid package is responsible for dewatering as it pertains to their scope of work.
13. Provide trenching plan and permits for excavations over 5' per OSHA requirements to the Construction Manager.
14. Each Prime Contractor is to provide all equipment and manpower as necessary to offload all materials required to complete their respective scope of work.
15. Monthly pay apps will not be approved if as-builts are not updated monthly.
16. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.
17. Provide daily cleanup to keep site clean and orderly.
18. There will be one wash out area as designated by CM. Bid package will be responsible for removal from the site of all construction debris generated by Prime Contractor's work. Extra spoils to be stockpiled at the direction of CM.
19. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this project.
20. This contract is to provide temporary power for own work until such time as building temporary power is established.

Coordination with Other Trades

1. Provide coordination drawings for underground work related to this bid package. Coordinate all drawings (Plumbing, Electrical, site, Off Site, and Landscape) with the drawings of this bid package. Note conflicts and provide potential solutions to the architect for review. Coordination must occur prior to excavation and/or installation of the work. Attend all coordination meetings required to coordinate all underground.
2. Coordinate routing of underground utilities miss foundations.
3. Coordinate alignment of all utilities between plumbing and civil drawings prior to excavation.
4. All underground utilities (Gas/DCW/Fire) are to be a minimum of 3' below finish grade.

Furnish and Install Items

1. Furnish and install all site utilities and fixtures complete. Water, Fire, Sewer, Storm.
2. Make provisions to obtain water for own work. Dust control, excavations, backfills, compactions, etc. There are fire hydrants on two sides of the project. Make necessary arrangements with the city of Fresno to acquire a meter and pay for own water usages until such time that the site water has been installed and approved for site usage.

3. Provide all backfill of excavations to original subgrade for work included in this bid package.
4. Stockpile extra spoils from excavations in location to be determined by CM.
5. Furnish and install all attachment of all equipment related to this scope of work.
6. Furnish and install all excavation for own work.
7. Furnish and install all concrete required for installation of thrust blocks, manholes, vaults, boxes, underground structures, mow strips and collars for work related to this bid package.
8. Furnish and install asphalt patch back related to own work as required.
9. Adjust all utility boxes to finish grade.
10. Clean and disinfect all site piping required for this project to subsequent point of connection.
11. Furnish and install all piping required to accommodate new work.
12. Furnish, install, and maintain traffic control for work included in this package.
13. Furnish and install all site fire water, sewer systems, storm systems, domestic water & gas.
14. Furnish and install all dry wells, drainage, water and drinking fountains. Clarification: see G/SD/X102 for dry well at ball fields.
15. Furnish and install all site trench drains and piping (If shown)
16. Furnish and install all site Fire, all fire line piping, and stub in to building per plans to above finished floor with a capped flanged fitting, as the POC for the fire sprinkler contractor. Furnish and install all site check valves, Christy vaults, PIV's, FDC's, Hydrants, Backflow Preventors, and Bollards per plans at fire equipment per plans. CLARIFICATION: See note # 6 on site plans, and J7/SD/A302
17. Furnish and install all site domestic water complete from POC at back flow preventors, check valves, SOV's, etc. to within 5' of buildings.
18. F&I complete storm to within 5'.
19. F&I complete gas to within 5' of where pressure regulators are shown for each building.

FOB Items

1. None

Installation of FOB Items

Note: Coordinate all deliveries to jobsite with CM. Prime Contractor to Unload, inventory, store and notify CM of any deficiencies for all items delivered to the jobsite FOB.

1. Not Applicable.

End of Bid package

BID PACKAGES CES-01, CES-02, CES-03, AND CES-04 PREVIOUSLY BID IN INCREMENT #1

CES-03 SITE ELECTRICAL & LOW VOLTAGE

Furnish and install all work specifically required throughout the project documents to complete the work of this bid package that specifically includes, but is not limited to the following:

Specification Sections

Refer to additional related specifications sections for work specifically included in this bid package noted below.

Division 00
Division 01
Section 03 15 14 Drilled Anchors
Section 03 30 00 Cast in place Concrete (As applicable to slurry, and light pole bases, and grouting)
Section 26 05 00 Common Work Results for Electrical
Section 26 05 26 Grounding
Section 26 05 53 Electrical Identification
Section 26 20 00 Low Voltage Electrical Transmission
Section 27 00 00 Telecommunication Systems
Section 27 05 28 Communications Infrastructure System
Section 27 10 00 Structured Cabling System

General Items

1. See General Notes at the beginning of the Summary of Work Specification Section for other items to be included in this Bid Package.
2. Furnish and install all layout for own work from survey provided. Prime Contractor will be responsible for all additional layout not performed by the survey contractor. Prime Contractors are responsible for protection of all requested survey. Any needed re-staking of already provided points will be subject to deductive change order.
3. Provide all backfill of excavations to original sub-grade for work included in this bid package.
4. Obtain all permits required to perform the work specified in the bid package. CM will submit the Dust Control plan to the Air Board. Prime Contractor will be responsible for all other permits required to perform the work identified. Prime Contractor will be responsible for dust control for their own work.
5. Provide daily cleanup to keep site clean and orderly.
6. Protect identified improvements to remain on civil plan sheets.
7. Should the Prime Contractor damage and/or otherwise alter work installed under separate contracts, Prime Contractor shall be responsible for the correction/repair of work installed under separate contracts.
8. Prime Contractor is required to attend all coordination meetings as required by CM.
9. Phasing is projected to be as shown on the Bid Schedule. However, the Construction Manager reserves the right to revise the schedule, as necessary.
10. Promptly submit written notice to CM of observed variance of Contract Documents from legal requirements.
    a. Appropriate modifications to Contract Documents will adjust necessary changes.
    b. Assume responsibility for work known to be contrary to such requirements and without written notice to Architect of observed variance.

11. Provide material, equipment, mobilizations, and manpower to meet Construction Schedule provided in Contract Documents.
12. Each bid package is responsible for dewatering as it pertains to their scope of work.
13. Provide trenching plan and permits for excavations over 5' per OSHA requirements to the Construction Manager.
14. Each Prime Contractor is to provide all equipment and manpower as necessary to offload all materials required to complete their respective scope of work.
15. Monthly pay apps will not be approved if as-builts are not updated monthly.
16. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.
17. Provide daily cleanup to keep site clean and orderly.
18. There will be one wash out area as designated by CM. Bid package will be responsible for removal from the site of all construction debris generated by Prime Contractor's work. Extra spoils to be stockpiled at the direction of CM.
19. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this project.
20. This contract is to provide temporary power for own work until such time as building temporary power is established.

Coordination with Other Trades

1. Provide coordination drawings for underground work for work related to this bid package. Coordination must occur prior to excavation and/or installation of the work. Attend all coordination meetings required to coordinate all underground.
2. Coordinate all work to provide access to buildings for other trades as scheduled. Provide an underground utility schedule of where and when piping operations will be performed.
3. Coordinate location of UG utilities to be out of angle of repose of foundations.
4. Poured in place housekeeping and equipment pads to be supplied by concrete team. Precast housekeeping and equipment pads to be supplied and installed by this package
5. Review as-builts and pothole existing utilities prior to starting work.
6. Verify continuity of electrical and low voltage conduits for work in this contract.
7. Provide shop drawings for equipment layout in electrical rooms & yards to confirm that dimensions are adequate prior to rough in and pouring of footings and curbs.
8. Coordinate all underground utilities to miss foundation.
9. Provide Safe off of all electrical equipment as required for trade work.
10. Provide an underground utility schedule of where and when piping operations will be Installed.

Furnish and Install Items

CLARIFICATION:
Several pieces of equipment were added in the electrical drawing revisions that were included in (Increment #1 Addendum # 3), and are not to be furnished or installed within this bid package. The conduit, Christy's/ underground pathways for these items are to be included in this bid package. Mini Substation, PV disconnect, Transformer, IDF, and back stop PA will all be provided and installed with the

Inc 2 electrical bid package, with the exception of the Owner Supplied Switchgear, that will be installed under this CES-03 package, and previously addressed.

1. Furnish and install all site utilities conduit and infrastructure complete for all Power, Data, Fire Alarm, Security, Irrigation line voltage (pumps/time clocks), and EMS**.** See SD/M101 for EMS site conduit clarification. All conduits are to be brought to within 10' of the buildings. All stopping points are to be flagged, swing tied if possible, and recorded on the As-Builts for Increment 2 continuation. Conduits are to stop within 5' of pumps and time clocks if specific layout cannot be determined during the time of installation., and 5' for fire sprinkler components where alarm is required. CLARIFICATION: This includes power conduit for "Coach control switches", as described in the Landscape plans. Building electrical contractor will provide and install the housing, wiring, receptacle.
2. Site lighting conduit is to stop approximately 5' from the flagpole, all light pole bases, and first light of radiused (T-2's) at the concrete monument wall. Clarifications: 1. The in-ground T-2 lighting was removed from the site at the flag pole area. Disregard reference. 2. (Increment #1 Addendum 3) added lights at the CMU service yard. Install conduits to the footing alignment where each light is shown. Inc 2 electrician will coordinate and install the continuation conduit up in CMU.
3. Make provisions to obtain water for own work. Dust control, excavations, backfills, compactions, etc. There are fire hydrants on two sides of the project. Make necessary arrangements with the city of Fresno to acquire a meter and pay for own water usages until such time that the site water has been installed and approved for site usage.
4. Furnish and install physical layouts for all deepened foundations at utilities prior to excavation.
5. All excavation spoils to be deposited at one location on site as determined by CM.
6. Furnish and install all sleeves for work passing through masonry and concrete work. Coordinate with respective bid packages.
7. Provide all backfill of excavations to original subgrade for work included in this bid package.
8. Furnish and install fire stopping and fire caulking of own penetrations for own work.
9. Furnish and install pull strings/rope in all empty or future conduits.
10. Furnish and install all concrete required for installation of vaults, boxes, underground structures for work related to this bid package.
11. Furnish and install all site conduit required for Owner furnished equipment hook up as required.
12. Furnish and install all rough-in for all equipment of other bid packages as required by the related specification sections and drawings. Connect and or stub as described.
13. Furnish and install all conduit and sleeves for future low voltage and telecommunications wiring. Install fire stopping as required.
14. Furnish and install all attachment of all equipment related to this scope of work.
15. Furnish and install all supports and bracing required for electrical work.
16. Furnish and install all identification and lettering called for in the contract documents related to the work of this bid package.
17. Adjust all electrical and low voltage boxes in new landscape and concrete areas as needed.
18. Furnish and install all physical layout for your own work.
19. Furnish and install all site conduits, including vaults and boxes for all electrical and low voltage systems.
20. Provide all power/Breaker testing for own work.
21. Chase and prove all electrical site pathways as required to complete work.

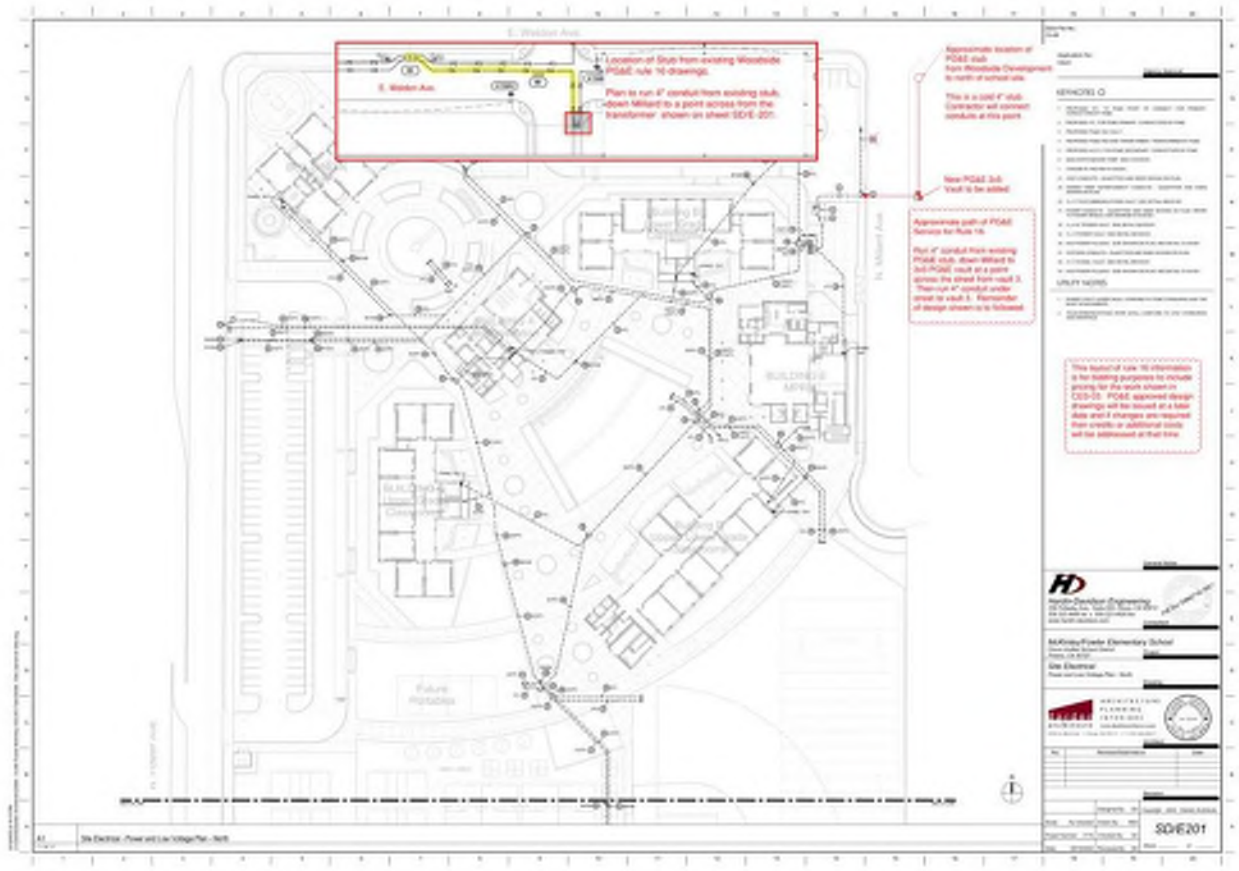
22. Furnish and install electrical equipment, conduit, pre cast pads required for the utility provider (Rule 16 and similar for site power connections). Switchgear will be Owner Furnished, Contractor Installed.
23. Furnish and install all site rough-in conduit for all equipment of other trade as required by the related specification sections and drawings. Connect and or stub as described.
24. Furnish and install all site lighting conduits including vaults / boxes. Bring all conduits to withing 5' of light pole locations and buildings. Cap and flag each end, (swing tie if possible) for subsequent connection by the building electrical contractor. Coordinate the location of the conduit at the building end to the point of entry established by the building electrician.
25. Furnish and install disconnects and associated supports as applicable to increment 1.
26. Furnish and install sealant system as required to provide watertight condition at devices mounted on masonry units.
27. Furnish and install PG&E, ATT, and Comcast conduit for onsite as shown on the drawings.
28. Furnish and install all colored concrete cap over all required duct banks.
29. Furnish and install conduits for all landscape equipment such as controllers, pumps, etc. as required by the landscape drawings.
30. Furnish and install all backfill of excavations to original subgrade for work included in this contract.
31. Provide Dust Control for own work.
32. This contract will adhere to guidelines for all work per the requirements of the Dust Control Plan and SWPPP Plan.
33. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this Project.
34. Electrical Prime Contractor responsible for any and all patch back and finishing for any trenching made in roadways, for work performed under this bid package.
35. All excavation spoils to be deposited at one location on site as determined by CM.
36. Furnish and install all sleeves for work passing through masonry and concrete work. Coordinate with respective bid packages.
37. Provide all backfill of excavations to original subgrade for work included in this bid package.
38. Furnish and install drilling of holes for work performed in this bid package.
39. Furnish and install pull strings/rope in all empty or future conduits.
40. Furnish and install all concrete required for installation of vaults, boxes, underground structures for work related to this bid package.
41. Furnish and install all conduit and sleeves for future low voltage and telecommunications wiring. Install fire stopping as required.
42. Furnish and install all attachment of all equipment related to this scope of work.
43. Furnish and install all identification and lettering called for in the contract documents related to the work of this bid package.
44. Furnish and install all physical layout for your own work. Same as 18
45. This contract shall be responsible for holes at metal deck for installation of hanger wires for own work.

For Rule 16, and associated PG&E work.

1. This contract will provide all PG&E electrical requirements as outlined for connection to/for PG&E Rule 16 work in conjunction with the project drawings. This Prime Contractor will run all conduits,

proof, and mandrel all conduits for the new PG&E feeders from the POC shown in the attached marked up site plan for reference, then to the transformer, then to the Switchgear.

2. Coordinate all meetings with PG&E, obtain permits, and provide all services required to facilitate and install the main power distribution on to the site.
3. Furnish and install all work relating to PG&E rule drawings, off-site plans of existing conduit pathway, to connect to new conduit and vault on site, and leading to the switchgear.
4. Furnish and install all excavations, and patch back to road crossing. CLARIFICATION: Millard street is not currently paved, nor have the sidewalks been installed on either side. The curbs and gutters are already installed. If damaged during installation, these repairs would also be included in this package responsibility.



FOB Items

Installation of FOB Items

Note: Coordinate all deliveries to jobsite with CM. Prime Contractor to Unload, inventory, store and notify CM of any deficiencies for all items delivered to the jobsite FOB.

End of Bid package

BID PACKAGES CES-01, CES-02, CES-03, AND CES-04 PREVIOUSLY BID IN INCREMENT #1

CES-04 LANDSCAPE

Furnish and install all work specifically required throughout the project documents to complete the work of this bid package that specifically includes, but is not limited to the following:

Specification Sections

Division 00
Division 01
Section 03 15 14 Drilled Anchors
Section 32 84 00 Landscape Irrigation System
Section 32 90 00 Landscape Construction

Refer to additional related specifications sections for work specifically included in this bid package noted below.

General Items

1. See General Notes at the beginning of the Summary of Work Specification Section for other items to be included in this Bid Package.
2. Furnish and install all layout for own work from survey provided. Prime Contractor will be responsible for all additional layout not performed by the survey contractor. Prime Contractors are responsible for protection of all requested survey. Any needed re-staking of already provided points will be subject to deductive change order.
3. Provide all backfill of excavations to original sub-grade for work included in this bid package.
4. Obtain all permits required to perform the work specified in the bid package. CM will submit the Dust Control plan to the Air Board. Prime Contractor will be responsible for all other permits required to perform the work identified. Prime Contractor will be responsible for dust control for their own work.
5. Provide daily cleanup to keep site clean and orderly.
6. Protect identified improvements to remain on civil plan sheets.
7. Should the Prime Contractor damage and/or otherwise alter work installed under separate contracts, Prime Contractor shall be responsible for the correction/repair of work installed under separate contracts.
8. Prime Contractor is required to attend all coordination meetings as required by CM.
9. Phasing is projected to be as shown on the Bid Schedule. However, the Construction Manager reserves the right to revise the schedule, as necessary.
10. Promptly submit written notice to CM of observed variance of Contract Documents from legal requirements.
    a. Appropriate modifications to Contract Documents will adjust necessary changes.
    b. Assume responsibility for work known to be contrary to such requirements and without written notice to Architect of observed variance.
11. Provide material, equipment, mobilizations, and manpower to meet Construction Schedule provided in Contract Documents.
12. Each bid package is responsible for dewatering as it pertains to their scope of work.
13. Provide trenching plan and permits for excavations over 5’ per OSHA requirements to the Construction Manager.

14. Each Prime Contractor is to provide all equipment and manpower as necessary to offload all materials required to complete their respective scope of work.
15. Monthly pay apps will not be approved if as-builts are not updated monthly.
16. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.
17. Provide daily cleanup to keep site clean and orderly.
18. There will be one wash out area as designated by CM. Bid package will be responsible for removal from the site of all construction debris generated by Prime Contractor's work. Extra spoils to be stockpiled at the direction of CM.
19. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this project.
20. This contract is to provide temporary power for own work until such time as building temporary power is established.

Coordination with Other Trades

1. Coordinate sleeve installations with site concrete.
2. Coordinate pump location, house pad, layout, and elevation with electrical, plumbing, and concrete packages.
3. Coordinate all valve boxes, quick connects, with concrete, planters, and elevations.

Furnish and Install Items

1. Furnish and install all irrigation and landscaping complete. Connect to existing power, wiring and controls where required at existing landscape areas.
2. Make provisions to obtain water for own work. Dust control, excavations, backfills, compactions, etc. There are fire hydrants on two sides of the project. Make necessary arrangements with the city of Fresno to acquire a meter and pay for own water usages until such time that the site water has been installed and approved for site usage.
3. Provide and install new irrigation, controls, wiring, pumps, premanufactured concrete pads, etc. for own work. Main power supply and connection to pumps or equipment (Line voltage), will be supplied by the electrical Prime Contractor.
4. Furnish and install all thrust blocks for own work.
5. Furnish and install grading and top soil.
6. Provide water test of turf and planter areas prior to planting to confirm proper drainage and coverage.
7. Furnish and install all irrigation sleeves.
8. Furnish and install backfill all planters.
9. Furnish and install all fine grading of planter areas prior to planting.
10. Furnish and install all irrigation pipe system from POC at main backflow preventor, installed by the site plumbing Prime Contractor per spec.
11. Furnish and install irrigation pump(s), controls, secondary backflow preventer if applicable, valves, etc. associated with the irrigation system, complete ready for electrical connection where applicable.
12. Furnish and install all new irrigation and drip irrigation complete.

13. Furnish and install all new planter dressings, bark, mulches, and all landscape materials. CLARIFICATION: This Landscape package will be responsible to supply and install all materials as noted within the landscape plans, including screened infield top soil materials, DG, sod, Stolens, Mulches, etc. unless specifically noted otherwise.
14. Furnish and install all baseball bases and pitching blocks per plans.
15. Furnish and provide weed control and clean up of grasses/weeds for the project site, and associated off site locations for the duration of the project, until such time that the district takes possession and acceptance of the new facility.
16. This Landscape contractor is responsible for all the final elevations of Turf, infields, including pitchers mounds, DG, planters, tree wells, and mulches. Coordinate subgrades with Earthwork Contractor, as they will be responsible for the subgrades.
17. Furnish and install all coaches boxes/switches as shown in the Landscape plans, including valves, conduit, control wiring and connections. Coordinate locations with the Site electrical contractor for AC power conduit. Building electrical contractor to install wiring, housing for controller, and receptacle.

FOB Items

1. Provide remote controllers and extra materials to the district through close out procedures with CM Construction Management process.

Installation of FOB Items

Note: Coordinate all deliveries to jobsite with CM. Prime Contractor to Unload, inventory, store and notify CM of any deficiencies for all items delivered to the jobsite FOB.

End of Bid package

CES-05 BUILDING CONCRETE AND REBAR

Furnish and install all work specifically required throughout the project documents to complete the work of this bid package that specifically includes, but is not limited to the following:

Division 00
Division 01
Section 03 11 01 Concrete Formwork
Section 03 15 14 Drilled Anchors
Section 03 20 00 Reinforcement
Section 03 30 00 Cast-In-Place Concrete
Section 07 14 16 Fluid Applied Waterproofing
Section 07 92 00 Sealants
Appendix "B" Interior Color Schedule Plus Drawings
Appendix "C" Exterior Color Schedule
Geotechnical Engineering Report

General Items

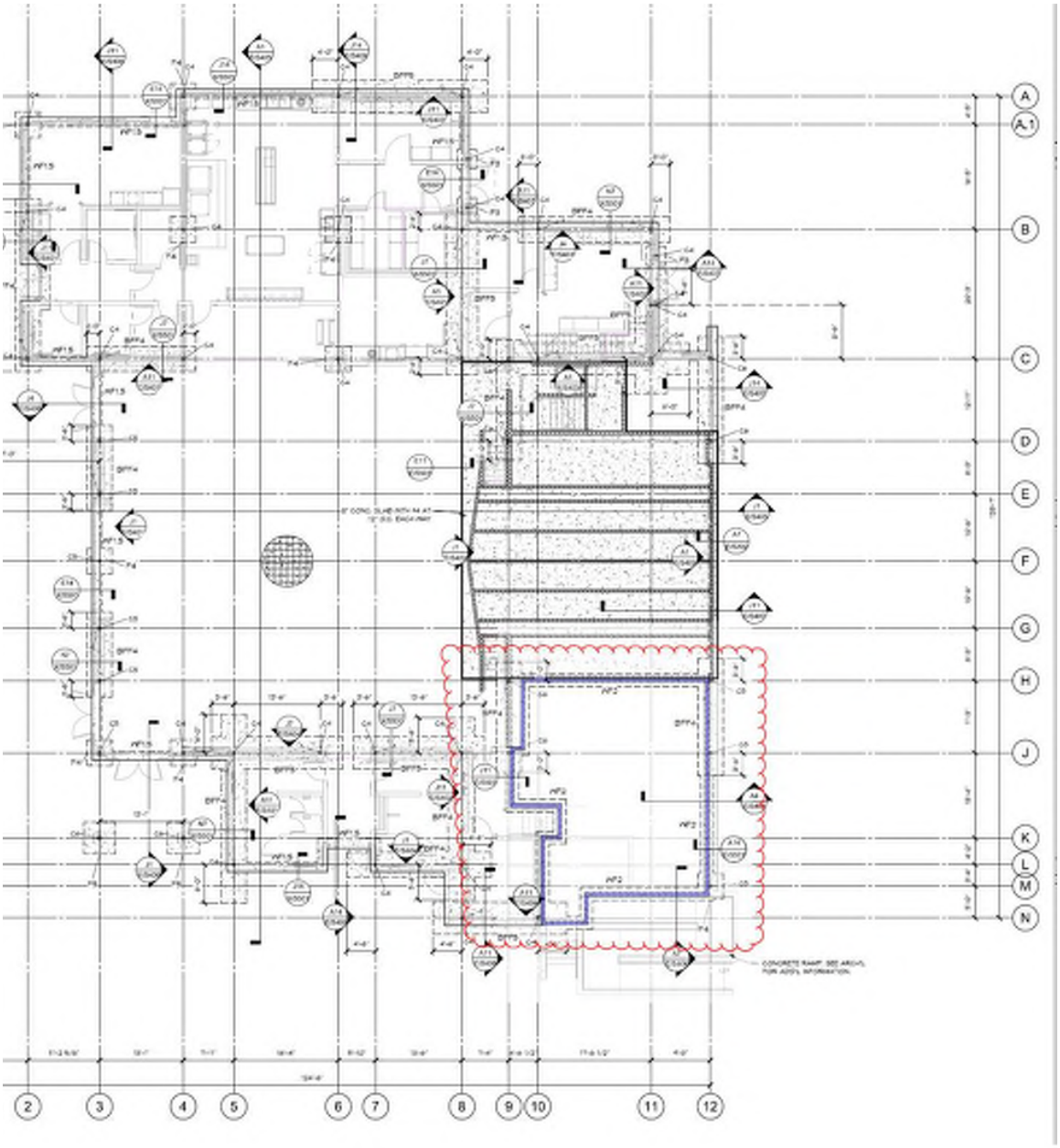
1. See General Notes at the beginning of the Summary of Work Specification Section for other items to be included in this Bid Package.
2. Furnish and install all layout for own work from survey provided. Prime Contractor will be responsible for all additional layout not performed by the survey contractor. Prime Contractors are responsible for protection of all requested survey. Any needed re-staking of already provided points will be subject to deductive change order.
3. Provide all backfill of excavations to original sub-grade for work included in this bid package.
4. Obtain all permits required to perform the work specified in the bid package. CM will submit the Dust Control plan to the Air Board. Prime Contractor will be responsible for all other permits required to perform the work identified. Prime Contractor will be responsible for dust control for their own work.
5. Provide daily cleanup to keep site clean and orderly.
6. Protect identified improvements to remain on civil plan sheets.
7. Should the Prime Contractor damage and/or otherwise alter work installed under separate contracts, Prime Contractor shall be responsible for the correction/repair of work installed under separate contracts.
8. Prime Contractor is required to attend all coordination meetings as required by CM
9. Phasing is projected to be as shown on the Bid Schedule. However, the Construction Manager reserves the right to revise the schedule, as necessary.
10. Promptly submit written notice to CM of observed variance of Contract Documents from legal requirements.
    a. Appropriate modifications to Contract Documents will adjust necessary changes.
    b. Assume responsibility for work known to be contrary to such requirements and without written notice to Architect of observed variance.
11. Provide material, equipment, mobilizations, and manpower to meet Construction Schedule provided in Contract Documents.
12. Each bid package is responsible for dewatering as it pertains to their scope of work.

13. Provide trenching plan and permits for excavations over 5’ per OSHA requirements to the Construction Manager.
14. Each Prime Contractor is to provide all equipment and manpower as necessary to offload all materials required to complete their respective scope of work.
15. Monthly pay apps will not be approved if as-builts are not updated monthly.
16. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.
17. There will be one wash out area as designated by CM. Bid package will be responsible for removal from the site of all construction debris generated by Prime Contractor’s work. Extra spoils to be stockpiled at the direction of CM.
18. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this project.
19. This contract is to provide temporary power for own work until such time as building temporary power is established.
20. SUBMITTALS: Provide Rebar reinforcement shop drawings for all footings, curbs, and building columns for buildings E and A will be the first order of business, and due within 30 days of NTP. Bar needs to be pulled for initial tagging at the earliest lab availability following approved review, to expedite production. Following in order will be buildings B, C, D, and K, no later than one week each, after the initial 30 day start for buildings E and A. All subsequent building reinforcement steel drawings are due for submittal no later than 30 days of their scheduled start, noted above.
21. Furnish clean up daily and off-haul of all debris generated by this contract to disposal bins provided under CES-12. Prime Contractor must abide by the Waste Management specification.

Coordination with Other Trades

1. Location for trades to stockpile their spoils will be established with David A. Bush, and the CES-01 Bid Package contractor.
2. Any survey requests require a minimum of 48-hour notice.
3. Coordinate dimensions with other related contractors of all equipment and housekeeping pads. Pad sizes shall be provided by other contractors and physically laid out and installed by this contract.
4. Coordinate installation of all sleeves for work passing through concrete work with respective contractors prior to excavation.
5. Install and physically layout all embedded items (as provided by other contractors), holes, sleeves and block outs in concrete as shown in the contract documents, related shop drawings or provided written layout. Coordinate locations with related contractors prior to installation.
6. Provide layout drawings for all slab concrete joints for approval prior to installation of site concrete.
7. Review as-builts prior to starting work.
8. This bid package will received all building pads at +/-0.05’and will be responsible for all cut and fill necessary to complete the work of this bid package.
9. Maintain building slab subgrade moisture content per soils report once building pad is received from the earthwork bid package.
10. Coordinate all work to provide access to buildings for other trades as scheduled.

11. Coordinate the location of depressions, block outs, slopes and drains prior to pour.
12. Coordinate concrete curbs relative to framing and door jambs prior to pour.
13. Review as-builts and underground locator survey and pothole utilities prior to starting work.
14. Work must be coordinated to accommodate staff and other trade access.
15. Once all steel embed templates and bolts have been formed and set in place by this bid package, the contractor will schedule with the surveyor to survey the templates for accuracy. Modification and fine tuning to be done under the building concrete bid package, prior to pouring footings. Once footings have been poured, and this bid package has stripped forms and templates, the concrete contractor will set a minimum of one leveling nut to the planned elevation at each column or tube frame.
16. Clean all footings, furnish dewatering and protection of all embed bolts until turned over to structural steel for erection.
17. Set a minimum of one leveling nut, to the planned finish elevation, at each steel column location, interior and exterior.
18. For reference, the following note is in CES-01, Increment 1 for the earthwork contractor, and the coordination with this CES-05 Structural building Concrete package. Specific to building E, from grid lines H to N, and 9 to 12, the slab is 3'-7" higher than the overall building slab. The earthwork contractor will build this up as required, then cut the material back to allow adequate work space for the structural concrete Bid Package to build footings. The structural concrete contractor will pour footings, build formwork, pour walls, strip, clean, and install fluid applied waterproofing. Once cured, the earthwork contractor will return to backfill and compact up against new walls, and fine grade in preparation for elevated slab pour. See plan detail below for additional reference.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Furnish and Install Items

1. Furnish and install all building concrete. Buildings A, B, C, D, E, K, and Portable building P with associated access, vents, 2-inch rat slab, stem walls and piers. Furnish and install ADA ramps, stairs, and stem walls associated with Building E. Flatwork surrounding these areas to be provided with the site concrete package CES-01, in Increment 1.
2. Furnish and install 22-gauge flashing at Building P below grade as required. Reference Detail 3/S1.4.
3. Furnish and install all rebar complete. including ties to existing slab, footings, or stem walls where applicable.
4. Furnish and install all surface saw cutting and sealer per the contract documents.
5. Furnish and install all expansion joints and sealant complete required by the contract documents in concrete.
6. Furnish and install all fluid applied waterproofing at formed walls for elevated slab. Bldg. E
7. Furnish and install all sand, gravel, crushed rock, etc. as detailed at building concrete. All other fill material shall be furnished and installed by the earthwork bid package.
8. Furnish and install any and all excavations and backfill of excavations at all foundations, to the required grade. Excavations to include layout and digging of all building and CMU footings, spread footings, grade beams, etc.
9. Physically layout and install all blockouts, openings, etc.… in concrete from written layout provided by other bid packages for installation of their work.
10. Protect all slab blockouts for other trades working in the area.
11. Furnish and install all building anchor bolts. Coordinate layout with respective primes.
12. Furnish installation of all steel column templates, including bolts, as provided by Steel Contractor. Once installed, schedule a request for survey to have the bolt layouts confirmed with the steel shop drawings layout. Fine tune and adjust as necessary prior to pour.
13. Furnish & install all floor prep for floors out of tolerance poured by this contract, except at LVT.
14. Furnish & install all concrete equipment and housekeeping pads within the buildings.
15. All minor depressions for tile(if applicable) and slopes to drain shall be performed by this Concrete Bid package.
16. Furnish and install all patch and infill at slab as required for all work.
17. Furnish and install redwood nailers in concrete curbs the attachment of finishes as detailed.
18. Furnish and install all drilling of holes for work performed in this contract.
19. Furnish & install all building concrete sealant. Exterior walk sealant to be provided and installed by CES-01, Inc 1 package.
20. Furnish and install all grouting under handrails and at sleeves within the buildings.
21. Furnish and install steel channels for knee wall supports, as provided by the steel bid package, and coordinate layout and quantities with the framing bid package.
22. Provide for architect and engineer's review, saw cutting and expansion joint plan, prior to pouring any interior building concrete.
23. At all exposed concrete floors, pay special attention to obtain a uniform finish, and flatness per specifications. Areas found to be out of tolerance may be required to be removed in their entirety/ or from joint to joint, at the owner/Architect's discretion.
24. Provide and install rebar and concrete at the stairs and landings to the second floor of Building E.
25. Furnish and install rebar caps per OSHA for all rebar associated with this contract's scope of work, installed by the reinforcement contractor. Furnish and install concrete stake caps associated with this contract's scope of work. Maintaining of Caps is the responsibility of this Prime Contractor. Safety walks at end of day required to ensure caps are in place, and any

missing caps replaced.

FOB Items

1. None.

Installation of FOB Items

Note. Unload, inventory, store and notify of deficiencies for all items delivered to the jobsite FOB, to be installed by this bid package.

1. Physically layout and install all items embedded in concrete within the building and structural footings. (i.e. plates, angles, non-bolted tube steel, rails, sleeves, pipe rail, handrails, stair nosing, etc.…) as provided FOB jobsite by other bid packages from written layout provided by those bid packages. Install and grout all items installed in sleeves.
2. Install and remove when complete all bolt templates provided by other bid packages except for sill plate bolts.
3. Furnish and install templates from layout provided by the framing and steel bid package.

CES-06 STRUCTURAL STEEL

Furnish and install all work specifically required throughout the project documents to complete the work of this bid package that specifically includes, but is not limited to the following:

Specification Sections

Refer to additional related specifications sections for work specifically included in this bid package noted below.

Division 00
Division 01
Section 05 12 00 Steel and Fabrications
Section 05 30 00 Metal Deck
Appendix "B" Interior Color Schedule Plus Drawings
Appendix "C" Exterior Color Schedule
Geotechnical Engineering Report

General Items

1. See General Notes at the beginning of the Summary of Work Specification Section for other items to be included in this Bid Package.
2. Furnish and install all layout for own work from survey provided. Prime Contractor will be responsible for all additional layout not performed by the survey contractor. Prime Contractors are responsible for protection of all requested survey. Any needed re-staking of already provided points will be subject to deductive change order.
3. Provide all backfill of excavations to original sub-grade for work included in this bid package.
4. Obtain all permits required to perform the work specified in the bid package. CM will submit the Dust Control plan to the Air Board. Prime Contractor will be responsible for all other permits required to perform the work identified. Prime Contractor will be responsible for dust control for their own work.
5. Provide daily cleanup to keep site clean and orderly.
6. Protect identified improvements to remain on civil plan sheets.
7. Should the Prime Contractor damage and/or otherwise alter work installed under separate contracts, Prime Contractor shall be responsible for the correction/repair of work installed under separate contracts.
8. Prime Contractor is required to attend all coordination meetings as required by CM.
9. Phasing is projected to be as shown on the Bid Schedule. However, the Construction Manager reserves the right to revise the schedule, as necessary.
10. Promptly submit written notice to CM of observed variance of Contract Documents from legal requirements.
    a. Appropriate modifications to Contract Documents will adjust necessary changes.
    b. Assume responsibility for work known to be contrary to such requirements and without written notice to Architect of observed variance.
11. Provide material, equipment, mobilizations, and manpower to meet Construction Schedule provided in Contract Documents.
12. Each bid package is responsible for dewatering as it pertains to their scope of work.
13. Provide trenching plan and permits for excavations over 5' per OSHA requirements to the Construction Manager.

14. Each Prime Contractor is to provide all equipment and manpower as necessary to offload all materials required to complete their respective scope of work.
15. Monthly pay apps will not be approved if as-builts are not updated monthly.
16. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.
17. There will be one wash out area as designated by CM. Bid package will be responsible for removal from the site of all construction debris generated by Prime Contractor's work. Extra spoils to be stockpiled at the direction of CM.
18. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this project.
19. This contract is to provide temporary power for own work until such time as building temporary power is established.
20. SUBMITTALS: Provide erection, bolt templates and shop drawings for all structural steel columns. Buildings are all to be submitted separately, site FOB items can be as one. Anchor bolt drawings, along with actual templates with the anchor bolts installed, for buildings E and A will be the first order of business, and due within 30 days of NTP. Following in order will be buildings B, C, D, and K, no later than one week each, after the initial 30 day start for buildings E and A. All subsequent building steel drawings are due for submittal no later than 30 days of their scheduled start.
21. Safe off for existing electrical equipment to be demolished will be the responsibility of this bid package.
22. Furnish clean up daily and off-haul of all debris generated by this contract to disposal bins provided under CES-12. Prime Contractor must abide by the Waste Management specification.

Coordination with Other Trades

1. Provide coordination drawings for work related to this bid package. Coordinate all drawings with the drawings of other bid packages. Note conflicts and provide potential solutions to CM for review. Coordination must occur prior to installation of work. A representative from your company must be in attendance at all coordination meetings.
2. Field measure all guardrails and handrails.
3. Provide erection and shop drawings for all handrails, stair rails and guard rails.
4. All steel shall be detailed, ordered, fabricated, and erected per the project schedule.
5. All miscellaneous iron shall be detailed, ordered, fabricated, and erected per the project schedule.
6. Provide erection, bolt templates and shop drawings for all structural steel columns. Buildings are all to be submitted separately, site FOB items can be as one. Anchor bolt drawings, along with actual templates with the anchor bolts installed, for buildings E and A will be the first order of business, and due within 30 days of NTP. Following in order will be buildings B, C, D, and K, no later than one week each, after the initial 30 day start for buildings E and A. All subsequent building steel drawings are due for submittal no later than 30 days of their scheduled start.
7. Provide shop drawings for all steel fabrications.
8. Coordinate structural steel embeds.
9. Coordinate steel gate sizes with plans and CMU contractor for embed components/frame. Install frame in conjunction with the CMU installation process.
10. Request and Receive layout (prior to detailing and fabrication) from other Prime Contractors for all items which require holes, openings, reinforcing and bracing related to this Prime Contractor's

scope of work, including but not limited to, bolt holes for attachments, roof openings, HVAC supports, reinforcing steel, etc. Allow 10 days for return of dimensions. Provide coordination drawings for dimension mark ups by other Prime Contractors.

11. Provide a written crane access plan, laydown areas, and movement schedule for coordination with other Prime Contractors.
12. Coordinate vent frames and grating with plans for Portables, and see P/A101 for additional information.

Furnish and Install Items

1. Furnish and install all steel and fabrications, metal deck, and railing systems complete per plans and specifications.
2. Furnish and install all structural steel, miscellaneous iron, metal decking and closures at buildings and canopies, tube steel, channel, and outriggers.
3. Physically layout and install all block outs, openings, reinforcing, bracing and holes in steel & metal deck from written layout provided by other Prime Contractors.
4. Furnish and install deck supports, steel beams, angles, "C" channel reinforcing at all deck penetrations and openings shown on the architectural, mechanical, electrical, plumbing, structural drawings & coordination drawings.
5. Furnish and install all deck support plates required on parallel to deck spanning beams.
6. Furnish and install all metal deck closures, profile closures, closures strips, penetration closures, and neoprene closures at metal deck, exterior canopies, and head of walls. Framing Prime Contractor to furnish and install closures where closure mounts to deck and stud with no concrete.
7. Furnish and install painted markings as required to identify yield lines on brace frames and similar.
8. Furnish and install all primer touch up at welding, structural steel, nuts and bolts, and metal deck.
9. Set leveling nuts at anchor bolts to the proper elevation for structural steel installation after one nut has been set to elevation by the concrete contractor. Assume protection of block outs in slab on grade once structural steel erection begins.
10. Furnish and install covers at all holes in elevated decks created by your own work in which debris may fall to the level below, per Cal OSHA regulations.
11. Furnish all roof access ladders. Coordinated blocking as required.
12. Furnish and install all rebar welded to structural steel, angle iron, and misc. iron.
13. Furnish and install all tube steel assemblies and angles for roof screens.
14. Furnish and install all steel canopies complete.
15. Furnish and install all pipe rails, handrails, drinking fountain guard rails/bollards, hold open posts / rails, and guard rails directly embedded in concrete or masonry.
16. Furnish and install all misc. iron & angles attached to concrete and masonry.
17. Furnish and install all components of the steel gate assemblies at CMU. Coordinate the channel attachment with plans and CMU contractor. Install channels during the CMU installations. See SD/A303 for example.
18. Furnished and install all attachment devices for handrails / guard rails.
19. Furnish and install all compressible material at structural steel.
20. Furnish and install all steel stairs and rails complete. Schedule installation with steel erection to allow for use by the project for access.
21. Furnish and install all beams and rails for stage curtain systems, including all holes if required for installation of material.
22. Furnish and install all tube steel and angles for roll up doors, if required.
23. Furnish and install steel closure plates for attachment of clips by framing Prime Contractor.

24. Furnish and install all AESS (Architecturally Exposed Structural Steel) as called for on the contract documents.
25. This contract will complete all work per the requirements of the Dust Control Plan and SWPPP Plan.
26. Provide Dust Control for own work.
27. Furnish / Install / Maintain safety cables, posts, temporary guardrails, and / or covers at all floor opening (per OSHA requirements) and for all leading edges throughout the project. Posts are not to be installed in a manner which would cause them to be embedded within exposed concrete.
28. Furnish and install own floor protection.
29. Furnish and install all miscellaneous iron required for framing.
30. Furnish and install all structural steel support in roof framing for all HVAC equipment. HVAC Prime Contractor to provide and install support rods, angle iron, and diagonal bracing as shown in mechanical.
31. Furnish and install all structural support as required for electrical or plumbing items to be suspended or mounted to structural steel members.
32. Provide all Galvanizing of steel and deck components as required by contract documents.
33. Provide All Deck and deck closures per plan.
34. Provide all gage metal associated with structural steel or deck.
35. Furnish and install any and all steel framing for architectural, mechanical, plumbing, and electrical openings.
36. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this Project.

FOB Items

1. All structural steel anchor bolts and templates.
2. Furnish FOB jobsite all bolt templates for all patterns (made 10ga or thicker of steel one of each column) for use by the concrete contractor. Include (4) punched ¼" holes on each plate as directed by the building concrete contractor.
3. Furnish FOB jobsite all associated sleeves for handrails, and guard rails, etc. for installation by this contract.
4. FOB all counter support brackets, Structural steel / iron that attaches to framing/casework and equipment support. Count and handing to be confirmed with plans and casework. See X/A 310, and Similar at counter roll up's, see A7, A11/ X/A411.
5. Furnish embed plates and angles with rebar/nelson studs per contract documents FOB Jobsite for installation by others.
6. Furnish threshold / slab edge angles FOB jobsite. See slab edge angles A1/X/A411 as an example.
7. Access ladders
8. Steel tube wall supports at low walls. See N1/E/A104.
9. Furnish steel angles and grating for venting of the portable buildings. See plans for size and quantities. Grates and frames to be installed by site concrete bid package.
10. Furnish steel stand for the safe. See details.

Installation of FOB Items

Note: Coordinate all deliveries to jobsite with CM. Prime Contractor to Unload, inventory, store and notify CM of any deficiencies for all items delivered to the jobsite FOB.

1. Not Applicable.

End of Bid package

CES-07 SHEET METALS, MEMBRANE ROOFS, WALL AND ROOF PANEL SYSTEMS

Furnish and install all work specifically required throughout the project documents to complete the work of this bid package that specifically includes, but is not limited to the following:

Specification Sections

Refer to additional related specifications sections for work specifically included in this bid package noted below.

Division 00
Division 01
Section 07 21 00 Insulation (As applicable to roof systems)
Section 07 40 00 Metal Panels
Section 07 54 19 Elastomeric Membrane Roofing
Section 07 60 00 Sheet Metal
Section 07 92 00 Sealants
Appendix "B" Interior Color Schedule Plus Drawings
Appendix "C" Exterior Color Schedule
Geotechnical Engineering Report

General Items

1. See General Notes at the beginning of the Summary of Work Specification Section for other items to be included in this Bid Package.
2. Furnish and install all layout for own work from survey provided. Prime Contractor will be responsible for all additional layout not performed by the survey contractor. Prime Contractors are responsible for protection of all requested survey. Any needed re-staking of already provided points will be subject to deductive change order.
3. Provide all backfill of excavations to original sub-grade for work included in this bid package.
4. Obtain all permits required to perform the work specified in the bid package. CM will submit the Dust Control plan to the Air Board. Prime Contractor will be responsible for all other permits required to perform the work identified. Prime Contractor will be responsible for dust control for their own work.
5. Provide daily cleanup to keep site clean and orderly.
6. Protect identified improvements to remain on civil plan sheets.
7. Should the Prime Contractor damage and/or otherwise alter work installed under separate contracts, Prime Contractor shall be responsible for the correction/repair of work installed under separate contracts.
8. Prime Contractor is required to attend all coordination meetings as required by CM.
9. Phasing is projected to be as shown on the Bid Schedule. However, the Construction Manager reserves the right to revise the schedule, as necessary.
10. Promptly submit written notice to CM of observed variance of Contract Documents from legal requirements.
    a. Appropriate modifications to Contract Documents will adjust necessary changes.
    b. Assume responsibility for work known to be contrary to such requirements and without written notice to Architect of observed variance.
11. Provide material, equipment, mobilizations, and manpower to meet Construction Schedule provided in Contract Documents.
12. Each bid package is responsible for dewatering as it pertains to their scope of work.

13. Provide trenching plan and permits for excavations over 5’ per OSHA requirements to the Construction Manager.
14. Each Prime Contractor is to provide all equipment and manpower as necessary to offload all materials required to complete their respective scope of work.
15. Monthly pay apps will not be approved if as-builts are not updated monthly.
16. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.
17. There will be one wash out area as designated by CM. Bid package will be responsible for removal from the site of all construction debris generated by Prime Contractor’s work. Extra spoils to be stockpiled at the direction of CM.
18. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this project.
19. This contract is to provide temporary power for own work until such time as building temporary power is established.
20. Furnish clean up daily and off-haul of all debris generated by this contract to disposal bins provided under CES-12. Prime Contractor must abide by the Waste Management specification.

Coordination with Other Trades

1. Provide coordination drawings for work related to this bid package. Coordinate all drawings with the drawings of other bid packages. Note conflicts and provide potential solutions to CM for review. Coordination must occur prior to installation of work. A representative from your company must be in attendance of all coordination meetings.
2. Coordinate all work to provide access to buildings for other trades as scheduled. Coordinate other activities in the schedule for other trades and confirm with construction schedule.
3. Provide shop drawings for all fabrications.
4. Coordinate downspouts with steel, Framing, and Site Plumbing package.
5. Provide written lay-out for all backing required.
6. Coordinate backing and reglet elevations with metal framing contractor.

Furnish and Install Items

1. Furnish and install all flashing and sheet metal including prefinished, for metal panels.
2. Furnish and install parapet cap at all locations and all other flashing and sheet metal on the project.
3. Furnish and install reglet flashing where stucco or wall panels meet roofs or other surfaces.
4. Furnish and install gutters.
5. Furnish and install all hangers, supports and bracing necessary for installation of work included in this contract.
6. Physically layout for own work.
7. Furnish and install all boot flashings.
8. Furnish and install Door and Window Flashings.
9. Furnish and install all sheet metal window sill flashings. Coordinate sizes, depths, and configurations with Storefront/window prime contractor and all plans.
10. Furnish and install all sleeves for all utilities passing through exterior finishes where applicable.
11. Furnish and install wall penetration flashings.

12. Furnish and install all wall opening flashings.
13. Furnish and install all metal wall, roof, and ceiling panel systems complete. Install Z furring as indicated. All wall rigid Insulation included in Bid Package CES-09.
14. Furnish and install all items noted in the drawings and spec's associated with metal roof and wall panels as a complete system.
15. Furnish and install prefinished, color matched sheet metal for all conditions shown.
16. Furnish and install all sealants as noted above, in addition to the following is a list of specific items:
    a. Furnish and install all sealants associated with the prefinished roof or wall systems, including where prefinished materials abut an adjoining finished material, as shown in specific details.
17. Furnish and install all panels, and clip systems complete, including Z furring/hat channels as detailed.
18. Furnish and install all exterior rigid insulation at roof and under metal roof panels per plans.
19. Furnish and install all flashings and trim at ductwork penetrations through exterior walls or roof.
20. Furnish and install all flashing and trim at exterior wall to slab transitions.
21. Furnish and install metal and roof panels including all closure and flashings complete.
22. Furnish and install all sealant between metal panels and plaster.
23. Furnish and install all field cutting of metal roof and wall panels, as required, to meet construction schedule.
24. Furnish and install sealant at louvers and hollow metal frames.
25. Furnish and install drip edge, flashings, and counter flashings at roof.
26. Furnish and install watertight closures, (pre flashings) at all gang and individual pipe penetration through exterior walls.
27. This contract will adhere to the requirements of the Dust Control Plan and SWPPP Plan.
28. Provide Dust Control for Own Work.
29. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this Project.
30. Furnish and install all roof jacks. Coordinate sizes and quantities with other Primes and plans.
31. Furnish and install all sheet metal window sill flashings. Coordinate sizes, depths, and configurations with Storefront/window Prime Contractor and all plans.
32. Furnish and install all sleeves for all utilities passing through exterior finishes where applicable.
33. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this Project.

FOB Items

1. Color match touch up paint.

Installation of FOB Items

Note: Coordinate all deliveries to jobsite with CM. Prime Contractor to Unload, inventory, store and notify CM of any deficiencies for all items delivered to the jobsite FOB.

End of Bid package

CES-08 FINISH CARPENTRY

Furnish and install all work specifically required throughout the project documents to complete the work of this bid package that specifically includes, but is not limited to the following:

Specification Sections

Division 00
Division 01
Section 06 22 00 Millwork
Section 06 41 23 Modular Casework
Appendix "B" Interior Color Schedule Plus Drawings
Appendix "C" Exterior Color Schedule
Geotechnical Engineering Report

Refer to additional related specifications sections for work specifically included in this bid package noted below.

General Items

1. See General Notes at the beginning of the Summary of Work Specification Section for other items to be included in this Bid Package.
2. Furnish and install all layout for own work from survey provided. Prime Contractor will be responsible for all additional layout not performed by the survey contractor. Prime Contractors are responsible for protection of all requested survey. Any needed re-staking of already provided points will be subject to deductive change order.
3. Provide all backfill of excavations to original sub-grade for work included in this bid package.
4. Obtain all permits required to perform the work specified in the bid package. CM will submit the Dust Control plan to the Air Board. Prime Contractor will be responsible for all other permits required to perform the work identified. Prime Contractor will be responsible for dust control for their own work.
5. Provide daily cleanup to keep site clean and orderly.
6. Protect identified improvements to remain on civil plan sheets.
7. Should the Prime Contractor damage and/or otherwise alter work installed under separate contracts, Prime Contractor shall be responsible for the correction/repair of work installed under separate contracts.
8. Prime Contractor is required to attend all coordination meetings as required by CM.
9. Phasing is projected to be as shown on the Bid Schedule. However, the Construction Manager reserves the right to revise the schedule, as necessary.
10. Promptly submit written notice to CM of observed variance of Contract Documents from legal requirements.
    a. Appropriate modifications to Contract Documents will adjust necessary changes.
    b. Assume responsibility for work known to be contrary to such requirements and without written notice to Architect of observed variance.
11. Provide material, equipment, mobilizations, and manpower to meet Construction Schedule provided in Contract Documents.
12. Each bid package is responsible for dewatering as it pertains to their scope of work.
13. Provide trenching plan and permits for excavations over 5' per OSHA requirements to the Construction Manager.

14. Each Prime Contractor is to provide all equipment and manpower as necessary to offload all materials required to complete their respective scope of work.
15. Monthly pay apps will not be approved if as-builts are not updated monthly.
16. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.
17. Provide daily cleanup to keep site clean and orderly.
18. There will be one wash out area as designated by CM. Bid package will be responsible for removal from the site of all construction debris generated by Prime Contractor's work. Extra spoils to be stockpiled at the direction of CM.
19. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this project.
20. This contract is to provide temporary power for own work until such time as building temporary power is established.
21. Furnish clean up daily and off-haul of all debris generated by this contract to disposal bins provided under CES-12. Prime Contractor must abide by the Waste Management specification.

Coordination with Other Trades

Furnish and Install Items

1. Coordinate and install counter brackets mounted to studs furnished by building steel bid package.
2. Furnish and install all casework shown on the contract documents.
3. Furnish and install all drilling of holes for work performed in this bid package.
4. Furnish and install all openings in casework and tops for other trades as well as cable holes and grommets as laid out by District.
5. Furnish & install all sleepers, shims, floor anchorage devices, angles, and floor blocking for attachment of casework. Backing in wall to be provided by the framing bid package.
6. Furnish and install wood rough carpentry framing incorporated into casework including utility chases.
7. Furnish and install all supports and bracing necessary for installation of work included in this bid package. Including surface mounted counter support brackets, and those built into reception counter areas. Structural steel counter brackets by others.
8. Furnish and install casework accessories as noted in specification.
9. Furnish and install shims and wood supports.
10. Install all counter support brackets, Structural steel / iron that attaches to framing/casework support.
11. Furnish and install all counter tops.
12. Furnish and install all solid surface window sills.
13. Furnish and install all casework/Millwork, doors, trims, nosing, skirting, railings, etc. at stage. Steps to be flooring contractor.
14. Furnish and install all Wood framing incorporated into casework and laminated walls.
15. Furnish and install angle connectors.
16. Furnish and install trim.
17. Provide casework submittals and shop drawings within 14 days of Notice to Proceed.

18. Provide all accessory items normally required by this trades standard of care.
19. Furnish and install upholstery where shown.

FOB Items

1. None

Installation of FOB Items

Note: Coordinate all deliveries to jobsite with CM. Prime Contractor to Unload, inventory, store and notify CM of any deficiencies for all items delivered to the jobsite FOB.

End of Bid package

CES-09 METAL FRAMING, PLASTER, AND GYPSUM BOARD

Furnish and install all work specifically required throughout the project documents to complete the work of this bid package that specifically includes, but is not limited to the following:

Specification Sections

Refer to additional related specifications sections for work specifically included in this bid package noted below.

Division 00
Division 01
Section 03 15 14 Drilled Anchors
Section 07 21 00 Insulation (as applicable to all exterior wall rigid insulation)
Section 09 22 16 Metal Framing
Section 09 24 00 Cement Plaster
Section 09 29 00 Gypsum Board
Appendix "B" Interior Color Schedule Plus Drawings
Appendix "C" Exterior Color Schedule
Geotechnical Engineering Report

General Items

1. See General Notes at the beginning of the Summary of Work Specification Section for other items to be included in this Bid Package.
2. Furnish and install all layout for own work from survey provided. Prime Contractor will be responsible for all additional layout not performed by the survey contractor. Prime Contractors are responsible for protection of all requested survey. Any needed re-staking of already provided points will be subject to deductive change order.
3. Provide all backfill of excavations to original sub-grade for work included in this bid package.
4. Obtain all permits required to perform the work specified in the bid package. CM will submit the Dust Control plan to the Air Board. Prime Contractor will be responsible for all other permits required to perform the work identified. Prime Contractor will be responsible for dust control for their own work.
5. Provide daily cleanup to keep site clean and orderly.
6. Protect identified improvements to remain on civil plan sheets.
7. Should the Prime Contractor damage and/or otherwise alter work installed under separate contracts, Prime Contractor shall be responsible for the correction/repair of work installed under separate contracts.
8. Prime Contractor is required to attend all coordination meetings as required by CM.
9. Phasing is projected to be as shown on the Bid Schedule. However, the Construction Manager reserves the right to revise the schedule, as necessary.
10. Promptly submit written notice to CM of observed variance of Contract Documents from legal requirements.
    a. Appropriate modifications to Contract Documents will adjust necessary changes.
    b. Assume responsibility for work known to be contrary to such requirements and without written notice to Architect of observed variance.
11. Provide material, equipment, mobilizations, and manpower to meet Construction Schedule provided in Contract Documents.
12. Each bid package is responsible for dewatering as it pertains to their scope of work.

13. Provide trenching plan and permits for excavations over 5’ per OSHA requirements to the Construction Manager.
14. Each Prime Contractor is to provide all equipment and manpower as necessary to offload all materials required to complete their respective scope of work.
15. Monthly pay apps will not be approved if as-builts are not updated monthly.
16. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.
17. There will be one wash out area as designated by CM. Bid package will be responsible for removal from the site of all construction debris generated by Prime Contractor’s work. Extra spoils to be stockpiled at the direction of CM.
18. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this project.
19. This contract is to provide temporary power for own work until such time as building temporary power is established.
20. Furnish clean up daily and off-haul of all general trash debris generated by this contract to the bins provided by CES-12. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.

Coordination with Other Trades

1. Provide coordination drawings for above ceiling work for work related to this bid package. Coordinate all drawings with the drawings of other bid packages. Note conflicts and provide potential solutions to the CM architect for review. Coordination must occur prior to installation of work. Attend all coordination meetings required to coordinate all above ceiling work.
2. Coordinate installation of blocking, backing, etc. for other bid packages from written/physical layout provided.
3. Provide review and verification of space for ADA requirements prior to framing. Report any discrepancies.
4. Confirm backing is installed to satisfaction of toilet accessory and toilet partition contractor prior to installation of ceramic tile.
5. Coordinate stud layout where applicable for the installation of counter support brackets.
6. Coordinate the installation of fire safing/insulation with the insulation contractor. Insulation contractor to provide insulating materials for all areas that would be concealed during the framing, making post framing installation not practical or possible. Framing package to install insulation in headers, trimmers, channels, and heads of walls.
7. Provide a plaster control and expansion joint layout for architect approval prior to installation.
8. Plaster Bid package shall coordinate with Painting Bid Package the application of the cement plaster painting system, and provide written report of the cement plaster pH prior to the painting application.
9. Install and bolt metal studs to Steel tube wall supports at low walls. See N1/E/A104.

Furnish and Install Items

1. Furnish and install all exterior rigid insulation at walls, including weather barrier over framing and insulation if assembly required per specs. “All exterior” is to include areas behind all wall finishes, stucco, metal panels, columns, when applicable, etc. Coordinate with metal panel contractor for specifics as necessary.
2. Furnish and install own floor protection (i.e., Tarps, plastic, plywood, etc.).
3. Furnish and install all drywall systems as called for in the contract documents.
4. Furnish and install all fire rated top of wall systems. Insulation contractor to “Stuff and Spray” appropriate materials per plans.
5. Furnish and install all cement board/green board including skim coat prep for finishes.
6. Furnish and install all tape and texture systems. Provide adequate heating to ensure that tape/textured areas that are worked on any given day, are dry enough to resume work for the following coat, texture, priming, or paint, the following day, start of work.
7. Furnish and install all sound board.
8. Furnish and install all gypsum suspended ceilings.
9. Furnish and install all insulation and fire safing as required in concealed and framing entrapped areas.
10. Furnish and install acoustical caulking where applicable.
11. Furnish and install all lath, plaster, drywall, and metal stud framing complete.
12. Install insulation at metal deck voids at top of wall in entrapment conditions.
13. Furnish and install all metal stud or flat backing for all trades, including backing for plumbing downspouts, Casework, railings, signage, electrical, restroom accessories, kitchen equipment, etc.
14. Furnish and install all fire rated assemblies wrapped in drywall as called for throughout the documents.
15. Furnish, install, remove scaffolding for all work included in this trade.
16. Furnish and install all gauge plate to install studs at metal deck.
17. Furnish and install all gauge closure plate to connect deck to studs.
18. Furnish and install all gauge material for attachment for metal studs and braces.
19. Furnish and install all insulation draft / fire stops framing and drywall per plans.
20. Furnish and install all items noted in contract documents as cement plaster. This includes but is not limited to the following: Flexible flashings and water/air barrier specified as part of the system.
21. Furnish and install all Flexible Penetration Flashing Sheets around all items that penetrate the Cement Plaster including but not limited to doorframes, window frames, structural steel, piping etc. as required for a complete water/airtight assembly as designed.
22. Furnish and install all metal framing attachments to Structural Steel & metal deck.
23. Furnish and install metal stud/flat strap backing for all electrical mechanical and plumbing shown on those drawings.
24. Furnish and install backing for plaster expansion joints and moldings as required for proper installation.
25. Furnish and install framing and sheetrock for fire rated assemblies at electrical, plumbing, and mechanical utilities and fixtures.
26. Furnish and install gypsum board exterior sheathing.
27. Furnish and install primer / surface coat at gypsum board as called for in the specifications.
28. Furnish, install and physically layout all openings, block-outs, metal backing, blocking, blocking for utility and fixture supports. Coordinated locations with related trades prior to installation of metal framing.
29. Protect adjacent products during plaster operations.

30. All means of temporary heat/cooling for installation of work (taping/texture) will be provided by this bid package.
31. This contract will complete all work per the requirements of the Dust Control Plan and SWPPP Plan.
32. Provide Dust Control for Own Work.
33. This bid package is to provide a washout for cleanup after construction activities, reference SWPPP plan for details and requirements. Location of washout should be in a location so as to not obstruct or impede work by other trades.
34. This bid package is to off haul all metal stud/framing scrap. All weight and recycle tags are to be delivered to the Waste Management Coordinator (CES-12).
35. This bid package is to provide all haul off of drywall gyp scrap. All weight tags to be delivered to the Waste Management coordinator.
36. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this Project.
37. Provide all scaffolding for own work, including all permits for scaffolding as required. Daily inspections before start of work are mandatory. Provide daily safety inspection reports to CM (CM).
38. Furnish and install all hangers, supports and bracing necessary for installation of work included in this Contract.
39. Prime Contractor is responsible for all work referenced throughout the project documents related to this Prime Contractor's scope of work.
40. Provide complete mockups as required by the specifications.
41. Furnish and install protection of all roofing when work under this contract requires access on the roofing systems.
42. Furnish and install self-furring lath and smooth wall/Parged wall material over CMU for chalk board paint. See N4/SD-A304

FOB Items

1. Provide the concrete bid package with physical layout and all bolts if required for this package, that embed into concrete and masonry for sill, wall, cap, and ceiling framing related to this scope of work. A concrete sign-off will be acknowledge prior to concrete placement.

Installation of FOB Items

Note: Coordinate all deliveries to jobsite with CM. Prime Contractor to Unload, inventory, store and notify CM of any deficiencies for all items delivered to the jobsite FOB.

End of Bid package

CES-10 WALL MATERIALS AND ACOUSTICAL CEILINGS

Furnish and install all work specifically required throughout the project documents to complete the work of this bid package that specifically includes, but is not limited to the following:

Specification Sections

Division 00
Division 01
Section 09 50 00 Acoustical Ceilings
Section 09 72 00 Wall Coverings
Section 10 26 00 Wall and Corner Guards
Appendix "B" Interior Color Schedule Plus Drawings
Appendix "C" Exterior Color Schedule
Geotechnical Engineering Report

Refer to additional related specifications sections for work specifically included in this bid package noted below.

General Items

1. See General Notes at the beginning of the Summary of Work Specification Section for other items to be included in this Bid Package.
2. Furnish and install all layout for own work from survey provided. Prime Contractor will be responsible for all additional layout not performed by the survey contractor. Prime Contractors are responsible for protection of all requested survey. Any needed re-staking of already provided points will be subject to deductive change order.
3. Provide all backfill of excavations to original sub-grade for work included in this bid package.
4. Obtain all permits required to perform the work specified in the bid package. CM will submit the Dust Control plan to the Air Board. Prime Contractor will be responsible for all other permits required to perform the work identified. Prime Contractor will be responsible for dust control for their own work.
5. Provide daily cleanup to keep site clean and orderly.
6. Protect identified improvements to remain on civil plan sheets.
7. Should the Prime Contractor damage and/or otherwise alter work installed under separate contracts, Prime Contractor shall be responsible for the correction/repair of work installed under separate contracts.
8. Prime Contractor is required to attend all coordination meetings as required by CM.
9. Phasing is projected to be as shown on the Bid Schedule. However, the Construction Manager reserves the right to revise the schedule, as necessary.
10. Promptly submit written notice to CM of observed variance of Contract Documents from legal requirements.
    a. Appropriate modifications to Contract Documents will adjust necessary changes.
    b. Assume responsibility for work known to be contrary to such requirements and without written notice to Architect of observed variance.
11. Provide material, equipment, mobilizations, and manpower to meet Construction Schedule provided in Contract Documents.
12. Each bid package is responsible for dewatering as it pertains to their scope of work.
13. Provide trenching plan and permits for excavations over 5' per OSHA requirements to the Construction Manager.

14. Each Prime Contractor is to provide all equipment and manpower as necessary to offload all materials required to complete their respective scope of work.
15. Monthly pay apps will not be approved if as-builts are not updated monthly.
16. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.
17. There will be one wash out area as designated by CM. Bid package will be responsible for removal from the site of all construction debris generated by Prime Contractor's work. Extra spoils to be stockpiled at the direction of CM.
18. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this project.
19. This contract is to provide temporary power for own work until such time as building temporary power is established.
20. Furnish clean up daily and off-haul of all debris generated by this contract to disposal bins provided under CES-12. Prime Contractor must abide by the Waste Management specification.

Coordination with Other Trades

Furnish and Install Items

1. Furnish and install all acoustical ceiling complete.
2. Furnish and install all FRP.
3. Furnish and install all vinyl covered tack board.
4. Furnish and install all hangers, supports and bracing necessary for installation of work included in this bid package.
5. Furnish and install all Acoustical caulking and sealant at all locations where tack board meets other materials.
6. Furnish and install tile at electrical and low voltage devices prior to dropping of tile activity.
7. Furnish and install all "hanger wires" for work in this bid package and light fixtures, cable trays, projector mounts and air terminals per detail. Electrical and mechanical bid packages will make final connections to devices.
8. Furnish and install all compression struts.
9. Furnish and install all protective wall coverings (FRP) and corner guards complete.
10. Furnish and install all tack board and associated trims.
11. Furnish and install all corner guards.
12. Provide daily clean-up and off-haul of own debris.

FOB Items

1. None

Installation of FOB Items

Note: Coordinate all deliveries to jobsite with CM. Prime Contractor to Unload, inventory, store and notify CM of any deficiencies for all items delivered to the jobsite FOB.

End of Bid package

CES-11 PAINTING

Furnish and install all work specifically required throughout the project documents to complete the work of this bid package that specifically includes, but is not limited to the following:

Specification Sections

Division 00
Division 01
Section 03 35 10 Polished Concrete Finishing
Section 07 92 00 Sealants
Section 09 67 23 Resinous Flooring
Section 09 91 00 Painting
Appendix "B" Interior Color Schedule Plus Drawings
Appendix "C" Exterior Color Schedule
Geotechnical Engineering Report

Refer to additional related specifications sections for work specifically included in this bid package noted below.

General Items

1. See General Notes at the beginning of the Summary of Work Specification Section for other items to be included in this Bid Package.
2. Furnish and install all layout for own work from survey provided. Prime Contractor will be responsible for all additional layout not performed by the survey contractor. Prime Contractors are responsible for protection of all requested survey. Any needed re-staking of already provided points will be subject to deductive change order.
3. Provide all backfill of excavations to original sub-grade for work included in this bid package.
4. Obtain all permits required to perform the work specified in the bid package. CM will submit the Dust Control plan to the Air Board. Prime Contractor will be responsible for all other permits required to perform the work identified. Prime Contractor will be responsible for dust control for their own work.
5. Provide daily cleanup to keep site clean and orderly.
6. Protect identified improvements to remain on civil plan sheets.
7. Should the Prime Contractor damage and/or otherwise alter work installed under separate contracts, Prime Contractor shall be responsible for the correction/repair of work installed under separate contracts.
8. Prime Contractor is required to attend all coordination meetings as required by CM.
9. Phasing is projected to be as shown on the Bid Schedule. However, the Construction Manager reserves the right to revise the schedule, as necessary.
10. Promptly submit written notice to CM of observed variance of Contract Documents from legal requirements.
    a. Appropriate modifications to Contract Documents will adjust necessary changes.
    b. Assume responsibility for work known to be contrary to such requirements and without written notice to Architect of observed variance.
11. Provide material, equipment, mobilizations, and manpower to meet Construction Schedule provided in Contract Documents.
12. Each bid package is responsible for dewatering as it pertains to their scope of work.

13. Provide trenching plan and permits for excavations over 5’ per OSHA requirements to the Construction Manager.
14. Each Prime Contractor is to provide all equipment and manpower as necessary to offload all materials required to complete their respective scope of work.
15. Monthly pay apps will not be approved if as-builts are not updated monthly.
16. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.
17. There will be one wash out area as designated by CM. Bid package will be responsible for removal from the site of all construction debris generated by Prime Contractor’s work. Extra spoils to be stockpiled at the direction of CM.
18. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this project.
19. This contract is to provide temporary power for own work until such time as building temporary power is established.
20. Furnish clean up daily and off-haul of all debris generated by this contract to disposal bins provided under CES-12. Prime Contractor must abide by the Waste Management specification.

Coordination with Other Trades

1. Schedule paint coats so as to allow for completion of work with minimal damage with final coat being installed with majority of work completed. Touch up as required.
2. Plaster Bid package shall coordinate with Painting Bid Package the application of the cement plaster painting system, and provide written report of the cement plaster pH prior to the painting application.
3. Coordinate the painting of mechanical Prime Contractor provided louvers or vents, light fixture escutcheons, and other similar items designated to be painted to match at accent walls and ceilings.

Furnish and Install Items

1. Furnish and install all painting and sealing complete for the project.
2. Furnish and install finish as specified for trim, doors, and millwork.
3. Furnish and install all surface preparation and finish of all flashing to be painted.
4. Furnish and install touch-up painting.
5. Furnish and install all painting of mechanical, plumbing, and electrical utilities and equipment as required. HVAC grilles & registers as required.
6. Furnish and install painting at all new doors as required.
7. Furnish and install all accent, murals, Logo’s, and signage painting.
8. Furnish and install own floor protection (i.e., Tarps, plastic, plywood, etc.).
9. Furnish and install CFS Concrete Floor Sealers on floors as specified.
10. Furnish and install all resinous floor systems complete. Prep as required. Grind concrete at openings. Coordinate with door hardware installer. (Thresholds for extent)
11. Furnish and install painting of door frames as shown on the drawings and in the openings schedule.
12. Furnish and install Caulking and sealants of new hollow metal frames, interior and exterior.
13. Furnish and install Paint at all flashings, caps, trims, steel, steel downspouts, etc., where not noted to have “Factory Finish”.

14. Furnish and install painting of all site items noted or scheduled. See fire equipment for example SD/X102.
15. Furnish and install Chalk Board Paint at CMU. Coordinate with CMU and Plaster. See N4/SD/A304 for reference.

FOB Items

1. None

Installation of FOB Items

Note: Coordinate all deliveries to jobsite with CM. Prime Contractor to Unload, inventory, store and notify CM of any deficiencies for all items delivered to the jobsite FOB.

End of Bid package

CES-12 GENERAL SPECIALTIES

Furnish and install all work specifically required throughout the project documents to complete the work of this bid package that specifically includes, but is not limited to the following:

Specification Sections

Division 00
Division 01
Section 01 74 19 Waste Management
Section 03 15 14 Drilled Anchors
Section 06 10 00 Rough Carpentry
Section 07 18 50 Vapor-Alkalinity Control
Section 07 21 00 Insulation
Section 07 72 00 Roof Accessories
Section 07 92 00 Sealants
Section 08 11 00 Metal Doors and Frames
Section 08 15 13 Laminate-Faced Wood Doors
Section 08 31 13 Access Doors and Frames
Section 08 33 00 Coiling Doors
Section 08 41 00 Storefronts
Section 08 56 59 Service Windows
Section 08 70 00 Hardware
Section 08 70 00.1 Hardware Schedule
Section 08 80 00 Glass
Section 09 30 00 Tile
Section 09 64 66 Resilient Wood Floor
Section 09 65 10 Resilient Base and Accessories
Section 09 65 16 Resilient Sheet
Section 09 68 40 Carpet
Section 10 05 00 Miscellaneous Specialties (Building Plaque, Dimensional Letters)
Section 10 11 00 Visual Display Boards
Section 10 14 00 Identifying Devices
Section 10 21 13 Toilet Partitions
Section 10 28 13 Toilet Accessories
Section 10 44 00 Fire Protection Specialties
Section 10 51 13 Metal Lockers
Section 11 16 16 Safes
Section 11 40 00.01 Food Service Equipment
Section 11 61 43 Platform Curtains
Section 11 68 13 Play Equipment
Section 14 42 00 Wheelchair Lifts
Appendix “B” Interior Color Schedule Plus Drawings
Appendix “C” Exterior Color Schedule
Geotechnical Engineering Report

Refer to additional related specifications sections for work specifically included in this bid package noted below.

General Items

1. See General Notes at the beginning of the Summary of Work Specification Section for other items to be included in this Bid Package.
2. Furnish and install all layout for own work from survey provided. Prime Contractor will be responsible for all additional layout not performed by the survey contractor. Prime Contractors are responsible for protection of all requested survey. Any needed re-staking of already provided points will be subject to deductive change order.
3. Provide all backfill of excavations to original sub-grade for work included in this bid package.
4. Obtain all permits required to perform the work specified in the bid package. CM will submit the Dust Control plan to the Air Board. Prime Contractor will be responsible for all other permits required to perform the work identified. Prime Contractor will be responsible for dust control for their own work.
5. Provide daily cleanup to keep site clean and orderly.
6. Protect identified improvements to remain on civil plan sheets.
7. Should the Prime Contractor damage and/or otherwise alter work installed under separate contracts, Prime Contractor shall be responsible for the correction/repair of work installed under separate contracts.
8. Prime Contractor is required to attend all coordination meetings as required by CM.
9. Phasing is projected to be as shown on the Bid Schedule. However, the Construction Manager reserves the right to revise the schedule, as necessary.
10. Promptly submit written notice to CM of observed variance of Contract Documents from legal requirements.
    a. Appropriate modifications to Contract Documents will adjust necessary changes.
    b. Assume responsibility for work known to be contrary to such requirements and without written notice to Architect of observed variance.
11. Provide material, equipment, mobilizations, and manpower to meet Construction Schedule provided in Contract Documents.
12. Each bid package is responsible for dewatering as it pertains to their scope of work.
13. Provide trenching plan and permits for excavations over 5’ per OSHA requirements to the Construction Manager.
14. Each Prime Contractor is to provide all equipment and manpower as necessary to offload all materials required to complete their respective scope of work.
15. Monthly pay apps will not be approved if as-builts are not updated monthly.
16. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.
17. There will be one wash out area as designated by CM. Bid package will be responsible for removal from the site of all construction debris generated by Prime Contractor’s work. Extra spoils to be stockpiled at the direction of CM.
18. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this project.

19. This contract is to provide temporary power for own work until such time as building temporary power is established.
20. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.

Coordination with Other Trades

1. Provide coordination drawings for above ceiling work for work related to this bid package. Coordinate all drawings with the drawings of other bid packages. Note conflicts and provide potential solutions to the architect for review. Coordination must occur prior to installation of work. Attend all coordination meetings required to coordinate all underground and above ceiling work.
2. Confirm that backing by framer is installed to satisfaction of toilet accessory and toilet partitions installer prior to installation of ceramic tile.
3. Coordinate ceramic tile installation with mirror locations at toilets.
4. Provide written layout for all backing required for this bid package.
5. Coordinate at the jobsite all plumbing and electrical locations during rough-in activities to assure proper fit at time of casework and equipment installation.
6. Due to schedule constraints field measuring should be considered at framing stage in lieu of after all drywall and finishes are complete. Review the schedule to determine necessity relative to fabrication times. If measurement is required at the framing stage, provide measurement to meet the schedule and figure all associated finishes.
7. Coordinate hollow metal and storefront openings with framing Prime Contractor. Verify all openings after framing, and before exterior finishes to ensure proper fitment.
8. Coordinate size, shape and profiles of sheet metal pans and head flashings with sheet metal package. Installations and phasing to be coordinated for best time management of multiple trades with CM.
9. Coordinate electrical and FA with coiling doors as required.

Furnish and Install Items

1. Furnish and install all hangers, supports and bracing necessary for installation of work included in this bid package.
2. Provide daily clean-up and off-haul of own debris.
3. Furnish and install own floor protection.
4. Furnish and install fire-stopping/safing complete.
5. Furnish and install layout for your own work.
6. Furnish and install Scaffold for own work.
7. Protect existing surfaces to remain from damage from your work.
8. Furnish and install all interior insulation complete.
9. Furnish and install all fire safing and insulation at underside of roof decks at head of walls, beam pockets, and structural steel.
10. Furnish and install all fire rated top of wall systems complete. Safe, stuff, spray, etc.
11. Furnish and install floor prep for flooring. Level concrete within tolerance as required.
12. Furnish and install all flooring prep per manufacturers requirements, including filling, patching, crack control, leveling as required.

13. Furnish and install all flooring, with the exception of polished or resinous materials.
14. Furnish and install all wood steps, nosing's, and coordinate with Finish Contractor trims.
15. Furnish and install all walk off materials.
16. Furnish and install all sheet flooring.
17. Furnish and install all carpet. Clarification: All carpet specified as "Clovis Blue" and "Walk off" will be provided by the district, and installed by this bid package. Any other carpet types or colors will be furnished and installed under this bid package.
18. The flooring contractor is to include all flooring installations at the portables. This might include "Furnish Mondo and install". New portables drawings indicates that carpet, sheet flooring, and rubber base are all by others.
19. Furnish and install all rubber base at all floor systems throughout the project per plans and finish schedules.
20. Furnish and install all tile. Walls, floors, base, and grouts.
21. Furnish and install all exterior signage shown on architectural drawings complete except for parking and street signage.
22. Furnish and install all access signage on walls and fencing. Earthwork to provide all parking lot signage.
23. Furnish and install all building lettering and signage.
24. Furnish and install all dimensional letters complete.
25. Furnish and install all interior graphics.
26. Furnish and install building plaque.
27. Furnish and install all toilet accessories and mirrors.
28. Install all owner provided Soap and paper towel dispensers.
29. Furnish and install all mop/broom/rag holders.
30. Furnish and install all new toilet partitions.
31. Furnish and install firefighting devices.
32. Install Owner supplied Knox boxes.
33. Furnish and install access doors shown on the reflected ceiling plan.
34. Furnish and install all wood framing. Steps, plywood backer boards, and in electrical/data rooms per finish schedule
35. Project final cleaning.
36. Provide project final cleaning. All buildings, inside and out, windows, doors, walls, floors, cabinets, tops, restrooms, sidewalks, parking areas, etc.
37. Furnish, install, manage, trash and waste management.
38. Provide project trash/recyclable materials dumpsters, per spec section 01 74 19. Provide for the haul off and disposal of all trash and recyclables during the course of the project. Provide Reports per specifications. Drywall and metal stud scrap will be disposed/recycled by the metal stud framing contractor, and all tags will be provided to this general Specialties contractor for tracking and waste management reporting.
39. Furnish and install all roof accessories. Hatches, ladder ups, railings, stage roof vent, etc.
40. Furnish and install all stage roof vent rigging, pulleys, winch, proposed installation layout plan, etc. for manual testing. Coordinate all backings and blockings with metal framing, and manufacturers recommendations. Any materials thicker than the 16 ga stud materials required for backing (if applicable) will be provided and installed under this Misc. Specialties package.
41. Furnish and install all doors. Wood, aluminum, laminate faced, hollow metal, steel, roll up, etc.
42. Furnish and install all electronic access controls. Connect to power supplied by Electrical contractor. Test and confirm operations.

43. Furnish and install all hardware and doors complete.
44. Furnish and install all Storefront systems complete, including all testing, glazing, hardware, etc.
45. Furnish and install door hold opens at concrete including coring of existing concrete as needed.
46. Furnish and install all wood doors and plastic laminate faced wood doors.
47. Furnish and install all bituminous penetration flashing around all items that penetrate the building envelope including but not limited to door frames, window frames, structural steel, piping, etc.
48. Furnish and install building paper, moisture barrier / Tyvek, flexible flashings, and sealants per plans and manufacturer's instructions at installations.
49. All and any aluminum closures, break metals, trims, flashings, sill pans, for any storefront is to be provided and installed under this package.
50. Furnish and install all glass/glazing, and associated sealants.
51. Furnish and install all hollow metal frames, doors, and windows.
52. Furnish and install all louvers and door lights as shown and per schedule.
53. Furnish and install all coiling doors.
54. Furnish and install all service windows.
55. Furnish and install all hardware. Gate and decorative fence hardware to be provided and installed under the site concrete and fence package.
56. Furnish and install all visual display/dry erase markerboards. Coordinate and confirm backing with framing, and coordinate placement with electrical and low voltage.
57. Furnish and install all lockers, including the installation of the owner furnished Bike Lockers.
58. Furnish and install all bike racks.
59. Furnish and install Flagpole assembly complete. Coordinate location, excavation, sleeve installations with Site Concrete plan and Prime Contractor.
60. Furnish and Install Safe. Coordinate installation with casework and metal stand in tall storage cabinet.
61. Furnish and install all food service equipment per plans, including custom fabrications, and all stainless wall panels at cooking line. Coordinate Food Service Shop drawings with plans and Framing.
62. Provide all factory start ups for supplied equipment.
63. Furnish and install sneeze guards. Coordinate size with plans, framing, and Hollow metal Primes and shop drawings.
64. Furnish and install cubicle curtains and stage curtain.
65. Furnish all playground Play structures. Coordinate delivery of the structures to the site to be installed by the CES-01 contractor.
66. Furnish and install all bleachers. (6-five row sets) at ball fields. See plans and detail E on SD/X107. Dugout benches are provided and installed under CES-01 bid package.
67. Furnish and install wheelchair lift. Coordinate layout and installation with building concrete, Framing, electrical, and low voltage.
68. Install all roof access ladders, as furnished by Struct Steel bid package. Coordinate bolting and backing with struct steel, framing, backing, drywall, etc. This may require installing ladder to establish bolting locations, tack weld nuts, then remove ladder for drywall and finishes, then reinstall ladder at finish.
69. Furnish and install all projection screens. Coordinate with framing and electrical.
70. Furnish and install operable wall/folding partition. Coordinate with structural steel, metal framing, and finishes.

FOB Items

1. Deliver insulation to the metal framing Prime Contractor as needed for installations at concealed, entrapped conditions.

Installation of FOB Items

Note: Coordinate all deliveries to jobsite with CM. Prime Contractor to Unload, inventory, store and notify CM of any deficiencies for all items delivered to the jobsite FOB.

End of Bid package

CES-13 FIRE SPRINKLERS

Furnish and install all work specifically required throughout the project documents to complete the work of this bid package that specifically includes, but is not limited to the following:

Specification Sections

Division 00
Division 01
Section 03 15 14 Drilled Anchors
Section 07 92 00 Sealants
Section 21 05 17 Sleeves and Sleeve Seals for Fire-Suppression Piping
Section 21 05 18 Escutcheons for Fire-Suppression Piping
Section 21 05 23 General-Duty Valves for Fire Protection Piping
Section 21 05 29 Hangers and Supports for Fire Suppression Piping and Equipment
Section 21 05 48 Vibration & Seismic Controls for Fire-Suppression Piping & Equipment
Section 21 05 53 Identification for Fire-Suppression Piping and Equipment
Section 21 11 00 Facility Fire-Suppression Water-Service Piping
Section 21 11 19 Fire Department Connections
Section 21 13 13 Wet-Pipe Sprinkler Systems
Appendix "B" Interior Color Schedule Plus Drawings
Appendix "C" Exterior Color Schedule
Geotechnical Engineering Report

Refer to additional related specifications sections for work specifically included in this bid package noted below.

General Items

1. See General Notes at the beginning of the Summary of Work Specification Section for other items to be included in this Bid Package.
2. Furnish and install all layout for own work from survey provided. Prime Contractor will be responsible for all additional layout not performed by the survey contractor. Prime Contractors are responsible for protection of all requested survey. Any needed re-staking of already provided points will be subject to deductive change order.
3. Provide all backfill of excavations to original sub-grade for work included in this bid package.
4. Obtain all permits required to perform the work specified in the bid package. CM will submit the Dust Control plan to the Air Board. Prime Contractor will be responsible for all other permits required to perform the work identified. Prime Contractor will be responsible for dust control for their own work.
5. Provide daily cleanup to keep site clean and orderly.
6. Protect identified improvements to remain on civil plan sheets.
7. Should the Prime Contractor damage and/or otherwise alter work installed under separate contracts, Prime Contractor shall be responsible for the correction/repair of work installed under separate contracts.
8. Prime Contractor is required to attend all coordination meetings as required by CM.
9. Phasing is projected to be as shown on the Bid Schedule. However, the Construction Manager reserves the right to revise the schedule, as necessary.

10. Promptly submit written notice to CM of observed variance of Contract Documents from legal requirements.
    a. Appropriate modifications to Contract Documents will adjust necessary changes.
    b. Assume responsibility for work known to be contrary to such requirements and without written notice to Architect of observed variance.
11. Provide material, equipment, mobilizations, and manpower to meet Construction Schedule provided in Contract Documents.
12. Each bid package is responsible for dewatering as it pertains to their scope of work.
13. Provide trenching plan and permits for excavations over 5' per OSHA requirements to the Construction Manager.
14. Each Prime Contractor is to provide all equipment and manpower as necessary to offload all materials required to complete their respective scope of work.
15. Monthly pay apps will not be approved if as-builts are not updated monthly.
16. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.
17. There will be one wash out area as designated by CM. Bid package will be responsible for removal from the site of all construction debris generated by Prime Contractor's work. Extra spoils to be stockpiled at the direction of CM.
18. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this project.
19. This contract is to provide temporary power for own work until such time as building temporary power is established.
20. Furnish clean up daily and off-haul of all debris generated by this contract to disposal bins provided under CES-12. Prime Contractor must abide by the Waste Management specification.

Coordination with Other Trades

Furnish and Install Items

1. Furnish and install own floor protection (i.e., Tarps, plastic, plywood, etc.).
2. Furnish and install all supports and bracing necessary for installation of work included in this bid package.
3. Furnish and install fire sprinkler system complete from the point of connection provided from the underground utilities Prime Contractor. (See site plumbing SOW for clarity)
4. Test and flush system per specifications
5. Coordinate the installation of the fire alarm safety devices with the electrical, low voltage Prime Contractor for devices associated with the sprinkler system.
6. Provide and install all signage, and ID tags as required.

FOB Items

1. Tools, keys, and extra heads per plans/spec.

Installation of FOB Items

Note: Coordinate all deliveries to jobsite with CM. Prime Contractor to Unload, inventory, store and notify CM of any deficiencies for all items delivered to the jobsite FOB.

End of Bid package

CES-14 BUILDING PLUMBING and HVAC

Furnish and install all work specifically required throughout the project documents to complete the work of this bid package that specifically includes, but is not limited to the following:

Specification Sections

Refer to additional related specifications sections for work specifically included in this bid package noted below.

Division 00
Division 01
Section 03 15 14 Drilled Anchors
Section 05 12 00 Steel and Fabrications (For downspouts/RWL's and support attachments)
Section 07 92 00 Sealants
Section 08 91 00 Louvers
Section 22 00 00 General Plumbing Provisions
Section 22 00 50 Plumbing
Section 23 01 00 General Mechanical Provisions
Section 23 01 00 General Mechanical Provisions
Section 23 05 00 Common Work Results for HVAC
Section 23 05 13 Common Motor Requirements for HVAC Equipment
Section 23 05 29 Hangers and Supports for HVAC Piping and Equipment
Section 23 05 48 Vibration and Seismic Controls for HVAC Piping and Equipment
Section 23 05 53 Identification for HVAC Piping and Equipment
Section 23 05 93 Testing, Adjusting, and Balancing for HVAC
Section 23 07 00 HVAC Insulation
Section 23 08 00 Commissioning of HVAC
Section 23 17 10 Variable Frequency Drives
Section 23 23 00 Refrigerant Piping
Section 23 31 13 Metal Ducts
Section 23 31 16 Nonmetal Ducts
Section 23 33 00 Air Duct Accessories
Section 23 34 23 HVAC Power Ventilators
Section 23 34 33 Air Curtains
Section 23 38 13 Commercial Kitchen Hoods
Section 23 72 00 Air to Air Energy Recovery Equipment
Section 23 74 13 Package Outdoor Central Station Air Handling Units
Section 23 74 33 Packaged Outdoor Heat and Cool Makeup Air Units
Section 23 81 50 Variable Refrigerant Flow Air Conditioners
Section 25 50 00 Direct Digital Control and Energy Management Systems
Appendix "B" Interior Color Schedule Plus Drawings
Appendix "C" Exterior Color Schedule
Geotechnical Engineering Report

General Items

1. See General Notes at the beginning of the Summary of Work Specification Section for other items to be included in this Bid Package.
2. Furnish and install all layout for own work from survey provided. Prime Contractor will be responsible for all additional layout not performed by the survey contractor. Prime Contractors are responsible for protection of all requested survey. Any needed re-staking of already provided points will be subject to deductive change order.
3. Provide all backfill of excavations to original sub-grade for work included in this bid package.
4. Obtain all permits required to perform the work specified in the bid package. CM will submit the Dust Control plan to the Air Board. Prime Contractor will be responsible for all other permits required to perform the work identified. Prime Contractor will be responsible for dust control for their own work.
5. Provide daily cleanup to keep site clean and orderly.
6. Protect identified improvements to remain on civil plan sheets.
7. Should the Prime Contractor damage and/or otherwise alter work installed under separate contracts, Prime Contractor shall be responsible for the correction/repair of work installed under separate contracts.
8. Prime Contractor is required to attend all coordination meetings as required by CM.
9. Phasing is projected to be as shown on the Bid Schedule. However, the Construction Manager reserves the right to revise the schedule, as necessary.
10. Promptly submit written notice to CM of observed variance of Contract Documents from legal requirements.
    a. Appropriate modifications to Contract Documents will adjust necessary changes.
    b. Assume responsibility for work known to be contrary to such requirements and without written notice to Architect of observed variance.
11. Provide material, equipment, mobilizations, and manpower to meet Construction Schedule provided in Contract Documents.
12. Each bid package is responsible for dewatering as it pertains to their scope of work.
13. Provide trenching plan and permits for excavations over 5’ per OSHA requirements to the Construction Manager.
14. Each Prime Contractor is to provide all equipment and manpower as necessary to offload all materials required to complete their respective scope of work.
15. Monthly pay apps will not be approved if as-builts are not updated monthly.
16. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.
17. There will be one wash out area as designated by CM. Bid package will be responsible for removal from the site of all construction debris generated by Prime Contractor’s work. Extra spoils to be stockpiled at the direction of CM.
18. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this project.
19. This contract is to provide temporary power for own work until such time as building temporary power is established.
20. Furnish clean up daily and off-haul of all debris generated by this contract to disposal bins provided under CES-12. Prime Contractor must abide by the Waste Management specification.

Coordination with Other Trades

1. Provide coordination drawings for work related to this bid package. Coordinate all drawings with the drawings of other bid package. Note conflicts and provide potential solutions to DABI for review. Coordination must occur prior to installation of work. A representative from your company must be in attendance of all coordination meetings.
2. Coordinate locations of all openings, block-outs, backing, and blocking for utility and fixture supports with related trades prior to installation of framing.
3. Any holes made through materials to allow installation of utilities not called for in the contract documents shall be installed and reinforced by this bid package.
4. Coordinate all work to provide access to buildings for other trades as scheduled. Provide a breakout schedule of where and when piping operations will be performed that has been coordinated with other activities in the schedule for other trades.
5. Coordinate routing of plumbing to miss foundations.
6. Coordinate the location of depressions, block outs, slopes, and drains with the drawings prior to pour.
7. Housekeeping and equipment pads will be furnished and installed by the concrete bid package. Provide dimensions for pads.
8. Coordinate alignment of all utilities between plumbing and civil drawings prior to excavation.
9. Coordinate at the jobsite all plumbing and electrical locations during rough-in activities to assure proper fit at time of casework and equipment installation. In addition, contractor to confirm all piping will fit in walls.
10. Coordinate individual building tie-ins or cut over with DABI. Provide a written testing plan for all systems prior to start of service.
11. Coordinate with other trades that will interface with plumbing equipment and material.
12. Clean and disinfect all building piping and portables with water piping. Phased construction will necessitate a specific schedule of disinfection coordinated with the other building & site contractors. Create disinfection plan and coordinate with building & site contractors to allow for complete and maintained disinfection of the entire system until acceptance by Owner.
13. Coordinate water, gas, condensate, and sewer with plans, and food service shop drawings prior to rough in.
14. Provide dimensions for structural steel openings within 30 days of NTP.
15. Review as-built drawings for POC prior to starting work.
16. Layout blocking as required for hangers and supports for own work. Structural steel contractor will provide and install additional structural steel in roof framing as required and shown. Mechanical to provide and install all suspension rods, angle iron, and bracing as shown in mechanical plans.
17. Provide all necessary openings and/or connection points for EMS and fire alarm wiring and devices.
18. Housekeeping and equipment pads will be furnished and installed by the concrete bid package. Provide dimensions for pads.
19. Coordinate heights of all roof curbs to confirm with roofing requirements prior to ordering curbs.
20. Coordinate location of rough-in prior to ordering HVAC units for electrical mechanical and plumbing utilities.
21. Physically layout all coring, drilling, block outs, openings, holes, backing, etc.
22. All sheet metal as required for HVAC scope, whether noted or not, used on this project shall be furnished and installed under this bid package.

23. Provide all equipment ready for hook up by Electrical bid package. Coordinate utilities and connections with related trades.
24. Coordinate HVAC ductwork and equipment with structural steel, fire sprinkler, electrical, and plumbing.
25. Coordinate all work to provide access to buildings for other trades as scheduled. Provide a breakout schedule of where and when rough-in operations will be performed in the building that has been coordinated with other activities in the schedule for other trades.
26. Provide all necessary openings and/or connection points for EMS and fire alarm wiring and devices. Fire Alarms Systems will be provided under separate contracts. EMS by this contract.
27. Coordinate locations of all openings, block-outs backing blocking and blocking for utility and fixture supports with related trades prior to installation of framing.
28. Layout blocking as required for hangers and supports for own work.
29. Coordinate all utilities with food service prior to rough in of any materials.
30. Provide dimensions for structural steel openings within 30 days of NTP.

Furnish and Install Items (Plumbing)

1. Furnish and install all building fixtures and plumbing utilities to the POC provided by the Site Plumbing bid package, approximately 5'-0" outside of building.
2. Furnish and install all two-way building sewer clean outs as close to the building as possible. This is a district request. Coordinate with building concrete package to avoid footing conflicts.
3. Furnish and install water valves and boxes after POC from site utilities contractor's pipe.
4. Reference building Architectural sheets for all building downspout connections and details. See sheet XA531 for more information.
5. Furnish and install all drinking fountains, interior, exterior, and site.
6. This bid package will be responsible for all final points of connection to all site utilities.
7. Furnish and install physical layout for all deepened foundations at utilities prior to excavation by the concrete bid package.
8. Provide Furnish and install all access Panels required for your work.
9. Provide all backfill of excavations to original subgrade for work included in this bid package.
10. Furnish off-haul of all excavation spoils for work included in this bid package to one location as determined by DABI.
11. Furnish and install all attachments of equipment related to this scope of work.
12. Furnish and install all sleeves in foundations prior to the installation of concrete and reinforcing steel. Coordinate location with other related trades prior to excavation.
13. Furnish and install all excavations for own work.
14. Furnish and install all concrete required for installation of work in this bid package.
15. Furnish and install all drilling of holes for work performed in this bid package.
16. Furnish and install drilling of wood and metal as needed for pipes and supports.
17. Furnish and install all rough-in for equipment supplied under other bid packages(Kitchen equipment, hvac,…) as required by the related specification sections and drawings. Connect to equipment.
18. Furnish and install all required utilities for Owner Furnished Equipment, capped and ready for connection. Make connection when installed.
19. Furnish and install watertight closures at all gang and individual pipe penetration through exterior walls or through roof.
20. Provide testing of floor and roof drains during installation and at completion of project.

21. Clean and disinfect all building piping and portables with water piping. Phased construction will necessitate a specific schedule of disinfection coordinated with the other building & site contractors. Create disinfection plan and coordinate with building & site contractors to allow for complete and maintained disinfection of the entire system until acceptance by Owner. Building contractors will be responsible for cleaning and disinfection of building and portable piping.
22. Furnish and install all identification or lettering noted for the project required for this scope of work.
23. Furnish and install own floor protection (i.e., Tarps, plastic, plywood, etc.).
24. Furnish and install all flues associated with own work.
25. Furnish and install water heater, strapping and platforms complete including steel stand if specified.
26. Furnish & install drain & overflow piping.
27. Furnish & install all trap primers and access panels as needed.
28. Furnish and install protection of existing finishes and roofing for own work.
29. Insulate hot water and drain pipes under sinks per ADA/code.
30. Furnish and install all trench drains.
31. Furnish and install all sand/oil separators complete.
32. Drill all holes required for curb attachment through steel.
33. Furnish and install all fire stopping and acoustical/sound sealant assemblies complete for this scope of work.
34. Furnish and install all condensate piping complete including hook up.
35. Furnish and install all coring or place sleeves for utilities through masonry and concrete. Sleeves are to be installed prior to rebar and concrete. Coordinate with other contractors prior to excavation.
36. Furnish and install all fabrication and installation of steel downspouts and brackets. Coordinate fabrication with steel specifications for reference where applicable.
37. Furnish and install all downspouts and related support bracket assemblies as outlined in Detail A1 on X/A531. Coordinate all backing layout with metal stud framing package, and roofing contractor.
38. Connect steel downspouts to all rain gutters and storm drains, per all disciplines of drawings.
39. This contract is to provide temporary power for own work through completion of steel erection as required. Once temporary power has been established by DABI, each contractor will only need to provide temporary utility distribution from services provided. Contractors are responsible for own distribution of power and lighting.
40. Furnish and install all plumbing identified in the plumbing notes, food service documents, and plumbing drawings.
41. Furnish and install covers at all holes in elevated decks created by your own work in which debris may fall to the level below, per Cal OSHA regulations.
42. Furnish and install all roof accessories relative to this contractor's work.
43. Furnish and install all shut off valves, and pressure regulator for the gas systems. Connect gas lines from building to gas POC.
44. Furnish and install all floor drains.
45. Furnish and install all Unistrut, angles, clips, fasteners, etc. to bottom of deck, beams, etc. for hanging of utilities. Means and methods meeting detailed attachment, code, and approved manufacturers methods.
46. Furnish and install all gas regulators. And their security cages as noted "General Specialties" see SD/A302
47. Furnish and install all toilet and sink sensors complete.

48. This contract will complete all work per the requirements of the Dust Control Plan and SWPPP Plan.
49. Provide Dust Control for own work.
50. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this Project.
51. Provide early startup/use of plumbing equipment as required by the DABI/Owner for construction or building systems testing, prior to final acceptance, which will not initiate the warranty period until the filing notice of completion.
52. The Plumbing Contractor shall include all of the following in its bid and coordinate with each of its own sub trade for a complete project. Each contractor shall submit, at time of the bid, their crewing and bid package plan as to who will be performing what scopes of work and the crew size planned for each.
53. Any deviation from the contract documents resulting in additional design will be at the cost of this bid package.
54. This contract shall be responsible for all fireproofing/caulking/assemblies for own work.
55. Furnish and install all building clean outs approximately 2' from the building, or as close to the footing as possible at wide footings. Coordinate layout and installation with structural concrete bid package. All clean outs are to be two-way clean outs, per district standards.

Furnish and Install Items (HVAC)

1. Furnish and install all HVAC equipment, duct, hangers, backing, bracing, supports, and piping supports and curbs necessary for installation of work included in this bid package.
2. Furnish and install EMS system complete.
3. Furnish and install all access doors necessary to provide access to work included in this bid package.
4. Furnish and install all drilling of holes for work performed in this bid package.
5. Furnish and install all attachment of all equipment related to this scope of work.
6. Furnish and install all fire stopping related to this bid package.
7. This contract shall be responsible for all fireproofing/caulking/assemblies for own work.
8. Furnish and install all identification and lettering called for in the contract documents related to this bid package.
9. Provide for testing of fire smoke dampers resettable link coordinate with Fire Alarm bid package. Provide fire smoke dampers ready for power hook up.
10. Provide start up and run equipment for acclimation and allow use of HVAC systems without effecting official start date of Warranty period upon Owner acceptance of project. Provide early startup and maintenance of HVAC equipment as required by CM, for acclimatization of buildings prior to final acceptance, which will not initiate the warranty period until the filing notice of completion. Provide for 2 filter changes for all required equipment throughout the building. If filter replacement is not required, then filters are to be turned over to the district during close out procedures.
11. Furnish and install own floor protection (i.e., Tarps, plastic, plywood, etc.).
12. Furnish and install all pre-manufactured roof curbs at the roof.
13. Furnish and install all roof curb adapters as required.
14. Furnish and install transfer air grilles as noted.
15. Furnish and install fusible links for equipment testing if applicable.

16. Provide all controls unless specifically called for in electrical drawings.
17. Furnish and install all duct work and flues complete associated with own work.
18. Furnish and install all metal louvers and screens. Provide associated attachment accessories.
19. Furnish and install louvers at walls complete. Coordinate with exterior envelope flashing contractor/ installer.
20. Furnish and install all fire and fire smoke dampers ready for device hook up by electrical.
21. Furnish and install all fans.
22. Furnish and install all exhaust systems.
23. Furnish and install sealant as related to this package.
24. Furnish and install Unistrut & pipe support assembly for own work.
25. Provide all necessary openings and/or connection points for EMS and fire alarm. Provide conduit and wiring as required for unit shut down controls.
26. Provide daily clean up. Haul off own debris.
27. Provide sheet metal cap and associated flashings for electrical and mechanical equipment platforms as shown.
28. Furnish and install all unit anchorage complete as noted.
29. Furnish and install control conduit and conductors.
30. Install communicating smoke detector unit shutdown at the air handler as noted.
31. Furnish and install all refrigeration piping for all HVAC equipment shown on the plans per manufacturer's instructions, engineered calculations and Specifications.
32. Furnish and install all HVAC and Sheet metal (as applies to mechanical equipment) work complete per plans and specs.
33. Furnish and install all control panels and support.
34. This contract is to provide temporary power for own work through completion of steel erection as required. Once temporary power has been established each contractor will only need to provide temporary utility distribution from services provided at the building. Contractors are responsible for own distribution of power and lighting.
35. Furnish and install all drilling of holes, including through metal, for work performed in this contract.
36. Furnish and install all galvanized steel supports for ductwork at roof if required.
37. Furnish and install fire duct wrap.
38. Furnish and install all equipment anchorage.
39. Furnish and install all flashings associated with ductwork, fans, and hoods, through walls, decks, and roof.
40. Furnish and install all louver assemblies complete including all clips, screws, and angles necessary to attach louvers except for hollow metal frame to be provided by other Prime Contractors
41. Furnish and install all mechanical noted in the mechanical notes throughout the food service documents complete.
42. Furnish and install all Ansul system complete. Provide gas valve to plumber for installation.
43. Furnish and install all Roof Accessories and/or Curbs/Platforms/Stands/Supports/Steel Backing/Bolts/Angles (wood/ steel / pre-manufactured / framed) for all Mechanical equipment provided under this contract.
44. Furnish and install all roof mounted pipe supports when required.
45. Furnish and install covers at all holes in elevated decks created by your own work in which debris may fall to the level below, per Cal OSHA regulations.
46. Install all duct mounted smoke detector housings provided by the fire alarm Prime Contractor.
47. Provide all equipment ready for hook up by EMS and Electrical Prime Contractors. Coordinate utilities and connections with related trades.

48. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this Project.
49. Furnish and install EMS system complete including all conduit, wire, controls, and control panels.
50. Furnish Air Balancing with report (to include modular buildings).
51. This contract will complete all work per the requirements of the Dust Control Plan and SWPPP Plan.
52. Provide Dust Control for own work.
53. The Mechanical Prime Contractor shall include all of the following in its bid and coordinate with each of its own sub trade for a complete project. Each Prime Contractor shall submit, at time of bid, their crewing and bid package plan as to who will be performing what scopes of work and the crew size planned for each.
54. This contract shall be responsible for all fireproofing patch back as a result of own work.
55. Furnish and Install sealant for HVAC work included in this contract abutting other materials.
56. Furnish and install all sleeves for work passing through masonry and concrete work where required. Coordinate with Respective Prime Contractors.
57. Furnish and install protection of all roofing when work under this contract requires access on the roofing systems.
58. Furnish and install all hangers, supports, Unistrut and bracing necessary for installation of work included in this contract.
59. Furnish and install all sleeves in foundations prior to the installation of concrete and reinforcing steel. Coordinate location with other related Prime Contractors prior to excavation.
60. All Prime Contractors will provide their own temporary and task lighting needed for this scope of work.
61. This contract is responsible for holes through metal deck and installation of hanger wires for own work where applicable and approved.
62. All work will need to be completed as per the supplied bid schedule.
63. Coordination must occur prior to installation of work. A representative from your company must be in attendance at all coordination meetings.

FOB Items

1. Furnish all starters at HVAC units. Electrical connections shall be made by Electrical bid package.

Installation of FOB Items

Note: Coordinate all deliveries to jobsite with CM. Prime Contractor to Unload, inventory, store and notify CM of any deficiencies for all items delivered to the jobsite FOB.

1. Install Duct Detectors provided by Fire Alarm Prime Contractor. Wiring to be completed by electrical Prime Contractor.

End of Bid package

CES-15 BUILDING ELECTRICAL

Furnish and install all work specifically required throughout the project documents to complete the work of this bid package that specifically includes, but is not limited to the following:

Specification Sections

Refer to additional related specifications sections for work specifically included in this bid package noted below.

Division 00
Division 01
Section 03 15 14 Drilled Anchors
Section 07 92 00 Sealants
Section 10 05 00 Miscellaneous Specialties (Projector Support Panel)
Section 26 05 00 Common Work Results for Electrical
Section 26 05 26 Grounding
Section 26 05 53 Electrical Identification
Section 26 20 00 Low Voltage Electrical Transmission
Section 26 50 00 Lighting Fixtures
Section 27 00 00 Telecommunication Systems
Section 27 05 28 Communications Infrastructure System
Section 27 10 00 Structured Cabling System
Section 27 20 10 Uninterruptible Power Supply
Section 27 42 00 Classroom Audio-Visual Systems
Section 27 53 13 Analog Synchronous Clocks
Section 27 70 00 Intercom Clock Public Address System
Section 27 80 00 Video Surveillance
Section 28 31 00 Fire Alarm and Detection
Appendix "B" Interior Color Schedule Plus Drawings
Appendix "C" Exterior Color Schedule
Geotechnical Engineering Report

General Items

1. See General Notes at the beginning of the Summary of Work Specification Section for other items to be included in this Bid Package.
2. Furnish and install all layout for own work from survey provided. Prime Contractor will be responsible for all additional layout not performed by the survey contractor. Prime Contractors are responsible for protection of all requested survey. Any needed re-staking of already provided points will be subject to deductive change order.
3. Provide all backfill of excavations to original sub-grade for work included in this bid package.
4. Obtain all permits required to perform the work specified in the bid package. CM will submit the Dust Control plan to the Air Board. Prime Contractor will be responsible for all other permits required to perform the work identified. Prime Contractor will be responsible for dust control for their own work.
5. Provide daily cleanup to keep site clean and orderly.
6. Protect identified improvements to remain on civil plan sheets.

7. Should the Prime Contractor damage and/or otherwise alter work installed under separate contracts, Prime Contractor shall be responsible for the correction/repair of work installed under separate contracts.
8. Prime Contractor is required to attend all coordination meetings as required by CM.
9. Phasing is projected to be as shown on the Bid Schedule. However, the Construction Manager reserves the right to revise the schedule, as necessary.
10. Promptly submit written notice to CM of observed variance of Contract Documents from legal requirements.
    a. Appropriate modifications to Contract Documents will adjust necessary changes.
    b. Assume responsibility for work known to be contrary to such requirements and without written notice to Architect of observed variance.
11. Provide material, equipment, mobilizations, and manpower to meet Construction Schedule provided in Contract Documents.
12. Each bid package is responsible for dewatering as it pertains to their scope of work.
13. Provide trenching plan and permits for excavations over 5' per OSHA requirements to the Construction Manager.
14. Each Prime Contractor is to provide all equipment and manpower as necessary to offload all materials required to complete their respective scope of work.
15. Monthly pay apps will not be approved if as-builts are not updated monthly.
16. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.
17. There will be one wash out area as designated by CM. Bid package will be responsible for removal from the site of all construction debris generated by Prime Contractor's work. Extra spoils to be stockpiled at the direction of CM.
18. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this project.
19. This contract is to provide temporary power for own work until such time as building temporary power is established.
20. Furnish clean up daily and off-haul of all debris generated by this contract to disposal bins provided under CES-12. Prime Contractor must abide by the Waste Management specification.

Coordination with Other Trades

1. Provide coordination drawings for underground and above ceiling work for work related to this bid package. Coordination must occur prior to excavation and/or installation of the work. Attend all coordination meetings required to coordinate all underground and above ceiling work.
2. Provide use and maintenance of electrical equipment and devices as required by the District/or CM for construction and testing of other equipment prior to final acceptance, which will not initiate the warranty period until filing of notice of completion.
3. Coordinate all work to provide access to buildings for other trades as scheduled. Provide an underground utility schedule of where and when piping operations will be performed.
4. Coordinate locations of all openings, block-outs, backing, and blocking for utility and fixture supports with related trades prior to installation of framing.
5. Coordinate location of UG utilities to be out of angle of repose of foundations.
6. Poured in place housekeeping and equipment pads to be supplied by the concrete contractor.

7. Review as-builts and pothole existing utilities prior to starting work.
8. Verify continuity of electrical and low voltage conduits for work in this contract.
9. Provide shop drawings for equipment layout in electrical rooms to confirm that dimensions are adequate prior to rough in and pouring of footings and curbs.
10. Connect “hanger wires” provided by the Acoustical Prime Contractor to hang light fixtures.
11. Coordinate all locations of kitchen equipment for the kitchen and electrical drawings.
12. Provide dimensions for structural steel openings within 30 days of NTP.
13. Coordinate all utilities with food service prior to rough in of any materials.
14. Coordinate wall sizes with pipe sizes prior to installation to confirm all piping will fit in walls.
15. Coordinate locations of all openings, block-outs, backing and blocking for utility and fixture supports with related trades prior to installation of framing.
16. Layout above ceiling blockings/backings as required for hangers and support of own work.
17. Coordinate all underground utilities to miss foundation.
18. Provide Safe off of all electrical equipment as required for trade work.

Furnish and Install Items

1. Furnish and install all building and site electrical, wiring and equipment complete, with exception to that being provided in Inc #1, Site Electrical conduit, Rule 16 conduit, switchgear pad, and the installation of the owner supplied switchgear. This bid package CES-15 will provide and install all transformers, disconnects, panels, IDF cabinets, Environmental exterior cabinets, mini unit substation, etc., including concrete footings, equipment pedestal, precast pads, etc.
2. Furnish and install all conduit from the POC where the Inc 1 electrical Prime Contractors installations stop. Continue all conduits to their final installations into the buildings per plans. Continue all fire conduit to fire sprinkler systems for all fire alarm completion in this package.
3. Continue all site lighting conduits to all lights and light poles.
4. Furnish and install all light poles, bases, templates, bolts, forms, groundings, and concrete to complete the site lighting.
5. Provide installation of final conduit and all connections to pump(s), and irrigation controllers. The site electrical contractor will provide conduit to within 5’ of “Coaches switches” locations. This contract will connect and finish conduit and provided and install a housing box per plan, provide receptacle, wiring and all connections for coaches switches controller to plug in to.
6. Furnish and install all wiring. Power, lighting, low voltage, data, Fire. EMS and Irrigation to be provided under those prime packages.
7. Furnish/install/disconnect job site temporary power as required.
8. Furnish and install temporary lighting in the main areas of each building equal to a minimum of a continuous temp light stringer the long length of each building, or equal. Connect temp lighting to temp power distribution box, and power, also provided under this package.
9. Furnish and install physical layouts for all deepened foundations at utilities prior to excavation.
10. All excavation spoils to be deposited at one location on site as determined by CM.
11. Furnish and install all sleeves in foundation prior to the installation of reinforcing steel and concrete. Coordinate layout and location with other related bid package trades prior to excavation.
12. Furnish and install all sleeves for work passing through masonry and concrete work. Coordinate with respective bid packages.
13. Provide all backfill of excavations to original subgrade for work included in this bid package.
14. Furnish and install all floor boxes solid for install of slab on grade.
15. Furnish and install drilling of holes for work performed in this bid package.
16. Furnish and install fire stopping and fire caulking of own penetrations for own work.

17. Furnish and install pull strings/rope in all empty or future conduits.
18. Furnish and install all concrete required for installation of vaults, boxes, underground structures for work related to this bid package.
19. Provide conduit path/raceway for reception panic button, and dedicated principals phone if required by the district.
20. Furnish and install all access panels and doors necessary to provide access to work included in this bid package.
21. Furnish and install all required utilities for Owner furnished equipment hook up as required.
22. Furnish and install all rough-in for all equipment of other bid packages as required by the related specification sections and drawings. Connect and or stub as described.
23. Furnish and install all conduit and sleeves for future low voltage and telecommunications wiring. Install fire stopping as required.
24. Furnish and install disconnects and associated supports not provided on factory equipment installed by other bid packages.
25. Furnish and install all supports and bracing required for electrical work except for ceiling hanger wires to lights in new ceilings.
26. Provide connection of “Hanger Wires” to light fixtures, layout of wires will be by this bid package. Connect “Hanger Wires” provided by the Acoustical Bid package to light fixtures, cable trays and projector mounts.
27. Furnish and install watertight closures and sealants at all gang and individual pipe penetration thru exterior walls.
28. Furnish and install all identification and lettering called for in the contract documents related to the work of this bid package.
29. Furnish and install all roof accessories relative to this bid package’s work.
30. Furnish and install own floor protection (i.e., Tarps, plastic, plywood, etc.).
31. Furnish and install all clocks and speakers.
32. Furnish and install all power and fire alarm to smoke and fire dampers as called for in the documents.
33. Adjust all electrical and low voltage boxes in new landscape and concrete areas as needed.
34. Furnish and install all physical layout for your own work.
35. Core penetrations through CMU wall as required for conduit installation.
36. Furnish and install all power requirements for owner supplied equipment.
37. Furnish and install all anchor bolts and templates for light poles and equipment. Form and pour all light pole bases.
38. Furnish and install electrical to HVAC units.
39. Furnish and install protection of all roofing when work under this bid package requires access on the roofing systems.
40. Provide all power testing for own work.
41. Furnish duct detector for fan shut-down and signal to fire alarm system at noted Air Handlers, AC Units, Makeup Air Units and Supply, and exhaust Fans.
42. Furnish and install all lighting and controls as required.
43. Furnish communicating smoke detector unit shutdown at the air handler and furnish and install fire alarm monitoring as noted.
44. Furnish and install all power and low-voltage systems complete except for EMS controls. This includes but is not limited to all buildings and site wiring, cable trays and conduit for power clock and speaker, data, fire alarm, lighting controls, security, etc.
45. Furnish and install all rough in conduit, and power for security and electronic access control.

46. Furnish and install all Unistrut for electrical work and lighting fixture supports. This includes Unistrut for projector support.
47. Furnish and install all chain mounted fixtures complete.
48. Furnish and install all electrical panel mounting complete at roofs except flashing.
49. Furnish and install all electrical required for kitchen hoods complete including hook up.
50. Furnish and install all electrical, data, and fire alarm connections required for the stage elevator including testing.
51. Furnish and install covers at all holes in elevated decks created by your own work in which debris may fall to the level below, per Cal OSHA regulations.
52. Furnish layout and Unistrut as necessary for backing and supports required for pendent light fixtures.
53. Furnish and install all power and fire alarm conduit and wiring complete to rollup doors including connections and testing.
54. Furnish and install all conduit, wiring, and connections for all powered roll up doors.
55. Furnish and install all power to water heaters, recirculating pumps, and thermo switch complete, in collaboration with the plumbing Prime Contractors installations.
56. Furnish and install all projectors, projector mounts.
57. Furnish and install all required utilities for Owner Furnished Equipment, capped and ready for connection. Make connections as required upon arrival.
58. Furnish and install all roof curbs associated with electrical work.
59. Furnish and install all rough-in for all equipment of other trade as required by the related specification sections and drawings. Connect and or stub as described.
60. Furnish and install all site lighting including bases, poles, and fixtures.
61. Furnish and install data infrastructure, wiring and cabling per plans and specifications.
62. Furnish and install disconnects and associated supports.
63. Furnish and install fire alarm including connection to all fire sprinkler devices.
64. Furnish and install sealant system as required to provide watertight condition at all exterior devices.
65. Furnish, install, and coordinate all conduit and wiring within casework. Coordinate with casework Prime Contractor for chase requirements.
66. Furnish and install all speakers and associated brackets.
67. Proved power and make connections to owner furnished equipment.
68. Provide for any and all electrical testing for modular buildings.
69. Provide low voltage work at modular buildings. including but not limited to, pulling of wire, fire alarm system, security system.
70. Provide Dust Control for own work.
71. This contract will complete all work per the requirements of the Dust Control Plan and SWPPP Plan.
72. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this Project.
73. All excavation spoils to be deposited at one location on site as determined by CM.
74. Furnish and install all sleeves for work passing through masonry and concrete work. Coordinate with respective bid packages.
75. Provide all backfill of excavations to original subgrade for work included in this bid package.
76. Furnish and install drilling of holes for work performed in this bid package.
77. Furnish and install pull strings/rope in all empty or future conduits.

78. Furnish and install all attachment of all equipment related to this scope of work.
79. Furnish and install all identification and lettering called for in the contract documents related to the work of this bid package.
80. Furnish and install all physical layout for your own work.
81. This contract shall be responsible for holes at metal deck for installation of hanger wires for own work.
82. Furnish and install all conduit, wiring, and connections for all powered roll up doors.

FOB Items

1. Duct Detector Work: These items are provided by Fire Alarm, to be installed by Mechanical Prime Contractors and wired by this contract. Provide additional circuits as needed for mechanical equipment, coordinate with mechanical Prime Contractor.

Installation of FOB Items

Note: Coordinate all deliveries to jobsite with CM. Prime Contractor to Unload, inventory, store and notify CM of any deficiencies for all items delivered to the jobsite FOB.

1. Install all switches for equipment provided by others i.e., coiling doors, fly fans, exhaust fans, etc.
2. Install all Owner furnished Electrical equipment and switches where applicable.

End of Bid package

CES-16 OFF SITE IMPROVEMENTS

Furnish and install all work specifically required throughout the project documents to complete the work of this bid package that specifically includes, but is not limited to the following:

PG&E drawings and specifications
City of Fresno codes, and requirements for all utility and street improvements.
Refer to additional related specifications sections for work specifically included in this bid package noted below.

Specification Sections

Division 00
Division 01
City Of Fresno Off Site Street Improvement Plans and Specifications
City of Fresno Street Lighting Plans and specifications
City of Fresno Off Site Water Main Improvements Plans and Specifications
City of Fresno Off Site Landscape improvements Plans and Specifications
PG&E Gas and Electrical Off-Site Plans
Section 32 84 00 Landscape Irrigation System (For Backflow Preventor and installation)
Appendix "B" Interior Color Schedule Plus Drawings
Appendix "C" Exterior Color Schedule
Geotechnical Engineering Report

City of Fresno specification for sidewalks, curbs, gutters, drive approaches, asphalt paving, sewer, storm, water, patch backs, etc. for all work associated with the Off-Site Improvements.

General Items

1. See General Notes at the beginning of the Summary of Work Specification Section for other items to be included in this Bid Package.
2. Furnish and install all layout for own work from survey provided. Prime Contractor will be responsible for all additional layout not performed by the survey contractor. Prime Contractors are responsible for protection of all requested survey. Any needed re-staking of already provided points will be subject to deductive change order.
3. Provide all backfill of excavations to original sub-grade for work included in this bid package.
4. Obtain all permits required to perform the work specified in the bid package. CM will submit the Dust Control plan to the Air Board. Prime Contractor will be responsible for all other permits required to perform the work identified. Prime Contractor will be responsible for dust control for their own work.
5. Provide daily cleanup to keep site clean and orderly.
6. Protect identified improvements to remain on civil plan sheets.
7. Should the Prime Contractor damage and/or otherwise alter work installed under separate contracts, Prime Contractor shall be responsible for the correction/repair of work installed under separate contracts.
8. Prime Contractor is required to attend all coordination meetings as required by CM.
9. Phasing is projected to be as shown on the Bid Schedule. However, the Construction Manager reserves the right to revise the schedule, as necessary.

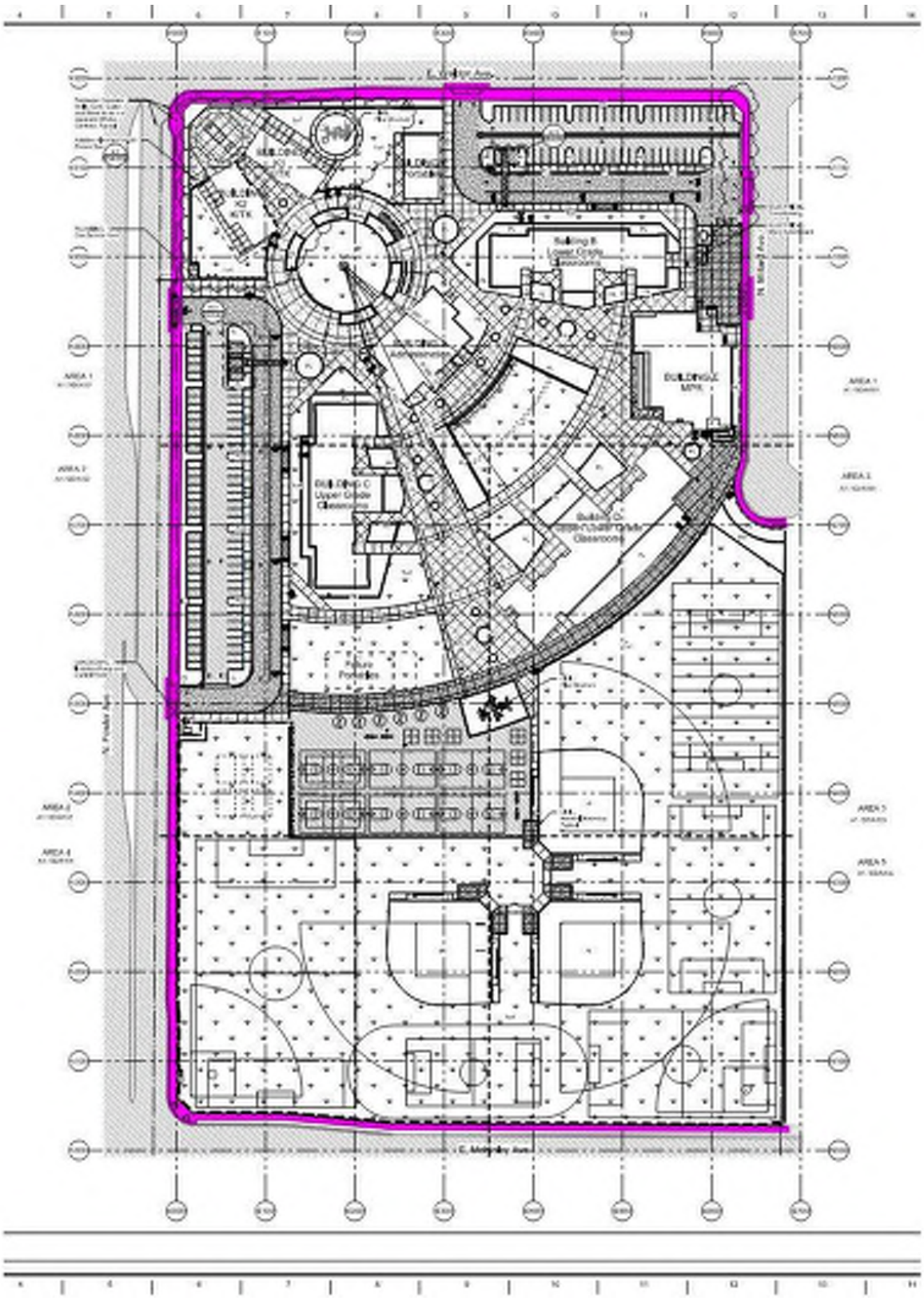
10. Promptly submit written notice to CM of observed variance of Contract Documents from legal requirements.
    a. Appropriate modifications to Contract Documents will adjust necessary changes.
    b. Assume responsibility for work known to be contrary to such requirements and without written notice to Architect of observed variance.
11. Provide material, equipment, mobilizations, and manpower to meet Construction Schedule provided in Contract Documents.
12. Each bid package is responsible for dewatering as it pertains to their scope of work.
13. Provide trenching plan and permits for excavations over 5' per OSHA requirements to the Construction Manager.
14. Each Prime Contractor is to provide all equipment and manpower as necessary to offload all materials required to complete their respective scope of work.
15. Monthly pay apps will not be approved if as-builts are not updated monthly.
16. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.
17. There will be one wash out area as designated by CM. Bid package will be responsible for removal from the site of all construction debris generated by Prime Contractor's work. Extra spoils to be stockpiled at the direction of CM.
18. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this project.
19. Furnish clean up daily and off-haul of all debris generated by this contract. Prime Contractor must abide by the Waste Management specification. This includes, but is not limited to, providing recycling tags for each haul off removed from the project site.
20. All construction equipment shall meet the requirements of the SJVAPCD ISR Report (Air Impact Assessment- AIA) under the Construction Fleet Summary. This shall include reporting requirements as defined within the Monitoring and Reporting Schedule within the ISR for this project.
21. This contract is to provide temporary power for own work.

Coordination with Other Trades

1. This Prime Contractor will be responsible for the setup of SWPPP BMP's, as shown in the SWPPP plan drawings for all Off-Site work areas including but not limited to, silt fencing, track outs and fiber rolls surrounding existing drain inlets.
2. Allow for two additional mobilizations for movement or relocation of track outs as required during construction.
3. Any survey requests require a minimum of 48-hour notice.
4. Coordinate dimensions with other related Prime Contractors.
5. Coordinate installation of all sleeves for work passing through concrete work with respective Prime Contractors prior to excavation.
6. Review as-builts prior to starting work.

Furnish and install items

1. Furnish and install all off-site improvements for water, sewer, storm. All utilities will be brought on to the site as shown for connection by site utilities contractor, or to the location provided by the site utilities contractor, should that scope of work be installed prior.
2. Furnish and install all Surveying for all Off Site improvements.
3. Furnish and install all back flow and Detector Check Valves for fire and domestic water entering the site.
4. Furnish and install all Off-Site irrigation back flow preventors.
5. Furnish and install all Off-Site Fire Hydrants.
6. Furnish and install all offsite piping and connections for water, sewer, storm, and gas.
7. Furnish and install all gas on to site, ready for meter assembly.
8. Furnish and install all PG&E utilities work per plans.
9. Furnish and install all street lighting, traffic lighting, controls, connections, complete.
10. Furnish and install all trail and lighting complete.
11. Furnish and install all cut, patch back, grading and paving of roadways per Off-Site improvement plans, and for water tie-in along Weldon Ave for Fire Water, including back flow device.
12. Furnish and install all curb, gutter, sidewalks, trail, lighting, per Off-Site drawings, including those shown in the attached highlighted site plan sketch, to help show separation from project Site Concrete Bid Package.
13. Furnish and install all off-site landscape irrigation and planting complete.

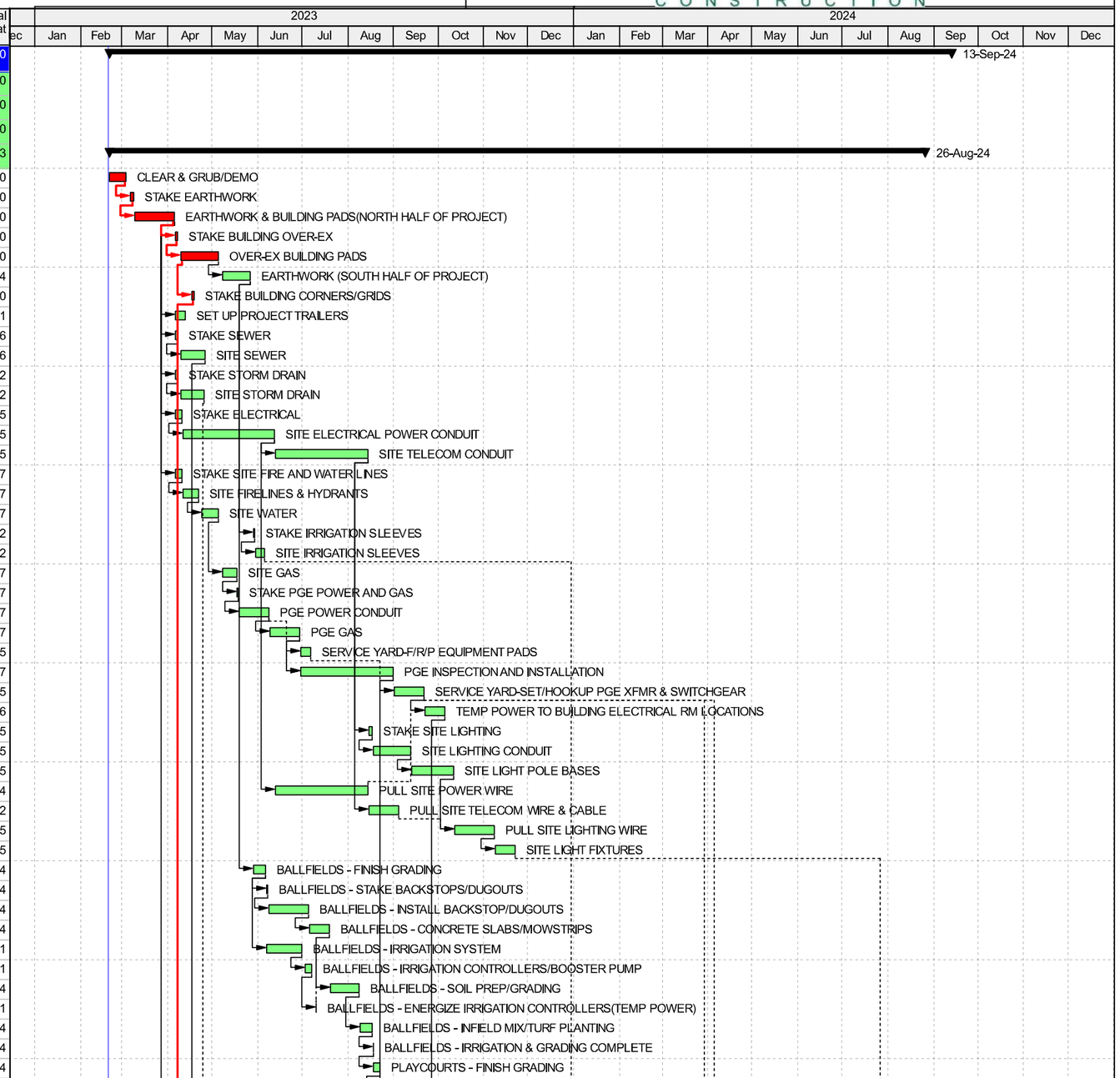


Clovis Elementary School #35 Increment 1 - Bid Schedule

Clovis Elementary School Baseline Layout

B·U·S·H CONSTRUCTION

#	Activity ID	Activity Name	Original Duration	Start	Finish	Total Float
1	**CES-5**	**Clovis Elementary School Revision 3 - Feb 20, 2023**	409	20-Feb-23	13-Sep-24	0
2	**CES-5.1**	**ADMIN/CONTRACT MILESTONE**	0			0
3	**CES-5.3**	**SUBMITTALS/REVIEW/PROCURE**	0			0
4	**CES-5.4**	**MOBILIZATION/PERMITS**	0			0
5	**CES-5.6**	**ON-SITE WORK**	396	20-Feb-23	26-Aug-24	13
6	OSW1000	CLEAR & GRUB/DEMO	10	20-Feb-23	03-Mar-23	0
7	OSW1010	STAKE EARTHWORK	3	06-Mar-23	08-Mar-23	0
8	OSW1020	EARTHWORK & BUILDING PADS(NORTH HALF OF PROJECT)	20	09-Mar-23	05-Apr-23	0
9	OSW1030	STAKE BUILDING OVER-EX	2	06-Apr-23	07-Apr-23	0
10	OSW1035	OVER-EX BUILDING PADS	20	10-Apr-23	05-May-23	0
11	OSW1040	EARTHWORK (SOUTH HALF OF PROJECT)	15	08-May-23	26-May-23	204
12	OSW1050	STAKE BUILDING CORNERS/GRIDS	2	17-Apr-23	18-Apr-23	0
13	OSW1060	SET UP PROJECT TRAILERS	5	06-Apr-23	12-Apr-23	371
14	OSW1070	STAKE SEWER	2	06-Apr-23	07-Apr-23	286
15	OSW1080	SITE SEWER	13	10-Apr-23	26-Apr-23	286
16	OSW1090	STAKE STORM DRAIN	2	06-Apr-23	07-Apr-23	292
17	OSW1100	SITE STORM DRAIN	12	10-Apr-23	25-Apr-23	292
18	OSW1110	STAKE ELECTRICAL	3	06-Apr-23	10-Apr-23	195
19	OSW1120	SITE ELECTRICAL POWER CONDUIT	45	11-Apr-23	12-Jun-23	195
20	OSW1130	SITE TELECOM CONDUIT	45	13-Jun-23	14-Aug-23	195
21	OSW1140	STAKE SITE FIRE AND WATER LINES	3	06-Apr-23	10-Apr-23	117
22	OSW1150	SITE FIRELINES & HYDRANTS	9	11-Apr-23	21-Apr-23	117
23	OSW1160	SITE WATER	10	24-Apr-23	05-May-23	117
24	OSW1180	STAKE IRRIGATION SLEEVES	1	29-May-23	29-May-23	272
25	OSW1190	SITE IRRIGATION SLEEVES	5	30-May-23	05-Jun-23	272
26	OSW1200	SITE GAS	8	08-May-23	17-May-23	117
27	OSW1210	STAKE PGE POWER AND GAS	1	18-May-23	18-May-23	117
28	OSW1220	PGE POWER CONDUIT	15	19-May-23	08-Jun-23	117
29	OSW1230	PGE GAS	15	09-Jun-23	29-Jun-23	117
30	OSW1240	SERVICE YARD-F/R/P EQUIPMENT PADS	5	30-Jun-23	06-Jul-23	235
31	OSW1250	PGE INSPECTION AND INSTALLATION	45	30-Jun-23	31-Aug-23	117
32	OSW1260	SERVICE YARD-SET/HOOKUP PGE XFMR & SWITCHGEAR	15	01-Sep-23	21-Sep-23	195
33	OSW1270	TEMP POWER TO BUILDING ELECTRICAL RM LOCATIONS	10	22-Sep-23	05-Oct-23	226
34	OSW1280	STAKE SITE LIGHTING	3	15-Aug-23	17-Aug-23	195
35	OSW1290	SITE LIGHTING CONDUIT	18	18-Aug-23	12-Sep-23	195
36	OSW1300	SITE LIGHT POLE BASES	21	13-Sep-23	11-Oct-23	195
37	OSW1310	PULL SITE POWER WIRE	45	13-Jun-23	14-Aug-23	254
38	OSW1320	PULL SITE TELECOM WIRE & CABLE	15	15-Aug-23	04-Sep-23	222
39	OSW1330	PULL SITE LIGHTING WIRE	20	12-Oct-23	08-Nov-23	195
40	OSW1340	SITE LIGHT FIXTURES	10	09-Nov-23	22-Nov-23	195
41	OSW1350	BALLFIELDS - FINISH GRADING	7	29-May-23	06-Jun-23	204
42	OSW1360	BALLFIELDS - STAKE BACKSTOPS/DUGOUTS	1	07-Jun-23	07-Jun-23	204
43	OSW1370	BALLFIELDS - INSTALL BACKSTOP/DUGOUTS	20	08-Jun-23	05-Jul-23	204
44	OSW1380	BALLFIELDS - CONCRETE SLABS/MOWSTRIPS	10	06-Jul-23	19-Jul-23	204
45	OSW1390	BALLFIELDS - IRRIGATION SYSTEM	18	07-Jun-23	30-Jun-23	211
46	OSW1400	BALLFIELDS - IRRIGATION CONTROLLERS/BOOSTER PUMP	5	03-Jul-23	07-Jul-23	211
47	OSW1410	BALLFIELDS - SOIL PREP/GRADING	14	20-Jul-23	08-Aug-23	204
48	OSW1420	BALLFIELDS - ENERGIZE IRRIGATION CONTROLLERS(TEMP POWER	1	10-Jul-23	10-Jul-23	211
49	OSW1430	BALLFIELDS - INFIELD MIX/TURF PLANTING	7	09-Aug-23	17-Aug-23	204
50	OSW1440	BALLFIELDS - IRRIGATION & GRADING COMPLETE	0	18-Aug-23	18-Aug-23	204
51	OSW1460	PLAYCOURTS - FINISH GRADING	3	18-Aug-23	22-Aug-23	204



Actual Work | Remaining Work | Critical Remaining Work | Milestone | Summary

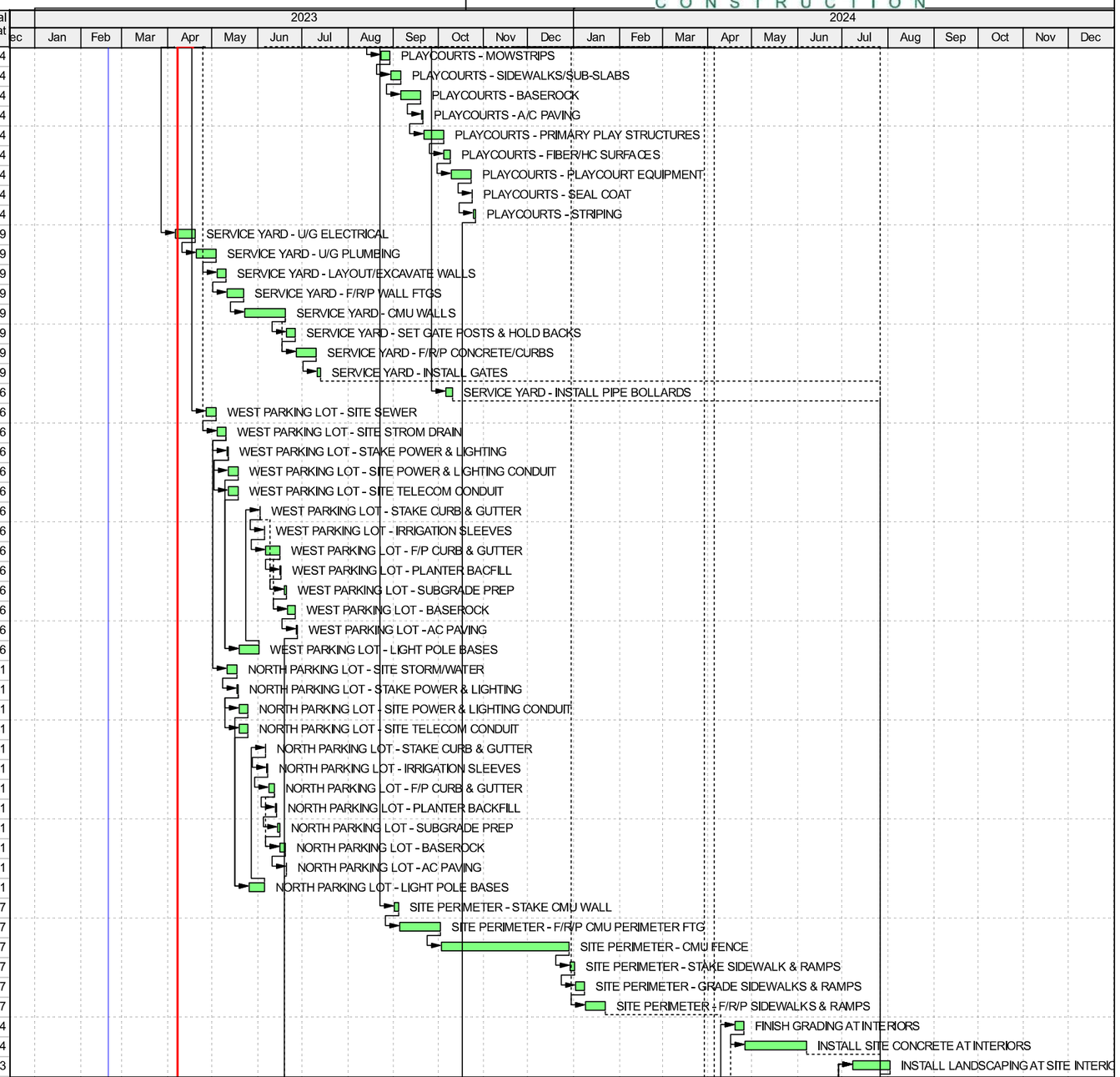
"PRE-BID SCHEDULE
CONSTRUCTION SCHEDULE WILL BE FINALIZED WITH INPUT OF EACH PRIME CONTRACTOR.
DAVID A. BUSH, INC. RESERVES THE RIGHT TO REVISE THIS SCHEDULE AT ANY TIME TO REFLECT CURRENT INFORMATION"

Clovis Elementary School #35 Increment 1 - Bid Schedule

Clovis Elementary School Baseline Layout

B·U·S·H CONSTRUCTION

#	Activity ID	Activity Name	Original Duration	Start	Finish	Total Float
52	OSW1470	PLAYCOURTS - MOWSTRIPS	5	23-Aug-23	29-Aug-23	204
53	OSW1480	PLAYCOURTS - SIDEWALKS/SUB-SLABS	5	30-Aug-23	05-Sep-23	204
54	OSW1490	PLAYCOURTS - BASEROCK	10	06-Sep-23	19-Sep-23	204
55	OSW1500	PLAYCOURTS - A/C PAVING	1	20-Sep-23	20-Sep-23	204
56	OSW1510	PLAYCOURTS - PRIMARY PLAY STRUCTURES	10	21-Sep-23	04-Oct-23	204
57	OSW1520	PLAYCOURTS - FIBER/HC SURFACES	3	05-Oct-23	09-Oct-23	204
58	OSW1530	PLAYCOURTS - PLAYCOURT EQUIPMENT	10	10-Oct-23	23-Oct-23	204
59	OSW1540	PLAYCOURTS - SEAL COAT	1	24-Oct-23	24-Oct-23	204
60	OSW1550	PLAYCOURTS - STRIPING	2	25-Oct-23	26-Oct-23	204
61	OSW1560	SERVICE YARD - U/G ELECTRICAL	10	06-Apr-23	19-Apr-23	289
62	OSW1561	SERVICE YARD - U/G PLUMBING	10	20-Apr-23	03-May-23	289
63	OSW1562	SERVICE YARD - LAYOUT/EXCAVATE WALLS	5	04-May-23	10-May-23	289
64	OSW1563	SERVICE YARD - F/R/P WALL FTGS	8	11-May-23	22-May-23	289
65	OSW1564	SERVICE YARD - CMU WALLS	20	23-May-23	19-Jun-23	289
66	OSW1565	SERVICE YARD - SET GATE POSTS & HOLD BACKS	5	20-Jun-23	26-Jun-23	289
67	OSW1566	SERVICE YARD - F/R/P CONCRETE/CURBS	10	27-Jun-23	10-Jul-23	289
68	OSW1568	SERVICE YARD - INSTALL GATES	3	11-Jul-23	13-Jul-23	289
69	OSW1569	SERVICE YARD - INSTALL PIPE BOLLARDS	3	06-Oct-23	10-Oct-23	226
70	OSW1570	WEST PARKING LOT - SITE SEWER	5	27-Apr-23	03-May-23	286
71	OSW1580	WEST PARKING LOT - SITE STROM DRAIN	5	04-May-23	10-May-23	286
72	OSW1590	WEST PARKING LOT - STAKE POWER & LIGHTING	1	11-May-23	11-May-23	286
73	OSW1600	WEST PARKING LOT - SITE POWER & LIGHTING CONDUIT	5	12-May-23	18-May-23	286
74	OSW1610	WEST PARKING LOT - SITE TELECOM CONDUIT	5	12-May-23	18-May-23	286
75	OSW1620	WEST PARKING LOT - STAKE CURB & GUTTER	1	02-Jun-23	02-Jun-23	286
76	OSW1630	WEST PARKING LOT - IRRIGATION SLEEVES	1	05-Jun-23	05-Jun-23	286
77	OSW1640	WEST PARKING LOT - F/P CURB & GUTTER	8	06-Jun-23	15-Jun-23	286
78	OSW1650	WEST PARKING LOT - PLANTER BACFILL	1	16-Jun-23	16-Jun-23	286
79	OSW1660	WEST PARKING LOT - SUBGRADE PREP	2	19-Jun-23	20-Jun-23	286
80	OSW1670	WEST PARKING LOT - BASEROCK	4	21-Jun-23	26-Jun-23	286
81	OSW1680	WEST PARKING LOT - AC PAVING	1	27-Jun-23	27-Jun-23	286
82	OSW1690	WEST PARKING LOT - LIGHT POLE BASES	10	19-May-23	01-Jun-23	286
83	OSW1700	NORTH PARKING LOT - SITE STORM/WATER	5	11-May-23	17-May-23	291
84	OSW1710	NORTH PARKING LOT - STAKE POWER & LIGHTING	1	18-May-23	18-May-23	291
85	OSW1720	NORTH PARKING LOT - SITE POWER & LIGHTING CONDUIT	5	19-May-23	25-May-23	291
86	OSW1730	NORTH PARKING LOT - SITE TELECOM CONDUIT	5	19-May-23	25-May-23	291
87	OSW1740	NORTH PARKING LOT - STAKE CURB & GUTTER	1	06-Jun-23	06-Jun-23	291
88	OSW1750	NORTH PARKING LOT - IRRIGATION SLEEVES	1	07-Jun-23	07-Jun-23	291
89	OSW1760	NORTH PARKING LOT - F/P CURB & GUTTER	3	08-Jun-23	12-Jun-23	291
90	OSW1780	NORTH PARKING LOT - PLANTER BACKFILL	1	13-Jun-23	13-Jun-23	291
91	OSW1781	NORTH PARKING LOT - SUBGRADE PREP	2	14-Jun-23	15-Jun-23	291
92	OSW1790	NORTH PARKING LOT - BASEROCK	2	16-Jun-23	19-Jun-23	291
93	OSW1800	NORTH PARKING LOT - AC PAVING	1	20-Jun-23	20-Jun-23	291
94	OSW1810	NORTH PARKING LOT - LIGHT POLE BASES	7	26-May-23	05-Jun-23	291
95	OSW1830	SITE PERIMETER - STAKE CMU WALL	2	01-Sep-23	04-Sep-23	117
96	OSW1840	SITE PERIMETER - F/R/P CMU PERIMETER FTG	20	05-Sep-23	02-Oct-23	117
97	OSW1850	SITE PERIMETER - CMU FENCE	63	03-Oct-23	28-Dec-23	117
98	OSW1860	SITE PERIMETER - STAKE SIDEWALK & RAMPS	2	29-Dec-23	01-Jan-24	117
99	OSW1870	SITE PERIMETER - GRADE SIDEWALKS & RAMPS	5	02-Jan-24	08-Jan-24	117
100	OSW1880	SITE PERIMETER - F/R/P SIDEWALKS & RAMPS	10	09-Jan-24	22-Jan-24	117
101	OSW1940	FINISH GRADING AT INTERIORS	5	19-Apr-24	25-Apr-24	54
102	OSW1950	INSTALL SITE CONCRETE AT INTERIORS	30	26-Apr-24	06-Jun-24	54
103	OSW1960	INSTALL LANDSCAPING AT SITE INTERIORS AND PARKING	20	08-Jul-24	02-Aug-24	13



Actual Work | Critical Remaining Work | Summary

Remaining Work | Milestone

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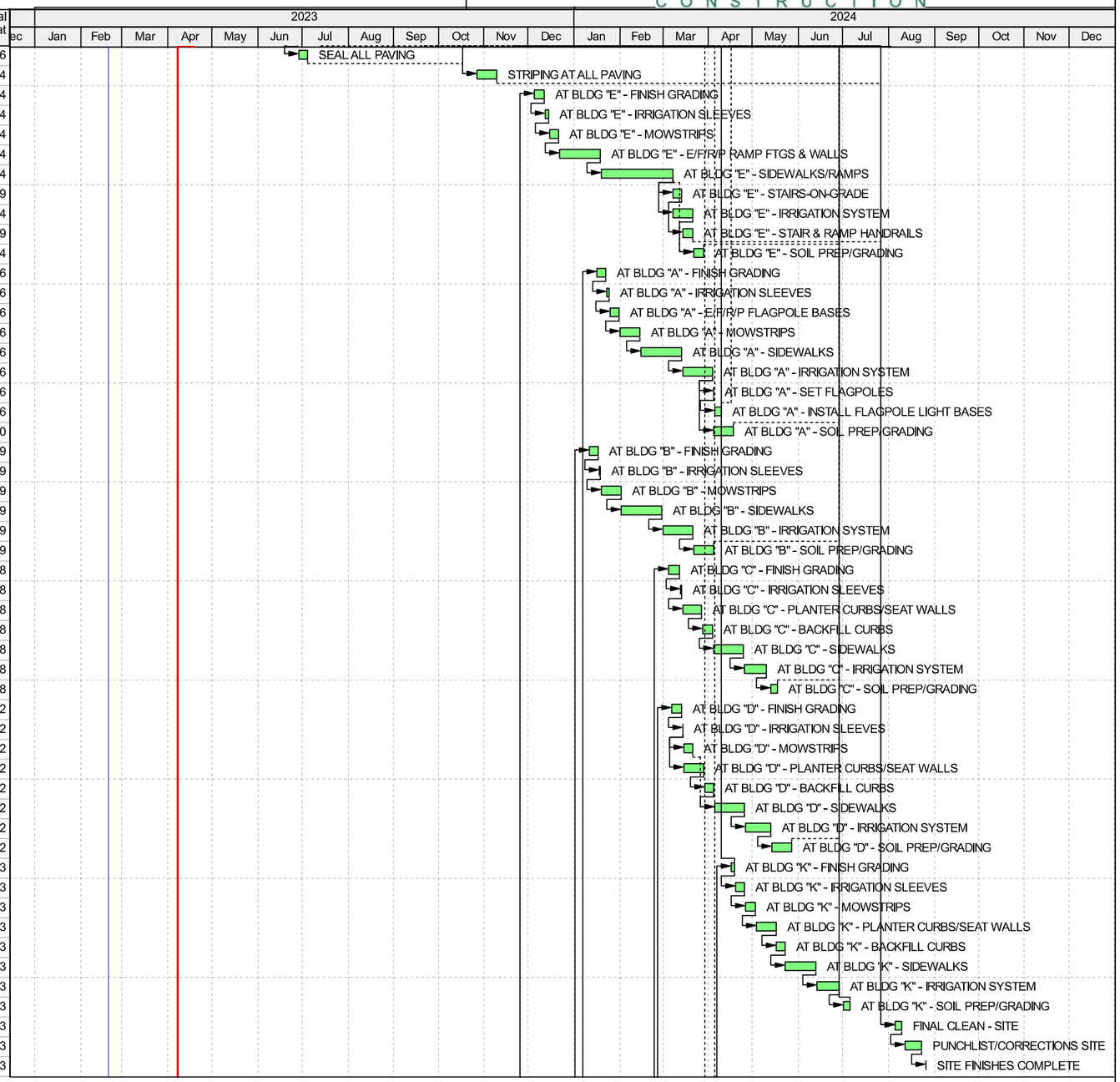
Clovis Elementary School #35 Increment 1 - Bid Schedule

Clovis Elementary School Baseline Layout

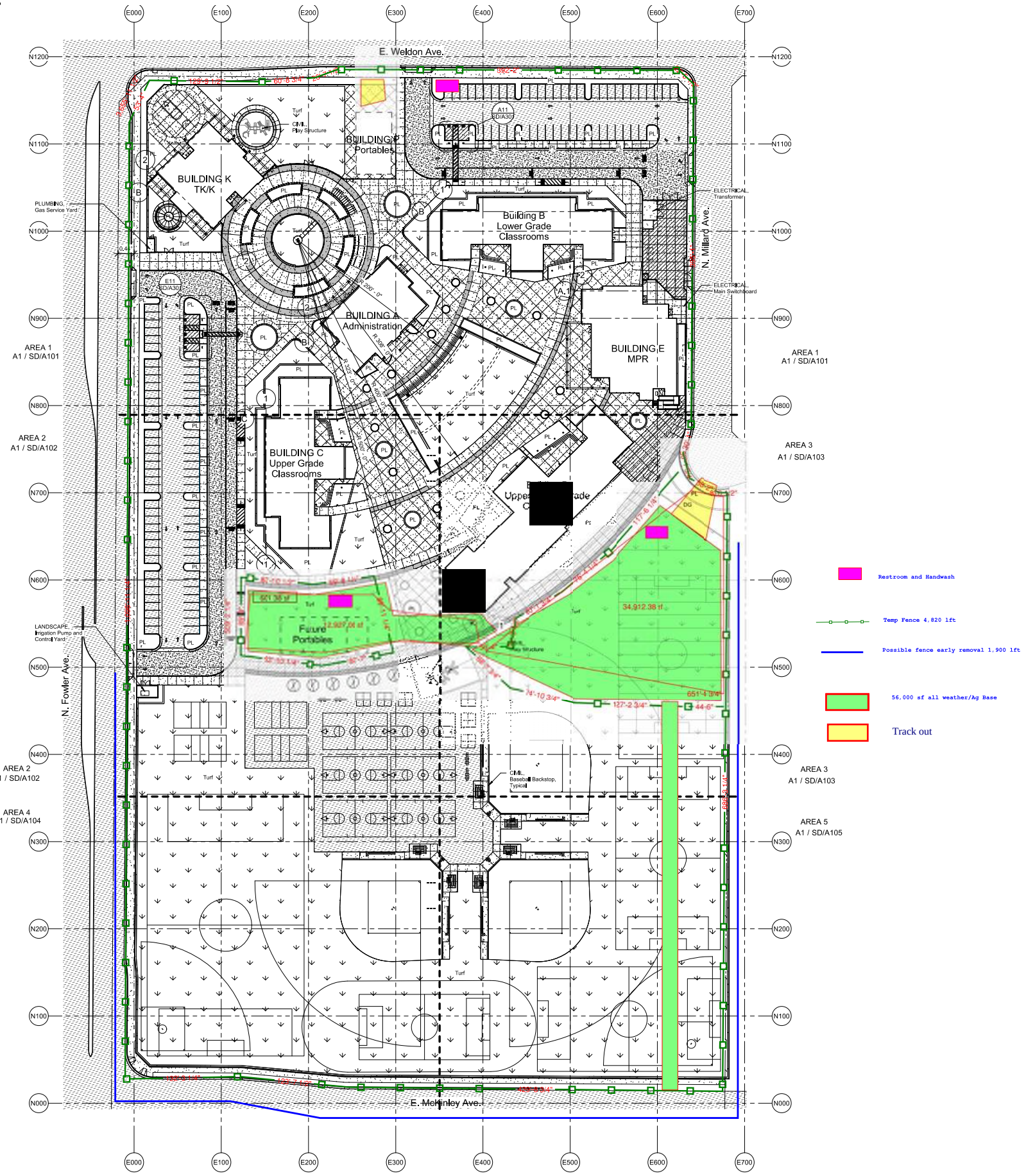
B·U·S·H CONSTRUCTION

#	Activity ID	Activity Name	Original Duration	Start	Finish	Total Float
104	OSW1970	SEAL ALL PAVING	5	28-Jun-23	04-Jul-23	286
105	OSW1980	STRIPING AT ALL PAVING	10	27-Oct-23	09-Nov-23	204
106	OSW1990	AT BLDG "E" - FINISH GRADING	5	05-Dec-23	11-Dec-23	84
107	OSW2000	AT BLDG "E" - IRRIGATION SLEEVES	3	12-Dec-23	14-Dec-23	84
108	OSW2010	AT BLDG "E" - MOWSTRIPS	5	15-Dec-23	21-Dec-23	84
109	OSW2020	AT BLDG "E" - E/F/R/P RAMP FTGS & WALLS	20	22-Dec-23	18-Jan-24	84
110	OSW2030	AT BLDG "E" - SIDEWALKS/RAMPS	35	19-Jan-24	07-Mar-24	84
111	OSW2040	AT BLDG "E" - STAIRS-ON-GRADE	4	08-Mar-24	13-Mar-24	109
112	OSW2050	AT BLDG "E" - IRRIGATION SYSTEM	10	08-Mar-24	21-Mar-24	84
113	OSW2060	AT BLDG "E" - STAIR & RAMP HANDRAILS	6	14-Mar-24	21-Mar-24	109
114	OSW2070	AT BLDG "E" - SOIL PREP/GRADING	5	22-Mar-24	28-Mar-24	84
115	OSW2080	AT BLDG "A" - FINISH GRADING	5	16-Jan-24	22-Jan-24	66
116	OSW2090	AT BLDG "A" - IRRIGATION SLEEVES	2	23-Jan-24	24-Jan-24	66
117	OSW2100	AT BLDG "A" - E/F/R/P FLAGPOLE BASES	5	25-Jan-24	31-Jan-24	66
118	OSW2110	AT BLDG "A" - MOWSTRIPS	10	01-Feb-24	14-Feb-24	66
119	OSW2120	AT BLDG "A" - SIDEWALKS	20	15-Feb-24	13-Mar-24	66
120	OSW2130	AT BLDG "A" - IRRIGATION SYSTEM	15	14-Mar-24	03-Apr-24	66
121	OSW2140	AT BLDG "A" - SET FLAGPOLES	1	04-Apr-24	04-Apr-24	66
122	OSW2150	AT BLDG "A" - INSTALL FLAGPOLE LIGHT BASES	3	05-Apr-24	09-Apr-24	66
123	OSW2160	AT BLDG "A" - SOIL PREP/GRADING	10	04-Apr-24	17-Apr-24	70
124	OSW2161	AT BLDG "B" - FINISH GRADING	5	11-Jan-24	17-Jan-24	79
125	OSW2162	AT BLDG "B" - IRRIGATION SLEEVES	1	18-Jan-24	18-Jan-24	79
126	OSW2163	AT BLDG "B" - MOWSTRIPS	10	19-Jan-24	01-Feb-24	79
127	OSW2164	AT BLDG "B" - SIDEWALKS	20	02-Feb-24	29-Feb-24	79
128	OSW2165	AT BLDG "B" - IRRIGATION SYSTEM	15	01-Mar-24	21-Mar-24	79
129	OSW2166	AT BLDG "B" - SOIL PREP/GRADING	10	22-Mar-24	04-Apr-24	79
130	OSW2250	AT BLDG "C" - FINISH GRADING	6	05-Mar-24	12-Mar-24	48
131	OSW2260	AT BLDG "C" - IRRIGATION SLEEVES	1	13-Mar-24	13-Mar-24	48
132	OSW2270	AT BLDG "C" - PLANTER CURBS/SEAT WALLS	10	14-Mar-24	27-Mar-24	48
133	OSW2280	AT BLDG "C" - BACKFILL CURBS	5	28-Mar-24	03-Apr-24	48
134	OSW2300	AT BLDG "C" - SIDEWALKS	15	04-Apr-24	24-Apr-24	48
135	OSW2310	AT BLDG "C" - IRRIGATION SYSTEM	12	25-Apr-24	10-May-24	48
136	OSW2320	AT BLDG "C" - SOIL PREP/GRADING	5	13-May-24	17-May-24	48
137	OSW2321	AT BLDG "D" - FINISH GRADING	5	07-Mar-24	13-Mar-24	42
138	OSW2322	AT BLDG "D" - IRRIGATION SLEEVES	1	14-Mar-24	14-Mar-24	42
139	OSW2323	AT BLDG "D" - MOWSTRIPS	5	15-Mar-24	21-Mar-24	52
140	OSW2324	AT BLDG "D" - PLANTER CURBS/SEAT WALLS	10	15-Mar-24	28-Mar-24	42
141	OSW2325	AT BLDG "D" - BACKFILL CURBS	5	29-Mar-24	04-Apr-24	42
142	OSW2326	AT BLDG "D" - SIDEWALKS	15	05-Apr-24	25-Apr-24	42
143	OSW2327	AT BLDG "D" - IRRIGATION SYSTEM	12	26-Apr-24	13-May-24	42
144	OSW2328	AT BLDG "D" - SOIL PREP/GRADING	10	14-May-24	27-May-24	42
145	OSW2330	AT BLDG "K" - FINISH GRADING	3	16-Apr-24	18-Apr-24	13
146	OSW2340	AT BLDG "K" - IRRIGATION SLEEVES	5	19-Apr-24	25-Apr-24	13
147	OSW2350	AT BLDG "K" - MOWSTRIPS	5	26-Apr-24	02-May-24	13
148	OSW2360	AT BLDG "K" - PLANTER CURBS/SEAT WALLS	10	03-May-24	16-May-24	13
149	OSW2370	AT BLDG "K" - BACKFILL CURBS	4	17-May-24	22-May-24	13
150	OSW2390	AT BLDG "K" - SIDEWALKS	15	23-May-24	12-Jun-24	13
151	OSW2400	AT BLDG "K" - IRRIGATION SYSTEM	12	13-Jun-24	28-Jun-24	13
152	OSW2410	AT BLDG "K" - SOIL PREP/GRADING	5	01-Jul-24	05-Jul-24	13
153	OSW2420	FINAL CLEAN - SITE	5	05-Aug-24	09-Aug-24	13
154	OSW2430	PUNCHLIST/CORRECTIONS SITE	10	12-Aug-24	23-Aug-24	13
155	OSW2440	SITE FINISHES COMPLETE	1	26-Aug-24	26-Aug-24	13



Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

"PRE-BID SCHEDULE
CONSTRUCTION SCHEDULE WILL BE FINALIZED WITH INPUT OF EACH PRIME CONTRACTOR.
DAVID A. BUSH, INC. RESERVES THE RIGHT TO REVISE THIS SCHEDULE AT ANY TIME TO REFLECT CURRENT INFORMATION"


E. Weldon Ave.
N. Millard Ave.
N. Fowler Ave.
E. McKinley Ave.
BUILDING P
Portables
BUILDING K
TK/K
Building B
Lower Grade
Classrooms
BUILDING A
Administration
BUILDING E
MPR
BUILDING C
Upper Grade
Classrooms
Future
Portables
CIML
Play Structure
CIML
Baseball Backstop,
Typical
PLUMBING
Gas Service Yard
LANDSCAPE
Irrigation Pump and
Control Yard
ELECTRICAL
Transformer
ELECTRICAL
Main Switchboard
AREA 1
A1 / SD/A101
AREA 2
A1 / SD/A102
AREA 3
A1 / SD/A103
AREA 4
A1 / SD/A104
AREA 5
A1 / SD/A105
34,932.38 sf
Restroom and Handwash
Temp Fence 4,820 lft
Possible fence early removal 1,900 lft
56,000 sf all weather/Ag Base
Track out

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS, 2019 CBC

Application Number:	School Name:	School District:
02-120543	McKinleyFowler Elementary School	Clovis Unified School District
DSA File Number:	**Increment Number:**	**Date Created:**
02- 120543	01	2022-09-22 15:02:56

The File Number is: 10-27

2019 CBC

IMPORTANT: This form is only a summary list of structural tests and some of the special inspections required for the project. Generally, the structural tests and special inspections noted on this form are those that will be performed by the Geotechnical Engineer of Record, Laboratory of Record, or Special Inspector. The actual complete test and inspection program must be performed as detailed on the DSA approved documents. The appendix at the bottom of this form identifies work NOT subject to DSA requirements for special inspection or structural testing. The project inspector is responsible for providing inspection of all facets of construction, including but not limited to, special inspections not listed on this form such as structural wood framing, high-load wood diaphragms, cold-formed steel framing, anchorage of non-structural components, etc., per Title 24, Part 2, Chapter 17A (2019 CBC).

****NOTE:** Undefined section and table references found in this document are from the CBC, or California Building Code.

KEY TO COLUMNS

1. TYPE	2. PERFORMED BY
Continuous – Indicates that a continuous special inspection is required **Periodic** – Indicates that a periodic special inspection is required **Test** – Indicates that a test is required	**GE** – Indicates that the special inspection shall be performed by a registered geotechnical engineer or his or her authorized representative. **LOR** – Indicates that the test or special inspection shall be performed by a testing laboratory accepted in the DSA Laboratory Evaluation and Acceptance (LEA) Program. See CAC Section 4-335. **PI –** Indicates that the special inspection may be performed by a project inspector when specifically approved by DSA. **SI** – Indicates that the special inspection shall be performed by an appropriately qualified/approved special inspector.

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (SOILS), 2019 CBC

Application Number:	**School Name:**	**School District:**
02-120543	McKinleyFowler Elementary School	Clovis Unified School District
DSA File Number:	**Increment Number:**	**Date Created:**
		2022-09-22 15:02:56

Geotechnical Reports: Project has a geotechnical report, or CDs indicate soils special inspection is required by GE

	1. GENERAL:	**Table 1705A.6**		
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Verify that: • Site has been prepared properly prior to placement of controlled fill and/or excavations for foundations. • Foundation excavations are extended to proper depth and have reached proper material. • Materials below footings are adequate to achieve the design bearing capacity.	**Periodic**	**GE***	* By geotechnical engineer or his or her qualified representative. (See Appendix for exemptions.)

	2. SOIL COMPACTION AND FILL:	**Table 1705A.6**		
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Perform classification and testing of fill materials.	**Test**	**LOR***	* Under the supervision of the geotechnical engineer.
☑	**b.** Verify use of proper materials, densities and inspect lift thicknesses, placement and compaction during placement of fill.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative. (Refer to specific items identified in the Appendix for exemptions where soils SI and testing may be conducted under the supervision of a geotechnical engineer or LOR's engineering manager. In such cases, the LOR's form DSA 291 shall satisfy the soil SI and test reporting requirements for the exempt items.)

☑	**c.** Compaction testing.	**Test**	**LOR***	* Under the supervision of the geotechnical engineer. (Refer to specific items identified in the Appendix for exemptions where soils testing may be conducted under the supervision of a geotechnical engineer or LOR's engineering manager. In such cases, the LOR's form DSA 291 shall satisfy the soil test reporting requirements for the exempt items.)

	3. DRIVEN DEEP FOUNDATIONS (PILES):	**Table 1705A.7**		
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Verify pile materials, sizes and lengths comply with the requirements.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative.
☐	**b.** Determine capacities of test piles and conduct additional load tests as required.	**Test**	**LOR***	* Under the supervision of the geotechnical engineer.
☐	**c.** Inspect driving operations and maintain complete and accurate records for each pile.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative.
☐	**d.** Verify locations of piles and their plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and record any pile damage.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative.
☐	**e.** Steel piles.	Provide tests and inspections per STEEL section below.		
☐	**f.** Concrete piles and concrete filled piles.	Provide tests and inspections per CONCRETE section below.		

☐	**g.** For specialty piles, perform additional inspections as determined by the registered design professional in responsible charge.	*	*	* As defined on drawings or specifications.

	4. CAST-IN-PLACE DEEP FOUNDATIONS (PIERS):	**Table 1705A.8**		
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Inspect drilling operations and maintain complete and accurate records for each pier.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative. (See Appendix for exemptions.)
☐	**b.** Verify pier locations, diameters, plumbness, bell diameters (if applicable), lengths and embedment into bedrock (if applicable); record concrete or grout volumes.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative. (See Appendix for exemptions.)
☐	**c.** Confirm adequate end strata bearing capacity.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative. (See Appendix for exemptions.)
☐	**d.** Concrete piers.	Provide tests and inspections per CONCRETE section below.		

	5. RETAINING WALLS:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Placement, compaction and inspection of backfill.	**Continuous**	**GE***	**1705A.6.1.** * By geotechnical engineer or his or her qualified representative. (See Section 2 above).

☐	**b.** Placement of soil reinforcement and/or drainage devices.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative.
☐	**c.** Segmental retaining walls; inspect placement of units, dowels, connectors, etc.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative. See DSA IR 16-3.
☐	**d.** Concrete retaining walls.	Provide tests and inspections per CONCRETE section below.		
☐	**e.** Masonry retaining walls.	Provide tests and inspections per MASONRY section below.		

	6. OTHER SOILS:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Soil Improvements	**Test**	**GE***	Submit a comprehensive report documenting final soil improvements constructed, construction observation and the results of the confirmation testing and analysis to CGS for final acceptance. * By geotechnical engineer or his or her qualified representative.
☐	**b.** Inspection of Soil Improvements	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative.
☐	**c.**			

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (Concrete), 2019 CBC

Table 1705A.3; ACI 318-14 Sections 26.12 & 26.13

Application Number:	**School Name:**	**School District:**
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	7. CAST-IN-PLACE CONCRETE			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
Material Verification and Testing:				
☑	**a.** Verify use of required design mix.	**Periodic**	**SI**	**Table 1705A.3 Item 5, 1910A.1.**
☑	**b.** Identifiy, sample, and test reinforcing steel.	**Test**	**LOR**	**1910A.2;** ACI 318-14 Section 26.6.1.2; DSA IR 17-10. (See Appendix for exemptions.)
☑	**c.** During concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	**Test**	**LOR**	**Table 1705A.3 Item 6**; ACI 318-14 Sections 26.5 & 26.12.
☑	**d.** Test concrete (f'_c).	**Test**	**LOR**	**1905A.1.15;** ACI 318-14 Section 26.12.
Inspection:				
☑	**e.** Batch plant inspection: **Continuous**	**See Notes**	**SI**	Default of **'Continuous'** per **1705A.3.3**. If approved by DSA, batch plant inspection may be reduced to **'Periodic'** subject to requirements in Section **1705A.3.3.1,** or eliminated per **1705A.3.3.2.** (See Appendix for exemptions.)
☐	**f.** Welding of reinforcing steel.	Provide special inspection per STEEL, Category 19.1(d) & (e) and/or 19.2(g) & (h) below.		

	8. PRESTRESSED / POST-TENSIONED CONCRETE (in addition to Cast-in-Place Concrete tests and inspections):

	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Sample and test prestressing tendons and anchorages.	**Test**	**LOR**	**1705A.3.4, 1910A.3**
☐	**b.** Inspect placement of prestressing tendons.	**Periodic**	**SI**	**1705A.3.4, Table 1705A.3 Items 1 & 9.**
☐	**c.** Verify in-situ concrete strength prior to stressing of post-tensioning tendons.	**Periodic**	**SI**	**Table 1705A.3 Item 11.** Special inspector to verify specified concrete strength test prior to stressing.
☐	**d.** Inspect application of post-tensioning or prestressing forces and grouting of bonded prestressing tendons.	**Continuous**	**SI**	**1705A.3.4, Table 1705A.3 Item 9;** ACI 318-14 Section 26.13

	9. PRECAST CONCRETE (in addition to Cast-in-Place Concrete tests and inspections):			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Inspect fabrication of precast concrete members.	**Continuous**	**SI**	ACI 318-14 Section 26.13.
☐	**b.** Inspect erection of precast concrete members.	**Periodic**	**SI***	**Table 1705A.3 Item 10.** * May be performed by PI when specifically approved by DSA.

	10. SHOTCRETE (in addition to Cast-in-Place Concrete tests and inspections):			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**

☐	**a.** Inspect shotcrete placement for proper application techniques.	**Continuous**	**SI**	**1705A.19, Table 1705A.3 Item 7, 1908A.6, 1908A.7, 1908A.8, 1908A.9, 1908A.11, 1908A.12.** See ACI 506.2-13 Section 3.4, ACI 506R-16.
☐	**b.** Sample and test shotcrete (f'_c).	**Test**	**LOR**	**1908A.5, 1908A.10.**

	11. POST-INSTALLED ANCHORS:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Inspect installation of post-installed anchors	**See Notes**	**SI***	**1617A.1.19, Table 1705A.3 Item 4a (Continuous) & 4b (Periodic), 1705A.3.8** (See Appendix for exemptions). ACI 318-14 Sections 17.8 & 26.13. * May be performed by the project inspector when specifically approved by DSA.
☑	**b.** Test post-installed anchors.	**Test**	**LOR**	**1910A.5.** (See Appendix for exemptions.)

	12. OTHER CONCRETE:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.**			

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (Masonry), 2019 CBC

1705A.4; TMS 602-16, Tables 3 and 4.

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	13. STRUCTURAL MASONRY: 2000 psi			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
Material Verification and Testing: (See Appendix for exemptions.)				
☑	**a.** Mill certificate indicatescompliance with requirements forreinforcement, anchors,ties, fasteners and metal accessories. See item 7b for identification, sampling and testing of reinforcing steel.	**Periodic**	**SI***	**2103A.4**; TMS 602-13 Article 1.5B.2 & 2.4. * To be performed by qualified LOR representative. Applicable testing by LOR. See IR 17-10.16 for unidentified reinforcing steel.
☑	**b.** Producer's certificate of compliance for masonry units, mortar and grout materials.	**Test**	**LOR**	**1705A.4, 2103A.2.1, 2103A.3, 2103A.5;** TMS 602-16 Articles 2.1, 2.2,2.6A and 2.6B, and Table 6 footnote 3.
☑	**c.** Test masonry (f'_m).	**Test**	**LOR**	**1705A.4. For Unit Strength: 2105A.3** (2114.6.1+); TMS 602-16 Articles 1.4B.2 ,1.5B.1 & 1.5B.2. **For Prism (required when f'_m > 2000 psi):2105A.2;** TMS 602-16 Articles 1.4B.3, 1.4B.4, 1.5B.1 & 1.5B.2.
☑	**d.** Verify proportions of siteprepared,premixed or preblended mortar and grout.	**Periodic**	**SI**	TMS 602-16 Table 3 Item 5, Table 4 Item 1a & 2d.
☑	**e.** Test core-drilled samples.	**Test**	**LOR**	**2105A.4**. (See Appendix for exemptions.)
Inspection: (See Appendix for exemptions.)				
☑	**f.** Inspect preparation of prisms.	**Continuous**	**SI**	TMS 602-16 Articles 1.4.B.3 & 1.4.B.4 & Table 4 Item 4.
☑	**g.** Verify size, location and condition of all dowels, construction supporting masonry, etc.	**Periodic**	**SI**	

☑	**h.** Verify size, grade and type of reinforcement and anchor bolts.	**Periodic**	**SI**	TMS 602-16 Table 4 Item 1c.
☐	**i.** Welding of reinforcing steel.	TMS 602-16 Table 4 Item 3e. Provide special inspection per STEEL, Category 19.1(d) & (e) and/or 19.2(g) & (h) below.		
☑	**j.** Inspect placement of reinforcement and connectors.	**Continuous**	**SI**	TMS 602-16 Table 4 Item 2c.
☑	**k.** Inspect placement of masonry units and construction of mortar joints.	**Periodic**	**SI**	TMS 602-16 Table 4 Item 3b.
☑	**l.** Verify preparation, construction and protection of masonry during cold weather (temperature below 40^{o} F) or hot weather (temperature above 90^{o} F).	**Periodic**	**SI***	TMS 602-16 Table 4 Item 3f. * May be performed by the project inspector when specifically approved by DSA.
☑	**m.** Inspect type, size and location of anchors and all other items to embedded in masonry including other details of anchorage of masonry to structural members,frames and other construction.	**Continuous**	**SI**	TMS 602-16 Table 4 Item 3d.
☑	**n.** Inspect grout space prior to placement of grout.	**Continuous**	**SI**	TMS 602-16 Table 4 Item 2a.

	14. VENEER OR GLASS BLOCK PARTITIONS: 1705A.4.1; TMS 602-16 Tables 3 and 4.			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Verify proportions of siteprepared mortar and grout and/or verify certification of premixed mortar.	**Periodic**	**SI**	TMS 602-16 Table 3 Item 5 and Table 4 Items 1a & 2d.

☐	**b.** Inspect placement of units and construction of mortar joints.	**Periodic**	**SI**	TMS 602-16 Table 4 Item 3b.
☐	**c.** Inspect placement of reinforcement, connectors and anchors.	**Periodic**	**SI**	TMS 602-16 Table 4 Item 2c.
☐	**d.** Inspect type, size and location of anchors and all other items to be embedded in masonry including details of anchorage of masonry to structural members, frames and other construction.	**Periodic**	**SI**	TMS 602-16 Table 4 Item 3d.
☐	**e.** Verify preparation, construction and protection of masonry during cold weather (temperature below 40^{o} F) or hot weather (above 90^{o} F).	**Periodic**	**SI***	TMS 602-16 Table 4 Item 3f. * May be performed by the project inspector when specifically approved by DSA.
☐	**f.** Test veneer bond strength	**Test**	**LOR**	**1410.2.1;** TMS 402 Article 12.3.2.4. **(Field constructed mock-up laboratory tested in accordance with ASTM C482).**

	15. POST-INSTALLED ANCHORS IN MASONRY:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Inspect installation of postinstalled anchors	**See Notes**	**SI***	**1617A.1.19, 1705A.4, Table 1705A.3 Item 4a (Continuous) & 4b (Periodic);** ACI 318-14 Sections 17.8 & 26.13. * May be performed by the project inspector when specifically approved by DSA. (See Appendix for exemptions.)
☐	**b.** Test post-installed anchors.	**Test**	**LOR**	**1705A.4, 1910A.5.** (See Appendix for exemptions.)

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (Masonry), 2019 CBC

1705A.4; TMS 602-16, Tables 3 and 4.

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	16. OTHER MASONRY:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.**			

	17. STRUCTURAL STEEL, COLD-FORMED STEEL AND ALUMINUM USED FOR STRUCTURAL PURPOSES			
Material Verification and Testing:				
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Verify identification of all materials and: • Mill certificates indicate material properties that comply with requirements. • Material sizes, types and grades comply with requirements.	**Periodic**	*	**Table 1705A.2.1 Item 3a–3c.** 2202A.1; AISI S100-16 Section A3.1 & A3.2, AISI S240-15 Section A3 & A5, AISI S220-15 Sections A4 & A6. * By special inspector or qualified technician when performed off-site.
☑	**b.** Test unidentified materials	**Test**	**LOR**	**2202A.1.**
☑	**c.** Examine seam welds of HSS shapes	**Periodic**	**SI**	DSA IR 17-3.
Inspection:				
☑	**d.** Verify and document steel fabrication per DSA-approved construction documents.	**Periodic**	**SI**	Not applicable to cold-formed steel light-frame construction, except for trusses (**1705A.2.4**).

	18. HIGH-STRENGTH BOLTS: RCSC 2014			
Material Verification and Testing of High-Strength Bolts, Nuts and Washers:				
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Verify identification markings and manufacturer's certificates of compliance conform to ASTM standards specified in the DSA-approved documents.	**Periodic**	**SI**	**Table 1705A.2.1 Items 1a & 1b, 2202A.1;** AISC 360-16 Section A3.3, J3.1, and N3.2; RCSC 2014 Section 1.5 & 2.1; DSA IR 17-8 & DSA IR 17-9.

☑	**b.** Test high-strength bolts, nuts and washers.	**Test**	**LOR**	**Table 1705A.2.1 Item 1c, 2213A.1**; RCSC 2014 Section 7.2; DSA IR 17-8.
Inspection of High-Strength Bolt Installation:				
☑	**c.** Bearing-type ("snug tight") connections.	**Periodic**	**SI**	**Table 1705A.2.1 Item 2a, 1705A.2.6, 2204A.2**; AISC 360-16 J3.1, J3.2, M2.5 & N5.6; RCSC 2014 Section 9.1; DSA IR 17-9.
☑	**d.** Pretensioned and slip-critical connections.	*	**SI**	**Table 1705A.2.1 Items 2b & 2c, 1705A.2.6, 2204A.2;** AISC 360-16 J3.1, J3.2, M2.5 & N5.6; RCSC 2014 Sections 9.2 & 9.3; DSA IR 17-9. * "Continuous" or "Periodic" depends on the tightening method used.

	19. WELDING:	**1705A.2.5, Table 1705A.2.1 Items 4 & 5;** AWS D1.1 and AWS D1.8 for structural steel; AWS D1.2 for Aluminum; AWS D1.3 for cold-formed steel; AWS D1.4 for reinforcing steel; DSA IR 17-3 (See Appendix for exemptions.)		
Verification of Materials, Equipment, Welders, etc.:				
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Verify weld filler material identification markings per AWS designation listed on the DSA-approved documents and the WPS.	**Periodic**	**SI**	DSA IR 17-3.
☑	**b.** Verify weld filler material manufacturer's certificate of compliance.	**Periodic**	**SI**	DSA IR 17-3.
☑	**c.** Verify WPS, welder qualifications and equipment.	**Periodic**	**SI**	DSA IR 17-3.

	19.1 SHOP WELDING:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds.	**Continuous**	**SI**	**Table 1705A.2.1 Items 5a.1–4;** AISC 360-16 (and AISC 341-16 as applicable); DSA IR 17-3.
☑	**b.** Inspect single-pass fillet welds ≤ 5/16", floor and roof deck welds.	**Periodic**	**SI**	**1705A.2.2, Table 1705A.2.1 Items 5a.5 & 5a.6;** AISC 360-16 (and AISC 341-16 as applicable); DSA IR 17-3.
☑	**c.** Inspect welding of stairs and railing systems.	**Periodic**	**SI**	**1705A.2.1**; AISC 360-16 (and AISC 341-16 as applicable); AWS D1.1 & D1.3; DSA IR 17-3.
☐	**d.** Verification of reinforcing steel weldability other than ASTM A706.	**Periodic**	**SI**	**1705A.3.1**; AWS D1.4; DSA IR 17-3. Verify carbon equivalent reported on mill certificates.
☐	**e.** Inspect welding of reinforcing steel.	**Continuous**	**SI**	**Table 1705A.2.1 Item 5b, 1705A.3.1, Table 1705A.3 Item 2, 1903A.8;** AWS D1.4; DSA IR 17-3.

	19.2 FIELD WELDING:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds.	**Continuous**	**SI**	**Table 1705A.2.1 Items 5a.1–4;** AISC 360-16 (AISC 341-16 as applicable); DSA IR 17-3.
☑	**b.** Inspect single-pass fillet welds ≤ 5/16".	**Periodic**	**SI**	**Table 1705A.2.1 Item 5a.5;** AISC 360-16 (AISC 341-16 as applicable); DSA IR 17-3.

☐	**c.** Inspect end-welded studs (ASTM A-108) installation (including bend test).	**Periodic**	**SI**	**2213A.2**; AISC 360-16 (AISC 341-16 as applicable); AWS D1.1; DSA IR 17-3.
☑	**d.** Inspect floor and roof deck welds.	**Periodic**	**SI**	**1705A.2.2, Table 1705A.2.1 Item 5a.6;** AISC 360-16 (AISC 341-16 as applicable); AWS D1.3; DSA IR 17-3.
☐	**e.** Inspect welding of structural cold-formed steel.	**Periodic**	**SI***	**1705A.2.5; AWS D1.3; DSA IR 17-3.** The quality control provisions of AISI S240-15 Chapter D shall also apply. * May be performed by the project inspector when specifically approved by DSA.
☑	**f.** Inspect welding of stairs and railing systems.	**Periodic**	**SI***	**1705A.2.1;** AISC 360-16 (AISC 341-16 as applicable); AWS D1.1 & D1.3; DSA IR 17-3. * May be performed by the project inspector when specifically approved by DSA.
☐	**g.** Verification of reinforcing steel weldability.	**Periodic**	**SI**	**1705A.3.1**; AWS D1.4; DSA IR 17-3. Verify carbon equivalent reported on mill certificates.
☐	**h.** Inspect welding of reinforcing steel.	**Continuous**	**SI**	**Table 1705A.2.1 Item 5b, 1705A.3.1, Table 1705A.3 Item 2, 1903A.8;** AWS D1.4; DSA IR 17-3.

	20. NONDESTRUCTIVE TESTING: **1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-16**			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Ultrasonic	**Test**	**LOR**	**1705A.2.1, 1705A.2.5;** AISC 341-16 J6.2, AISC 360-16 N5.5; ANSI/ ASNT CP-189, SNT-TC-1A; AWS D1.1, AWS D1.8; DSA IR 17-2.

☐	**b.** Magnetic Particle	**Test**	**LOR**	**1705A.2.1, 1705A.2.5;** AISC 341-16 J6.2, AISC 360-16 N5.5; ANSI/ ASNT CP-189, SNT-TC-1A; AWS D1.1, AWS D1.8; DSA IR 17-2.
☐	**c.**	**Test**	**LOR**	

	21. STEEL JOISTS AND TRUSSES: 1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-16			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Verify size, type and grade for all chord and web members as well as connectors and weld filler material; verify joist profile, dimensions and camber (if applicable); verify all weld locations, lengths and profiles; mark or tag each joist.	**Continuous**	**SI**	**1705A.2.3, Table 1705A.2.3;** AWS D1.1; DSA IR 22-3 for steel joists only. **1705A.2.4;** AWS D1.3 for cold-formed steel trusses.

	22. SPRAY APPLIED FIRE-PROOFING: 1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-16			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Examine structural steel surface conditions, inspect application, take samples, measure thickness and verify compliance of all aspects of application with DSA-approved documents.	**Periodic**	**SI**	**1705A.14.**
☑	**b.** Test bond strength.	**Test**	**LOR**	**1705A.14.6.**

☑	**c.** Test density.	**Test**	**LOR**	**1705A.14.5.**

	23. ANCHOR BOLTS AND ANCHOR RODS:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Anchor Bolts and Anchor Rods	**Test**	**LOR**	Sample and test anchor bolts and anchor rods not readily identifiable per procedures noted in DSA IR 17-11.
☑	**b.** Threaded rod not used for foundation anchorage.	**Test**	**LOR**	Sample and test threaded rods not readily identifiable per procedures noted in DSA IR 17-11.

	Other Steel			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.**			

Appendix: Work Exempt from DSA Requirements for Structural Tests / Special Inspections

Application Number:	**School Name:**	**School District:**
02-120543	McKinleyFowler Elementary School	Clovis Unified School District
DSA File Number:	**Increment Number:**	**Date Created:** 2022-09-22 15:02:56

Exempt items given in DSA IR A-22 or the 2019 CBC (including DSA amendments) and those items identified below with a check mark by the design professional are NOT subject to DSA requirements for the structural tests **/** special inspections noted. **Items marked as exempt shall be identified on the approved construction documents**. The project inspector shall verify all construction complies with the approved construction documents.

	SOILS:
☐	1. Deep foundations acting as a cantilever footing designed based on minimum allowable pressures per CBC Table 1806A.2 and having no geotechnical report for the following cases: A) free standing sign or scoreboard, B) cell or antenna towers and poles less than 35'-0" tall (e.g., lighting poles, flag poles, poles supporting open mesh fences, etc.), C) single-story structure with dead load less than 5 psf (e.g., open fabric shade structure), or D) covered walkway structure with an apex height less than 10'-0" above adjacent grade.
☐	2. Shallow foundations, etc. are exempt from special inspections and testing by a Geotechnical Engineer for the following cases: A) buildings without a geotechnical report and meeting the exception item #1 criteria in CBC Section 1803A.2 supported by native soil (any excavation depth) or fill soil (not exceeding 12" depth per CBC Section 1804A.6), B) soil scarification/recompaction not exceeding 12" depth, C) native or fill soil supporting exterior non-structural flatwork (e.g., sidewalks, site concrete ramps, site stairs, parking lots, driveways, etc.), D) unpaved landscaping and playground areas, or E) utility trench backfill.

	CONCRETE/MASONRY:
☐	1. Post-installed anchors for the following: A) exempt non-structural components (e.g., mechanical, electrical, plumbing equipment **-** see item 7 for "Welding") given in CBC Section 1617A.1.18 (which replaces ASCE 7-16, Section 13.1.4) or B) interior nonstructural wall partitions meeting criteria listed in exempt item 3 for "Welding."
☐	2. Concrete batch plant inspection is not required for items given in CBC Section 1705A.3.3.2 subject to the requirements and limitations in that section.

☐	3. Non-bearing non-shear masonry walls may be exempt from certain DSA masonry testing and special inspection items as allowed per DSA IR 21-1.16. Refer to construction documents for specific exemptions accordingly for each applicable wall condition.
☐	4. Epoxy shear dowels in site flatwork and/or other non-structural concrete.
☐	5. Testing of reinforcing bars is not required for items given in CBC Section 1910A.2 subject to the requirements and limitations in that section.

	Welding:
☐	1. Solid-clad and open-mesh gates with maximum leaf span or rolling section for rolling gates of 10' and apex height less than 8'-0" above lowest adjacent grade. When located above circulation or occupied space below, these gates are not located within 1.5x gate/fence height (max 8'-0") to the edge of floor or roof.
☐	2. Handrails, guardrails, and modular or relocatable ramps associated with walking surfaces less than 30" above adjacent grade (excluding post base connections per the 'Exception' language in Section 1705A.2.1); fillet welds shall not be ground flush.
☐	3. Non-structural interior cold-formed steel framing spanning less than 15'-0", such as in interior partitions, interior soffits, etc. supporting only self weight and light-weight finishes or adhered tile, masonry, stone, or terra cotta veneer no more than 5/8" thickness and apex less than 20'-0" in height and not over an exit way. Maximum tributary load to a member shall not exceed the equivalent of that occurring from a 10'x10' opening in a 15' tall wall for a header or king stud.
☐	4. Manufactured support frames and curbs using hot rolled or cold-formed steel (i.e., light gauge) for mechanical, electrical, or plumbing equipment weighing less than 2000# (equipment only) (connections of such frames to superstructure elements using welding will require special inspection as noted in selected item(s) for Sections 19, 19.1 and/or 19.2 of listing above).
☐	5. Manufactured components (e.g., Tolco, B-Line, Afcon, etc.) for mechanical, electrical, or plumbing hanger support and bracing (connections of such components to superstructure elements using welding will require special inspection as noted in selected item(s) for Sections 19, 19.1 and/or 19.2 of listing above).

Appendix: Work Exempt from DSA Requirements for Structural Tests / Special Inspections

Application Number:	School Name:	School District:
02-120543	McKinleyFowler Elementary School	Clovis Unified School District
DSA File Number:	**Increment Number:**	**Date Created:** 2022-09-22 15:02:56

☐	6. TV Brackets, projector mounts with a valid listing (see DSA IR A-5) and recreational equipment (e.g., playground structures, basketball backstops, etc.) (connections of such elements to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 located in the Steel/Aluminum category).
☐	7. Any support for exempt non-structural components given in CBC Section 1617A.1.18 (which replaces ASCE 7-16, Section 13.1.4) meeting the following: A) when supported on a floor/roof, <400# and resulting composite center of mass (including component's center of mass) ≤4' above supporting floor/roof, B) when hung from a wall or roof/floor, <20# for discrete units or <5 plf for distributed systems.

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS(SIGNATURE), 2019 CBC

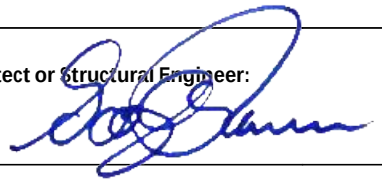
Application Number:	**School Name:**	**School District:**
02-120543	McKinleyFowler Elementary School	Clovis Unified School District
DSA File Number:	**Increment Number:**	**Date Created:**
		2022-09-22 15:02:56

Name of Architect or Engineer in general responsible charge:

Gaylord Ransom

Name of Structural Engineer (When structural design has been delegated):

Signature of Architect or Structural Engineer:



Date:

09/23/2022

Note: To facilitate DSA electronic mark-ups and identification stamp application, DSA recommends against using secured electronic or digital signatures.

DSA STAMP

DSA 103-19: LIST OF REQUIRED VERIFIED REPORTS, CBC 2019

Application Number:	School Name:	School District:
02-120543	McKinleyFowler Elementary School	Clovis Unified School District
DSA File Number:	**Increment Number:**	**Date Created:** 2022-09-22 15:02:56

1. Soils Testing and Inspection: Geotechnical Verified Report Form DSA 293
2. Structural Testing and Inspection: Laboratory Verified Report Form DSA 291
3. Concrete Batch Plant Inspection: Laboratory Verified Report Form DSA 291
4. Post-installed Anchors: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292
5. Masonry Inspection: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292
6. Shop Welding Inspection: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292
7. Field Welding Inspection: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292
8. High-Strength Bolt Installation Inspection: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292
9. Fire-Proofing Application Inspection: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292

SECTION 01 57 23 – STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Provide all material, labor, and services necessary to: comply with the Construction General Permit (CGP); implement the Storm Water Pollution Prevention Plan (SWPPP); and install and maintain appropriate Best Management Practices (BMP) according to the California Stormwater Quality Association (CASQA) Construction BMP Handbook.
2. Retain a certified Qualified SWPPP Practitioner (QSP) for SWPPP implementation oversight.
3. Complete and maintain all inspections, sampling, and recordkeeping required by the CGP, commensurate with the determined SWPPP Risk Level.
4. Ensure that all conditions are met for SWPPP termination including, but not limited to: fully stabilizing all disturbed areas of the site; removing temporary BMPs, construction materials, and equipment; cleaning the site of any storm water pollutants; and notifying Owner and QSD of acceptable termination conditions.
5. All Contract requirements in Division 00 and 01.

B. This Section does not include:
1. The Owner shall retain a Qualified SWPPP Developer (QSD) to prepare the SWPPP document.
2. The Owner shall submit the Notice of Intent (NOI), SWPPP, Changes of Information (COI), and Annual Reports to the SWRCB on SMARTS.
3. The Owner shall pay the NOI application fee and annual renewal fees.
4. The Owner shall maintain the role of LRP and all responsibilities associated, except where those responsibilities are assigned to the Contractor within these specifications.
5. The Owner shall complete online digital certification of online reporting on SMARTS
6. After the Contractor has met all conditions for SWPPP termination, Owner shall complete the NOT and obtain approval from SWRCB. If the NOT is returned by SWRCB due to unacceptable site conditions, Contractor shall implement any redresses specified by SWRCB.
7. Owner shall ensure that the Project design has incorporated all post-construction requirements specified by the CGP, MS4 permittee, and local agency stormwater regulations.

C. Acronyms:
1. BMP Best Management Practices
2. CGP Construction General Permit
3. CSMP Construction Site Monitoring Program
4. CASQA California Stormwater Quality Association
5. EPA Environmental Protection Agency

6.	ELAP	Environmental Laboratory Accreditation Program
7.	NOI	Notice of Intent
8.	NOT	Notice of Termination
9.	COI	Change of Information
10.	MS4	Municipal Separate Storm Sewer System
11.	NPDES	National Pollution Discharge Elimination System
12.	QSD	Qualified SWPPP Developer
13.	QSP	Qualified SWPPP Practitioner
14.	LRP	Legally Responsible Person
15.	PRD	Permit Registration Documents
16.	FMFCD	Fresno Metropolitan Flood Control District
17.	SMARTS	Stormwater Multiple Application and Report Tracking System
18.	SWPPP	Storm Water Pollution Prevention Plan
19.	SWRCB	State Water Resources Control Board
20.	RWQCB	Regional Water Quality Control Board

1.2 REFERENCES

A. Construction General Permit:
   1. 2009-0009-DWQ CONSTRUCTION GENERAL PERMIT (As amended by 2010-0014-DWQ and 2012-0006-DWQ)
   2. https://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml

B. Project SWPPP Document
   1. Available on SMARTS once approved by SWRCB
   2. Available by request from the Owner.

C. CASQA construction BMP Handbook: https://www.casqa.org/resources/bmp-handbooks

1.3 RELATED SECTIONS

A. Section 31 11 00 – Site Clearing

B. Section 31 20 00 – Earthwork

C. Section 33 40 00 – Storm Drainage

1.4 SUBMITTALS

A. All submittals shall be in accordance with the submittal requirements of these specifications.

B. The Contractor shall provide, to Owner and QSD, the name, certification number, and contact information of their retained QSP.

C. The Contractor shall provide, to Owner and QSD, proof of implementing all SWPPP requirements, for each Annual Report, within 30 calendar days of the end of each reporting period (reporting period is July 1 through June 30 of each year).

D. Upon request from the Owner or Owner's agents, Contractor shall provide all documentation that is required throughout construction including, but not limited to, CSMP records, sampling records rain logs, QSP oversight signatures, and QSP training of Contractor personnel responsible for BMP implementation and maintenance.

1.5 REQUIREMENTS

A. General:

1. Contractor is responsible for understanding and carrying out all provisions of the SWPPP, CGP, and any requirements from local agencies (except as excluded above in 1.1.B., where Owner responsibilities are specified).
2. The requirements of the CGP, SWPPP, MS4 permittee, and any other local regulations related to stormwater pollution prevention shall be reviewed by Contractor, prior to initiating any ground disturbance or other activities that could lead to stormwater pollution, for a full understanding of the intent, objectives, and implementation.
3. Contractor responsibilities begin immediately upon execution of the contract containing these specifications and continue until the SWPPP has been terminated with SWRCB.
4. Specific requirements include, but are not limited to:
   a. Weather monitoring to identify upcoming storm events.
   b. Installation, implementation, and maintenance of BMPs, and prevention of prohibited activities and unauthorized non-stormwater discharges
   c. Ensure that all subcontractors and agents understand and implement their relevant responsibilities under the CGP, SWPPP, and these specifications.
   d. Pay any penalties, fines, and corrective action costs resulting from failure to comply with SWPPP, CGP, and local agency requirements, and hold the Owner/LRP harmless from any such failures.
   e. Ensure that all conditions are met for SWPPP termination including, but not limited to: fully stabilizing all disturbed areas of the site; removing temporary BMPs, construction materials, and equipment; cleaning the site of any storm water pollutants; and notifying Owner and QSD of acceptable termination conditions.
5. The SWPPP is an aid to the Contractor in complying with the CGP. CGP requirements shall take precedence over anything contained in the SWPPP, Contractor shall notify the Owner and QSD of any conflicts between the SWPPP and CGP, and no such conflicts shall relieve the Contractor of any responsibilities for execution of these specifications.
6. See the approved SWPPP for the determined Project risk level. The requirements associated with the project's risk level shall be found in the SWPPP and CGP.

B. Retaining a Qualified SWPPP Practitioner (QSP)

1. The Contractor shall retain a certified QSP who will have responsibility and oversight for the implementation of the SWPPP and CGP.
2. Contractor shall maintain documentation the proves a certified QSP had oversight of all SWPPP and CGP compliance activities including, but not limited to:
   a. CSMP inspections and recordkeeping.
   b. Corrective actions for BMP repairs, modifications, or substitutions.
   c. Identify required amendments to the SWPPP and notify the Owner and QSD.

d. Provide all CSMP records, if requested by Owner and/or QSD, including but not limited to information required to complete the Annual Reports, COIs, and NOT, training documentation, and sampling records.
e. Provide and document training to Contractor personnel that will be responsible for implementation of BMPs.
f. If QSP delegates any CSMP requirements to Contractor personnel, QSP shall provide training to those personnel and document the training in the SWPPP.
g. Perform any stormwater and non-stormwater sampling, as required by the CGP. If any samples are sent offsite for laboratory analysis, QSP will identify a designated ELAP-certified laboratory and coordinate sample procurement, transportation, analysis, and recordkeeping. If QSP delegates any of these duties to Contractor personnel, QSP shall provide training and document the training in the SWPPP. QSP shall upload sampling results to SMARTS.

C. The Contractor shall be fully aware of the requirements for the full execution of the SWPPP; the requirements of these specifications for implementing, maintaining, and enforcing the provisions of the SWPPP; and the impact that the SWPPP will have on the operation, prosecution and cost of the work. A submittal of a bid on this project will be considered as prima facie evidence that the Contractor fully comprehends these requirements and impacts and has fully allowed for their effect on this project, both in time and cost. Failure to comply with the CGP is a violation of federal and state law. Contractor hereby agrees to indemnify, defend and hold harmless Owner, its officers, agents, and employees from and against any and all claims, demands, losses or liabilities of any kind or nature which Owner, its officers, agents, and employees may sustain or incur for noncompliance with the Permit arising out of or in connection with the Project, except for liability resulting from the negligence or willful misconduct of Owner, its officers, agents or employees. Owner may seek damages from Contractor for delay in completing the Project in accordance herewith, including damage caused by Contractor's failure to comply with Permit requirements.

1.6 QUALITY ASSURANCE

A. Certified SWPPP Professionals:
1. Qualified SWPPP Developer (QSD)
a. The Owner shall retain a certified QSD.
b. The QSD's name, certification number, and contact information shall be listed within the SWPPP document.
2. Qualified SWPPP Practitioner (QSP)
a. The Contractor shall retain a certified QSP.
b. The QSP's name, certification number, and contact information shall be listed within the SWPPP document.

B. Regulatory Requirements:
1. Contractor shall comply with the lawful requirements of any applicable municipality, county, drainage district, municipal storm water management program and other local agencies regarding discharges of storm water to separate storm drain system or other watercourses under their jurisdiction, including but not limited to the following:
a. EPA Environmental Protection Agency.
b. FMFCD Fresno Metropolitan Flood Control District

c. SWRCB State Water Resources Control Board.
d. RWQCB Regional Water Quality Control Board.

2. All stormwater compliance shall be in accordance with local regulations:
   a. Fresno Metropolitan Flood Control District (FMFCD).
   b. County of Fresno.
   c. City of Fresno.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Best Management Practices (BMPs):
   1. The Contractor is responsible for the providing and furnishing all BMPs, products, and practices necessary to comply with the SWPPP and CGP. All materials and BMPs shall follow the CASQA Construction BMP Handbook and installed as described within the fact sheets, unless otherwise instructed by a qualified professional.
   2. The Contractor must provide, implement, and carry out all BMPs required to comply with the CGP, regardless of the BMPs contained in the SWPPP, and shall notify Owner and QSD of any conflicts between the SWPPP and CGP.
   3. Prior to substantially altering BMPs recommended in the SWPPP, Contractor shall notify the Owner and QSD for review of the alternative BMPs and to obtain instructions for documenting the changes.
   4. Contractor shall consult with the QSP to ensure all BMPs are appropriate, feasible, effective, and correctly implemented.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Monitoring by the Contractor's QSP:
   a. Implement the CSMP, as required by the CGP, including, but not limited to: weekly, pre-storm, during-storm, post-storm, and quarterly inspections and associated documentation.
   b. The Contractor's QSP shall complete all inspections and associated documentation, or shall review and sign all inspection documentation.
   c. For the full monitoring requirements refer to the SWPPP and CGP.
   2. Monitoring by Owner
      a. The Owner has the right to monitor and oversee the Contractor's implementation and maintenance of the BMPs and SWPPP.
      b. Should the Owner determine that the Contractor's efforts fail to meet the requirements of the CGP and the SWPPP, the Owner reserves the right to employ any and/or all of the following actions:
         1) Notify the SWRCB of the perceived failure of the Contractor to comply with the CGP and SWPPP.
         2) Withhold an amount of money from the Contractor's Payment Request, equal to the Owner's estimate of the value of the work required to implement and maintain the required BMPs, as well as provide the required inspection, training, and testing forms.
         3) Hire a separate QSP to perform the work required to implement the

CSMP and deduct the costs thereof from the Contractor's Payment.

B. Availability and access to the SWPPP:
   1. As required by the SWPPP and CGP, the Contractor shall keep a minimum of one copy of the SWPPP, addenda, all PRDS, all inspection reports and all SWPPP records in the following locations:
      a. Contractor's Project Site Field Office.
      b. Contractor's General Business Office.
   2. The SWPPP shall be made available for public inspection at any time during normal business hours.
   3. All SWPPP records shall be made available to the Owner and their agents when requested.

3.2 CLEANING AND REMOVAL

A. Removal of BMPs
   1. All temporary BMPs shall be completely removed from the Project Site prior to filing of the NOT.
   2. The removal of any and all BMPs shall be coordinated and approved by the Contractor's QSP.
   3. All permanent BMPs shall remain on the Project Site, unless directed otherwise by Owner. The Owner will be responsible for ongoing inspection and maintenance after final acceptance.

B. Under written agreement and with the approval of the Owner, the Contractor may assign maintenance and removal responsibilities of the project BMPs to a subsequent Contractor for later work phases at the Project Site.

3.3 RECORD KEEPING

A. Paper and electronic records of all CSMP inspections, testing, training reports, all PRDs, inspection records, site photos, and all other SWPPP related records, shall be retained for a period of at least three years after the close of construction. These records shall be available at the project site until construction is completed.

3.4 PAYMENT

A. Full compensation for all costs involved in implementing, and monitoring the implementation of the SWPPP for this project, including inspections, testing, and training, performing corrective measures as required to better implement the SWPPP, providing all labor, materials, and resources to maintain the SWPPP and all required records of the SWPPP, and being full liable for all failures to fulfill the intent and requirements of the CGP set forth by the SWRCB, shall be included in the cost bid for the various items of work and no additional payment will be made therefor.

SECTION 01 57 24 - INDIRECT SOURCE REVIEW (ISR)

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Provide all material, labor and services necessary to implement the requirements of SJVPACD Rule 9510, the final approved ISR AIA Application, and the ISR Approval Letter, during construction, and as indicated by the Contract Documents.
2. Implement the mitigation measures and any other requirements contained within the final approved ISR AIA Application and Approval Letter.
3. If the AIA Application Approval Letter specifies a Construction Clean Fleet, follow the instructions in the AIA Application Approval Letter to implement a Construction Clean Fleet and submit to SJVAPCD a completed Construction Clean Fleet Report. If the Contractor fails to implement Construction Clean Fleet and/or submit an accepted Construction Clean Fleet Report, Contractor shall be liable for any resulting mitigation fees and/or fines.
4. Implement the monitoring and reporting requirements of the Monitoring and Reporting Schedule (MRS), which is included in the AIA Application Approval Letter, and submit documentation to SJVAPCD as required.

B. This Section does not include:
1. The Owner will complete the ISR application process and obtain approval from SJVAPCD.
2. The Owner will pay the ISR Application Filing Fee, Application Evaluation Fee, Administrative Fees for Mitigation Projects, and Off-site Emission Reduction Fees, as determined by SJVAPCD upon completion of the ISR.
3. The Owner will provide copies of the final approved ISR AIA Application and Approval Letter to the Contractor prior to initiating construction.
4. After Contractor has completed all construction activities, all ISR requirements related to project construction, and submission of all related documentation to SJVAPCD, Owner will be responsible for implementing all operational/post-construction requirements contained in the final approved ISR AIA Application and Approval Letter.

C. Acronyms:

1.	AIA	Air Impact Assessment
2.	CARB	California Air Resources Board
3.	EPA	Environmental Protection Agency
4.	ISR	Indirect Source Review
5.	MRS	Monitoring and Reporting Schedule
6.	SJVAPCD	San Joaquin Valley Air Pollution Control District

1.2 REFERENCES:

A. SJVAPCD Rule 9510 (Indirect Source Review) – https://www.valleyair.org/rules/currntrules/r9510-a.pdf

B. SJVAPCD Rule 3180 (Administrative Fees for Indirect Source Review) – https://www.valleyair.org/rules/currntrules/2018/R3180-a2.pdf

1.3 RELATED SECTIONS

A. All Division 00 specification sections.
B. All Division 01 specification sections.
C. All specification sections in the Facility Construction subgroup.
D. All specification sections in the Temporary Facilities and Controls section.
E. All specification sections in the Dust Prevention and Control Plan subgroup.
F. All specification sections in the Dust Control subgroup.

1.4 SUBMITTALS

A. Submit to SJVAPCD a completed Construction Clean Fleet Report.

B. The Contractor shall have sole responsibility for completing and submitting the required documentation to verify compliance with the Construction Clean Fleet according to SJVPACD requirements.

C. Upon completion of construction, Contractor shall provide to Owner a record of start and end dates for all construction phases including, but not limited to, Demolition/Grubbing/Land Clearing, Grading/Excavation, Services Installation, Building, Asphalt/Drainage/Utilities Subgrade.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. In accordance with Specification Section – Regulatory Requirements, and the following:
      a. CARB Materials and equipment used for this Project shall comply with the current applicable regulations of the California Air Resources Board and the EPA.
      b. CAL/OSHA California Division of Occupational Safety and Health Administration
      c. CF County of Fresno, Codes and Ordinances
      d. EPA Environmental Protection Agency.
      e. SJVAPCD San Joaquin Valley Air Pollution Control District.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.1 IMPLEMENTATION AND RESPONSIBILITY

A. General Requirements:

1. The Owner will complete ISR as required by SJVAPCD Rule 9510 (Indirect Source Review). An ISR AIA Application shall be completed by the Owner and approved by SJVAPCD. A copy of the final approved ISR AIA Application and the associated Approval Letter shall be provided to the Contractor prior to start of construction.
2. Contractor shall refer to the final approved ISR AIA Application, Approval Letter, and SJVAPCD Rule 9510 for complete ISR requirements. If there is a conflict between the final approved ISR AIA Application and/or Approval Letter and/or these specifications, the final approved ISR AIA Application, Approval Letter, and SJVAPCD Rule 9510 will prevail over the Contract Documents.
3. The Owner shall be responsible for paying all ISR application, evaluation, administrative, and mitigation fees for the project as required by SJVAPCD Rule 3180 (Administrative Fees for Indirect Source Review) and Rule 9510. Total fees will be determined by SJVAPCD upon completion of the ISR process. If the Contractor fails to implement Construction Clean Fleet and/or submit an accepted Construction Clean Fleet Report, Contractor shall be liable for any resulting mitigation fees and/or fines.
4. The Contractor shall be responsible for implementing a construction clean fleet as specified in SJVAPCD Rule 9510. The Contractor shall maintain and submit to SJVAPCD records to demonstrate compliance with the construction clean fleet requirements using the SJVAPCD Detailed Fleet Template (Residential, Non-Residential, or Mixed-Use). The Detailed Fleet Template can be obtained from the SJVAPCD ISR Forms and Applications web page (http://www.valleyair.org/ISR/ISRFormsAndApplications.htm).
5. Owner shall be responsible for implementing and maintaining all post-construction/operational mitigation and/or regulatory measures specified in the final approved ISR AIA Application and Approval Letter.
6. Contractor shall be responsible for maintaining compliance with all other SJVAPCD rules and regulations during construction. Owner shall be responsible for maintaining all other SJVAPCD rules and regulations post construction.
7. The Contractor shall be fully aware of the requirements for the full execution of the ISR during construction, the requirements of these specifications. A submittal of a bid on this project will be considered as prima facie evidence that the Contractor fully comprehends these requirements and impacts and has fully allowed for their effect on this project, both in time and cost.

END OF SECTION

SECTION 277000 – INTERCOM/CLOCK/PUBLIC ADDRESS SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes a fully operational school internal communications and clock incorporating safety including but not limited to the following:

1. The system shall provide complete internal communications and clock control employing state of the art VoIP Technology including the minimum functions listed.
   a. Two-way Loud Speaking Internal Intercommunications.
   b. Event announcement
   c. Emergency announcement that will override any pre-programmed zones assuring that all Emergency/Lockdown etc., are heard at each and every speaker location.
   d. Capability of prerecording emergency announcements that can simply be activated by a simple Soft Key or via a dedicated call-switch.
   e. School Safety Paging and Evacuation tones,
   f. Distributed (MDF/IDF) Electronic Architecture. (No home run wiring for each circuit).
   g. Atomic Time Synchronization with Class Change Tones utilizing multiple, programmable schedules for each zone,
   h. Paging and Program Distribution.
   i. Incorporate district-wide announcements, either live or recorded thru a direct connection to the WAN and telephone system.
2. Synchronous analog clock and time control
   a. Class change signaling
   b. Atomic Clock Synchronization
3. Emergency call-ins shall take precedence over normal calls so that they are answered first. The system shall support a minimum of 16 call level priorities which shall be user definable.
4. Any authorized administrator shall be able to call from outside the school into any classroom, zone or entire school directly via the School District supplied Telephone Network. This shall allow remote monitoring and two-way conversation from outside the school building as well as Paging into the system. This feature shall allow the user access to all functions via a user defined PIN code. (Compliance with NEMA Standard SB-40 for emergency communications in K-12 Schools)
5. Authorized system users shall be able to record a minimum of ten (10) automated messages with emergency instructions and replay them. Automated message strings shall be either automatically distributed as part of a dial string, manually played from a single-button access on the phone or thru the master clock as a timed event.
6. Paging and two-way loudspeaking features shall be accessible from any telephone by authorized users with the use of a user defined PIN code.
7. The system shall allow users to exclude their classroom from paging and tones in the event of testing or other activity that shouldn't be interrupted. This exclusion will not affect emergency paging. This "exclusion" must have the ability to "reset" at midnight.
8. The system shall synchronize its system time to the network timeserver or a web- based time server.

9. The system shall have the ability to correct and power classroom secondary Analog clocks over the same Cat5e/6 cable drop also used for Two- Loudspeaking intercom speakers, call switch and (optional) motion detector.
10. This specification establishes a minimum level of quality, features, and performance for individual components as well as the integrated system.

1.2 CONTRACTOR QUALIFICATIONS/QUALITY ASSURANCE

A. Safety and Indemnity
   1. Contractors will submit the necessary documentation to demonstrate their compliance with Section 270000 “1.5 A. Safety & Indemnity”.

B. Contractor Qualifications
   1. Contractors will submit the necessary documentation to demonstrate their compliance with Section 270000 “1.5 B. Contractor Qualification”.

C. Quality Assurance
   1. Contractor shall comply with all requirements as specified in Section 270000 “1.5 C. Quality Assurance”.

D. Warranty
   1. Contractor shall comply with all requirements as specified in Section 270000 “1.8. Acceptance & Warranties”.

1.3 SUBMITTAL DOCUMENTATION

A. The successful contractor shall provide their submittal package in accordance with the Section 01 20 00 1.06 Submittal Schedule, and Section 270000 “1.6 Submittal Documentation”.

B. Contractor shall also include in their Submittal Package:
   1. Shop Drawings: Prior to proceeding with the work: Provide detailed equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, and location of each field connection, and a complete schedule of all equipment and materials with associated manufacturers cuts sheets which are to be used.
      a. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Identify terminals to facilitate installation, operation, and maintenance. Include a single-line diagram showing cabling interconnection of components and levels throughout system and impedances.
      b. Artwork drawings and lists indicating proposed nameplate nomenclature and arrangements for control panels and plug panels prior to fabrication reflecting equipment used.
      c. Each drawing shall have a descriptive title and all sub-parts of each drawing shall be labeled. All drawings shall have the name and locations of the project, Systems Contractor’s name in the title block.
      d. Details and descriptions of any other aspect of the system, which must differ from the contract documents due to field conditions or equipment, furnished.

1.4 EQUIVALENT PRODUCTS

A. All Products described in this Specification are those of the Valcom Class Connection system.

B. Pre-Approved Equals:
   1. Bogen Quantum MC2000

C. Owner will accept no substitutions from the two manufactures/products currently approved.

D. In addition, Contractor shall certify that the proposed system complies with the following statements:
   1. Each major component of equipment shall have the manufacturers name, address and model number on a plate securely affixed in a conspicuous place. NEMA code ratings, UL Label, or other data that is die-stamped into the surface of the equipment shall be easily visible.
   2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
   3. Comply with NFPA 70
   4. Comply with NEMA Standard SB-40 for Emergency Communications in K-12 schools.
   5. Comply with UL 60950.

E. Not Equal:
   1. Rauland
   2. Telecor
   3. Teradon Raptor

1.5 IN-SERVICE TRAINING

A. The contractor shall provide and implement a complete and comprehensive staff training program for all administrators, facility staff members, and teachers. This mandatory training program will provide school staff a complete understanding of how to utilize and properly operate all functions.

B. The training program shall be implemented by a staff member/trainer employed by the contractor. The trainer must be factory certified to provide training on their product.

C. All staff development training is to be coordinated through the owner’s designated representative. As training sessions are completed, the trainer will provide the school’s administrative staff and school district’s staff a document listing all of the staff and faculty members who attended, received, and completed the training program.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. The system shall utilize state of the art VoIP Technology, Call-in Notification, School Safety Paging and Evacuation tones, Distributed (MDF/IDF) Electronic Architecture, Atomic Time Synchronization with Class Change Tones utilizing multiple, programmable schedules for each zone, Two-way Loud Speaking Internal Intercommunications and Paging, and Program

Distribution. The system shall be easy to learn and operate. All standard system programming shall be user friendly to allow the system administrator the ability to easily program system features.

B. Provide complete and satisfactorily operating school communications and School safety as described herein, using materials and equipment of types, sizes, ratings, and performances as indicated. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.

C. The system shall be a single electronic system consisting of amplified intercom channels depending upon the configuration of the system, (classroom) speakers, corridor speakers, inside and outside horns, call-in switches, and master clock.

D. Features offered by this system shall be implemented and controlled by a software program that can be changed and expanded as customer needs evolve.

E. The system shall lend itself to expansion by simple addition of hardware modules.

F. The system shall allow the implementation of bell schedules that are managed via the WAN/LAN. The system shall directly connect to the WAN/LAN without the need for a separate computer at the school location. Bell schedules can remotely be created, changed, stored and downloaded to the system by an authorized user from a browser- based interface.

G. The system shall provide the ability to initiate school safety paging announcements, evacuation tones and take cover tones from any telephone within the facility or outside the facility to any other location within the facility. The system must also allow the implementation of a district-wide announcement system where live messages, pre- recorded announcements and emergency tones can be triggered via a telephone or browser-based user interface.

H. The system shall provide the ability to selectively communicate or monitor individual classrooms in emergency situations from any telephone within the facility or outside the facility to any other location within the facility; all communication within the classroom shall be hands free and will not require any interaction by the end-user to answer.

I. Room speakers, call switches, shall be programmable and may be assigned any two-, three-, four-, or five-digit number. Any extension may be reassigned at any time, and it shall not be dependent on wiring or circuit numbers.

J. Amplified two-way voice communication shall be available from any provided telephone through any speaker in the system. This shall allow hands-free communication to any classroom or any individual loudspeaker unit. A programmable pre-announce tone shall sound immediately before the intercom path is opened and a supervisory tone shall continue to sound at regular intervals when speaker monitoring is active, complying fully with all privacy legislation.

K. Integrated Master Clock with unlimited schedules, unlimited events, and automatic Daylight Savings time correct. Up to 5 schedules may be active on any given day. User shall be able to

select from 16 tone options or user created .wav files for class change signaling. In addition the system shall allow unlimited user defined class change tones to be recorded. The system shall allow control of the bell schedules via the district WAN/LAN. The system shall directly connect to the WAN/LAN without the need for a separate computer at the school location. Bell schedules can remotely be created, changed, stored and downloaded to the system by an authorized user from a browser-based interface.

L. Ability to correct and power secondary clocks using the same Cat/6 cable drop (district standard) used for intercom speaker, call switch and (optional) motion detector.

2.2 EQUIPMENT AND MATERIAL

A. VoIP Based Controller (Gateway) with the following features and capabilities:
1. The ability to network multiple controllers via the LAN to provide a single interconnected system within the facility. The networking capability must provide for total transparency between controllers and in turn operate as a single system.
2. On-site or off-site diagnostics shall be capable via a standard Ethernet port for factory-trained personnel. The controllers shall tie directly into the LAN. In addition, all bell scheduling tasks must be browser based allowing authorized access from off-site district staff. On-site facility staff may also perform these tasks in the same manner as the district staff.
3. System shall connect to the district-provided Telephone Network via an analog trunk or a WAN station port.
4. The Operating System and system programming database shall be stored in non-volatile flash memory. The Operating System can be easily upgraded through a configuration program without requiring replacement of any chips. The system programming database can be easily archived.
5. Support a flexible numbering plan allowing two, three, four, or five digit extensions. The two, three, four, and/or five digit extensions can be intermixed within the same facility. Each extension can include leading or trailing alpha digits to match a facility's room numbering scheme.
6. Multiple attendant positions via district provided Telephone Network shall be capable of answering internal intercom call-ins a minimum of one (1) Marquee Display shall be provided.
7. Personal Identification Numbers (PIN's) shall be available for all staff. By dialing their PIN at any provided telephone, the staff member shall have access to the School Internal Intercom and Public Safety Network.
8. Reports on feature usage, system activity, etc. shall be available upon request either on site or remotely.
9. Direct Dialing, two-way amplified voice intercom between any provided telephone and speaker without the use of a press-to-talk or talk-listen switch.
10. DISA: Direct Inward System Access. The system can be configured to allow access to all system features/functions (paging, intercom, evacuation tones, class tone schedule selection, etc.) from any offsite DTMF dialing telephone via the district provided Telephone Network. Only authorized individuals may use this feature by dialing into the system through a dedicated trunk number, with or without a pass code, and then dialing a system function.
11. Ability to place two levels of call-in from any call-in switch.
12. The ability to answer intercom call-ins registered at pre-selected telephones.
13. The ability to automatically reroute incoming call-ins to an alternate telephone or group of telephones if they remain unanswered for a predetermined amount of time.

14. Call switches and analog clocks shall be wired using a single Category 5e/6 cable. Wiring for all speaker, analog clocks, and call switch shall be with one Cat 5e/6 cable drop per location. Systems requiring a custom cable plant will not be acceptable.
15. The ability to remotely locate VoIP Controller(s) (Gateways) among MDF and IDF equipment closets. This flexibility allows for the most economical wiring of the system based on the layout of the facility thus eliminating the need for individual home run wiring per previous standard.
16. The ability to initiate Class of Service changes either manually or automatically on a per station basis based on time of day, day of the week, and calendar via the integrated master clock.

B. Intercom/Paging/Tones/Clock Correction Module

1. Provide an integrated intercom module for individual room intercommunications, all page and zone page, evacuation tones, prerecorded messages, multilevel call-in, secondary clock correction, and class change tones. The module shall be from the same manufacturer as the VoIP Controller (Gateway) to ensure compatibility. The module shall integrate directly with the VoIP Controller and will not require analog or digital tie lines to the VoIP Controller. Module shall provide the following integrated features and functions that integrate seamlessly with the VoIP Controller:
    a. Two-way communication between any telephone and any room speaker.
    b. Preannounce tone prior to connecting any intercom conversation to alert the user to the call and prevent unauthorized monitoring. A tone shall be automatically repeated at regular intervals for the duration of the intercom call if the voice circuit is not activated. A requirement to meet existing privacy laws.
    c. Audio paging access from any telephone to any single intercom speaker, zone (group) of intercom/paging speakers, or all speakers/paging horns throughout the entire facility.
    d. Single button access from any telephone on the system to distribute emergency announcements within the facility to all or select locations equipped with speakers. Emergency announcements originating from any assigned administrative telephone shall have priority over all regular system functions.
    e. Single button access from any telephone on the system to initiate alarm signals within the facility to all or select locations equipped with speakers. Up to Sixteen (16) separate distinct alarm signals shall be provided. Alarm signals originating from any assigned administrative telephone shall have priority over all regular system functions.
    f. The system will have the ability to utilize a web-browser and USB microphone to deliver live emergency paging, pre-recorded messages and tones from any authorized computer in the facility or the district. The system must be capable of automatically notifying district personnel via the WAN of an alarm condition.
    g. The system can automatically broadcast page emergency instructions throughout an entire school when an alarm (e.g. lockdown, lockout, security, fire) is tripped or manually activated. The emergency instructions are preprogrammed and require no user intervention. The system provides redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm or security systems.
    h. Multilevel call-ins can be placed from either a classroom telephone or a call-in switch. The call-ins route to select or all administrative telephones and can only be cleared from the system once answered from an administrative telephone. If a call-in is not answered within a preprogrammed time the call-in may reroute to other administrative telephone(s) announce over selected or all speakers and shall

have the capability to also reroute calls to predefined Mobile telephones. Emergency Call-ins may can also be programmed to send e-mail alerts to specific addresses

i. An option for Privacy call-in switches. When the Privacy switch is activated it prevents administrative or classroom telephones from monitoring the specific classroom/location intercom speaker.

j. Classroom teachers shall have the capability to exclude pages and tones from their individual classroom for testing or other purposes. This exclusion cannot affect emergency pages. This exclusion will reset at midnight.

k. An option for Call Assurance call-in switches. When the normal or emergency button is pressed, an LED lights up to visually confirm that a call-in has been placed.

l. The system can automatically alter a call switch's class of service by time of day and date via the integrated master clock.

m. The capability to assign speaker locations to any one or more of the sixteen (16) independent zones for zone paging, sixteen (16) independent program/music distribution zones and sixteen (16) independent class change tone reception; this assignment is a programmable function. Each location shall be programmed in software to belong to any combination of software zones. Software/hardwired zones must be configured as part of an unlimited number of district wide groups for school district emergency announcements. These district announcements must be accessed via microphone, a web-browser or telephone.

n. Automatic class change tones sent through all or selected intercom/paging speakers and/or horns. Any combination of up to Sixteen (16) tones can be sounded to indicate different events. Up to sixteen (16) different class change schedules can be stored in the system and selected manually from an administrative telephone, web browser or selected automatically based on time, day of the week, and date. Tone type and duration are selectable for each class change event. An unlimited number of class change events can programmed as part of the system.

o. Programmable "Music-on-Class-Change." A program source can be automatically routed to select zones of paging speakers or all speakers within the facility during each class change period.

p. The system shall provide facilities to distribute program material (i.e. cassette tape, CD, radio broadcasts) in the following manner:
   1) The user shall cue remotely located music source or select radio station.
   2) From an Administrative Telephone the user can select the room(s) or areas to distribute program.
   3) Automated distribution based on event schedule.

q. The module provides for secondary clock correction with the following features and functions:
   1) User programmable Automatic Daylight Savings Time Change.
   2) Latched operation of zone outputs to control lighting or other devices.
   3) Interface with most types of secondary slave clocks whether synchronous wired, wireless or electronic.
   4) User-programmable custom slave clock correction. Output relays rated at 5 amperes shall be provided on all zone circuits as necessary.
   5) Ability to correct and power secondary clocks using same Cat5e/6 supporting intercom speakers, classroom telephone, call switch and motion detector. Secondary clocks requiring more than 15 mA shall not be

acceptable.

r. System has the ability to sync system time to the Atomic Clock Signal or to the school's or districts network time server. System has the ability to offset system time (+) or (–) 15 minutes from true atomic time to accommodate bus schedules or other scheduling issues.

s. The module provides for classroom security and call switch supervision with the following features and functions:

1) All field wiring to call switches connected to the system shall be capable of individual supervision for opens or shorts.

2) System shall be capable (future) to accept multiple alarm inputs from the main security and/or fire alarm system. Emergency tones and/or announcements can therefore be triggered, via the primary security and/or fire alarm system, to provide redundant annunciation using the classroom and corridor speakers.

C. Audio Paging/Program Amplifiers

D. Power amplifier(s) shall be provided to provide a minimum of ½ watt of power to all intercom speakers, 2 watts of power to all paging speakers, and 15 watts of power to all paging horns.

1. The maximum load on the paging/program amplifiers shall be 80% of the rated maximum output of the amplifiers.

E. Interior Recess-mounted Wall/Ceiling Speakers

1. Provide premium quality 8" cone transducer speaker. Transformer assembly shall be dual voltage multi-tap type suitable for 25 or 70-volt installations. The speaker shall have a frequency response of 65 Hz to 17 KHz with a power rating of 8 watts. Sensitivity shall be 93 dB, 1 watt, 1 meter. Voice coil shall be ¾" diameter with a 5-ounce magnet. When installed in ceiling, no speaker assembly weight shall be resting on any ceiling tiles.
2. The recessed back box shall be of heavy gauge cold-rolled steel, spot welded for stability with a rust-retardant gray primer finish. Acoustically treat the interior to eliminate mechanical resonance. The back box shall be 10-3/4"x10-3/4"x3-3/4" deep and shall be capable of accommodate the clock speaker baffle in locations designated.
3. The surface mount clock/speaker back box shall be of 22 gauge cold-rolled steel, with baked powdered epoxy cool gray finish. Supports either vertical or horizontal mounting. The surface mount clock/speaker back box shall be 20.18" x14.26" x2.78" deep.
4. The baffle shall be constructed of a one-piece, 22 gauge cold-rolled steel, zinc- treated to prevent corrosion. The finish shall be white baked powdered epoxy and be virtually scratch/mar proof. The baffle perforation pattern shall be designed for wide sound dispersion and screw attachment to top of the back box.

F. Exterior Recessed Wall Mounted Horns

1. Unit shall be double re-entrant type with compression driver mounted within weather-resistant housing. Audio power capability shall be 15 watts continuous. Frequency response shall be 600-14,000 Hz 700-5500 Hz (+ or – 5dB). Sound pressure level shall be 114dB (15W/1M). Sound dispersion angle shall be 95 degrees. Transformer equipped loudspeaker shall have impedance selection via seven position switch of 5000, 2500, 666, 333, 89, and 45 Ohms. Power taps shall be available .48, .94, 1.8, 7.5, and 15 watts on 25V line; 1, 2, 3.8, 7.5, and 15 watts on 70.7V line and 15 watts on 100V line. Loudspeaker mounting shall be by eight 3/16 "evenly spaced holes. Model APF-15T

dimensions shall be Dia. 5 3/8" x D 5 3/16" x Dia. Of flange 6 5/16"; Finish shall be grey baked epoxy.

Speaker shall be Atlas Sound APF-15T, **No Substitutions.**

G. Exterior Surface Wall or Ceiling Mounted Horns

1. Unit shall be double re-entrant type with compression driver mounted within weather-resistant housing. Audio power capability shall be 15 watts continuous. Frequency response shall be 600-14,000 Hz 700-5500 Hz (+ or – 5dB). Sound pressure level shall be 114dB (15W/1M). Sound dispersion angle shall be 95 degrees. Transformer equipped loudspeaker shall have impedance selection via seven position switch of 5000, 2500, 666, 333, 89, and 45 Ohms. Power taps shall be available .48, .94, 1.8, 7.5, and 15 watts on 25V line; 1, 2, 3.8, 7.5, and 15 watts on 70.7V line and 15 watts on 100V line. Loudspeaker mounting shall be by eight 3/16 "evenly spaced holes. Model APF-15T dimensions shall be Dia. 5 3/8" x D 5 3/16" x Dia. Of flange 6 5/16"; Finish shall be grey baked epoxy

Speaker shall be Atlas Sound APF-15T, **No Substitutions**

H. Accessories

Recessed Mounting Back Box

1. Unit shall be a Durable Enclosure Designed to Recess Mount VP 161 Series Vandal Proof Baffles. The Unit Accommodates A Wide Variety of Loudspeaker/Transformer Configurations. The Unit Shall be Constructed of Heavy-Duty 18 Gauge Stainless Steel Including Undercoating and a Natural Finish. The Unit Shall be designed for use with Atlas Sound VP 161 Series Vandal/Weather resistant Baffles.

Back Box shall be Atlas Sound 161RES; **No Substitutions.**

Surface Mounting Back Box

1. Unit shall be designed to Surface Mount VIP161 Series Vandal Proof Baffles. The Unit shall accommodate a Wide Variety of Loudspeaker/Transformer Configurations. The Unit Shall be Constructed of 18 gauge Stainless Steel Construction Including Undercoating and a White Powder Coat Finish. The Unit Shall be Weather-Resistant and Suitable for Outdoor Use.

Back Box shall be Atlas Sound 161SES; **No Substitutions.**

Recessed Vandal-Proof Baffles

1. Unit shall offer tamperproof protection for cone loudspeakers and re-entrant horns. Unit is constructed of special aluminum allow providing twice the strength of conventional cast aluminum baffles. Unit comes in attractive square (Our standard) or round models to meet varying applications and aesthetic requirements.

Recessed Baffle shall be Atlas Sound VP161-APF; **No Substitutions**

I. Uninterruptible Power Supplies (UPS)

1. UPS equipment provided for this system will include Power Conditioning to smooth current and voltage fluctuations.
2. UPS equipment will be sized in accordance with the system manufacturer's

recommendations.

3. Provide an individual UPS for EACH SYSTEM CONTROLLER (Gateway) furnished with the system.
4. Provide additional UPS(s) for protection of all other equipment furnished with the system and housed in the equipment racks.
5. All UPS equipment shall be rack mounted and assigned an IP address for network communication. Contact Owner for assigned IP address.

J. Equipment Racks

1. All equipment racks shall provide 44 spaces (77”) minimum for mounted system equipment.
2. All equipment racks shall be multi-rack format (“gangable”) style, bolted together, and open cavity.
3. All equipment racks will be provided with lockable rear doors.
4. Equipment rack(s) shall be located in climate-controlled areas/rooms as shown on drawings.
5. All head-end, distribution, and source equipment, including data and power, shall be located in racks configured as approved by the Engineer.
6. Rack mounted equipment shall be accessible from front and rear.
7. All unused rack spaces will be covered with appropriate blank/vent panels.
8. The intercom P.A. source equipment will mount in these approved data racks at a good working level approximately shoulder height.
9. The cables to/from the source equipment must be terminated on 66-M150 telephone type punch blocks and NEVER on 110 computer type punch blocks. The 66-M150 punch blocks must be snapped onto 89B brackets, and the 89B brackets must be mounted to telephone style blue boards either half or full size as necessary.
10. The blue boards must be mounted to one of the appropriate equipment room walls at a good working height.
11. The “house” cables for the speakers and any feeder cables must also be terminated on 66-M150 cables, NEVER on 110 type blocks.

K. Analog Secondary Clocks

1. Analog clocks shall be designed to provide long term maintenance free timekeeping in any commercial application with a five (5) year manufacturer’s warranty.
2. Analog shall correct for time, hour, minute and second hands.
3. The analog clock shall have an internal clock that can keep time for up to six (6) hours after a power failure without the use of batteries.
4. Typical recovery time after power failure shall be less than 2 minutes.
5. 12-inch analog clocks shall be supplied in all classrooms, administrative areas and common areas as indicated on the plans. 16-inch analog clocks shall be provided in auditoriums, and gymnasiums with protective cover,
6. In areas designated a clock/speaker baffle combo unit shall be supplied either surface or wall mounted depending on site condition.

L. Wireless Clock System

1. Provide complete and satisfactorily operating NTP Synchronized Wireless Clock System with analog clocks as described herein, using materials and equipment of types, sizes, ratings, and performances as indicated.
2. (NTP) Network Time Protocol is a network standard protocol that assures accurate synchronization to the millisecond of computer clock times in a network of computers. Based on UTC, NTP synchronizes client workstation clocks to the

3. U.S. Naval Observatory Master Clocks in Washington, DC and Colorado Springs, CO. Running as a continuous background client program on a computer, NTP sends periodic time requests to servers, obtaining server time stamps and using them to adjust computer clocks.
4. The system shall be easy to learn and operate. All standard system programming shall be user friendly to allow the system administrator the ability to easily program system features.
5. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction, in accordance with published product information.
6. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.
7. The NTP Synchronized Wireless System consists of a master transmitter located on the inside of the building, and a NTP receiver connected to a time server. An unlimited number of wireless analog clocks are synchronized to the NTP time. System shall synchronize all clocks to each other. System shall utilize NTP technology to provide atomic time to components.
8. System shall not require hard wiring for its components except for AC Power. Analog Clocks may be battery operated for full portability if required.
9. Analog Clocks shall synchronize to +/- 1 second of the transmitter displayed time.
10. Clocks shall automatically adjust for Daylight Saving per settings on the transmitter.
11. The system shall have an internal clock that is continually updated by the NTP receiver. If a NTP failure were to occur, the clocks would continue to be synchronized to the internal clock and would not deviate from each other. Once NTP time is restored, all clocks would once again be synchronized to the NTP time.
12. The system must have a failsafe design so that if a power interruption were to occur, the clocks will continue to operate. If a synch signal is not received by the analog clocks for 48 hours, the second hand will double pulse to indicate this condition. Upon restoration of power, the transmitter will once again communicate with the clocks and normal operation will resume.
13. Battery Powered Analog Clocks shall require 2 "D" cell batteries.
14. System shall be 100% programmable from the front operational panel with lights that indicate power status and NTP reception. Panel programming will also include Time Zone, Frequency, 12 or 24 hour operation and DST on/off.
15. The wireless backbone must support expansion of the system to include wireless alphanumeric displays for emergency crisis communications for district-wide communications.
16. The system may be modified to use GPS instead of NTP as the time source without the need to replace the transmitter. A GPS receiver would need to be added with access to the outside of the building.
17. The system shall lend itself to expansion by simple addition of wireless secondary clocks and their required power source.
18. EQUIPMENT AND MATERIALS
    a. WIRELESS TRANSMITTER
        1) FCC Part 90 Approved, 467.2125-467.4375 MHz frequency range
        2) Radio Technology (Narrowband FM, 12.5 KHz bandwidth)
        3) 10 selectively available channels
        4) 5 watt transmitter
        5) Daylight Savings Time pre-programmed
        6) Time Zone Pre-set
        7) Non-Volatile Memory

8) LCD Display for time, date, year, power, time zone and signal reception
9) Operating Range (32 degrees F to 158 degrees F)
10) Rack or Shelf Mount
11) Power Supply Input: 120-volt AC, Output: 12-volt DC, 3 Amps
12) 7” Rear Mounted Antenna
13) Dimensions: 12”L x 6”W x 1.75”H Weight: 2 lbs
14) NTP Receiver
15) Optional External Antenna for use in large campus applications. Up to 2 miles radius

b. SECONDARY 13” ANALOG CLOCK
1) 13” Analog Clock (Battery Powered using 2”D” Cell batteries).
2) Maintenance Free.
3) Five year manufacturer’s warranty.
4) Microprocessor based with built-in wireless receiver
5) Heavy Duty Construction
6) Durable ABS Casing
7) Clock numbering graphics shall be Standard Arabic Format (12HR- 60 Minute)
8) Face of clock is white
9) Hour and Minute hands shall be black, second hand is red
10) The clock lens shall use a shatterproof polycarbonate material with no visible molding marks. Glass and/or visible molding marks are unacceptable.
11) The clock shall have a low–profile, semi–flush design
12) Wire Guard Model in areas where protection is required as indicated on drawings or by owner.

c. SECONDARY DUAL FACE 13” ANALOG CLOCK
1) 13” Analog Clock (Battery Powered using 2”D” Cell batteries per face)
2) Wall or Ceiling Mount shall be determined by drawings or owner
3) Maintenance Free.
4) Five year manufacturer’s warranty
5) Microprocessor based with built-in wireless receiver
6) Heavy Duty Construction
7) Durable ABS Casing
8) Clock numbering graphics shall be Standard Arabic Format (12HR- 60 Minute)
9) Face of clock is white
10) Hour and Minute hands shall be black, second hand is red
11) The clock lens shall use a shatterproof polycarbonate material with no visible molding marks. Glass and/or visible molding marks are unacceptable.

d. SECONDARY 16” ANALOG CLOCK
1) 16” Analog Clock (Battery Powered using 2”D” Cell batteries).
2) Maintenance Free.
3) Five year manufacturer’s warranty.
4) Microprocessor based with built-in wireless receiver
5) Heavy Duty Construction
6) Durable ABS Casing
7) Clock numbering graphics shall be Standard Arabic Format (12HR- 60 Minute)

8) Face of clock is white
9) Hour and Minute hands shall be black, second hand is red
10) The clock lens shall use a shatterproof polycarbonate material with no visible molding marks. Glass and/or visible molding marks are unacceptable.
11) Wire Guard in areas where protection is required as indicated on drawings or by owner.
12) The clock shall have a low–profile, semi–flush design PART 3 –

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine conditions, with the Installer present, for compliance with requirements and other conditions affecting the performance of the School Communications and School Safety Network.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.

B. Furnish and install all material, devices, components and equipment for a complete operational system.

C. Impedance and Level Matching: Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

D. Control Circuit Wiring: Install control circuits in accordance with NFPA 70 and as indicated. Provide number of conductors as recommended by system manufacturer to provide control functions indicated or specified.

E. All housings are to be located as indicated.

F. The contractor shall provide necessary transient protection on the AC power feed, all copper station lines leaving or entering the building, and all central office trunks. All protection shall be as recommended by the equipment supplier and referenced to earth ground.

G. Wiring within Enclosures: Provide adequate length of conductors. Bundle, lace, and train the conductors to terminal points with no excess. Provide and use lacing bars.

H. Provide physical isolation from speaker-microphone, telephone, line-level wiring, and power wiring. Run in separate raceways, or where exposed or in same enclosure, provide 12-inch minimum separation between conductors to speaker-microphones, telephone wiring and adjacent parallel power. Provide physical separation as recommended by equipment manufacturer for other system conductors.

I. Identification of Conductors and Cables: Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams.

J. Weatherproofing: Provide weatherproof enclosures for items to be mounted outdoors or exposed to weather.

3.3 GROUNDING

A. Provide equipment grounding connections for Integrated Electronic Communications Network systems as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.

B. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

C. Provide all necessary transient protection on the AC power feed and on all copper station lines leaving or entering the building. Note in system drawings, the type and location of these protection devices as well as all wiring information.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of a duly factory authorized service representative for this project location to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.

B. Inspection: Make observations to verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Provide a list of final tap settings of paging speaker line matching transformers.

C. Testing: Rectify deficiencies indicated by tests and completely re-test work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

3.5 FINAL ACCEPTANCE TESTING

A. The Final Acceptance Testing shall be provided to the Owner or the Owners designated representative only. Final acceptance testing to any other trade or service provider for the project will not comply with the requirements of this section.

B. The contractor will provide a Final Acceptance Test record document signed by both the contractor and the Owner or designated Owner’s Representative establishing the “In Warranty” date. The warranty period will not commence until the Final Acceptance Test is completed. This document MUST list either the extension number, port number, or some other means so the owner will be able to look at the location of a speaker and cross reference it’s number/port on this list as to be able to make programming bell/zone type changes.

C. Be prepared to verify the performance of any portion of the installation by demonstration,

listening and viewing test, and instrumented measurements. Make additional adjustments within the scope of work and which are deemed necessary by the Owner because of the acceptance test.

D. Record Drawings: Prior to final acceptance, provide three (3) complete sets of drawings indicating all cable numbers and construction details in accordance with the actual system installation. Revise all shop drawings to represent actual installation conditions. These Record Drawings will be used during “Final Acceptance Testing”. Again, these drawings MUST show the extension/port number of every speaker in the system.

E. System Training: Submit the following information describing the training programs and system trainers in accordance with the specifications.
   1. Include with the submittal a preliminary staff development training program in outline form for review and approval by the owner’s representative.
   2. Include with the submittal a current copy of the trainer’s certification from the manufacturer that certifies and identifies the trainer(s) who are eligible to provide training and support for the project.
   3. Include with the submittal a current copy of trainer’s need’s assessment form which will be reviewed with the owner’s designated representative for the system’s preliminary system programming and configuration.
   4. Include with the submittal copies of all documentation used to identify for the owner those participants attending and completing the training programs.

3.6 COMMISSIONING

A. The contractor shall train the Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of the system. This training will be in accordance with the training as outlined in Section 1.6, paragraphs 3, 5 & 6 of these specifications. In addition to the Training Materials provided, the contractor will also furnish Operators Manuals and Users Guides at the time of this training.

B. Schedule training with Owner through the owner’s representative, with at least seven days advance notice.

3.7 OCCUPANCY ADJUSTMENTS

A. The contractor shall provide Occupancy Adjustments in accordance with Section 1.6, paragraph 9 of these specifications. A response scenario amenable to both the owner and the contractor will be established and followed for the first year of service.

3.8 CLEANING AND PROTECTION

A. Prior to final acceptance, the contractor shall vacuum and clean all system components and protect them from damage and deterioration. All blank spaces in equipment cabinets will be covered with blank panels. Top and side panels, and all cabinet doors will be installed. All general areas within and around all equipment rack/cabinets in the facility will be swept, vacuumed, and cleaned up. No cabinets will be left unlocked and all cabinet keys will be turned over to the owner or designated owner’s representative.

END OF SECTION

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STORMWATER POLLUTION PREVENTION PLAN

for

McKinley/Fowler Elementary School

RISK LEVEL 1

Legally Responsible Person (LRP):

Clovis Unified School District
1470 Herndon Avenue
Rick Lawson
Director of Construction and Engineering
(559) 327-9241

Project Address:

APN: 674-130-01T
Across From: 2211 N Fowler Ave
CA, 93727

SWPPP Prepared by:

Paige Noga , PE, QSD
Blair, Church & Flynn Consulting Engineers
451 Clovis Ave. Suite 200
Clovis, CA 93612
(559) 326-1400

SWPPP Preparation Date

January 5, 2023

WDID # _____

Estimated Project Dates:

Start of Construction	**02/06/2023**	Completion of Construction	**11/01/2024**

TABLE OF CONTENTS

QUALIFIED SWPPP DEVELOPER

Approval and Certification of the Stormwater Pollution Prevention Plan

Project Name: McKinley/Fowler Elementary School

Project Number/ID: *221-0312*

"This Stormwater Pollution Prevention Plan and Attachments were prepared under my direction to meet the requirements of the California Construction General Permit (SWRCB Orders No. 2009-009-DWQ as amended by Order 2010-0014-DWQ). I certify that I am a Qualified SWPPP Developer in good standing as of the date signed below."

QSD Signature | *Date*

Paige Noga | 00839

QSD Name | *QSD Certificate Number*

Project Engineer, QSD | (559) 326 – 1400

Title and Affiliation | *Telephone Number*

pnoga@bcf-engr.com

Email

LEGALLY RESPONSIBLE PERSON

Approval and Certification of the Stormwater Pollution Prevention Plan

Project Name: McKinley/Fowler Elementary School

Project Number/ID: *221-0312*

"I certify under penalty of law that this document and all Attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Rick Lawson

Legally Responsible Person

Signature of Legally Responsible Person or Approved Signatory

Date

(559) 327-9241

Name of Legally Responsible Person or Approved Signatory

Telephone Number

AMENDMENT LOG

Project Name: McKinley/Fowler Elementary School

Project Number/ID *221-0312*

Amendment No.	**Date**	**Brief Description of Amendment, include section and page number**	**Prepared and Approved By**
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#

SECTION 1 SWPPP REQUIREMENTS

1.1 INTRODUCTION

The McKinley/Fowler Elementary School project comprises approximately 21.63 acres including an undeveloped lot and Fowler Avenue and is located across Fowler Avenue to the east from a house located at 2211 N Fowler Avenue in Fresno, California. The property does not currently have a street address, the Project APN is 674-130-01T. The property is owned and being developed by Clovis Unified School District (District). The project location is shown on the Site Map in Appendix B*: Site Maps*.

This Stormwater Pollution Prevention Plan (SWPPP) is designed to comply with California's General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (General Permit) Order No. 2009-0009-DWQ as amended by Order No. 2010-0014-DWQ (NPDES No. CAS000002) issued by the State Water Resources Control Board (State Water Board). This SWPPP has been prepared following the SWPPP Template provided on the California Stormwater Quality Association Stormwater *Best Management Practice Handbook Portal: Construction* (CASQA, 2012). In accordance with the General Permit, Section XIV, this SWPPP is designed to address the following:

- Pollutants and their sources, including sources of sediment associated with construction, construction site erosion and other activities associated with construction activity are controlled;
- Where not otherwise required to be under a Regional Water Quality Control Board (Regional Water Board) permit, all non-stormwater discharges are identified and either eliminated, controlled, or treated;
- Site BMPs are effective and result in the reduction or elimination of pollutants in stormwater discharges and authorized non-stormwater discharges from construction activity to the Best Available Technology/Best Control Technology (BAT/BCT) standard;

Calculations for Risk Level and Runoff Coefficient are included in Appendix A*: Calculations*.

1.2 PERMIT REGISTRATION DOCUMENTS

Required Permit Registration Documents (PRDs) shall be submitted to the State Water Board via the Stormwater Multi Application and Report Tracking System (SMARTS) by the Legally Responsible Person (LRP), or authorized personnel (i.e., Approved Signatory) under the direction of the LRP. The project-specific PRDs include:

1. Notice of Intent (NOI);
2. Risk Assessment (Construction Site Sediment and Receiving Water Risk Determination);
3. Site Map;
4. Annual Fee;
5. Signed Certification Statement (LRP Certification is provided electronically with SMARTS PRD submittal); and

6. SWPPP.

Site Maps can be found in Appendix B*:* *Site Maps*. A copy of the submitted PRDs shall also be kept in Appendix C*:* *Permit Registration Documents* along with the Waste Discharge Identification (WDID) confirmation.

Additional PRDs may be required depending on the construction type and location.

- Post-construction water balance calculation;
- Dischargers proposing an alternate soil erodibility factor must submit justification (documentation of methods used [e.g. soil particle size analysis].

1.3 SWPPP AVAILABILITY AND IMPLEMENTATION

The discharger shall make the SWPPP available at the construction site during working hours (see Section 7.5 of CSMP for working hours) while construction is occurring and shall make it available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone. (CGP Section XIV.C)

The SWPPP shall be implemented concurrently with the start of ground disturbing activities.

1.4 SWPPP AMENDMENTS

The SWPPP should be revised when:

- There is a General Permit violation.
- There is a reduction or increase in total disturbed acreage (General Permit Section II Part C).
- BMPs do not meet the objectives of reducing or eliminating pollutants in stormwater discharges.

Additionally, the SWPPP shall be amended when:

- There is a change in construction or operations which may affect the discharge of pollutants to surface waters, groundwater(s), or a municipal separate storm sewer system (MS4);
- When there is a change in the project duration that changes the project's risk level; or
- When deemed necessary by the QSD. The QSD has determined that the changes listed in Table 1.1 can be field determined by the QSP. All other changes shall be made by the QSD as formal amendments to the SWPPP.

The following items shall be included in each amendment:

- Who requested the amendment;
- The location of proposed change;
- The reason for change;

- The original BMP proposed, if any; and
- The new BMP proposed.

Amendments shall be logged at the front of the SWPPP and certification kept in Appendix C*: Permit Registration Documents*. The SWPPP text shall be revised, replaced, and/or hand annotated as necessary to properly convey the amendment. SWPPP amendments must be made by a QSD. The following changes have been designated by the QSD as "to be field determined" and constitute minor changes that the QSP may implement based on field conditions.

Table 1.1 List of Changes to be Field Determined

Candidate changes for field location or determination by QSP(1)	Check changes that can be field located or field determined by QSP
Increase quantity of an Erosion or Sediment Control Measure	☑
Relocate/Add stockpiles or stored materials	☑
Relocate or add toilets	☑
Relocate vehicle storage and/or fueling locations	☑
Relocate areas for waste storage	☑
Relocate water storage and/or water transfer location	☑
Changes to access points (entrance/exits)	☑
Change type of Erosion or Sediment Control Measure	☑
Changes to location of erosion or sediment control	☑
Minor changes to schedule or phases	☑
Changes in construction materials	☑
(1) Any field changes not identified for field location or field determination by QSP must be approved by QSD	

1.5 RETENTION OF RECORDS

Paper or electronic records of documents required by this SWPPP shall be retained for a minimum of three years from the date generated or date submitted, whichever is later, for the following items:

- The onsite SWPPP with NOI, COIs, Annual Reports, and NOT
- All inspection reports

These records shall be available at the Site until construction is complete. Records assisting in the determination of compliance with the General Permit shall be made available within a reasonable time, to the Regional Water Board, State Water Board or U.S. Environmental

Protection Agency (EPA) upon request. Requests by the Regional Water Board for retention of records for a period longer than three years shall be adhered to.

1.6 REQUIRED NON-COMPLIANCE REPORTING

If a General Permit discharge violation occurs the QSP shall immediately notify the LRP and the LRP shall file a violation report electronically to the Regional Water Board within 30 days of identification of non-compliance using SMARTS. Corrective measures will be implemented immediately following the discharge or written notice of non-compliance from the Regional Water Board. Discharges and corrective actions will be documented on the NAL/NEL Exceedance Site Evaluation Report Form in CSMP Attachment 3 "Example Forms."

The report to the LRP and to the Regional Water Board will contain the following items:

- The date, time, location, nature of operation and type of unauthorized discharge.
- The cause or nature of the notice or order.
- The control measures (BMPs) deployed before the discharge event, or prior to receiving notice or order.
- The date of deployment and type of control measures (BMPs) deployed after the discharge event, or after receiving the notice or order, including additional measures installed or planned to reduce or prevent re-occurrence.

1.7 ANNUAL REPORT

The General Permit requires that permittees prepare, certify, and electronically submit an Annual Report no later than September 1st of each year. Reporting requirements are identified in Section XVI of the General Permit. Annual reports will be filed in SMARTS and in accordance with information required by the on-line forms.

1.8 CHANGES TO PERMIT COVERAGE

The General Permit allows for the reduction or increase of the total acreage covered under the General Permit when: a portion of the project is complete and/or conditions for termination of coverage have been met; when ownership of a portion of the project is purchased by a different entity; or when new acreage is added to the project.

Modified PRDs shall be filed electronically within 30 days of a reduction or increase in total disturbed area if a change in permit covered acreage is to be sought. The SWPPP shall be modified appropriately, shall be logged at the front of the SWPPP and cetrification of SWPPP amendments are to be kept in Appendix C*: Permit Registration Documents*.

1.9 NOTICE OF TERMINATION

A Notice of Termination (NOT) must be submitted electronically by the LRP via SMARTS to terminate coverage under the General Permit. The NOT must include a final Site Map and representative photographs of the project site that demonstrate final stabilization has been achieved. The NOT shall be submitted within 90 days of completion of construction. The Regional Water Board will consider a construction site complete when the conditions of the General Permit, Section II.D have been met.

SECTION 2 PROJECT INFORMATION

2.1 PROJECT AND SITE DESCRIPTION

2.1.1 Site Description

The McKinley/Fowler Elementary School project comprises approximately 21.63 acres including an undeveloped lot and Fowler Avenue, and is located across Fowler Avenue to the east from a house located at 2211 N Fowler Avenue in Fresno, California. The property does not currently have a street address, the Project APN is 674-130-01T (36.76609, -119.68129), approximately one mile north of Highway 180 and 3.75 miles east of Highway 168. The southern end of the site borders the Mill Ditch, and FMFCD basin "BS" is located immediately south of the Mill Ditch. The project is identified on the Vicinity Map in Appendix B*: Site Maps*.

2.1.2 Existing Conditions

As of the initial date of this SWPPP, the project site is former agricultural land used for row crops and orchards from at least 1937 to recently. In May 2018 the District submitted an Environmental Oversight Agreement (EOA) Application to the California Department of Toxic Substances Control (DTSC) to investigate the presence of hazardous materials at the proposed school site. DTSC determined it necessary to develop a Removal Workplan (RAW) to remove soil contaminated with of heavy metals (arsenic, hexavalent chromium, and lead), total petroleum hydrocarbons, and organochlorine pesticides (OCP, including chlordane, dichloro-diphenyltrichloroethane (DDT). From October 19, 2022 through December 31, 2020, 970 cubic yards of contaminated soil were removed and disposed from the site. On April 9, 2022 DTSC certified a Removal Action Complete Report (RACR) stating that the objectives of the RAW have been met within an acceptable risk management range. This information can be found on the California DTSC *Envirostor* database with the Envirostor ID Number 60002664.

2.1.3 Existing Drainage

The project site is relatively flat with elevations of the project site ranging from 340 to 334 feet above mean sea level (msl) with a gradient south. Surface drainage at the majority of the site percolates into the flat pervious field. During large storm events stormwater runnoff from the main field area would discharge into the existing Fowler Ave. and Weldon Ave. to be collected by FMFCD stormdrains.

Stormwater runnoff from Fowler Avenue is directed to the soil gutters and flows south as channelized flow to existing FMFCD stormdrains on both sides of Fowler Ave, approximately 50 feet north of the Mill Ditch. All FMFCD inlets convey underneath the Mill Ditch to FMFCD Basin "BS" immediately south of the project site.

Stormwater generated in the southern strip of the main site immediately north of the Mill Ditch flows as sheetflow south into the Mill Ditch. This runoff into the Mill Ditch is minimal as the project is relatively flat and the project site includes the banks of the Mill Ditch. The majority of the site discharges directly to FMFCD Basin "BS" and a very small area of the site discharges directly to the Mill Ditch (which discharges to the San Joaquin River), as defined by the State Waterboard. Existing stormwater conveyance systems are shown on the Site Map in Appendix B*: Site Maps*.

The project discharges to mainly to FMFCD Basin "BS" which is not listed for water quality impairments on the most recent 303(d) list. A minority the project discharges to the San Joaquin River which is listed for water quality impairment on the most recent 303(d)-list for:

- Invasive Species
- pH

2.1.4 Geology and Groundwater

The site is underlain by Ramona Loam which is characterized by loam from zero to 24 inches bsl, clay loam from 24 to 38 in bsl, and coarse sandy loam from 38 to 60 in bsl. Groundwater occurs beneath the site at approximately 280 feet below ground surface with a groundwater gradient is towards the east, according to the Department of Water Resources *Lines of Equal Elevation of Groundwater* (2011).

2.1.5 Project Description

Project grading will occur on approximately 21.25 acres of the project, which comprises approximately 98.23 percent of the total area. Grading will include fill activities, with the total graded material estimated to be 60,000 cubic yards. Approximately 30,000 cubic yards of fill material will be imported during grading activities. Soil will be stockpiled in the staging area or in as shown on the Site Map in Appendix B*: Site Maps*. Construction activities will not be phased.

2.1.6 Developed Condition

Post construction surface drainage from the school site will be directed throughout the site as sheet flow and channelized flow over the surface stormwater conveyance system where it will be collected by on-site stormdrains and roof drains. Stormdrains will tie into the existing FMFCD stormdrain system where stormwater will be directed south towards FMFCD Basin "BS" immediately south of the site.

The widened Fowler Avenue and new McKinley Avenue will convey stormwater to gutters on the street gutters where it will then be collected by FMFCD street gutter stormwater inlets which will also convey to FMFCD Basin "BS".

The southern strip of the site that borders the Mill Ditch includes a new asphalt walking path that will generate stormwater as sheetflow to the south until discharging into the Mill Ditch. This new sheetflow will be mitigated by the addition of riprap bank stabilization to the Mill Ditch and vegetation to intercept this sheetflow prior discharge.

Post construction drainage patterns and conveyance systems are presented on Figure 2: Site Map in Appendix B*: Site Maps*.

Table 2.1 Construction Site Estimates

Construction site area	21.63	acres
Percent impervious before construction	4.5	%
Runoff coefficient before construction	0.18	
Percent impervious after construction	53.2	%
Runoff coefficient after construction	0.56	

Table 2.1 Construction Site Estimates

Project Status	Runoff Coefficient	Site Area (acres)	Average Annual Rainfall (inches)	Average Annual Runoff (acre-feet)
Pre-Construction	0.18	21.63	12.5	4.14
Post-Construction	0.56	21.63	12.5	12.37

The project will convert 10.53 acres of developed and undeveloped land to building expansion, hardscape, including concrete sidewalk, curb and gutter, and asphalt concrete parking lots. The increase in imperviousness of the site will increase the Average Annual Runoff volume from the site by 8.23 acre-feet. This information is presented in Table 2.1.

2.2 PERMITS AND GOVERNING DOCUMENTS

In addition to the General Permit, the following documents have been taken into account while preparing this SWPPP

- Regional Water Board requirements
- Basin Plan requirements
- Contract Documents
- Air Quality Regulations and Permits

2.3 STORMWATER RUN-ON FROM OFFSITE AREAS

There is no anticipated offsite run-on to this construction site because the main school site is either surrounded by flat pervious areas or is above grade of the surrounding streets with gutters. The border of Fowler Avenue to the north of the site has stormwater drain inlets to dispose of stormwater that would run-on into the north of the site along Fowler Avenue.

2.4 FINDINGS OF THE CONSTRUCTION SITE SEDIMENT AND RECEIVING WATER RISK DETERMINATION

A construction site risk assessment has been performed for the project and the resultant risk level is Risk Level 1.

The risk level was determined through the use of the K, LS provided in SMARTS, a site-specific analysis. The risk level is based on project duration, location, proximity to impaired receiving waters and soil conditions. A copy of the Risk Level determination submitted on SMARTS with the PRDs is included in Appendix A*: Calculations*.

Table 2.2 and Table 2.3 summarize the sediment and receiving water risk factors and document the sources of information used to derive the factors.

Table 2.2 Summary of Sediment Risk

RUSLE Factor	**Value**	**Method for establishing value**
R	36.01	US Environmental Protection Agency Rainfall Erosivity Factor Calculator
K	0.2	SWRCB Map Risk Categories
LS	0.206	SWRCB Map Risk Categories
Total Predicted Sediment Loss (tons/acre)		**0**
Overall Sediment Risk Low Sediment Risk < 15 tons/ acre Medium Sediment Risk >= 15 and < 75 tons/acre High Sediment Risk >= 75 tons/acre		☒ **Low** ☐ **Medium** ☐ **High**

Table 2.3 Summary of Receiving Water Risk

Receiving Water Name	**303(d) Listed for Sediment Related Pollutant(1)**	**TMDL for Sediment Related Pollutant(1)**	**Beneficial Uses of COLD, SPAWN, and MIGRATORY(1)**
FMFCD Basin "BS"	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Overall Receiving Water Risk			☒ **Low** ☐ **High**
(1) If yes is selected for any option the Receiving Water Risk is High			

Risk Level 1 sites are subject to the narrative effluent limitations specified in the General Permit. The narrative effluent limitations require stormwater discharges associated with construction activity to minimize or prevent pollutants in stormwater and authorized non-stormwater through the use of controls, structures, and best management practices. This SWPPP has been prepared to address Risk Level 1 requirements (General Permit Attachment C).

2.5 CONSTRUCTION SCHEDULE

The site sediment risk was determined based on construction taking place February 6, 2023 and November 1, 2024. Modification or extension of the schedule (start and end dates) may affect risk determination and permit requirements. The LRP shall contact the QSD if the schedule changes during construction to address potential impact to the SWPPP.

2.6 POTENTIAL CONSTRUCTION ACTIVITY AND POLLUTANT SOURCES

Appendix D*: Construction Activities, Materials Used, and Associated Pollutants* includes a list of construction activities and associated materials that are anticipated to be used onsite. These activities and associated materials will or could potentially contribute pollutants, other than sediment, to stormwater runoff.

The anticipated activities and associated pollutants were used in Section 3 to select the Best Management Practices for the project. Location of anticipated pollutants and associated BMPs are show on the Site Map in Appendix B*: Site Maps*.

For sampling requirements for non-visible pollutants associated with construction activity please refer to Section 7.7.1. For a full and complete list of onsite pollutants, refer to the Material Safety Data Sheets (MSDS), which are retained onsite at the construction trailer.

2.7 IDENTIFICATION OF NON-STORMWATER DISCHARGES

Non-stormwater discharges consist of discharges which do not originate from precipitation events. The General Permit provides allowances for specified non-stormwater discharges that do not cause erosion or carry other pollutants.

Non-stormwater discharges into storm drainage systems or waterways, which are not authorized under the General Permit and listed in the SWPPP, or authorized under a separate NPDES permit, are prohibited.

Non-stormwater discharges that are authorized from this project site include the following:

- None

These authorized non-stormwater discharges will be managed with the stormwater and non-stormwater BMPs described in Section 3 of this SWPPP and will be minimized by the QSP.

Activities at this site that may result in unauthorized non-stormwater discharges include:

- Fuel/grease/oil leaks, drips, or spills
- Herbicide/pesticide mis-application, spills, or leaks
- Curing concrete/stucco/plaster contacting stormwater runnoff

- Concrete/stucco/plaster washout and waste storage
- Painting, paint storage
- Use of adhesives and degreasers
- Overwatering for dust control
- Trash

Steps will be taken, including the implementation of appropriate BMPs, to ensure that unauthorized discharges are eliminated, controlled, disposed, or treated on-site.

Discharges of construction materials and wastes, such as fuel or paint, resulting from dumping, spills, or direct contact with rainwater or stormwater runoff, are also prohibited.

2.8 REQUIRED SITE MAP INFORMATION

The construction project's Site Map(s) showing the project location, surface water boundaries, geographic features, construction site perimeter and general topography and other requirements identified in Attachment B of the General Permit is located in Appendix B*:* *Site Maps*. Table 2.6 identifies Map or Sheet Nos. where required elements are illustrated.

Table 2.6 Required Map Information

Included on Map/Plan Sheet No. (1)	Required Element
Figure 1	The project's surrounding area (vicinity)
Figure 2	Site layout
Figure 2	Construction site boundaries
Figure 2	Drainage areas
Figure 2	Discharge locations
Figure 2	Sampling locations, if applicable
Figure 2	Areas of soil disturbance (temporary or permanent)
Figure 2	Active areas of soil disturbance (cut or fill)
Figure 2	Locations of runoff BMPs
Figure 2	Locations of erosion control BMPs
Figure 2	Locations of sediment control BMPs
Figure 2	Locations of sensitive habitats, watercourses, or other features which are not to be disturbed
Figure 2	Waste storage areas
Figure 2	Vehicle storage areas
Figure 2	Material storage areas
Figure 2	Entrance and Exits
Figure 2	Fueling Locations

Notes: (1) Indicate maps or drawings that information is included on (e.g., Vicinity Map, Site Map, Drainage Plans, Grading Plans, Progress Maps, etc.)

SECTION 3 BEST MANAGEMENT PRACTICES

3.1 SCHEDULE FOR BMP IMPLEMENTATION

3.1.1 Project Specific BMP Descriptions

Table 3.1 BMP Implementation Schedule

	BMP	Implementation	Duration
Erosion Control	EC-1, Scheduling	Prior to Construction	Entirety of project
	EC-2, Preservation of Existing Vegetation	Start of Construction	Entirety of project
	EC-3, Hydraulic Mulch	During Construction	As needed during on-going construction activities
	EC-4, Hydroseed	During Construction	As needed during on-going construction activities
	EC-6, Straw Mulch	During Construction	As needed during on-going construction activities
	EC-7, Geotextiles and Mats	During Construction	As needed during on-going construction activities
	EC-8, Wood Mulching	During Construction	As needed for on-going landscaping activities
	EC-15, Soil Preparation-Roughening	Prior to Stabilization	As needed during soil preparation activities
	EC-16, Non-Vegetative Stabilization	Prior to Stabilization	As needed during on-going construction activities
Sediment Control	SE-1, Silt Fence	Prior to Construction	As needed during on-going construction activities
	SE-4, Check Dams	Prior to Construction	As needed during on-going construction activities
	SE-5, Fiber Rolls	During Construction	As needed during on-going construction activities
	SE-6, Gravel Bag Berm	During Construction	As needed during on-going construction activities
	SE-7, Street Sweeping	During Construction	Weekly, entirety of project
	SE-8, Sandbag Barrier	During Construction	As needed during on-going construction activities
	SE-10, Storm Drain Inlet Protection	Prior to Construction	As needed during on-going construction activities
	SE-14, Biofilter Bags	During Construction	As needed during on-going construction activities
Tracking Control	TC-1, Stabilized Construction Entrance and Exit	Start of Construction	Locations change as needed during on-going construction activities
	TC-2, Stabilized Construction Roadway	Start of Construction	Locations change as needed during on-going construction activities
Wind Erosion	WE-1, Wind Erosion Control	Start of Construction	Entirety of project

Table 3.1 BMP Implementation Schedule

	BMP	Implementation	Duration
Non-Stormwater Control	NS-1, Water Conservation Practices	During Construction	As needed during on-going construction activities
	NS-2, Dewatering Operation	During Construction	As needed during on-going construction activities
	NS-3, Paving and Grinding Operation	During Construction	As needed during on-going construction activities
	NS-6, Illicit Connection-Illegal Discharge Connection	During Construction	As needed during on-going construction activities
	NS-7, Potable Water Irrigation Discharge Detection	During Construction	As needed during on-going construction activities
	NS-8, Vehicle and Equipment Cleaning	During Construction	As needed during on-going construction activities
	NS-9, Vehicle and Equipment Fueling	During Construction	As needed during on-going construction activities
	NS-10, Vehicle and Equipment Maintenance	During Construction	As needed during on-going construction activities
	NS-12, Concrete Curing	During Construction	As needed during on-going construction activities
	NS-13, Concrete Finishing	During Construction	As needed during on-going construction activities
	NS-14, Material Over Water	During Construction	As needed during on-going construction activities
	NS-15, Demolition Adjacent to Water	During Construction	As needed during on-going demolition activities
Waste Management	WM-1, Material Delivery and Storage	During Construction	Entirety of project
	WM-2, Material Use	During Construction	Entirety of project
	WM-3, Stockpile Management	During Construction	Entirety of project
	WM-4, Spill Prevention and Control	During Construction	Entirety of project
	WM-5, Solid Waste Management	During Construction	Entirety of project
	WM-6, Hazardous Waste Management	During Construction	Entirety of project
	WM-7, Contaminated Soil Management	During Construction	Entirety of project
	WM-8, Concrete Waste Management	During Construction	Entirety of project
	WM-9, Sanitary-Septic Waste Management	During Construction	Entirety of project
	WM-10, Liquid Waste Management	During Construction	Entirety of project

3.2 EROSION AND SEDIMENT CONTROL

Erosion and sediment controls are required by the General Permit to provide effective reduction or elimination of sediment related pollutants in stormwater discharges and authorized non-stormwater discharges from the Site. Applicable BMPs are identified in this section for erosion control, sediment control, tracking control, and wind erosion control.

3.2.1 Erosion Control

Erosion control, also referred to as soil stabilization, consists of source control measures that are designed to prevent soil particles from detaching and becoming transported in stormwater runoff. Erosion control BMPs protect the soil surface by covering and/or binding soil particles.

This construction project will implement the following practices to provide effective temporary and final erosion control during construction:

1. Preserve existing vegetation where required and when feasible.
2. The area of soil disturbing operations shall be controlled such that the Contractor is able to implement erosion control BMPs quickly and effectively.
3. Stabilize non-active areas within 14 days of cessation of construction activities or sooner if stipulated by local requirements.
4. Control erosion in concentrated flow paths by applying erosion control blankets, check dams, erosion control seeding or alternate methods.
5. Prior to the completion of construction, apply permanent erosion control to remaining disturbed soil areas.

Sufficient erosion control materials shall be maintained onsite to allow implementation in conformance with this SWPPP.

The following temporary erosion control BMP selection table indicates the BMPs that shall be implemented to control erosion on the construction site. Fact Sheets for temporary erosion control BMPs are provided in Appendix E*: CASQA Stormwater BMP Handbook Portal: Construction Fact Sheets*.

Table 3.2 Temporary Erosion Control BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP Used		If not used, state reason
			YES	NO	
EC-1	Scheduling	✓	✓		
EC-2	Preservation of Existing Vegetation	✓	✓		
EC-3	Hydraulic Mulch	✓[2]	✓		
EC-4	Hydroseed	✓[2]	✓		
EC-5	Soil Binders	✓[2]		✓	Not needed.
EC-6	Straw Mulch	✓[2]	✓		
EC-7	Geotextiles and Mats	✓[2]	✓		
EC-8	Wood Mulching	✓[2]	✓		
EC-9	Earth Dike and Drainage Swales	✓[3]		✓	Not needed.
EC-10	Velocity Dissipation Devices			✓	Not needed.
EC-11	Slope Drains			✓	Not needed.
EC-12	Stream Bank Stabilization			✓	Not needed.
EC-14	Compost Blankets	✓[2]		✓	Not needed.
EC-15	Soil Preparation-Roughening		✓		
EC-16	Non-Vegetated Stabilization	✓[2]		✓	
WE-1	Wind Erosion Control	✓	✓		
Alternate BMPs Used:					**If used, state reason:**

[1] Applicability to a specific project shall be determined by the QSD.
[2] The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements.
[3] Run-on from offsite shall be directed away from all disturbed areas, diversion of offsite flows may require design/analysis by a licensed civil engineer and/or additional environmental permitting

These temporary erosion control BMPs shall be implemented in conformance with the following guidelines and as outlined in the BMP Factsheets provided in Appendix E*: CASQA Stormwater BMP Handbook Portal: Construction Fact Sheets*. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

3.2.2 Sediment Controls

Sediment controls are temporary or permanent structural measures that are intended to complement the selected erosion control measures and reduce sediment discharges from active construction areas. Sediment controls are designed to intercept and settle out soil particles that have been detached and transported by the force of water.

The following sediment control BMP selection table indicates the BMPs that shall be implemented to control sediment on the construction site. Fact Sheets for temporary sediment control BMPs are provided in Appendix E*: CASQA Stormwater BMP Handbook Portal: Construction Fact Sheets*.

Table 3.3 Temporary Sediment Control BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP used		If not used, state reason
			YES	NO	
SE-1	Silt Fence	✓[2] [3]	✓		
SE-2	Sediment Basin			✓	Not needed.
SE-3	Sediment Trap			✓	Not needed.
SE-4	Check Dams			✓	Not needed.
SE-5	Fiber Rolls	✓[2][3]	✓		
SE-6	Gravel Bag Berm	✓[3]	✓		
SE-7	Street Sweeping	✓	✓		
SE-8	Sandbag Barrier		✓		
SE-9	Straw Bale Barrier			✓	Not needed.
SE-10	Storm Drain Inlet Protection	✓	✓		
SE-11	ATS			✓	Not needed.
SE-12	Manufactured Linear Sediment Controls			✓	Not needed.
SE-13	Compost Sock and Berm	✓[3]		✓	Not needed.
SE-14	Biofilter Bags	✓[3]	✓		
TC-1	Stabilized Construction Entrance and Exit	✓	✓		
TC-2	Stabilized Construction Roadway		✓		
TC-3	Entrance Outlet Tire Wash			✓	
Alternate BMPs Used:					**If used, state reason:**

[1] Applicability to a specific project shall be determined by the QSD
[2] The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements
[3]Risk Level 2 &3 shall provide linear sediment control along toe of slope, face of slope, and at the grade breaks of exposed slope

These temporary sediment control BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix E*:*

CASQA Stormwater BMP Handbook Portal: Construction Fact Sheets. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

3.3 NON-STORMWATER CONTROLS AND WASTE AND MATERIALS MANAGEMENT

3.3.1 Non-Stormwater Controls

Non-stormwater discharges into storm drainage systems or waterways, which are not authorized under the General Permit, are prohibited. Non-stormwater discharges for which a separate NPDES permit is required by the local Regional Water Board are prohibited unless coverage under the separate NPDES permit has been obtained for the discharge. The selection of non-stormwater BMPs is based on the list of construction activities with a potential for non-stormwater discharges identified in Section 2.7 of this SWPPP.

The following non-stormwater control BMP selection table indicates the BMPs that shall be implemented to control sediment on the construction site. Fact Sheets for temporary non-stormwater control BMPs are provided in Appendix E*: CASQA Stormwater BMP Handbook Portal: Construction Fact Sheets*.

Non-stormwater BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix E*: CASQA Stormwater BMP Handbook Portal: Construction Fact Sheets*. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Table 3.4 Temporary Non-Stormwater BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP used		If not used, state reason
			YES	NO	
NS-1	Water Conservation Practices	✓	✓		
NS-2	Dewatering Operation			✓	Not needed.
NS-3	Paving and Grinding Operation		✓		
NS-4	Temporary Stream Crossing			✓	Not needed.
NS-5	Clear Water Diversion			✓	Not needed.
NS-6	Illicit Connection- Illegal Discharge Connection	✓	✓		
NS-7	Potable Water Irrigation Discharge Detection		✓		
NS-8	Vehicle and Equipment Cleaning	✓	✓		
NS-9	Vehicle and Equipment Fueling	✓	✓		
NS-10	Vehicle and Equipment Maintenance	✓	✓		
NS-11	Pile Driving Operation			✓	Not needed.
NS-12	Concrete Curing		✓		
NS-13	Concrete Finishing		✓		
NS-14	Material and Equipment Use Over Water		✓		
NS-15	Demolition Removal Adjacent to Water		✓		
NS-16	Temporary Batch Plants			✓	Not needed.
Alternate BMPs Used:			**If used, state reason:**		

[1] Applicability to a specific project shall be determined by the QSD

3.3.2 Materials Management and Waste Management

Materials management control practices consist of implementing procedural and structural BMPs for handling, storing and using construction materials to prevent the release of those materials into stormwater discharges. The amount and type of construction materials to be utilized at the Site will depend upon the type of construction and the length of the construction period. The materials may be used continuously, such as fuel for vehicles and equipment, or the materials may be used for a discrete period, such as soil binders for temporary stabilization.

Waste management consist of implementing procedural and structural BMPs for handling, storing and ensuring proper disposal of wastes to prevent the release of those wastes into stormwater discharges.

Materials and waste management pollution control BMPs shall be implemented to minimize stormwater contact with construction materials, wastes and service areas; and to prevent materials and wastes from being discharged off-site. The primary mechanisms for stormwater contact that shall be addressed include:

- Direct contact with precipitation
- Contact with stormwater run-on and runoff
- Wind dispersion of loose materials
- Direct discharge to the storm drain system through spills or dumping
- Extended contact with some materials and wastes, such as asphalt cold mix and treated wood products, which can leach pollutants into stormwater.

A list of construction activities is provided in Section 2.6. The following Materials and Waste Management BMP selection table indicates the BMPs that shall be implemented to handle materials and control construction site wastes associated with these construction activities. Fact Sheets for Materials and Waste Management BMPs are provided in Appendix E*: CASQA Stormwater BMP Handbook Portal: Construction Fact Sheets*.

Table 3.5 Temporary Materials Management BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP used		If not used, state reason
			YES	NO	
WM-01	Material Delivery and Storage	✓	✓		
WM-02	Material Use	✓	✓		
WM-03	Stockpile Management	✓	✓		
WM-04	Spill Preservation and Control	✓	✓		
WM-05	Solid Waste Management	✓	✓		
WM-06	Hazardous Waste Management	✓	✓		
WM-07	Contaminated Soil Management		✓		
WM-08	Concrete Waste Management	✓	✓		
WM-09	Sanitary-Septic Waste Management	✓	✓		
WM-10	Liquid Waste Management		✓		
Alternate BMPs Used:				**If used, state reason:**	

[1] Applicability to a specific project shall be determined by the QSD.

Material management BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix E*:* *CASQA Stormwater BMP Handbook Portal: Construction Fact Sheets*. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

3.4 POST CONSTRUCTION STORMWATER MANAGEMENT MEASURES

Post construction BMPs are permanent measures installed during construction, designed to reduce or eliminate pollutant discharges from the site after construction is completed.

This site is located in an area subject to a Phase I or Phase II Municipal Separate Storm Sewer System (MS4) permit approved Stormwater Management Plan. ☒ Yes ☐ No

If yes, state:

Post construction runoff reduction requirements have been satisfied through the MS4 program, this project is exempt from provision XIII A of the General Permit. A section of the Fresno Metropolitan Flood Control District's Stormwater Management Plan will be uploaded in SMARTS to document compliance with the MS4 post-construction requirements.

SECTION 4 BMP INSPECTION, AND MAINTENANCE

4.1 BMP INSPECTION AND MAINTENANCE

The General Permit requires routine weekly inspections of BMPs, along with inspections before, during, and after qualifying rain events. A BMP inspection checklist must be filled out for inspections and maintained on-site with the SWPPP. The inspection checklist includes the necessary information covered in Section 7.6. A blank inspection checklist can be found in Appendix F*: BMP Inspection Form*. Completed checklists shall be kept in CSMP Attachment 2 "Monitoring Records.

BMPs shall be maintained regularly to ensure proper and effective functionality. If necessary, corrective actions shall be implemented within 72 hours of identified deficiencies and associated amendments to the SWPPP shall be prepared by the QSD.

Specific details for maintenance, inspection, and repair of Construction Site BMPs can be found in the BMP Factsheets in Appendix E*: CASQA Stormwater BMP Handbook Portal: Construction Fact Sheets*.

4.2 RAIN EVENT ACTION PLANS

Rain Event Action Plans (REAPs) are not required for Risk Level 1 projects.

SECTION 5 TRAINING

Appendix G*:* *Training Reporting Form* identifies the QSPs for the project and those who have been trained by the QSP. To promote stormwater management awareness specific for this project, periodic training of job-site personnel shall be included as part of routine project meetings (e.g. daily/weekly tailgate safety meetings), or task specific trainings as needed.

The QSP shall be responsible for providing this information at the meetings, and subsequently completing the training logs shown in Appendix G*:* *Training Reporting Form*, which identifies the site-specific stormwater topics covered as well as the names of site personnel who attended the meeting. Tasks may be delegated to trained employees by the QSP provided adequate supervision and oversight is provided. Training shall correspond to the specific task delegated including: SWPPP implementation; BMP inspection and maintenance; and record keeping.

Documentation of training activities (formal and informal) is retained in SWPPP Appendix G*: Training Reporting Form.*

SECTION 6 RESPONSIBLE PARTIES AND OPERATORS

6.1 RESPONSIBLE PARTIES

Approved Signatories who are responsible for SWPPP implementation and have authority to sign permit-related documents are listed below. The Approved Signatories for the project are listed and certified by the LRP in SMARTS. The Approved Signatories assigned to this project are:

Name	Title	Phone Number

QSPs identified for the project are identified in Appendix G*:* *Training Reporting Form*. The QSP shall have primary responsibility and significant authority for the implementation, maintenance and inspection/monitoring of SWPPP requirements. The QSP will be available at all times throughout the duration of the project. Duties of the QSP include but are not limited to:

- Implementing all elements of the General Permit and SWPPP, including but not limited to:
  - Ensuring all BMPs are implemented, inspected, and properly maintained;
  - Performing non-stormwater and stormwater visual observations and inspections;
  - Performing non-stormwater and storm sampling and analysis, as required;
  - Performing routine inspections and observations;
  - Implementing non-stormwater management, and materials and waste management activities such as: monitoring discharges; general Site clean-up; vehicle and equipment cleaning, fueling and maintenance; spill control; ensuring that no materials other than stormwater are discharged in quantities which will have an adverse effect on receiving waters or storm drain systems; etc.;
- The QSP may delegate these inspections and activities to an appropriately trained employee but shall ensure adequacy and adequate deployment.
- Ensuring elimination of unauthorized discharges.
- The QSPs shall be assigned authority by the LRP to mobilize crews in order to make immediate repairs to the control measures.

- Coordinate with the Contractor(s) to assure all of the necessary corrections/repairs are made immediately and that the project complies with the SWPPP, the General Permit and approved plans at all times.
- Notifying the LRP or Authorized Signatory immediately of off-site discharges or other non-compliance events.

6.2 CONTRACTOR LIST

Contractor

Name: _____

Title: _____

Company: _____

Address: _____

Phone Number: _____

Number (24/7): _____

SECTION 7 CONSTRUCTION SITE MONITORING PROGRAM

7.1 Purpose

This Construction Site Monitoring Program was developed to address the following objectives:

1. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives;
2. To determine whether immediate corrective actions, additional Best Management Practices (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in stormwater discharges and authorized non-stormwater discharges;
3. To determine whether BMPs included in the SWPPP are effective in preventing or reducing pollutants in stormwater discharges and authorized non-stormwater discharges.

7.2 Applicability of Permit Requirements

This project has been determined to be a Risk Level 1 project. The General Permit identifies the following types of monitoring as being applicable for a Risk Level 1 project.

Risk Level 1

- Visual inspections of Best Management Practices (BMPs);
- Visual monitoring of the site related to qualifying storm events;
- Visual monitoring of the site for non-stormwater discharges;
- Sampling and analysis of construction site runoff for non-visible pollutants when applicable; and
- Sampling and analysis of construction site runoff as required by the Regional Water Board when applicable.

7.3. Weather and Rain Event Tracking

Visual monitoring and inspections requirements of the General Permit are triggered by a qualifying rain event. The General Permit defines a qualifying rain event as any event that produces ½ inch of precipitation. A minimum of 48 hours of dry weather will be used to distinguish between separate qualifying storm events.

7.3.1 Weather Tracking

The QSP should daily consult the National Oceanographic and Atmospheric Administration (NOAA) for the weather forecasts. These forecasts can be obtained at http://www.srh.noaa.gov/. Weather reports should be printed and maintained with the SWPPP in CSMP Attachment 1 "Weather Reports".

7.3.2 Rain Gauges

The QSP shall install a rain gauge(s) on the project site. Locate the gauge in an open area away from obstructions such as trees or overhangs. Mount the gauge on a post at a height of 3 to 5 feet with the gauge extending several inches beyond the post. Make sure that the top of the gauge is level. Make sure the post is not in an area where rainwater can indirectly splash from sheds, equipment, trailers, etc.

The rain gauge(s) shall be read daily during normal site scheduled hours. The rain gauge should be read at approximately the same time every day and the date and time of each reading recorded. Log rain gauge readings in CSMP Attachment 1 "Weather Records". Follow the rain gauge instructions to obtain accurate measurements.

Once the rain gauge reading has been recorded, accumulated rain shall be emptied and the gauge reset.

For comparison with the site rain gauge, the nearest appropriate governmental rain gauge(s) is located at Fresno Yosemite International Airport, and can be accessed at the NOAA website.

7.4 Monitoring Locations

Monitoring locations are shown on the Site Maps in Appendix B*: Site Maps*. Monitoring locations are described in the Sections 7.6 and 7.7.

Whenever changes in the construction site might affect the appropriateness of sampling locations, the sampling locations shall be revised accordingly. All such revisions shall be implemented as soon as feasible and the SWPPP amended. Temporary changes that result in a one-time additional sampling location do not require a SWPPP amendment.

7.5 Sample Collection Safety, Monitoring, and Monitoring Exemptions

To maintain sample integrity and prevent cross-contamination, sampling collection personnel will:

- Wear a clean pair of surgical gloves prior to the collection and handling of each sample at each location.
- Not contaminate the inside of the sample bottle by not allowing it to come into contact with any material other than the water sample.
- Discard sample bottles or sample lids that have been dropped onto the ground prior to sample collection.
- Not leave the cooler lid open for an extended period of time once samples are placed inside.
- Not sample near a running vehicle where exhaust fumes may impact the sample.
- Not touch the exposed end of a sampling tube, if applicable.
- Avoid allowing rainwater to drip from rain gear or other surfaces into sample bottles
- Not eat, smoke, or drink during sample collection.
- Not sneeze or cough in the direction of an open sample bottle.
- Minimize the exposure of the samples to direct sunlight, as sunlight may cause biochemical transformation of the sample to take place.
- Decontaminate sampling equipment prior to sample collection using a TSP-soapy water wash, distilled water rinse, and final rinse with distilled water.
- Dispose of decontamination water/soaps appropriately; i.e., not discharge to the storm drain system or receiving water.

This project is not required to collect samples or conduct visual observations (inspections) under the following conditions:

- During dangerous weather conditions such as flooding and electrical storms.
- Outside of scheduled site business hours.

Scheduled site business hours are: Site Business Hours (M-F 7-5).

If monitoring (visual monitoring or sample collection) of the site is unsafe because of the dangerous conditions noted above, then the QSP shall document the conditions for why an exception to performing the monitoring was necessary. The exemption documentation shall be filed in CSMP Attachment 2 “Monitoring Records”.

7.6 Visual Monitoring

Visual monitoring includes observations and inspections. Inspections of BMPs are required to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Visual observations of the site are required to observe storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources.

Table 7.1 identifies the required frequency of visual observations and inspections. Inspections and observations will be conducted at the locations identified in Section 7.6.3.

Table 7.1 Frequency of Visual Observations and Inspections

Type of Inspection	Frequency
Routine Inspections	
BMP Inspections	
EC-01 Scheduling	Daily/Weekly
EC-02 Preservation of Vegetation	Daily/Weekly
EC-03 Hydro-Mulch	Daily/Weekly
EC-04 Hydro-Seed	Daily/Weekly
~~EC-05 Soil Binders~~	~~Daily/Weekly~~
EC-06 Straw Mulch	Daily/Weekly
EC-07 Geotextiles, Plastic Covers, & Erosion Control	Daily/Weekly
EC-08 Wood Mulching	Daily/Weekly
~~EC-09 Earth Dikes and Drainage Swales~~	~~Daily/Weekly~~
~~EC-10 Velocity Dissipation Devices~~	~~Daily/Weekly~~
~~EC-11 Slope Drains~~	~~Daily/Weekly~~
EC-12Streambank Stabilization	Daily/Weekly
~~EC-14Compost Blanket~~	~~Daily/Weekly~~
EC-15Soil Preparation/Roughening	Daily/Weekly
EC-16 non-Vegetative Stabilization	Daily/Weekly

SE-01 Silt Fence	Daily/Weekly
~~SE-02 De-Silting Basin~~	~~Daily/Weekly~~
~~SE-03Sediment Trap~~	~~Daily/Weekly~~
~~SE-04 Check Dams~~	~~Daily/Weekly~~
SE-05 Fiber Rolls	Daily/Weekly
SE-06 Gravel Bag Berm	Daily/Weekly
SE-07 Street Sweeping and Vacuuming	Daily/Weekly
SE-08 Sandbag Barrier	Daily/Weekly
~~SE-09 Straw Bale Barrier~~	~~Daily/Weekly~~
SE-10 Inlet Protection	Daily/Weekly
~~SE-11 Active Treatment Systems~~	~~Daily/Weekly~~
~~SE-12 Manufactured Linear Sediment Controls~~	~~Daily/Weekly~~
~~SE-13 Compost Socks and Berms~~	~~Daily/Weekly~~
SE-14 Biofilter Bags	Daily/Weekly
WE-01 Wind Erosion Control	Daily/Weekly
TC-01 Stabilized entrance/exit	Daily/Weekly
TC-02 Stabilized Construction Roadway	Daily/Weekly
~~TC-03 Entrance/Outlet Tire Wash~~	~~Daily/Weekly~~
NS-01 Water Conservation Practices	Daily/Weekly
NS-02 Dewatering Operations	Daily/Weekly
NS-03 Paving & Grinding Operations	Daily/Weekly
~~NS-04 Temporary Stream Crossing~~	~~Daily/Weekly~~
~~NS-05 Clear Water Diversion~~	~~Daily/Weekly~~
NS-06 Illicit Connection/Discharge	Daily/Weekly
NS-07 Potable Water/Irrigation	Daily/Weekly
NS-08 Vehicle & Equipment Cleaning	Daily/Weekly
NS-09 Vehicle and Equipment Fueling	Daily/Weekly
NS-10 Vehicle & Equipment Maintenance	Daily/Weekly
NS-12 Concrete Curing	Daily/Weekly
NS-13 Concrete Finishing	Daily/Weekly
NS-14 Material Over Water	Daily/Weekly
NS-15 Demolition Adjacent to Water	Daily/Weekly
~~NS-16 Temporary Batch Plants~~	~~Daily/Weekly~~
WM-01 Material Delivery and Storage	Daily/Weekly
WM-02 Material Use	Daily/Weekly

WM-03 Stockpile Management	Daily/Weekly
WM-04 Spill Prevention and Control	Daily/Weekly
WM-05 Solid Waste Management	Daily/Weekly
WM-06 Hazardous Waste Management	Daily/Weekly
WM-07 Contaminated Soil Management	Daily/Weekly
WM-08 Concrete Waste Management	Daily/Weekly
WM-09 Sanitary/Septic Waste Management	Daily/Weekly
WM-10 Liquid Waste Management	Daily/Weekly
Non-Stormwater Discharge Observations	Quarterly during daylight hours
Rain Event Triggered Inspections	
Site Inspections Prior to a QRE	Within 48 hours of a QRE [1]
BMP Inspections During an Extended Storm Event	Every 24-hour period of a extended storm event [1]
Site Inspections Following a QRE	Within 48 hours of a QRE [1]

7.6.1 Routine Observations and Inspections

Routine site inspections and visual monitoring are necessary to ensure that the project is in compliance with the requirements of the Construction General Permit.

7.6.1.1 Routine BMP Inspections

Inspections of BMPs are conducted to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

7.6.1.2 Non-Stormwater Discharge Observations

Each drainage area will be inspected for the presence of or indications of prior unauthorized and authorized non-stormwater discharges. Inspections will record:

- Presence or evidence of any non-stormwater discharge (authorized or unauthorized);
- Pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.); and
- Source of discharge.

7.6.2 Rain-Event Triggered Observations and Inspections

Visual observations of the site and inspections of BMPs are required prior to a qualifying rain event; following a qualifying rain event, and every 24-hour period during a qualifying rain event.

Pre-rain inspections will be conducted after consulting NOAA and determining that a precipitation event with a 50% or greater probability of precipitation has been predicted.

7.6.2.1 Visual Observations Prior to a Forecasted Qualifying Rain Event

Within 48-hours prior to a qualifying event a stormwater visual monitoring site inspection will include observations of the following locations:

- Stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutant sources;
- BMPs to identify if they have been properly implemented;
- Any stormwater storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

Consistent with guidance from the State Water Resources Control Board, pre-rain BMP inspections and visual monitoring will be triggered by a NOAA forecast that indicates a probability of precipitation of 50% or more in the project area.

7.6.2.2 BMP Inspections During an Extended Storm Event

During an extended rain event BMP inspections will be conducted to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

If the construction site is not accessible during the rain event, the visual inspections shall be performed at all relevant outfalls, discharge points, downstream locations. The inspections should record any projected maintenance activities.

7.6.2.2 Visual Observations Following a Qualifying Rain Event

Within 48 hours following a qualifying rain event (0.5 inches of rain) a stormwater visual monitoring site inspection is required to observe:

- Stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutant sources;
- BMPs to identify if they have been properly designed, implemented, and effective;
- Need for additional BMPs;
- Any stormwater storage and containment areas to detect leaks and ensure maintenance of adequate freeboard; and
- Discharge of stored or contained rain water.

7.6.3 Visual Monitoring Procedures

Visual monitoring shall be conducted by the QSP or staff trained by and under the supervision of the QSP.

The name(s) and contact number(s) of the site visual monitoring personnel are listed below and their training qualifications are provided in Appendix G*:* *Training Reporting Form*.

Assigned inspector: _____ Contact phone: _____

Alternate inspector: _____ Contact phone: _____

Stormwater observations shall be documented on the *Visual Inspection Field Log Sheet* (see CSMP Attachment 3 "Example Forms"). BMP inspections shall be documented on the site-specific BMP inspection checklist. Any photographs used to document observations will be referenced on stormwater site inspection report and maintained with the Monitoring Records in Attachment 2.

The completed reports will be kept in CSMP Attachment 2 "Monitoring Records".

7.6.4 Visual Monitoring Follow-Up and Reporting

Correction of deficiencies identified by the observations or inspections, including required repairs or maintenance of BMPs, shall be initiated and completed as soon as possible.

If identified deficiencies require design changes, including additional BMPs, the implementation of changes will be initiated within 72 hours of identification and be completed as soon as possible. When design changes to BMPs are required, the SWPPP shall be amended to reflect the changes.

Deficiencies identified in site inspection reports and correction of deficiencies will be tracked on the *Inspection Field Log Sheet* or *BMP Inspection Report* and shall be submitted to the QSP and shall be kept in CSMP Attachment 2 "Monitoring Records".

Results of visual monitoring must be summarized and reported in the Annual Report.

7.6.5 Visual Monitoring Locations

The inspections and observations identified in Sections 7.6.1 and 7.6.2 will be conducted at the locations identified in this section.

7.7 Water Quality Sampling and Analysis

7.7.1 Sampling and Analysis Plan for Non-Visible Pollutants in Stormwater Runoff Discharges

This Sampling and Analysis Plan for Non-Visible Pollutants describes the sampling and analysis strategy and schedule for monitoring non-visible pollutants in stormwater runoff discharges from the project site.

Sampling for non-visible pollutants will be conducted when (1) a breach, leakage, malfunction, or spill is observed; and (2) the leak or spill has not been cleaned up prior to the rain event; and (3) there is the potential for discharge of non-visible pollutants to surface waters or drainage system.

The following construction materials, wastes, or activities, as identified in Section 2.6, are potential sources of non-visible pollutants to stormwater discharges from the project. Storage, use, and operational locations are shown on the Site Maps in Appendix B*: Site Maps*.

- None

The following existing site features, as identified in Section 2.6, are potential sources of non-visible pollutants to stormwater discharges from the project. Locations of existing site features contaminated with non-visible pollutants are shown on the Site Maps in Appendix B*: Site Maps*.

- None

The following soil amendments have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil and will be used on the project site. Locations of soil amendment application are shown on the Site Maps in Appendix B*: Site Maps*.

- None

7.7.1.1 Sampling Schedule

Samples for the potential non-visible pollutant(s) and a sufficiently large unaffected background sample shall be collected during the first two hours of discharge from rain events that result in a sufficient discharge for sample collection. Samples shall be collected during the site's scheduled hours and shall be collected regardless of the time of year and phase of the construction.

Collection of discharge samples for non-visible pollutant monitoring will be triggered when any of the following conditions are observed during site inspections conducted prior to or during a rain event.

- Materials or wastes containing potential non-visible pollutants are not stored under watertight conditions. Watertight conditions are defined as (1) storage in a watertight container, (2) storage under a watertight roof or within a building, or (3) protected by temporary cover and containment that prevents stormwater contact and runoff from the storage area.
- Materials or wastes containing potential non-visible pollutants are stored under watertight conditions, but (1) a breach, malfunction, leakage, or spill is observed, (2) the leak or spill is not cleaned up prior to the rain event, and (3) there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- A construction activity, including but not limited to those in Section 2.6, with the potential to contribute non-visible pollutants (1) was occurring during or within 24 hours prior to the rain event, (2) BMPs were observed to be breached, malfunctioning, or improperly implemented, and (3) there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- Soil amendments that have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil have been applied, and there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- Stormwater runoff from an area contaminated by historical usage of the site has been observed to combine with stormwater runoff from the site, and there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.

7.7.1.2 Sampling Locations – Not Required for Risk Level 1 Projects

Sampling locations are based on proximity to planned non-visible pollutant storage, occurrence or use; accessibility for sampling, and personnel safety. Planned non-visible pollutant sampling locations are shown on the Site Maps in Appendix B*: Site Maps* and include the locations identified in Table 7.5 through 7.10.

If a stormwater visual monitoring site inspection conducted prior to or during a storm event identifies the presence of a material storage, waste storage, or operations area with spills or the potential for the discharge of non-visible pollutants to surface waters or a storm drain system that is at a location not listed above and has not been identified on the Site Maps, sampling locations will be selected by the QSP using the same rationale as that used to identify planned locations. Non-visible pollutant sampling locations shall be identified by the QSP on the pre-rain event inspection form prior to a forecasted qualifying rain event.

7.7.1.3 Monitoring Preparation

Non-visible pollutant samples will be collected by:

Contractor	☐ Yes	☒ No
Consultant	☐ Yes	☒ No
Laboratory	☒ Yes	☐ No

Samples on the project site will be collected by the following:

Company Name:

Street Address:

City, State Zip:

Telephone Number:

Point of Contact:

Name of Sampler(s):

Name of Alternate(s):

The QSP or his/her designee will contact the sampling laboratory 24 hours prior to a predicted rain event or for an unpredicted event, as soon as a rain event begins if one of the triggering conditions is identified during an inspection to ensure that adequate sample collection personnel and supplies for monitoring non-visible pollutants are available and will be mobilized to collect samples on the project site in accordance with the sampling schedule.

7.7.1.4 Analytical Constituents

Table 7.11 lists the specific sources and types of potential non-visible pollutants on the project site and the water quality indicator constituent(s) for that pollutant.

Potential Pollutant Source/ Applicable Construction Activity	Water Quality Indicator Constituent
Adhesives	COD, Phenols, SVOCs
Asphalt Work	VOCs
Concrete/Masonry Work	
Sealant (Methyl Methacrylate)	SVOC
Curing Compounds	VOCs, SVOCs, pH
Ash, Slag, Sand	pH, Al, Ca, Va, Zn
Grading/Earthworks	
Gypsum/Lime amendments	pH
Contaminated Soil	Constituents specific to known contaminants, check with Laboratory
Landscaping	
Pesticides/Herbicides	Product dependent, see label and check with Laboratory
Fertilizers	TKN, NO_3, BOD, COD, DOC, Sulfate, NH_3, Phosphate, Potassium
Aluminum Sulfate	Al, TDS, Sulfate
Liquid Waste	Constituents specific to materials, check with Laboratory
Painting	
Resins	COD, SVOCs
Thinners	COD, VOCs
Paint strippers	VOCs, SVOCs, metals
Lacquers, varnishes, enamels	COD, VOCs, SVOCs
Sealants	COD
Adhesives	Phenols, SVOCs
Planting/Vegetation Management	
Vegetation Stockpiles	BOD
Sanitary Waste Sewer line breaks and portable toilets	BOD, Total/Fecal coliform
Soil Preparation/Amendments/Dust Control	
Polymer/Co-polymers	TKN, NO_3, BOD, COD, DOC, Sulfate, Ni
Lignin Sulfate	TDS, alkalinity
Psyllium	COD, TOC

Potential Pollutant Source/ Applicable Construction Activity	Water Quality Indicator Constituent
Guar/Plant Fums	COD, TOC, Ni
Solid Waste (leakage)	BOD
Vehicle and Equipment Use	
Batteries	Sulfuric acid; Pb, pH

7.7.1.5 Sample Collection

Samples of discharge shall be collected at the designated non-visible pollutant sampling locations shown on the Site Maps in Appendix B*: Site Maps* or in the locations determined by observed breaches, malfunctions, leakages, spills, operational areas, soil amendment application areas, and historical site usage areas that triggered the sampling event.

Grab samples shall be collected and preserved in accordance with the methods identified in the Table, "Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants" provided in Section 7.7.1.6. Only the QSP, or personnel trained in water quality sampling under the direction of the QSP shall collect samples.

Sample collection and handling requirements are described in Section 7.7.7.

7.7.1.6 Sample Analysis

Samples shall be analyzed using the analytical methods identified in the Table 7.12.

Samples will be analyzed by:

Laboratory Name:

Street Address:

City, State Zip:

Telephone Number:

Point of Contact:

ELAP Certification Number:

Samples will be delivered to the laboratory by:

Driven by Contractor	☐	Yes	☒	No
Picked up by Laboratory Courier	☒	Yes	☐	No
Shipped	☐	Yes	☒	No

Table 7.12 Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants

Constituent	Analytical Method	Minimum Sample Volume	Sample Containers	Sample Preservation	Reporting Limit	Maximum Holding Time
Lead Sulfate, Battery Acid	EPA 150.1 ph / EPA 300 Sulfate	500 ml	500 ml+ Plastic Container	Ice / refrigeration	10 ph / 10 Sulfate	14 days
Lead from Vehicle Batteries	EPA 6010b Lead	500 ml	500 ml+ Plastic Container	Nitric Acid	5 ppb	14 days
Solvents, VOC / SVOC	EPA 601/602 or EPA 624 0r EPA 625	40 ml	3 VOA	HCL	Several	14 days
Curing Compounds, non pigmented	SM 2310B/2320, EPA 150.1, 601, 602, 624, 625	1000 ml	500 ml Plastic	Ice / HCL	Several	ph 24 hrs / 14 Days
Sealants, COD	EPA 410.4	500 ml	500 ml Poly	H2SO4	10 mg/l	28 days
Fertilizer, Nitrates	EPA 300.0	100 ml	500 ml Poly	Non-Req	0,10	48 hrs
Notes:						

7.7.1.7 Data Evaluation and Reporting

The QSP shall complete an evaluation of the water quality sample analytical results.

Runoff/downgradient results shall be compared with the associated upgradient/unaffected results and any associated run-on results. Should the runoff/downgradient sample show an increased level of the tested analyte relative to the unaffected background sample, which cannot be explained by run-on results, the BMPs, site conditions, and surrounding influences shall be assessed to determine the probable cause for the increase.

As determined by the site and data evaluation, appropriate BMPs shall be repaired or modified to mitigate discharges of non-visible pollutant concentrations. Any revisions to the BMPs shall be recorded as an amendment to the SWPPP.

The General Permit prohibits the storm water discharges that contain hazardous substances equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4. The results of any non-stormwater discharge results that indicate the presence of a hazardous substance in excess of established reportable quantities shall be immediately reported to the Regional Water Board and other agencies as required by 40 C.F.R. §§ 117.3 and 302.4.

Results of non-visible pollutant monitoring shall be reported in the Annual Report.

7.7.2 Sampling and Analysis Plan for pH and Turbidity in Stormwater Runoff Discharges

Sampling and analysis of runoff for pH and turbidity is not required for Risk Level 1 projects.

7.7.3 Additional Monitoring Following an NEL Exceedance

This project is not subject to NELs.

7.7.4 Sampling and Analysis Plan for Non-Stormwater Discharges

This project is not subject to the non-stormwater sampling and analysis requirements of the General Permit because it is a Risk Level 1 project.

7.7.5 Sampling and Analysis Plan for Other Pollutants Required by the Regional Water Board

The Regional Water Board has not specified monitoring for additional pollutants.

7.7.6 Training of Sampling Personnel

Sampling personnel shall be trained to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring program (SWAMP) 2008 Quality Assurance Program Plan (QAPrP). Training records of designated contractor sampling personnel are provided in Appendix G*: Training Reporting Form*.

The stormwater sampler(s) and alternate(s) have received the following stormwater sampling training:

Name	Training

The stormwater sampler(s) and alternates have the following stormwater sampling experience:

Name	Experience

7.7.7 Sample Collection and Handling

7.7.7.1 Sample Collection

Samples shall be collected at the designated sampling locations shown on the Site Maps and listed in the preceding sections. Samples shall be collected, maintained and shipped in accordance with the SWAMP 2008 Quality Assurance Program Plan (QAPrP).

Grab samples shall be collected and preserved in accordance with the methods identified in preceding sections.

To maintain sample integrity and prevent cross-contamination, sample collection personnel shall follow the protocols below.

- Collect samples (for laboratory analysis) only in analytical laboratory-provided sample containers;
- Wear clean, powder-free nitrile gloves when collecting samples;
- Change gloves whenever something not known to be clean has been touched;
- Change gloves between sites;
- Decontaminate all equipment (e.g. bucket, tubing) prior to sample collection using a trisodium phosphate water wash, distilled water rinse, and final rinse with distilled water. (Dispose of wash and rinse water appropriately, i.e., do not discharge to storm drain or receiving water). Do not decontaminate laboratory provided sample containers;
- Do not smoke during sampling events;
- Never sample near a running vehicle;
- Do not park vehicles in the immediate sample collection area (even non-running vehicles);
- Do not eat or drink during sample collection; and
- Do not breathe, sneeze, or cough in the direction of an open sample container.

The most important aspect of grab sampling is to collect a sample that represents the entire runoff stream. Typically, samples are collected by dipping the collection container in the runoff flow paths and streams as noted below.

i. For small streams and flow paths, simply dip the bottle facing upstream until full.
ii. For larger stream that can be safely accessed, collect a sample in the middle of the flow stream by directly dipping the mouth of the bottle. Once again making sure that the opening of the bottle is facing upstream as to avoid any contamination by the sampler.
iii. For larger streams that cannot be safely waded, pole-samplers may be needed to safely access the representative flow.
iv. Avoid collecting samples from ponded, sluggish or stagnant water.
v. Avoid collecting samples directly downstream from a bridge as the samples can be affected by the bridge structure or runoff from the road surface.

Note, that depending upon the specific analytical test, some containers may contain preservatives. These containers should **never** be dipped into the stream, but filled indirectly from the collection container.

7.7.7.2 Sample Handling

Turbidity and pH measurements must be conducted immediately. Do not store turbidity or pH samples for later measurement.

Samples for laboratory analysis must be handled as follows. Immediately following sample collection:

- Cap sample containers;
- Complete sample container labels;
- Sealed containers in a re-sealable storage bag;
- Place sample containers into an ice-chilled cooler;
- Document sample information on the *Effluent Sampling Field Log Sheet*; and
- Complete the CoC.

All samples for laboratory analysis must be maintained between 0-6 degrees Celsius during delivery to the laboratory. Samples must be kept on ice, or refrigerated, from sample collection through delivery to the laboratory. Place samples to be shipped inside coolers with ice. Make sure the sample bottles are well packaged to prevent breakage and secure cooler lids with packaging tape.

Ship samples that will be laboratory analyzed to the analytical laboratory right away. Hold times are measured from the time the sample is collected to the time the sample is analyzed. The General Permit requires that samples be received by the analytical laboratory within 48 hours of the physical sampling (unless required sooner by the analytical laboratory).

Laboratory Name:

Address:

City, State Zip:

Telephone Number:

Point of Contact:

7.7.7.3 Sample Documentation Procedures

All original data documented on sample bottle identification labels, *Effluent Sampling Field Log Sheet*, and CoCs shall be recorded using waterproof ink. These shall be considered accountable documents. If an error is made on an accountable document, the individual shall make corrections by lining through the error and entering the correct information. The erroneous information shall not be obliterated. All corrections shall be initialed and dated.

Duplicate samples shall be identified consistent with the numbering system for other samples to prevent the laboratory from identifying duplicate samples. Duplicate samples shall be identified in the Effluent Sampling Field Log Sheet.

Sample documentation procedures include the following:

Sample Bottle Identification Labels: Sampling personnel shall attach an identification label to each sample bottle. Sample identification shall uniquely identify each sample location.

Field Log Sheets: Sampling personnel shall complete the *Effluent Sampling Field Log Sheet* and *Receiving Water Sampling Field Log Sheet* for each sampling event, as appropriate.

Chain of Custody: Sampling personnel shall complete the CoC for each sampling event for which samples are collected for laboratory analysis. The sampler will sign the CoC when the sample(s) is turned over to the testing laboratory or courier.

7.11 Quality Assurance and Quality Control

An effective Quality Assurance and Quality Control (QA/QC) plan shall be implemented as part of the CSMP to ensure that analytical data can be used with confidence. QA/QC procedures to be initiated include the following:

- Field logs;
- Clean sampling techniques;
- CoCs;
- QA/QC Samples; and
- Data verification.

Each of these procedures is discussed in more detail in the following sections.

7.11.1 Field Logs

The purpose of field logs is to record sampling information and field observations during monitoring that may explain any uncharacteristic analytical results. Sampling information to be included in the field log include the date and time of water quality sample collection, sampling personnel, sample container identification numbers, and types of samples that were collected. Field observations should be noted in the field log for any abnormalities at the sampling location (color, odor, BMPs, etc.). Field measurements for pH and turbidity should also be recorded in the field log. A Visual Inspection Field Log, an Effluent Sampling Field Log Sheet, are included in CSMP Attachment 3 “Example Forms”.

7.11.2 Clean Sampling Techniques

Clean sampling techniques involve the use of certified clean containers for sample collection and clean powder-free nitrile gloves during sample collection and handling. As discussed in Section

7.7.7, adoption of a clean sampling approach will minimize the chance of field contamination and questionable data results.

7.11.3 Chain of Custody

The sample CoC is an important documentation step that tracks samples from collection through analysis to ensure the validity of the sample. Sample CoC procedures include the following:

- Proper labeling of samples;
- Use of CoC forms for all samples; and
- Prompt sample delivery to the analytical laboratory.

Analytical laboratories usually provide CoC forms to be filled out for sample containers. An example CoC is included in CSMP Attachment 3 “Example Forms”.

7.11.4 QA/QC Samples

QA/QC samples provide an indication of the accuracy and precision of the sample collection; sample handling; field measurements; and analytical laboratory methods. The following types of QA/QC will be conducted for this project:

☐ Field Duplicates at a frequency of 5% or 1 duplicate minimum per sampling event
(Required for all sampling plans with field measurements or laboratory analysis)

☐ Equipment Blanks at a frequency of 1 duplicate
(Only needed if equipment used to collect samples could add the pollutants to sample)

☐ Field Blanks at a frequency of 1 duplicate
(Only required if sampling method calls for field blanks)

☐ Travel Blanks at a frequency of 1 duplicate
(Required for sampling plans that include VOC laboratory analysis)

7.11.4.1 Field Duplicates

Field duplicates provide verification of laboratory or field analysis and sample collection. Duplicate samples shall be collected, handled, and analyzed using the same protocols as primary samples. The sample location where field duplicates are collected shall be randomly selected from the discharge locations. Duplicate samples shall be collected immediately after the primary sample has been collected. Duplicate samples must be collected in the same manner and as close in time as possible to the original sample. Duplicate samples shall not influence any evaluations or conclusion.

7.11.4.2 Equipment Blanks

Equipment blanks provide verification that equipment has not introduced a pollutant into the sample. Equipment blanks are typically collected when:

- New equipment is used;
- Equipment that has been cleaned after use at a contaminated site;
- Equipment that is not dedicated for surface water sampling is used; or
- Whenever a new lot of filters is used when sampling metals.

7.11.4.3 Field Blanks

Field blanks assess potential sample contamination levels that occur during field sampling activities. De-ioninzed water field blanks are taken to the field, transferred to the appropriate container, and treated the same as the corresponding sample type during the course of a sampling event.

7.11.4.4 Travel Blanks

Travel blanks assess the potential for cross-contamination of volatile constituents between sample containers during shipment from the field to the laboratory. De-ioninzed water blanks are taken along for the trip and held unopened in the same cooler with the VOC samples.

7.11.5 Data Verification

After results are received from the analytical laboratory, the QSP shall verify the data to ensure that it is complete, accurate, and the appropriate QA/QC requirements were met. Data must be verified as soon as the data reports are received. Data verification shall include:

- Check the CoC and laboratory reports.
  Make sure all requested analyses were performed and all samples are accounted for in the reports.
- Check laboratory reports to make sure hold times were met and that the reporting levels meet or are lower than the reporting levels agreed to in the contract.
- Check data for outlier values and follow up with the laboratory.
  Occasionally typographical errors, unit reporting errors, or incomplete results are reported and should be easily detected. These errors need to be identified, clarified, and corrected quickly by the laboratory. The QSP should especially note data that is an order of magnitude or more different than similar locations or is inconsistent with previous data from the same location.
- Check laboratory QA/QC results.
  EPA establishes QA/QC checks and acceptable criteria for laboratory analyses. These data are typically reported along with the sample results. The QSP shall evaluate the reported QA/QC data to check for contamination (method, field, and equipment blanks), precision (laboratory matrix spike duplicates), and accuracy (matrix spikes and laboratory control samples). When QA/QC checks are outside acceptable ranges, the laboratory must flag the data, and usually provides an explanation of the potential impact to the sample results.
- Check the data set for outlier values and, accordingly, confirm results and re-analyze samples where appropriate.
  Sample re-analysis should only be undertaken when it appears that some part of the QA/QC resulted in a value out of the accepted range. Sample results may not be discounted unless the analytical laboratory identifies the required QA/QC criteria were not met and confirms this in writing.

Field data including inspections and observations must be verified as soon as the field logs are received, typically at the end of the sampling event. Field data verification shall include:

- Check field logs to make sure all required measurements were completed and appropriately documented;
- Check reported values that appear out of the typical range or inconsistent; Follow-up immediately to identify potential reporting or equipment problems, if appropriate, recalibrate equipment after sampling;
- Verify equipment calibrations;
- Review observations noted on the field logs; and
- Review notations of any errors and actions taken to correct the equipment or recording errors.

7.12 Records Retention

All records of stormwater monitoring information and copies of reports (including Annual Reports) must be retained for a period of at least three years from date of submittal or longer if required by the Regional Water Board.

Results of visual monitoring, field measurements, and laboratory analyses must be kept in the SWPPP along with CoCs, and other documentation related to the monitoring.

Records are to be kept onsite while construction is ongoing. Records to be retained include:

- The date, place, and time of inspections, sampling, visual observations, and/or measurements, including precipitation;
- The individual(s) who performed the inspections, sampling, visual observation, and/or field measurements;
- The date and approximate time of field measurements and laboratory analyses;
- The individual(s) who performed the laboratory analyses;
- A summary of all analytical results, the method detection limits and reporting limits, and the analytical techniques or methods used;
- Rain gauge readings from site inspections;
- QA/QC records and results;
- Calibration records;
- Visual observation and sample collection exemption records;
- The records of any corrective actions and follow-up activities that resulted from analytical results, visual observations, or inspections

CSMP ATTACHMENT 1: WEATHER REPORTS

Place Printed NOAA weather forecasts in this attachment

CSMP ATTACHMENT 2: MONITORING RECORDS

Place completed BMP Inspection Forms, Visual Monitoring, Effluent Sampling and Receiving Water Field Logs, Monitoring Exceptions, in this Attachment.

CSMP ATTACHMENT 3: EXAMPLE FORMS

- *Rain Gauge Log Sheet*
- *Visual Inspection Field Log Sheet*
- *BMP Inspection Report*
- *NAL or NEL Exceedance Evaluations Summary Report*
- *Chain of Custody Forms*

Rain Gauge Log Sheet				
Construction Site Name: McKinley/Fowler Elementary School				
WDID #:				
Date (mm/dd/yy)	Time (24-hr)	Initials	Rainfall Depth (Inches)	Notes:

Risk Level 1, 2, 3 ***Visual Inspection Field Log Sheet***						
Date and Time of Inspection:				Report Date:		
Inspection Type:	☐ Weekly	☐ Before predicted rain	☐ During rain event	☐ Following qualifying rain event	☐ Contained stormwater release	☐ Quarterly non-stormwater
Site Information						
Construction Site Name: McKinley/Fowler Elementary School						
Construction stage and completed activities:				Approximate area of exposed site:		
Weather and Observations						
Date Rain Predicted to Occur:				Predicted % chance of rain:		
Estimate storm beginning: _____ (date and time)		Estimate storm duration:_____ (hours)		Estimate time since last storm: _____ (days or hours)	Rain gauge reading: _____ (inches)	
Observations: If yes identify location						
Odors	Yes ☐ No ☐					
Floating material	Yes ☐ No ☐					
Suspended Material	Yes ☐ No ☐					
Sheen	Yes ☐ No ☐					
Discolorations	Yes ☐ No ☐					
Turbidity	Yes ☐ No ☐					
Site Inspections						
Outfalls or BMPs Evaluated			**Deficiencies Noted**			
(add additional sheets or attached detailed BMP Inspection Checklists)						
Photos Taken:	Yes ☐	No ☐	Photo Reference IDs:			
Corrective Actions Identified (note if SWPPP/REAP change is needed)						
Inspector Information						
Inspector Name:				Inspector Title:		
Signature:				Date:		

Risk Level 2 – Not Applicable ***Effluent Sampling Field Log Sheets***			
Construction Site Name: McKinley/Fowler Elementary School		Date:	Time Start:
Sampler:			
Sampling Event Type:	☐ Stormwater	☐ Non-stormwater	☐ Non-visible pollutant
Field Meter Calibration			
pH Meter ID No./Desc.: Calibration Date/Time:		Turbidity Meter ID No./Desc.: Calibration Date/Time:	

Field pH and Turbidity Measurements			
Discharge Location Description	pH	Turbidity	Time

Grab Samples Collected		
Discharge Location Description	Sample Type	Time

Additional Sampling Notes:
Time End:

Risk Level 3 – Not Applicable ***Effluent Sampling Field Log Sheets***				
Construction Site Name: McKinley/Fowler Elementary School		Date:		Time Start:
Sampler:				
Sampling Event Type:	☐ Stormwater	☐ Non-stormwater	☐ Non-visible pollutant	☐ Post NEL Exceedance
Field Meter Calibration				
pH Meter ID No./Desc.: Calibration Date/Time:		Turbidity Meter ID No./Desc.: Calibration Date/Time:		
Field pH and Turbidity Measurements				
Discharge Location Description		pH	Turbidity	Time
Grab Samples Collected				
Discharge Location Description		SSC	Other (specify)	Time
Additional Sampling Notes:				
Time End:				

Risk Level 3 – Not Applicable ***Receiving Water Sampling Field Log Sheets***		
Construction Site Name: McKinley/Fowler Elementary School	Date:	Time Start:
Sampler:		

Receiving Water Description and Observations	
Receiving Water Name/ID:	
Observations:	
Odors	Yes ☐ No ☐
Floating material	Yes ☐ No ☐
Suspended Material	Yes ☐ No ☐
Sheen	Yes ☐ No ☐
Discolorations	Yes ☐ No ☐
Turbidity	Yes ☐ No ☐

Field Meter Calibration	
pH Meter ID No./Desc.: Calibration Date/Time:	Turbidity Meter ID No./Desc.: Calibration Date/Time:

Field pH and Turbidity Measurements and SSC Grab Sample			
Upstream Location			
Type	Result	Time	Notes
pH			
Turbidity			
SSC	Collected Yes ☐ No ☐		
Downstream Location			
Type	Result	Time	Notes
pH			
Turbidity			
SSC	Collected Yes ☐ No ☐		

Additional Sampling Notes:
Time End:

NAL or NEL Exceedance Evaluation Summary Report	Page __ of __
Project Name	**McKinley/Fowler Elementary School**
Project WDID	
Project Location	**PROJECT ADDRESS**
Date of Exceedance	
Type of Exceedance	**NAL Daily Average** ☐ **pH** ☐ **Turbidity** **NEL Daily Average** ☐ **pH** ☐ **Turbidity** ☐ **Other (specify) _____**
Measurement or Analytical Method	☐ **Field meter** **(Sensitivity: _____)** ☐ **Lab method (specify) _____** **(Reporting Limit: _____)** **(MDL: _____)**
Calculated Daily Average	☐ **pH _ pH units** ☐ **Turbidity __ NTU**
Rain Gauge Measurement	**_____ inches**
Compliance Storm Event	**_____ inches (5-year, 24-hour event)**
Visual Observations on Day of Exceedance	

NAL or NEL Exceedance Evaluation Summary Report	Page __ of __
Description of BMPs in Place at Time of Event	
Initial Assessment of Cause	
Corrective Actions Taken (deployed after exceedance)	
Additional Corrective Actions Proposed	
Report Completed By	_____ **(Print Name, Title)**
Signature	_____

CHAIN-OF-CUSTODY **DATE:** **Lab ID:**

DESTINATION LAB: ATTN: **ADDRESS:** **Office Phone:** **Cell Phone:**							REQUESTED ANALYSIS				Notes:
SAMPLED BY:											
Contact:											
Project Name				McKinley/Fowler Elementary School							
Client Sample ID	**Sample Date**	**Sample Time**	**Sample Matrix**	**Container #**	**Container Type**	**Container Pres.**					
SENDER COMMENTS:						**RELINQUISHED BY**					
						Signature:					
						Print:					
						Company:					
						Date:				TIME:	
LABORATORY COMMENTS:						**RECEIVED BY**					
						Signature:					
						Print:					
						Company:					
						Date:			TIME:		

SECTION 8 REFERENCES

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APPENDIX A: CALCULATIONS

221-0312
McKinley/Fowler Elementary School

Runoff Coefficient Calculation

Pre-Development

	C-Factor	% of Site	Effective "C"	
Graded Dirt	0.20	0.0%	0	
Fields w/ Weeds	0.15	0.0%	0	
Landscaping/Turf	0.15	95.5%	0.14325	
Concrete/Asphalt/Roof Top	0.90	4.5%	0.0405	
		100.0%	**0.18**	<<Effective "Pre-Development" C-Factor

Post-Development

	C-Factor	% of Site	Effective "C"	
Graded Dirt	0.20	0.0%	0	
Fields w/ Weeds	0.15	0.0%	0	
Landscaping/Turf	0.15	46.8%	0.0702	
Concrete/Asphalt/Roof Top	0.90	53.2%	0.4788	
		100.0%	**0.55**	<<Effective "Post-Development" C-Factor

Total Site Acreage **21.63** acres

Total Annual Rainfall **12.50** inches

Project Status	Runoff Coefficient	Site Area (acres)	Average Annual Rainfall (inches)	Average Annual Runoff (acre-feet)
Pre-Construction	0.18	21.63	12.50	4.14
Post-Construction	0.55	21.63	12.50	12.37

8.23 Difference Between the Two

Calculations Generated: 1/4/2023

221-0312
McKinley/Fowler Elementary School

Acres/Sqr-ft	2.30E-05

Pre Construction Project Area Cover

	Sqr-ft	Acres	Percent Cover
Non-Roof Impervious	42710	0.98	4.53%
Roof (imp)	0	0.00	0.00%
Pervious	899462	20.65	95.47%
Total	942172	21.63	100.00%

Post Construction Project Area Cover

	Sqr-ft	Acres	Percent Cover
Non-Roof Impervious	435547	10.00	46.23%
Roof (imp)	65906	1.51	7.00%
Pervious	440719	10.12	46.78%
Total	942172	21.63	100.00%

Work Area Calculations

	Sqr-ft	Acres	Percent Cover
Graded Areas	925495.6	21.25	98.23%
Disturbed Areas	925495.6	21.25	98.23%

Calculations Generated: 1/4/2023

AD-1

Water Boards Stormwater Multiple Application & Report Tracking System

Help Logout

You are logged-in as: **Paige Noga**
If this account does not belong to you, please log out.

Navigate To:

Risk

The application is organized into different tabs. Please complete all applicable tabs before submitting the form. If you want to complete the application at a later time, please click on "Save & Exit".

WDID/App ID:	- 553061	**Owner:**	Blair Church & Flynn Consulting Engineers	**Certified Date:**	
Status:	Not Submitted		451 Clovis Avenue Clovis CA 93612	**Processed Date:**	
Order No:	2009-0009-DWQ	**Site:**	Fowler McKinley ES TEST TEST	**NOT Effective Date:**	
Permit Type:	Construction - NOI		2211 N Fowler Ave Fresno CA 93727	**Previous ID:**	-

Owner Info | Developer Info | Site Info | Risk | Addl. Site Info | Post Construction | Billing Info | Attachments | Certification | Reports | Inspections | Print | Status History | Linked Users | NOTs | COIs

SEDIMENT RISK FACTOR WORKSHEET **Instructions: Enter R,K and LS factor values. System will calculate watershed erosion estimates and site sediment risk factor** **A. Sediment Risk**	
A) R Factor Value: (What's this?)	36.01 *Erosivity Calculator
B) K Factor Value (weighted average, by area, for all site soils) (What's this?) ***If not using the SWRCB map(Populate K Factor) upload your analysis on the Attachment Tab prior to submitting to the SWRCB.	0.2 * Populate K Factor
C) LS Factor (weighted average, by area, for all slopes) (What's this?) ***If not using the SWRCB map(Populate LS Factor) upload your analysis on the Attachment Tab prior to submitting to the SWRCB.	0.20601493 * Populate LS Factor
Watershed Erosion Estimate (=R*K*LS) in tons/acre	1.48371952586
Site Sediment Risk Factor Low Sediment Risk: < 15 tons/acre Medium Sediment Risk: >/= 15 and <75 tons/acre High Sediment Risk: >/= 75 tons/acre	Low

RECEIVING WATER (RW) RISK FACTOR WORKSHEET

A. Watershed Characteristics

A.1.(a) Does the disturbed area discharge directly or indirectly to a 303(d) listed waterbody impaired by sediment? OR A.1.(b) Is the disturbed area located within a sub-watershed draining to a 303(d) listed waterbody impaired by sediment? OR A.2. Is the disturbed area located within a planning watershed draining to a waterbody with designated beneficial uses of COLD, SPAWN AND MIGRATORY?	Populate Receiving Water Risk No * Yes = High, No = Low Statewide Map of High Receiving Water Risk Watersheds	Low

C. Combined Risk Level Matrix

		Sediment Risk: Low	Sediment Risk: Medium	Sediment Risk: High
Receiving Water Risk	Low	Level1	Level2	
	High		Level2	Level3

Project Sediment Risk:	Low
Project Receiving Water Risk:	Low
Project Combined Risk:	Level1

Save & Exit | Save & Continue

Fields marked with * are mandatory fields.

AD-1

AD-1

National Pollutant Discharge Elimination System (NPDES)

Rainfall Erosivity Factor Calculator for Small Construction Sites

EPA's stormwater regulations allow NPDES permitting authorities to waive NPDES permitting requirements for stormwater discharges from small construction sites if:

- the construction site disturbs less than five acres, and
- the rainfall erosivity factor ("R" in the revised universal soil loss equation, or RUSLE) value is less than five during the period of construction activity.

If your small construction project is located in an area where EPA is the permitting authority and your R factor is less than five, you qualify for a low erosivity waiver (LEW) from NPDES stormwater permitting. If your small construction project does not qualify for a waiver, then NPDES stormwater permit coverage is required. Follow the steps below to calculate your R-Factor.

LEW certifications are submitted through the NPDES eReporting Tool or "CGP-NeT". Several states that are authorized to implement the NPDES permitting program also accept LEWs. Check with your state NPDES permitting authority for more information.

- Submit your LEW through EPA's eReporting Tool
- List of states, Indian country, and territories where EPA is the permitting authority (pdf)
- Construction Rainfall Erosivity Waiver Fact Sheet
- Small Construction Waivers and Instructions (pdf)

The R-factor calculation can also be integrated directly into custom applications using the R-Factor web service.

For questions or comments, email EPA's CGP staff at cgp@epa.gov.

● Select the estimated start and end dates of construction by clicking the boxes and using the dropdown calendar.

The period of construction activity begins at initial earth disturbance and ends with final stabilization.

Start Date: 02/06/2023 **End Date:** 02/05/2024

● Locate your small construction project using the search box below or by clicking on the map.

Location: 36.76608, -119.68129 **Search**

AD-1

Click the "Calculate R Factor" button below to calculate an R Factor for your small construction project.

Calculate R Factor

Facility Information

Start Date: 02/06/2023	**Latitude:** 36.7661
End Date: 02/05/2024	**Longitude:** -119.6813

Calculation Results

Rainfall erosivity factor (R Factor) = **24.56**

A rainfall erosivity factor of 5.0 or greater has been calculated for your site's period of construction.

You do NOT qualify for a waiver from NPDES permitting requirements and must seek Construction General Permit (CGP) coverage. If you are located in an area where EPA is the permitting authority (pdf), you must submit a Notice of Intent (NOI) through the NPDES eReporting Tool (NeT).Otherwise, you must seek coverage under your state's CGP.

AD-1

National Pollutant Discharge Elimination System (NPDES)

Rainfall Erosivity Factor Calculator for Small Construction Sites

EPA's stormwater regulations allow NPDES permitting authorities to waive NPDES permitting requirements for stormwater discharges from small construction sites if:

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- List of states, Indian country, and territories where EPA is the permitting authority (pdf)
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- Small Construction Waivers and Instructions (pdf)

The R-factor calculation can also be integrated directly into custom applications using the R-Factor web service.

For questions or comments, email EPA's CGP staff at cgp@epa.gov.

● Select the estimated start and end dates of construction by clicking the boxes and using the dropdown calendar.

The period of construction activity begins at initial earth disturbance and ends with final stabilization.

Start Date: 02/06/2024 **End Date:** 11/01/2024

● Locate your small construction project using the search box below or by clicking on the map.

Location: 36.76608, -119.68129 **Search**

AD-1

Click the "Calculate R Factor" button below to calculate an R Factor for your small construction project.

Calculate R Factor

Facility Information

Start Date: 02/06/2024	**Latitude:** 36.7661
End Date: 11/01/2024	**Longitude:** -119.6813

Calculation Results

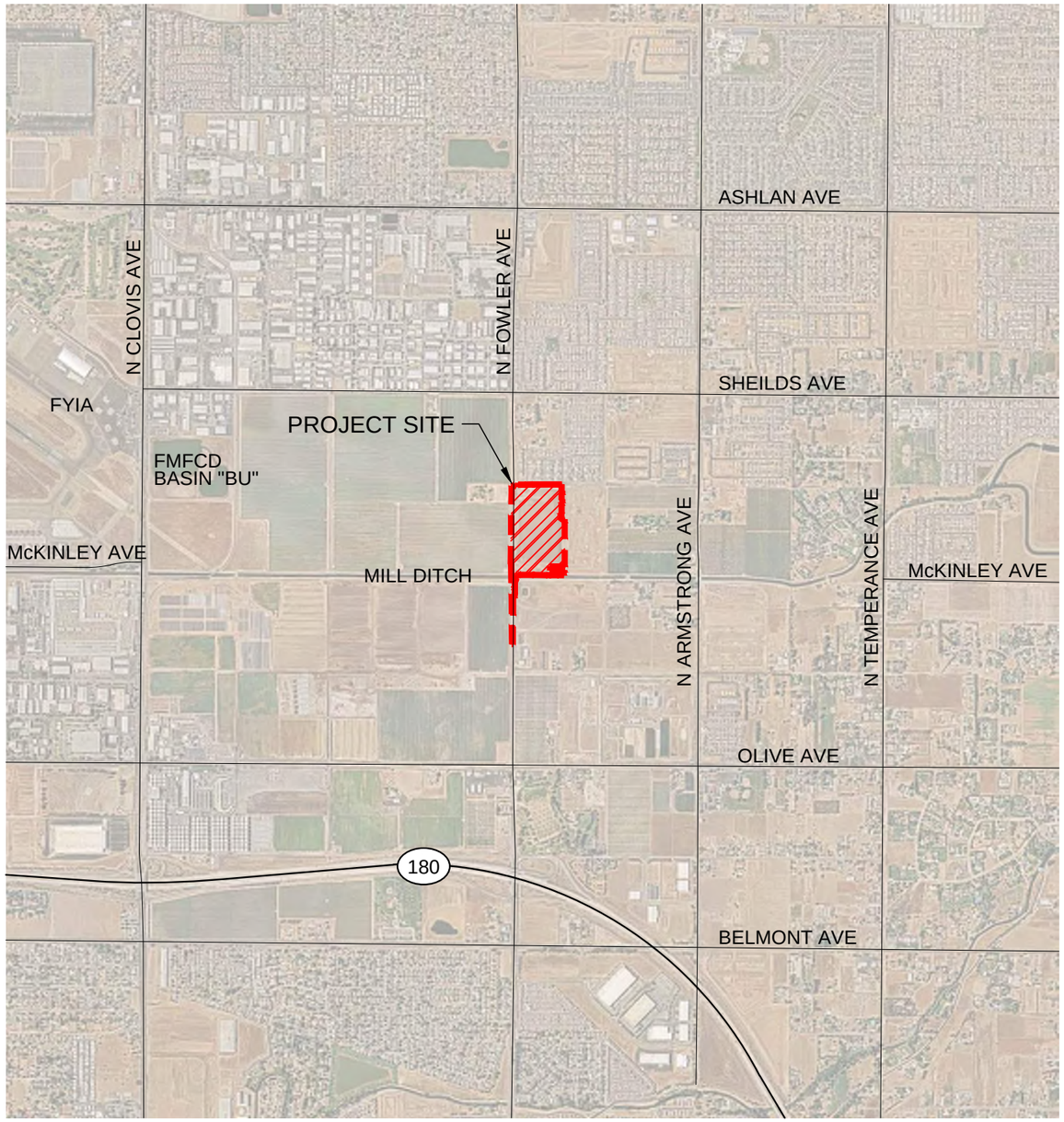
Rainfall erosivity factor (R Factor) = **11.45**

A rainfall erosivity factor of 5.0 or greater has been calculated for your site's period of construction.

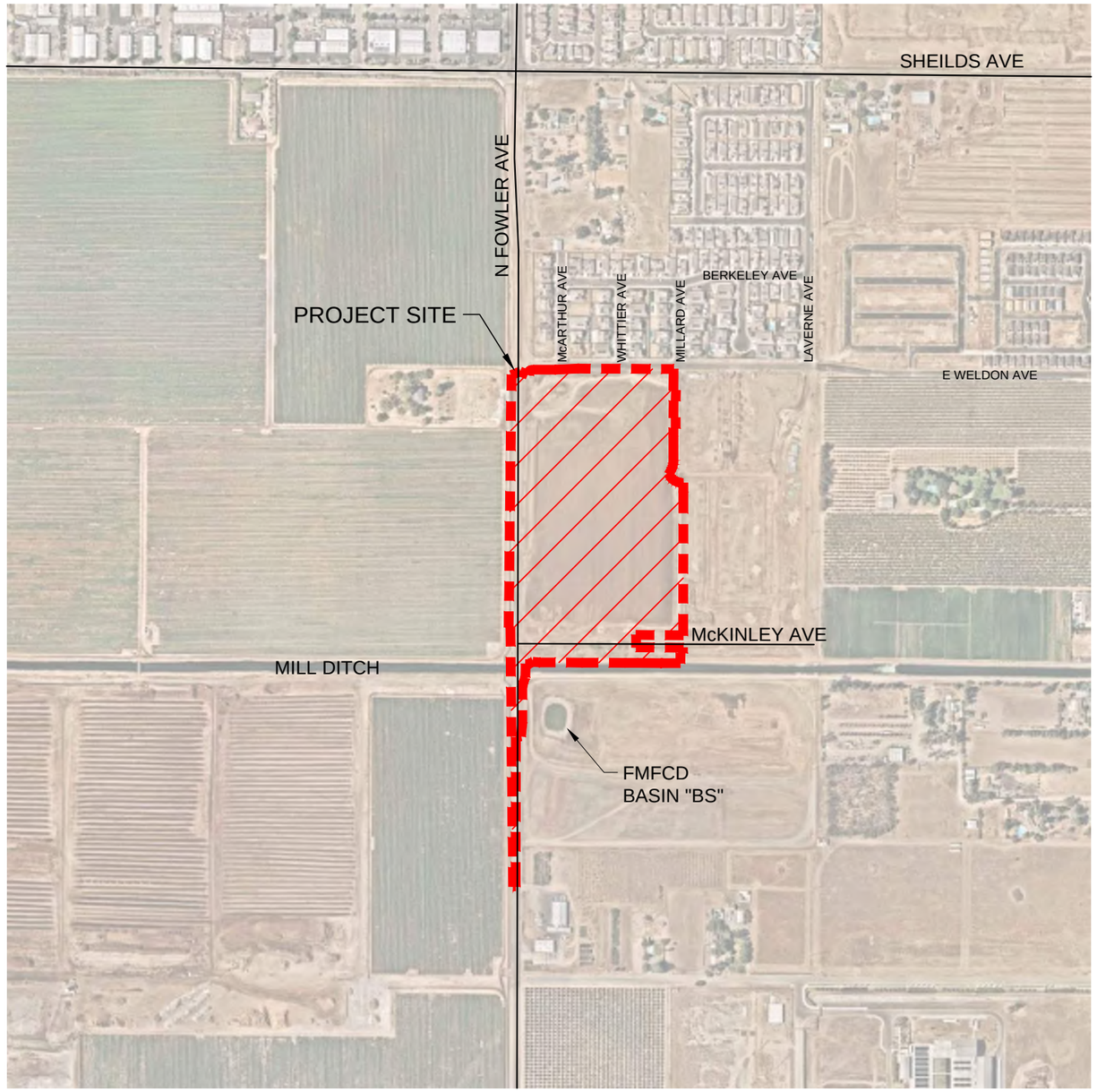
You do NOT qualify for a waiver from NPDES permitting requirements and must seek Construction General Permit (CGP) coverage. If you are located in an area where EPA is the permitting authority (pdf), you must submit a Notice of Intent (NOI) through the NPDES eReporting Tool (NeT).Otherwise, you must seek coverage under your state's CGP.

APPENDIX B: SITE MAPS

AD-1



PROJECT SITE
SCALE: 1"=2000'



PROJECT SITE
SCALE: 1"=600'

SITE LOCATION: APN: 674-130-01T | ACROSS FROM: 2211 N FOWLER AVE | FRESNO, CA 93727 | 36.76608, -119.68129 | FIGURE: 1A

Blair, Church & Flynn CONSULTING ENGINEERS

CONSULTANT
Blair, Church & Flynn Consulting Engineers
481 Clovis Avenue, Suite 200
Clovis, California 93612
Tel (559) 326-1400
Fax (559) 326-1500

CLOVIS UNIFIED SCHOOL DISTRICT

STORM WATER POLLUTION PREVENTION PLAN
McKINLEY FOWLER ELEMENTARY SCHOOL
LOCATION MAPS

DR. BY MG
CH. BY JM
DATE 01-05-2023
SCALE: AS NOTED

SHEET NO. 1
OF 5 SHEETS

Drawing: C:\Users\mgennaro\appdata\local\temp\AcPublish_28528\221312_Fowler McKinley_SWPPP Figures.dwg; Figure 1A Plot by: MGennaro Jan 05, 2023 - 12:18pm

SYMBOL LEGEND:

- PROTECT STORM WATER COLLECTION POINT/DRAIN INLET PER CASQA SE-10
- SURFACE FLOW DIRECTION
- PROJECT BOUNDARY
- LOCATION OF MINIMUM SITE PERIMETER CONTROL BMP'S. REFER TO NOTE 1 AND THE SWPPP FOR BMP DETAILS AND FACT SHEETS. EXACT LOCATIONS OF THE PERIMETER SEDIMENT CONTROL BMP'S SHALL BE COORDINATED WITH THE QSP PRIOR TO INSTALLATION OR REMOVAL. (PERIMETER CONTROL EXAMPLES MAY INCLUDE FIBER ROLLS, SILT FENCE, SANDBAGS, ETC.)
- PROPOSED STORM DRAIN PIPELINE
- SWALE/DRAINAGE/DITCH/CULVERT/FLOWLINE/VALLEY GUTTER
- EXISTING STORM DRAIN PIPELINE
- AREAS OF PROPOSED ASPHALT CONCRETE (IMPERVIOUS AREAS)
- AREAS OF PROPOSED CONCRETE (IMPERVIOUS AREAS)
- AREAS OF PROPOSED BRICK WALL (IMPERVIOUS AREAS)
- AREAS OF PROPOSED VEGETATION (PERVIOUS AREAS)
- AREAS TO BE STABILIZED AT CLOSEOUT IF DISTURBED
- LOCATION OF STABILIZED CONSTRUCTION ENTRANCE/EXIT PER CASQA TC-1
- AREAS OF PROPOSED BUILDING (IMPERVIOUS AREA)
- PROPOSED RIPRAP/GRAVEL/DECOMPOSED GRANITE (PERVIOUS AREA)
- AREA OF EXISTING ROAD TO BE DEMOLISHED AND REPLACED
- AREAS OF ACTIVE ASPHALT CONCRETE DEVELOPMENT BY NEIGHBORING DEVELOPER
- AREAS OF ACTIVE CONCRETE DEVELOPMENT BY NEIGHBORING DEVELOPER
- AREAS OF ACTIVE RIPRAP DEVELOPMENT BY NEIGHBORING DEVELOPER

STAGING AREA ITEMS:

1. CONCRETE WASHOUT LOCATION PER CASQA WM-08
2. LOCATION OF JOB TRAILER CONTAINING SPILL KIT AND ONSITE SWPPP
3. LOCATION OF RAIN GAUGE
4. MATERIAL STORAGE LOCATION PER CASQA WM-01
5. OVERNIGHT EQUIPMENT/VEHICLE STORAGE AND MAINTENANCE PER CASQA NS-8, NS-9 AND NS-10
6. RESTROOMS AND SANITARY FACILITIES PER CASQA WM-09
7. SOLID WASTE STORAGE LOCATION PER CASQA WM-05
8. STOCKPILE STORAGE LOCATION PER CASQW WM-03

NOTES TO CONTRACTOR:

1. THE BMPS DEPICTED HEREON ARE NOT A COMPLETE LIST. REFER TO THE SWPPP APPENDIX FOR A FULL DESCRIPTION OF BMPS.
2. IN ADDITION TO THE BMPS DEPICTED HEREON, THE QSP SHALL SELECT, IMPLEMENT AND MAINTAIN AN EFFECTIVE COMBINATION OF BOTH SEDIMENT AND EROSION CONTROL BMPS THROUGHOUT THE LIFE OF THE PROJECT. PERIMETER BMPS MAY INCLUDE SILT FENCE, SANDBAGS, FIBER ROLLS, BERMS, SWALES ETC.
3. STREET SURFACES SHALL BE SWEPT BY THE CONTRACTOR PER CASQA SE-7. VISIBLE SEDIMENT TRACKING SHALL BE SWEPT OR VACUUMED ON A DAILY BASIS.
4. DUST CONTROL PRACTICES SHALL CONFORM WITH THE LOCAL AIR DISTRICT AND CASQA WE-1.
5. IF CONSTRUCTION IS PHASED, BMPS MAY BE INSTALLED ONLY WITHIN ACTIVE AREAS OF CONSTRUCTION. ONCE EACH PHASE OF CONSTRUCTION IS COMPLETE AND PROJECT AREA IS STABILIZED, BMPS MAY BE REMOVED WITHIN THE STABILIZED AREA.
6. THE INDICATED BMP LOCATIONS ARE RECOMMENDATIONS FOR THE CONTRACTOR AND QSP. THE QSP SHALL CONTINUALLY UPDATE FIGURE 2 WITH THE ACTUAL LOCATIONS OF ALL BMPS, AND MAINTAIN A CURRENT COPY IN THE SITE SWPPP BINDER. IF THE IMPLEMENTED BMPS ARE SIGNIFICANTLY DIFFERENT FROM THOSE INDICATED IN THE SWPPP, A SWPPP AMENDMENT SHALL BE PREPARED AND SUBMITTED TO THE WATER BOARD.
7. THE INDICATED STAGING AREAS ARE ASSUMED FOR SCHEMATIC PURPOSED ONLY, AND SHOULD BE COORDINATED WITH THE OWNER. DEPICTION OF STAGING AREAS SHALL NOT GUARANTEE USE OF THOSE AREAS WITHOUT PRIOR PERMISSION. THE QSP SHALL CONTINUALLY UPDATE FIGURE 2 WITH THE ACTUAL LOCATIONS OF ALL STAGING, AND MAINTAIN A CURRENT COPY IN THE SITE SWPPP BINDER. ALL STAGING AREAS SHALL BE FULLY STABILIZED BEFORE CLOSEOUT.
8. FINAL STABILIZATION MUST BE IMPLEMENTED AT ANY AREA THAT HAS BEEN DISTURBED, AT ANY POINT DURING CONSTRUCTION, AND MUST REACH AT LEAST 70% ESTABLISHMENT BEFORE CLOSEOUT.
9. REFER TO THE CONSTRUCTION DRAWINGS FOR MORE DETAIL.

SITE LOCATION: APN: 674-130-01T | ACROSS FROM: 2211 N FOWLER AVE | FRESNO, CA 93727 | 36.76608, -119.68129

FIGURE: 1B

Blair, Church & Flynn CONSULTING ENGINEERS

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Blair, Church & Flynn Consulting Engineers
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Clovis, California 93612
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Fax (559) 326-1500

CLOVIS UNIFIED SCHOOL DISTRICT

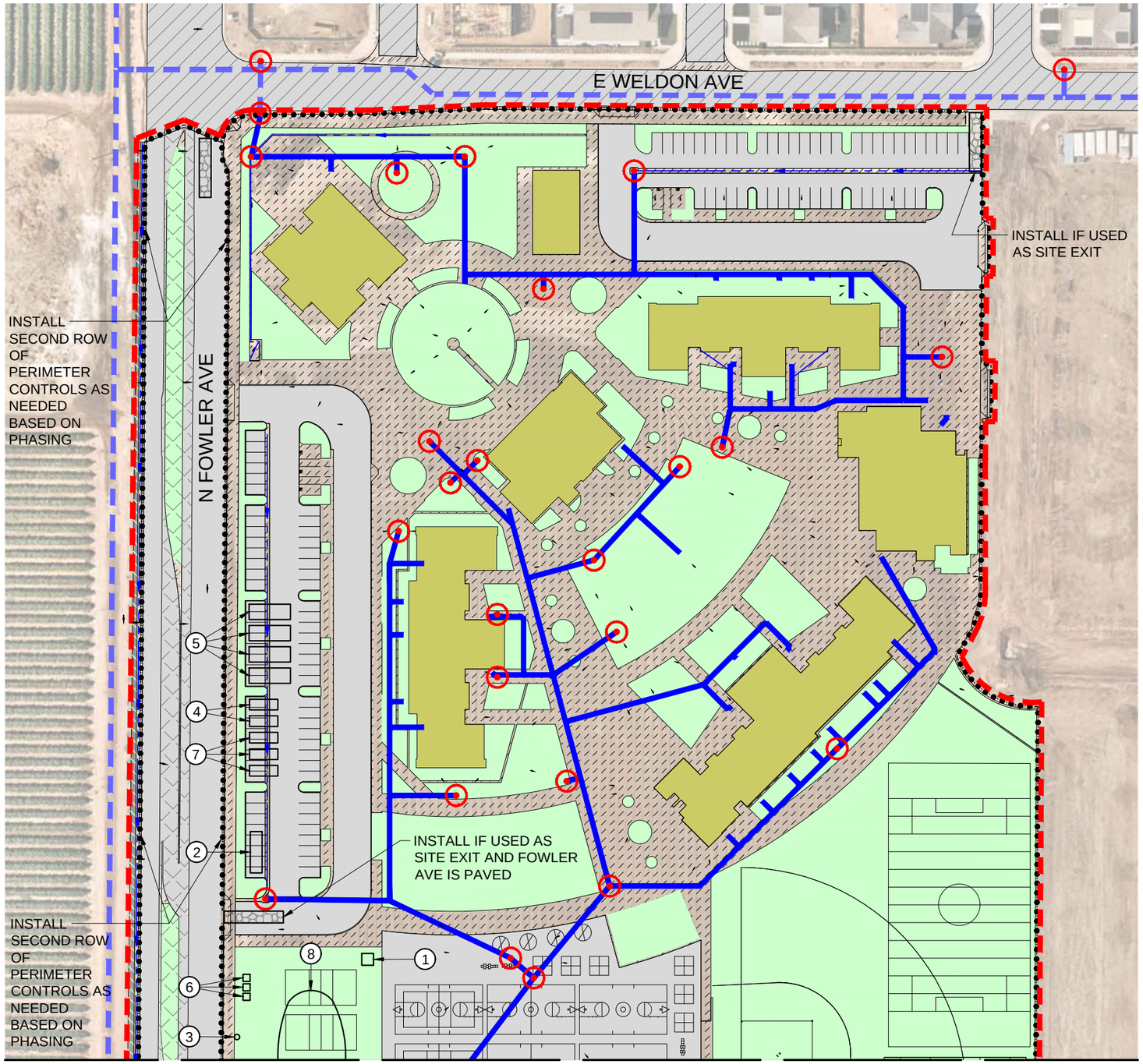
STORM WATER POLLUTION PREVENTION PLAN
McKINLEY FOWLER ELEMENTARY SCHOOL
LEGENDS AND NOTES

DR. BY MG
CH. BY JM
DATE 01-05-2023
SCALE: AS NOTED

SHEET NO. 2
OF 5 SHEETS

Drawing: C:\Users\mgennaro\appdata\local\temp\AcPublish_28528\221312_Fowler McKinley_SWPPP Figures.dwg; Figure 1B Plot by: MGennaro Jan 05, 2023 - 12:18pm

AD-1



MATCH LINE - SEE SHEET 2B

SYMBOL LEGEND:

- PROTECT STORM WATER COLLECTION POINT/DRAIN INLET PER CASQA SE-10
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- PROJECT BOUNDARY
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6. RESTROOMS AND SANITARY FACILITIES PER CASQA WM-09
7. SOLID WASTE STORAGE LOCATION PER CASQA WM-05
8. STOCKPILE STORAGE LOCATION PER CASQW WM-03

N

0 50 100 150 300
SCALE IN FEET

SITE LOCATION: APN: 674-130-01T | ACROSS FROM: 2211 N FOWLER AVE | FRESNO, CA 93727 | 36.76608, -119.68129 | FIGURE: 2A

Blair, Church & Flynn CONSULTING ENGINEERS

CONSULTANT
Blair, Church & Flynn Consulting Engineers
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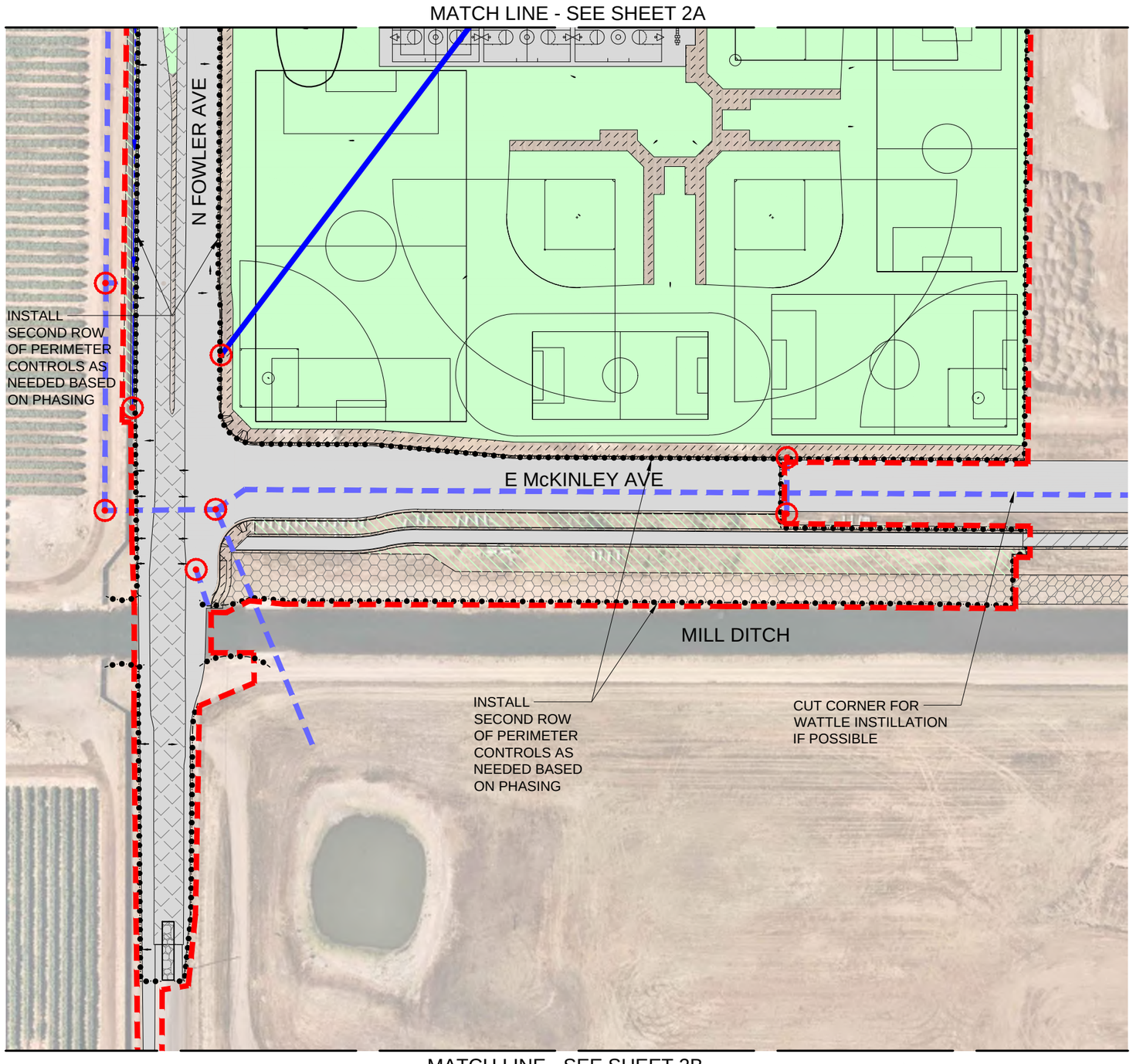
CLOVIS UNIFIED SCHOOL DISTRICT

STORM WATER POLLUTION PREVENTION PLAN
McKINLEY FOWLER ELEMENTARY SCHOOL
SITE MAP

DR. BY MG
CH. BY JM
DATE 01-05-2023
SCALE: AS NOTED

SHEET NO. 3
OF 5 SHEETS

Drawing: C:\Users\mgennaro\appdata\local\temp\AcPublish_28528\221312_Fowler McKinley_SWPPP Figures.dwg; Figure 2A Plot by: MGennaro Jan 05, 2023 - 12:18pm



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- PROPOSED STORM DRAIN PIPELINE
- SWALE/DRAINAGE/DITCH/CULVERT/FLOWLINE/VALLEY GUTTER
- EXISTING STORM DRAIN PIPELINE
- AREAS OF PROPOSED ASPHALT CONCRETE (IMPERVIOUS AREAS)
- AREAS OF PROPOSED CONCRETE (IMPERVIOUS AREAS)
- AREAS OF PROPOSED BRICK WALL (IMPERVIOUS AREAS)
- AREAS OF PROPOSED VEGETATION (PERVIOUS AREAS)
- AREAS TO BE STABILIZED AT CLOSEOUT IF DISTURBED
- LOCATION OF STABILIZED CONSTRUCTION ENTRANCE/EXIT PER CASQA TC-1
- AREAS OF PROPOSED BUILDING (IMPERVIOUS AREA)
- PROPOSED RIPRAP/GRAVEL/DECOMPOSED GRANITE (PERVIOUS AREA)
- AREA OF EXISTING ROAD TO BE DEMOLISHED AND REPLACED
- AREAS OF ACTIVE ASPHALT CONCRETE DEVELOPMENT BY NEIGHBORING DEVELOPER
- AREAS OF ACTIVE CONCRETE DEVELOPMENT BY NEIGHBORING DEVELOPER
- AREAS OF ACTIVE RIPRAP DEVELOPMENT BY NEIGHBORING DEVELOPER

STAGING AREA ITEMS:

1. CONCRETE WASHOUT LOCATION PER CASQA WM-08
2. LOCATION OF JOB TRAILER CONTAINING SPILL KIT AND ONSITE SWPPP
3. LOCATION OF RAIN GAUGE
4. MATERIAL STORAGE LOCATION PER CASQA WM-01
5. OVERNIGHT EQUIPMENT/VEHICLE STORAGE AND MAINTENANCE PER CASQA NS-8, NS-9 AND NS-10
6. RESTROOMS AND SANITARY FACILITIES PER CASQA WM-09
7. SOLID WASTE STORAGE LOCATION PER CASQA WM-05
8. STOCKPILE STORAGE LOCATION PER CASQW WM-03

N

0 50 100 150 300
SCALE IN FEET

SITE LOCATION: APN: 674-130-01T | ACROSS FROM: 2211 N FOWLER AVE | FRESNO, CA 93727 | 36.76608, -119.68129 | FIGURE: 2B

Blair, Church & Flynn CONSULTING ENGINEERS

CONSULTANT
Blair, Church & Flynn Consulting Engineers
481 Clovis Avenue, Suite 200
Clovis, California 93612
Tel (559) 326-1400
Fax (559) 326-1500

CLOVIS UNIFIED SCHOOL DISTRICT

STORM WATER POLLUTION PREVENTION PLAN
McKINLEY FOWLER ELEMENTARY SCHOOL
SITE MAP

DR. BY MG
CH. BY JM
DATE 01-05-2023
SCALE: AS NOTED

SHEET NO. 4
OF 5 SHEETS

Drawing: C:\Users\mgennaro\appdata\local\temp\AcPublish_28528\221312_Fowler McKinley_SWPPP Figures.dwg; Figure 2B Plot by: MGennaro Jan 05, 2023 - 12:18pm

AD-1

MATCH LINE - SEE SHEET 2A

SYMBOL LEGEND:

- PROTECT STORM WATER COLLECTION POINT/DRAIN INLET PER CASQA SE-10
- SURFACE FLOW DIRECTION
- PROJECT BOUNDARY
- LOCATION OF MINIMUM SITE PERIMETER CONTROL BMP'S. REFER TO NOTE 1 AND THE SWPPP FOR BMP DETAILS AND FACT SHEETS. EXACT LOCATIONS OF THE PERIMETER SEDIMENT CONTROL BMP'S SHALL BE COORDINATED WITH THE QSP PRIOR TO INSTALLATION OR REMOVAL. (PERIMETER CONTROL EXAMPLES MAY INCLUDE FIBER ROLLS, SILT FENCE, SANDBAGS, ETC.)
- PROPOSED STORM DRAIN PIPELINE
- SWALE/DRAINAGE/DITCH/CULVERT/FLOWLINE/VALLEY GUTTER
- EXISTING STORM DRAIN PIPELINE
- AREAS OF PROPOSED ASPHALT CONCRETE (IMPERVIOUS AREAS)
- AREAS OF PROPOSED CONCRETE (IMPERVIOUS AREAS)
- AREAS OF PROPOSED BRICK WALL (IMPERVIOUS AREAS)
- AREAS OF PROPOSED VEGETATION (PERVIOUS AREAS)
- AREAS TO BE STABILIZED AT CLOSEOUT IF DISTURBED
- LOCATION OF STABILIZED CONSTRUCTION ENTRANCE/EXIT PER CASQA TC-1
- AREAS OF PROPOSED BUILDING (IMPERVIOUS AREA)
- PROPOSED RIPRAP/GRAVEL/DECOMPOSED GRANITE (PERVIOUS AREA)
- AREA OF EXISTING ROAD TO BE DEMOLISHED AND REPLACED
- AREAS OF ACTIVE ASPHALT CONCRETE DEVELOPMENT BY NEIGHBORING DEVELOPER
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N

0 50 100 150 300
SCALE IN FEET

SITE LOCATION: APN: 674-130-01T | ACROSS FROM: 2211 N FOWLER AVE | FRESNO, CA 93727 | 36.76608, -119.68129 — FIGURE: 2C

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CONSULTANT
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CLOVIS UNIFIED SCHOOL DISTRICT

STORM WATER POLLUTION PREVENTION PLAN
McKINLEY FOWLER ELEMENTARY SCHOOL
SITE MAP

DR. BY	MG
CH. BY	JM
DATE	01-05-2023
SCALE:	AS NOTED

SHEET NO. 5 OF 5 SHEETS

Drawing: C:\Users\mgennaro\appdata\local\temp\AcPublish_28528\221312_Fowler McKinley_SWPPP Figures.dwg; Figure 2C Plot by: MGennaro Jan 05, 2023 - 12:18pm

APPENDIX C: PERMIT REGISTRATION DOCUMENTS

Permit Registration Documents
Notice of Intent
Change of Information (as applicable)
Annual Report(s)

APPENDIX D: CONSTRUCTION ACTIVITIES, MATERIALS USED, AND ASSOCIATED POLLUTANTS

Table D.1 Construction Activities and Associated Pollutants

Phase	Activity	Associated Materials or Pollutants
Demolition, Grading and Land Development	• Saw cut, crush, and remove existing concrete improvements • Saw cut, break up, and remove existing asphalt pavement • Remove trees, stump and roots • Remove turf and vegetation • Distribute material at designated areas • Deliver and empty trash bins • Deliver and service portable outhouses to site • Deliver materials to site and store in containers • Deliver equipment to site • Park equipment during off hours, refuel, check fluid levels, grease, service and repair (oil, hydraulics, cooling fluid, brake fluid, power steering fluid, etc.) • Import fill material • Excavate and compact areas	• Construction equipment fluids • Concrete rubble and dust • Saw cut wastewater • Sediment from erosion • Spills • Septic spills, cleaning fluids, and washout • Trash • Fueling drips and spills (gasoline, diesel) • Operating fluid drips and spills (oil, hydraulic, coolant, brake, power steering, etc.) • Grease drips
Landscaping and Site Stabilization Phase	• Deliver materials to site • Deliver mulch material to site • Excavate trenches • Install water irrigation pipelines, valves, emitters and bubblers • Install controller electrical service and valve control wires • Install valve boxes • Backfill and compact trenches • Blow lines and test sytem • Plant shrubs and trees • Hydroseed, as required	• Residue from materials • Mulches • Construction equipment fluids • Sediments • Shavings from conduit material • Wastewater and chlorinated water • PVC pipe dust, primer, and glue • Fertilizers • Herbicides • Trash

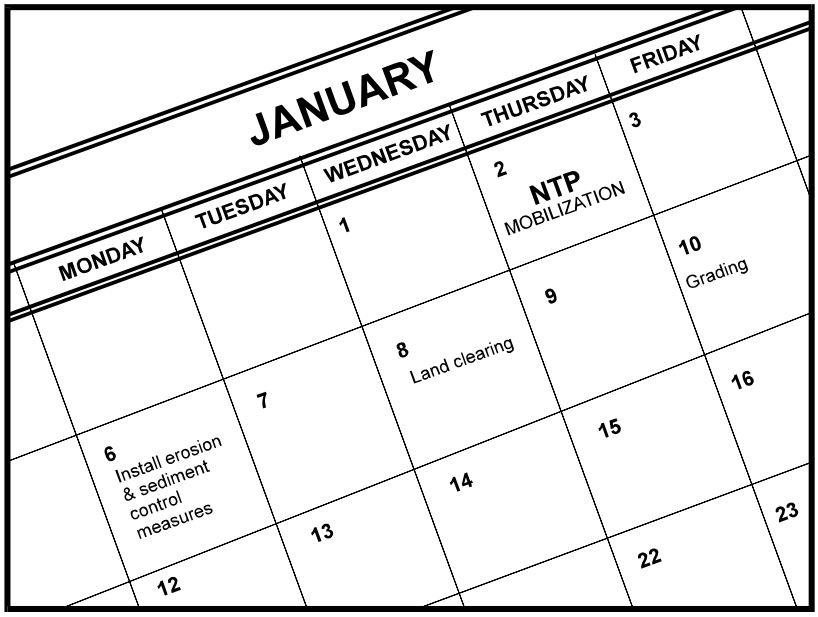
Table D.1 Construction Activities and Associated Pollutants

Phase	Activity	Associated Materials or Pollutants
Streets and Utilities Phase	• Excavate trenches • Install pipelines, laterals, and conduit • Install manholes and utility structures • Install inlets, cleanouts, valves, and conductors • Backfill and compact trenches • Install trench surface restoration • Excavate and compact subgrade • Install and compact base materials • Apply paint binder • Install forms and guide wires • Install concrete and concrete improvements • Install emulsion sealer • Paint pavement striping and markings	• Construction equipment fluids • Concrete paste and curing compound • Concrete and grout washout • Joint and form lubricants • Paints, thinners, and solvents • Sediments • Shavings from conduit material and sawdust • Trash • Wastewater and chlorinated water
Vertical Construction Phase	• Excavate building foundations • Distribute excavated materials as onsite fill • Construct foundation, building walls, and roof • Install building plumbing • Construct building exterior covering and interior • Install insulation and finish system • Apply trim accessories, primer, sealer, and weather resistant barrier coating • Install windows, electrical wiring, cabinets, and flooring • Install building HVAC • Texture walls, paint interiors and building • Touch-up painting and clean exposed finished surfaces	• Construction equipment fluids • Sediments • Concrete, grout, and stucco washout • Adhesives, cleaners, and sealants • Solder, lead, and heavy metal shavings • Cutting oil and welding slag • Steel and aluminum grindings • Roofing and flooring material trash • Sheetrock dust and sawdust • Insulation fibers • Ceramic tile dust and wash off water • Paint, lacquers, varnishes, thinners, stripping agents, sanding dust, stripping residue, paint washout, spills • Freon spills • Trash

Categories per CASQA BMP Handbook (i.e., Sediment, Nutrients, Bacteria and Viruses, Oil and Grease, Metals, Synthetic Organics, Pesticides, Gross Pollutants, and Vector Production)

APPENDIX E: CASQA STORMWATER BMP HANDBOOK PORTAL: CONSTRUCTION FACT SHEETS

Scheduling EC-1



Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.
- Plan the project and develop a schedule showing each phase of construction. Clearly show how the rainy season relates

Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

Scheduling EC-1

Inspection and Maintenance

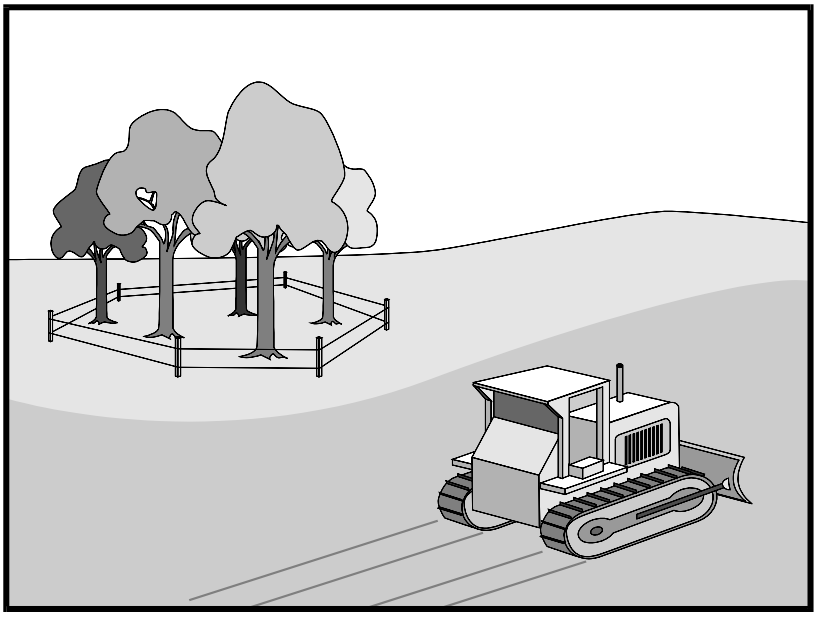
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Preservation Of Existing Vegetation EC-2



Categories

EC	Erosion Control	☑
SE	Sediment Control	
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WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Carefully planned preservation of existing vegetation minimizes the potential of removing or injuring existing trees, vines, shrubs, and grasses that protect soil from erosion.

Suitable Applications

Preservation of existing vegetation is suitable for use on most projects. Large project sites often provide the greatest opportunity for use of this BMP. Suitable applications include the following:

- Areas within the site where no construction activity occurs, or occurs at a later date. This BMP is especially suitable to multi year projects where grading can be phased.
- Areas where natural vegetation exists and is designated for preservation. Such areas often include steep slopes, watercourse, and building sites in wooded areas.
- Areas where local, state, and federal government require preservation, such as vernal pools, wetlands, marshes, certain oak trees, etc. These areas are usually designated on the plans, or in the specifications, permits, or environmental documents.
- Where vegetation designated for ultimate removal can be temporarily preserved and be utilized for erosion control and sediment control.

Preservation Of Existing Vegetation EC-2

Limitations

- Requires forward planning by the owner/developer, contractor, and design staff.
- Limited opportunities for use when project plans do not incorporate existing vegetation into the site design.
- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactory for the planned development.

Implementation

The best way to prevent erosion is to not disturb the land. In order to reduce the impacts of new development and redevelopment, projects may be designed to avoid disturbing land in sensitive areas of the site (e.g., natural watercourses, steep slopes), and to incorporate unique or desirable existing vegetation into the site's landscaping plan. Clearly marking and leaving a buffer area around these unique areas during construction will help to preserve these areas as well as take advantage of natural erosion prevention and sediment trapping.

Existing vegetation to be preserved on the site must be protected from mechanical and other injury while the land is being developed. The purpose of protecting existing vegetation is to ensure the survival of desirable vegetation for shade, beautification, and erosion control. Mature vegetation has extensive root systems that help to hold soil in place, thus reducing erosion. In addition, vegetation helps keep soil from drying rapidly and becoming susceptible to erosion. To effectively save existing vegetation, no disturbances of any kind should be allowed within a defined area around the vegetation. For trees, no construction activity should occur within the drip line of the tree.

Timing

- Provide for preservation of existing vegetation prior to the commencement of clearing and grubbing operations or other soil disturbing activities in areas where no construction activity is planned or will occur at a later date.

Design and Layout

- Mark areas to be preserved with temporary fencing. Include sufficient setback to protect roots.
  - Orange colored plastic mesh fencing works well.
  - Use appropriate fence posts and adequate post spacing and depth to completely support the fence in an upright position.
- Locate temporary roadways, stockpiles, and layout areas to avoid stands of trees, shrubs, and grass.
- Consider the impact of grade changes to existing vegetation and the root zone.
- Maintain existing irrigation systems where feasible. Temporary irrigation may be required.
- Instruct employees and subcontractors to honor protective devices. Prohibit heavy equipment, vehicular traffic, or storage of construction materials within the protected area.

Preservation Of Existing Vegetation EC-2

Costs

There is little cost associated with preserving existing vegetation if properly planned during the project design, and these costs may be offset by aesthetic benefits that enhance property values. During construction, the cost for preserving existing vegetation will likely be less than the cost of applying erosion and sediment controls to the disturbed area. Replacing vegetation inadvertently destroyed during construction can be extremely expensive, sometimes in excess of $10,000 per tree.

Inspection and Maintenance

During construction, the limits of disturbance should remain clearly marked at all times. Irrigation or maintenance of existing vegetation should be described in the landscaping plan. If damage to protected trees still occurs, maintenance guidelines described below should be followed:

- Verify that protective measures remain in place. Restore damaged protection measures immediately.
- Serious tree injuries shall be attended to by an arborist.
- Damage to the crown, trunk, or root system of a retained tree shall be repaired immediately.
- Trench as far from tree trunks as possible, usually outside of the tree drip line or canopy. Curve trenches around trees to avoid large roots or root concentrations. If roots are encountered, consider tunneling under them. When trenching or tunneling near or under trees to be retained, place tunnels at least 18 in. below the ground surface, and not below the tree center to minimize impact on the roots.
- Do not leave tree roots exposed to air. Cover exposed roots with soil as soon as possible. If soil covering is not practical, protect exposed roots with wet burlap or peat moss until the tunnel or trench is ready for backfill.
- Cleanly remove the ends of damaged roots with a smooth cut.
- Fill trenches and tunnels as soon as possible. Careful filling and tamping will eliminate air spaces in the soil, which can damage roots.
- If bark damage occurs, cut back all loosened bark into the undamaged area, with the cut tapered at the top and bottom and drainage provided at the base of the wood. Limit cutting the undamaged area as much as possible.
- Aerate soil that has been compacted over a trees root zone by punching holes 12 in. deep with an iron bar, and moving the bar back and forth until the soil is loosened. Place holes 18 in. apart throughout the area of compacted soil under the tree crown.
- Fertilization
  - Fertilize stressed or damaged broadleaf trees to aid recovery.
  - Fertilize trees in the late fall or early spring.

Preservation Of Existing Vegetation EC-2

- Apply fertilizer to the soil over the feeder roots and in accordance with label instructions, but never closer than 3 ft to the trunk. Increase the fertilized area by one-fourth of the crown area for conifers that have extended root systems.

- Retain protective measures until all other construction activity is complete to avoid damage during site cleanup and stabilization.

References

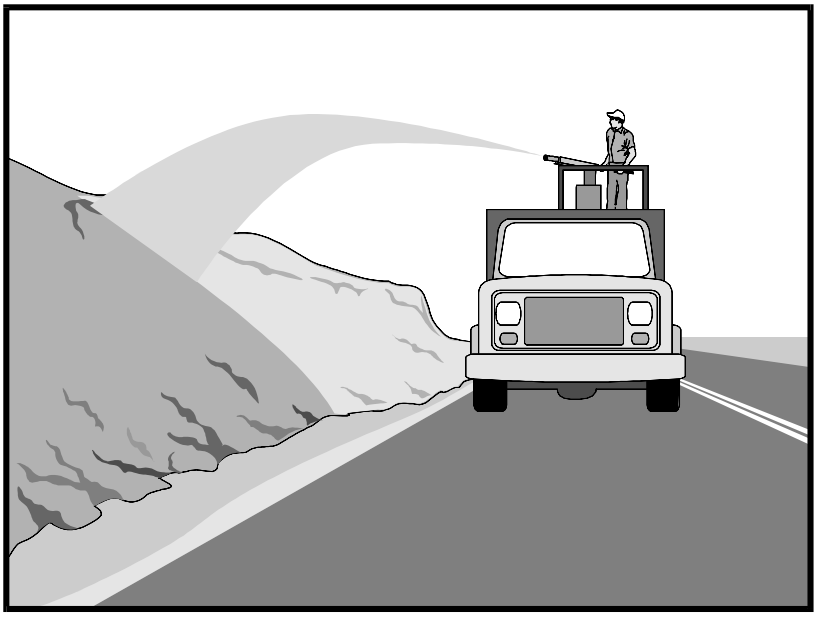
County of Sacramento Tree Preservation Ordinance, September 1981.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Hydraulic Mulch EC-3



Categories

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SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-4 Hydroseeding
EC-5 Soil Binders
EC-6 Straw Mulch
EC-7 Geotextiles and Mats
EC-8 Wood Mulching
EC-14 Compost Blanket
EC-16 Non-Vegetative Stabilization

Description and Purpose

Hydraulic Mulch consists of various types of fibrous materials mixed with water and sprayed onto the soil surface in slurry form to provide a layer of temporary protection from wind and water erosion.

Suitable Applications

Hydraulic mulch as a temporary, stand alone, erosion control BMP is suitable for disturbed areas that require temporary protection from wind and water erosion until permanent soil stabilization activities commence. Examples include:

- Rough-graded areas that will remain inactive for longer than permit-required thresholds (e.g., 14 days) or otherwise require stabilization to minimize erosion or prevent sediment discharges.
- Soil stockpiles.
- Slopes with exposed soil between existing vegetation such as trees or shrubs.
- Slopes planted with live, container-grown vegetation or plugs.
- Slopes burned by wildfire.

Hydraulic Mulch EC-3

Hydraulic mulch can also be applied to augment other erosion control BMPs such as:

- In conjunction with straw mulch (see EC-6 Straw Mulch) where the rate of hydraulic mulch is reduced to 100-500 lbs per acre and the slurry is applied over the straw as a tackifying agent to hold the straw in place.
- Supplemental application of soil amendments, such as fertilizer, lime, gypsum, soil bio-stimulants or compost.

Limitations

In general, hydraulic mulch is not limited by slope length, gradient or soil type. However, the following limitations typically apply:

- Most hydraulic mulch applications, particularly bonded fiber matrices (BFMs), require at least 24 hours to dry before rainfall occurs.
- Temporary applications (i.e., without a vegetative component) may require a second application in order to remain effective for an entire rainy season.
- Treatment areas must be accessible to hydraulic mulching equipment.
- Availability of water sources in remote areas for mixing and application.
- As a stand-alone temporary BMP, hydraulic mulches may need to be re-applied to maintain their erosion control effectiveness, typically after 6-12 months depending on the type of mulch used.
- Availability of hydraulic mulching equipment may be limited just prior to the rainy season and prior to storms due to high demand.
- Cellulose fiber mulches alone may not perform well on steep slopes or in course soils.
- This BMP consists of a mixture of several constituents (e.g., fibers/mulches, tackifiers, and other chemical constituents), some of which may be proprietary and may come pre-mixed by the manufacturer. The water quality impacts of these constituents are relatively unknown and some may have water quality impacts due to their chemical makeup. Refer to specific chemical properties identified in the product Material Safety Data Sheet; products should be evaluated for project-specific implementation by the SWPPP Preparer. Refer to factsheet EC-05 for further guidance on selecting soil binders.

Implementation

- Where feasible, it is preferable to prepare soil surfaces prior to application by roughening embankments and fill areas with a crimping or punching type roller or by track walking.
- The majority of hydraulic mulch applications do not necessarily require surface/soil preparation (See EC-15 Soil Preparation) although in almost every case where re-vegetation is included as part of the practice, soil preparation can be beneficial. One of the advantages of hydraulic mulch over other erosion control methods is that it can be applied in areas where soil preparation is precluded by site conditions, such as steep slopes, rocky soils, or inaccessibility.

Hydraulic Mulch EC-3

- Avoid mulch over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Hydraulic mulching is generally performed utilizing specialized machines that have a large water-holding/mixing tank and some form of mechanical agitation or other recirculation method to keep water, mulch and soil amendments in suspension. The mixed hydraulic slurry can be applied from a tower sprayer on top of the machine or by extending a hose to areas remote from the machine.
- Where possible apply hydraulic mulch from multiple directions to adequately cover the soil. Application from a single direction can result in shadowing, uneven coverage and failure of the BMP.
- Hydraulic mulch can also include a vegetative component, such as seed, rhizomes, or stolons (see EC-4 Hydraulic Seed).
- Typical hydraulic mulch application rates range from 2,000 pounds per acre for standard mulches (SMs) to 3,500 pounds per acre for BFMs. However, the required amount of hydraulic mulch to provide adequate coverage of exposed topsoil may appear to exceed the standard rates when the roughness of the soil surface is changed due to soil preparation methods (see EC-15 Soil Preparation) or by slope gradient.
- Other factors such as existing soil moisture and soil texture can have a profound effect on the amount of hydraulic mulch required (i.e. application rate) applied to achieve an erosion-resistant covering.
- Avoid use of mulch without a tackifier component, especially on slopes.
- Mulches used in the hydraulic mulch slurry can include:
  - Cellulose fiber
  - Thermally-processed wood fibers
  - Cotton
  - Synthetics
  - Compost (see EC-14, Compost Blanket)
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Categories of Hydraulic Mulches

Standard Hydraulic Mulch (SM)

Standard hydraulic mulches are generally applied at a rate of 2,000 pounds per acre and are manufactured containing around 5% tackifier (i.e. soil binder), usually a plant-derived guar or psyllium type. Most standard mulches are green in color derived from food-color based dyes.

Hydraulic Matrices (HM) and Stabilized Fiber Matrices (SFM)

Hydraulic matrices and stabilized fiber matrices are slurries which contain increased levels of tackifiers/soil binders; usually 10% or more by weight. HMs and SFMs have improved performance compared to a standard hydraulic mulch (SM) because of the additional percentage of tackifier and because of their higher application rates, typically 2,500 – 4,000 pounds per acre. Hydraulic matrices can include a mixture of fibers, for example, a 50/50 blend of paper and wood fiber. In the case of an SFM, the tackifier/soil binder is specified as a polyacrylamide (PAM).

Bonded Fiber Matrix (BFM)

Bonded fiber matrices (BFMs) are hydraulically-applied systems of fibers, adhesives (typically guar based) and chemical cross-links. Upon drying, the slurry forms an erosion-resistant blanket that prevents soil erosion and promotes vegetation establishment. The cross-linked adhesive in the BFM should be biodegradable and should not dissolve or disperse upon re-wetting. BFMs are typically applied at rates from 3,000 to 4,000 lbs/acre based on the manufacturer's recommendation. BFMs should not be applied immediately before, during or immediately after rainfall or if the soil is saturated. Depending on the product, BFMs typically require 12 to 24 hours to dry and become effective.

Mechanically-Bonded Fiber Matrices (MBFM)

Mechanically-bonded fiber matrices (MBFMs) are hydraulically applied systems similar to BFM that use crimped synthetic fibers and PAM and are typically applied to a slope at a higher application rate than a standard BFM.

Hydraulic Compost Matrix (HCM)

Hydraulic compost matrix (HCM) is a field-derived practice whereby finely graded or sifted compost is introduced into the hydraulic mulch slurry. A guar-type tackifier can be added for steeper slope applications as well as any specified seed mixtures. A HCM can help to accelerate seed germination and growth. HCMs are particularly useful as an in-fill for three-dimensional re-vegetation geocomposites, such as turf reinforcement mats (TRM) (see EC-7 Geotextiles and Mats).

Costs

Average installed costs for hydraulic mulch categories are is provided in Table 1, below.

Table 1
HYDRAULIC MULCH BMPs
INSTALLED COSTS

BMP	Installed Cost/Acre
Standard Hydraulic Mulching (SM)	$1,700 - $3,600 per acre
Hydraulic Matrices (HM) and Stabilized Fiber Matrices	
Guar-based	$2,000 - $4,000 per acre
PAM-based	$2,500 - $5,610 per acre
Bonded Fiber Matrix (BFM)	$3,900 - $6,900 per acre
Mechanically Bonded Fiber Matrix (MBFM)	$4,500 - $6,000 per acre
Hydraulic Compost Matrix (HCM)	$3,000 - $3,500 per acre

Source: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004)

Inspection and Maintenance

- Maintain an unbroken, temporary mulched ground cover throughout the period of construction when the soils are not being reworked.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Compare the number of bags or weight of applied mulch to the area treated to determine actual application rates and compliance with specifications.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Controlling Erosion of Construction Sites, Agricultural Information #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

Guides for Erosion and Sediment Control in California, USDA Soils Conservation Service, January 1991.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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Soil Erosion by Water, Agriculture Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

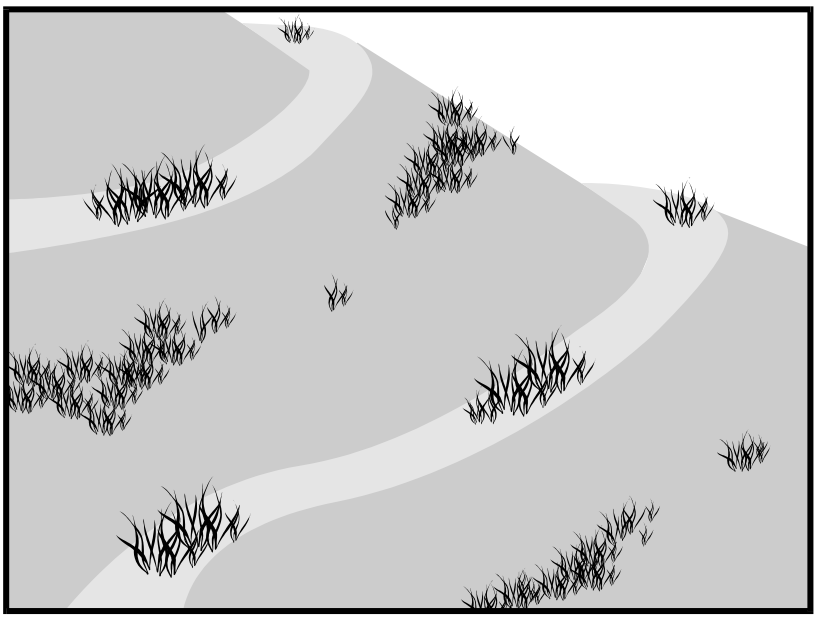
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Hydroseeding EC-4



Description and Purpose

Hydroseeding typically consists of applying a mixture of a hydraulic mulch, seed, fertilizer, and stabilizing emulsion with a hydraulic mulcher, to temporarily protect exposed soils from erosion by water and wind. Hydraulic seeding, or hydroseeding, is simply the method by which temporary or permanent seed is applied to the soil surface.

Suitable Applications

Hydroseeding is suitable for disturbed areas requiring temporary protection until permanent stabilization is established, for disturbed areas that will be re-disturbed following an extended period of inactivity, or to apply permanent stabilization measures. Hydroseeding without mulch or other cover (e.g. EC-7, Erosion Control Blanket) is not a stand-alone erosion control BMP and should be combined with additional measures until vegetation establishment.

Typical applications for hydroseeding include:

- Disturbed soil/graded areas where permanent stabilization or continued earthwork is not anticipated prior to seed germination.
- Cleared and graded areas exposed to seasonal rains or temporary irrigation.
- Areas not subject to heavy wear by construction equipment or high traffic.

Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch
EC-5 Soil Binders
EC-6 Straw Mulch
EC-7 Geotextiles and Mats
EC-8 Wood Mulching
EC-14 Compost Blanket
EC-16 Non-Vegetative Stabilization

Hydroseeding EC-4

Limitations

- Availability of hydroseeding equipment may be limited just prior to the rainy season and prior to storms due to high demand.
- Hydraulic seed should be applied with hydraulic mulch or a stand-alone hydroseed application should be followed by one of the following:
  - Straw mulch (see Straw Mulch EC-6)
  - Rolled erosion control products (see Geotextiles and Mats EC-7)
  - Application of Compost Blanket (see Compost Blanket EC-14)

  Hydraulic seed may be used alone only on small flat surfaces when there is sufficient time in the season to ensure adequate vegetation establishment and coverage to provide adequate erosion control.
- Hydraulic seed without mulch does not provide immediate erosion control.
- Temporary seeding may not be appropriate for steep slopes (i.e., slopes readily prone to rill erosion or without sufficient topsoil).
- Temporary seeding may not be appropriate in dry periods without supplemental irrigation.
- Temporary vegetation may have to be removed before permanent vegetation is applied.
- Temporary vegetation may not be appropriate for short term inactivity (i.e. less than 3-6 months).
- This BMP consists of a mixture of several constituents (e.g., fibers/mulches, tackifiers, and other chemical constituents), some of which may be proprietary and may come pre-mixed by the manufacturer. The water quality impacts of these constituents are relatively unknown and some may have water quality impacts due to their chemical makeup. Additionally these constituents may require non-visible pollutant monitoring. Refer to specific chemical properties identified in the product Material Safety Data Sheet; products should be evaluated for project-specific implementation by the SWPPP Preparer. Refer to factsheet EC-05 for further guidance on selecting soil binders.

Implementation

In order to select appropriate hydraulic seed mixtures, an evaluation of site conditions should be performed with respect to:

- Soil conditions
- Site topography and exposure (sun/wind)
- Season and climate
- Vegetation types
- Maintenance requirements
- Sensitive adjacent areas
- Water availability
- Plans for permanent vegetation

Hydroseeding EC-4

The local office of the U.S.D.A. Natural Resources Conservation Service (NRCS), Resource Conservation Districts and Agricultural Extension Service can provide information on appropriate seed mixes.

The following steps should be followed for implementation:

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying (See EC-15, Soil Preparation) the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.
- Avoid use of hydraulic seed in areas where the BMP would be incompatible with future earthwork activities.
- Hydraulic seed can be applied using a multiple step or one step process.
  - In a multiple step process, hydraulic seed is applied first, followed by mulch or a Rolled Erosion Control Product (RECP).
  - In the one step process, hydraulic seed is applied with hydraulic mulch in a hydraulic matrix. When the one step process is used to apply the mixture of fiber, seed, etc., the seed rate should be increased to compensate for all seeds not having direct contact with the soil.
- All hydraulically seeded areas should have mulch, or alternate erosion control cover to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.
- All seeds should be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag should be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container should be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed should be pellet inoculated. Inoculant sources should be species specific and should be applied at a rate of 2 lb of inoculant per 100 lb seed.
- Commercial fertilizer should conform to the requirements of the California Food and Agricultural Code, which can be found at http://www.leginfo.ca.gov/.html/fac_table_of_contents.html. Fertilizer should be pelleted or granular form.
- Follow up applications should be made as needed to cover areas of poor coverage or germination/vegetation establishment and to maintain adequate soil protection.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Hydroseeding EC-4

Costs

Average cost for installation and maintenance may vary from as low as $1,900 per acre for flat slopes and stable soils, to $4,000 per acre for moderate to steep slopes and/or erosive soils. Cost of seed mixtures vary based on types of required vegetation.

BMP	Installed Cost per Acre
Hydraulic Seed	$1,900-$4,000

Source: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004).

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Where seeds fail to germinate, or they germinate and die, the area must be re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates.
- Irrigation systems, if applicable, should be inspected daily while in use to identify system malfunctions and line breaks. When line breaks are detected, the system must be shut down immediately and breaks repaired before the system is put back into operation.
- Irrigation systems should be inspected for complete coverage and adjusted as needed to maintain complete coverage.

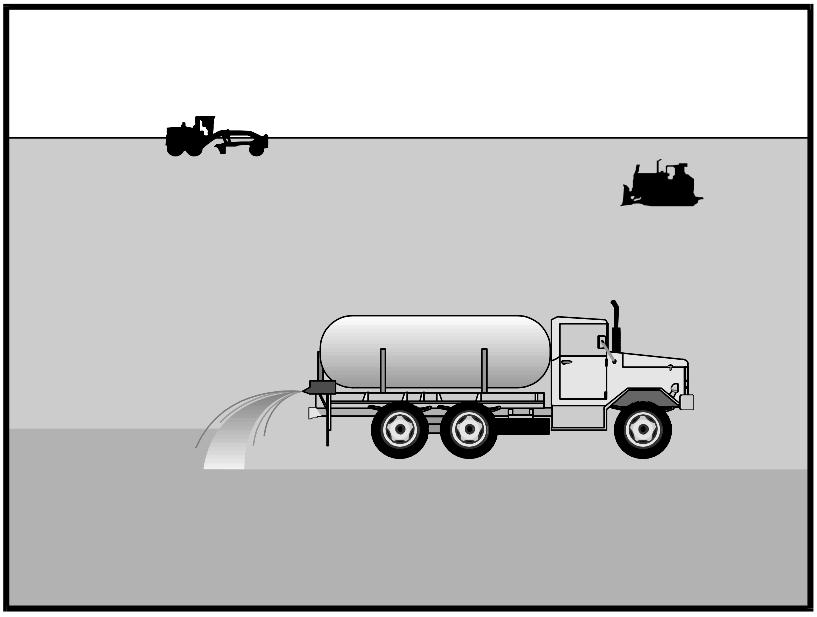
References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

Soil Binders EC-5



Categories

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Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch
EC-4 Hydroseeding
EC-6 Straw Mulch
EC-7 Geotextiles and Mats
EC-8 Wood Mulching

Description and Purpose

Soil binding consists of application and maintenance of a soil stabilizer to exposed soil surfaces. Soil binders are materials applied to the soil surface to temporarily prevent water and wind induced erosion of exposed soils on construction sites.

Suitable Applications

Soil binders are typically applied to disturbed areas requiring temporary protection. Because soil binders, when used as a stand-alone practice, can often be incorporated into the soil, they are a good alternative to mulches in areas where grading activities will soon resume. Soil binders are commonly used in the following areas:

- Rough graded soils that will be inactive for a short period of time
- Soil stockpiles
- Temporary haul roads prior to placement of crushed rock
- Compacted soil road base
- Construction staging, materials storage, and layout areas

Limitations

- Soil binders are temporary in nature and may need reapplication.
- Soil binders require a minimum curing time until fully effective, as prescribed by the manufacturer. Curing time

may be 24 hours or longer. Soil binders may need reapplication after a storm event.

- Soil binders will generally experience spot failures during heavy rainfall events. If runoff penetrates the soil at the top of a slope treated with a soil binder, it is likely that the runoff will undercut the stabilized soil layer and discharge at a point further down slope.
- Plant-material-based soil binders do not generally hold up to pedestrian or vehicular traffic across treated areas as well as polymeric emulsion blends or cementitious-based binders.
- Soil binders may not sufficiently penetrate compacted soils.
- Some soil binders are soil texture specific in terms of their effectiveness. For example, polyacrylamides (PAMs) work very well on silt and clayey soils but their performance decreases dramatically in sandy soils.
- Some soil binders may not perform well with low relative humidity. Under rainy conditions, some agents may become slippery or leach out of the soil.
- Soil binders may not cure if low temperatures occur within 24 hours of application.
- The water quality impacts of some chemical soil binders are relatively unknown and some may have water quality impacts due to their chemical makeup. Additionally, these chemical may require non-visible pollutant monitoring. Products should be evaluated for project-specific implementation by the SWPPP Preparer. Refer to the product Material Safety Data Sheet for chemical properties.

Implementation

General Considerations

- Soil binders should conform to local municipality specifications and requirements.
- Site soil types will dictate appropriate soil binders to be used.
- A soil binder must be environmentally benign (non-toxic to plant and animal life), easy to apply, easy to maintain, economical, and should not stain paved or painted surfaces. Soil binders should not pollute stormwater when cured. Obtain a Material Safety Data Sheet (MSDS) from the manufacturer to ensure non-toxicity.
- Stormwater runoff from PAM treated soils should pass through one of the following sediment control BMP prior to discharging to surface waters.
  - When the total drainage area is greater than or equal to 5 acres, PAM treated areas should drain to a sediment basin.
  - Areas less than 5 acres should drain to sediment control BMPs, such as a sediment trap, or a series of check dams. The total number of check dams used should be maximized to achieve the greatest amount of settlement of sediment prior to discharging from the site. Each check dam should be spaced evenly in the drainage channel through which stormwater flows are discharged off site.

Soil Binders EC-5

- Performance of soil binders depends on temperature, humidity, and traffic across treated areas.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Selecting a Soil Binder

Properties of common soil binders used for erosion control are provided on Table 1 at the end of this Fact Sheet. Use Table 1 to select an appropriate soil binder. Refer to WE-1, Wind Erosion Control, for dust control soil binders.

Factors to consider when selecting a soil binder include the following:

- Suitability to situation - Consider where the soil binder will be applied, if it needs a high resistance to leaching or abrasion, and whether it needs to be compatible with any existing vegetation. Determine the length of time soil stabilization will be needed, and if the soil binder will be placed in an area where it will degrade rapidly. In general, slope steepness is not a discriminating factor for the listed soil binders.
- Soil types and surface materials - Fines and moisture content are key properties of surface materials. Consider a soil binder's ability to penetrate, likelihood of leaching, and ability to form a surface crust on the surface materials.
- Frequency of application - The frequency of application is related to the functional longevity of the binder, which can be affected by subgrade conditions, surface type, climate, and maintenance schedule.
- Frequent applications could lead to high costs. Application frequency may be minimized if the soil binder has good penetration, low evaporation, and good longevity. Consider also that frequent application will require frequent equipment clean up.

Plant-Material-Based (Short Lived, <6 months) Binders

Guar: Guar is a non-toxic, biodegradable, natural galactomannan-based hydrocolloid treated with dispersant agents for easy field mixing. It should be mixed with water at the rate of 11 to 15 lb per 1,000 gallons. Recommended minimum application rates are as follows:

Application Rates for Guar Soil Stabilizer

Slope (H:V):	Flat	4:1	3:1	2:1	1:1
lb/acre:	40	45	50	60	70

Psyllium: Psyllium is composed of the finely ground muciloid coating of plantago seeds that is applied as a dry powder or in a wet slurry to the surface of the soil. It dries to form a firm but rewettable membrane that binds soil particles together, but permits germination and growth of seed. Psyllium requires 12 to 18 hours drying time. Application rates should be from 80 to 200 lb/acre, with enough water in solution to allow for a uniform slurry flow.

Starch: Starch is non-ionic, cold water soluble (pre-gelatinized) granular cornstarch. The material is mixed with water and applied at the rate of 150 lb/acre. Approximate drying time is 9 to 12 hours.

Plant-Material-Based (Long Lived, 6-12 months) Binders

Pitch and Rosin Emulsion: Generally, a non-ionic pitch and rosin emulsion has a minimum solids content of 48%. The rosin should be a minimum of 26% of the total solids content. The soil stabilizer should be non-corrosive, water dilutable emulsion that upon application cures to a water insoluble binding and cementing agent. For soil erosion control applications, the emulsion is diluted and should be applied as follows:

- For clayey soil: 5 parts water to 1 part emulsion
- For sandy soil: 10 parts water to 1 part emulsion

Application can be by water truck or hydraulic seeder with the emulsion and product mixture applied at the rate specified by the manufacturer.

Polymeric Emulsion Blend Binders

Acrylic Copolymers and Polymers: Polymeric soil stabilizers should consist of a liquid or solid polymer or copolymer with an acrylic base that contains a minimum of 55% solids. The polymeric compound should be handled and mixed in a manner that will not cause foaming or should contain an anti-foaming agent. The polymeric emulsion should not exceed its shelf life or expiration date; manufacturers should provide the expiration date. Polymeric soil stabilizer should be readily miscible in water, non-injurious to seed or animal life, non-flammable, should provide surface soil stabilization for various soil types without totally inhibiting water infiltration, and should not re-emulsify when cured. The applied compound typically requires 12 to 24 hours drying time. Liquid copolymer should be diluted at a rate of 10 parts water to 1 part polymer and the mixture applied to soil at a rate of 1,175 gallons/acre.

Liquid Polymers of Methacrylates and Acrylates: This material consists of a tackifier/sealer that is a liquid polymer of methacrylates and acrylates. It is an aqueous 100% acrylic emulsion blend of 40% solids by volume that is free from styrene, acetate, vinyl, ethoxylated surfactants or silicates. For soil stabilization applications, it is diluted with water in accordance with the manufacturer's recommendations, and applied with a hydraulic seeder at the rate of 20 gallons/acre. Drying time is 12 to 18 hours after application.

Copolymers of Sodium Acrylates and Acrylamides: These materials are non-toxic, dry powders that are copolymers of sodium acrylate and acrylamide. They are mixed with water and applied to the soil surface for erosion control at rates that are determined by slope gradient:

Slope Gradient (H:V)	lb/acre
Flat to 5:1	3.0 – 5.0
5:1 to 3:1	5.0 – 10.0
2:1 to 1:1	10.0 – 20.0

Poly-Acrylamide (PAM) and Copolymer of Acrylamide**:** Linear copolymer polyacrylamide for use as a soil binder is packaged as a dry flowable solid, as a liquid. Refer to the manufacturer's recommendation for dilution and application rates as they vary based on liquid or dry form, site conditions and climate.

- Limitations specific to PAM are as follows:
  - Do not use PAM on a slope that flows into a water body without passing through a sediment trap or sediment basin.
  - The specific PAM copolymer formulation must be anionic. Cationic PAM should not be used in any application because of known aquatic toxicity problems. Only the highest drinking water grade PAM, certified for compliance with ANSI/NSF Standard 60 for drinking water treatment, should be used for soil applications.
  - PAM designated for erosion and sediment control should be "water soluble" or "linear" or "non-cross linked".
  - PAM should not be used as a stand-alone BMP to protect against water-based erosion. When combined with mulch, its effectiveness increases dramatically.

Hydro-Colloid Polymers: Hydro-Colloid Polymers are various combinations of dry flowable poly-acrylamides, copolymers and hydro-colloid polymers that are mixed with water and applied to the soil surface at rates of 55 to 60 lb/acre. Drying times are 0 to 4 hours.

Cementitious-Based Binders

Gypsum: This is a formulated gypsum based product that readily mixes with water and mulch to form a thin protective crust on the soil surface. It is composed of high purity gypsum that is ground, calcined and processed into calcium sulfate hemihydrate with a minimum purity of 86%. It is mixed in a hydraulic seeder and applied at rates 4,000 to 12,000 lb/acre. Drying time is 4 to 8 hours.

Applying Soil Binders

After selecting an appropriate soil binder, the untreated soil surface must be prepared before applying the soil binder. The untreated soil surface must contain sufficient moisture to assist the agent in achieving uniform distribution. In general, the following steps should be followed:

- Follow manufacturer's written recommendations for application rates, pre-wetting of application area, and cleaning of equipment after use.
- Prior to application, roughen embankment and fill areas.
- Consider the drying time for the selected soil binder and apply with sufficient time before anticipated rainfall. Soil binders should not be applied during or immediately before rainfall.
- Avoid over spray onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.

Soil Binders EC-5

- Soil binders should not be applied to frozen soil, areas with standing water, under freezing or rainy conditions, or when the temperature is below 40°F during the curing period.
- More than one treatment is often necessary, although the second treatment may be diluted or have a lower application rate.
- Generally, soil binders require a minimum curing time of 24 hours before they are fully effective. Refer to manufacturer's instructions for specific cure time.
- For liquid agents:
  - Crown or slope ground to avoid ponding.
  - Uniformly pre-wet ground at 0.03 to 0.3 gal/yd^2 or according to manufacturer's recommendations.
  - Apply solution under pressure. Overlap solution 6 to 12 in.
  - Allow treated area to cure for the time recommended by the manufacturer; typically at least 24 hours.
  - Apply second treatment before first treatment becomes ineffective, using 50% application rate.
  - In low humidities, reactivate chemicals by re-wetting with water at 0.1 to 0.2 gal/yd^2.

Costs

Costs vary according to the soil stabilizer selected for implementation. The following are approximate installed costs:

Soil Binder	Cost per Acre (2004)[1]	Estimated Cost per Acre (2009)[2]
Plant-Material-Based (Short Lived) Binders	$700-$900	$770-$990
Plant-Material-Based (Long Lived) Binders	$1,200-$1,500	$1,320-$1,650
Polymeric Emulsion Blend Binders	$700 -$1,500	$770-$1,650
Cementitious-Based Binders	$800-$1,200	$880-$1,350

1. Source: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004).

2. 2009 costs reflect a 10% escalation over year 2004 costs. Escalation based on informal survey of industry trends. Note: Expected cost increase is offset by competitive economic conditions.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

Soil Binders EC-5

- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Reapply the selected soil binder as needed to maintain effectiveness.

Table 1 Properties of Soil Binders for Erosion Control

Evaluation Criteria	Binder Type			
	Plant Material Based (Short Lived)	**Plant Material Based (Long Lived)**	**Polymeric Emulsion Blends**	**Cementitious-Based Binders**
Relative Cost	Low	Moderate to High	Low to High	Low to Moderate
Resistance to Leaching	High	High	Low to Moderate	Moderate
Resistance to Abrasion	Moderate	Low	Moderate to High	Moderate to High
Longevity	Short to Medium	Medium	Medium to Long	Medium
Minimum Curing Time before Rain	9 to 18 hours	19 to 24 hours	0 to 24 hours	4 to 8 hours
Compatibility with Existing Vegetation	Good	Poor	Poor	Poor
Mode of Degradation	Biodegradable	Biodegradable	Photodegradable/ Chemically Degradable	Photodegradable/ Chemically Degradable
Labor Intensive	No	No	No	No
Specialized Application Equipment	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher
Liquid/Powder	Powder	Liquid	Liquid/Powder	Powder
Surface Crusting	Yes, but dissolves on rewetting	Yes	Yes, but dissolves on rewetting	Yes
Clean Up	Water	Water	Water	Water
Erosion Control Application Rate	Varies (1)	Varies (1)	Varies (1)	4,000 to 12,000 lbs/acre

(1) See Implementation for specific rates.

References

Erosion Control Pilot Study Report, State of California Department of Transportation (Caltrans), June 2000.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

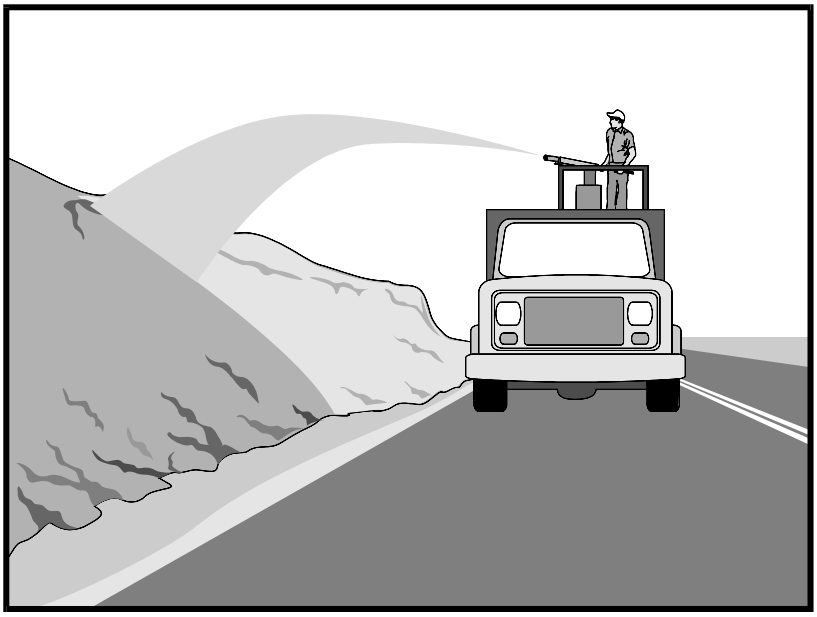
Sedimentation and Erosion Control, An Inventory of Current Practices Draft, US EPA, April 1990.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Straw Mulch EC-6



Categories

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Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- EC-3 Hydraulic Mulch
- EC-4 Hydroseeding
- EC-5 Soil Binders
- EC-7 Geotextiles and Mats
- EC-8 Wood Mulching
- EC-14 Compost Blanket

Description and Purpose

Straw mulch consists of placing a uniform layer of straw and incorporating it into the soil with a studded roller or crimper, or anchoring it with a tackifier or stabilizing emulsion. Straw mulch protects the soil surface from the impact of rain drops, preventing soil particles from becoming dislodged.

Suitable Applications

Straw mulch is suitable for disturbed areas requiring temporary protection until permanent stabilization is established. Straw mulch can be specified for the following applications:

- As a stand-alone BMP on disturbed areas until soils can be prepared for permanent vegetation. The longevity of straw mulch is typically less than six months.
- Applied in combination with temporary seeding strategies
- Applied in combination with permanent seeding strategies to enhance plant establishment and final soil stabilization
- Applied around containerized plantings to control erosion until the plants become established to provide permanent stabilization

Limitations

Availability of straw and straw blowing equipment may be limited just prior to the rainy season and prior to storms due to high demand.

- There is a potential for introduction of weed seed and unwanted plant material if weed-free agricultural straw is not specified.
- Straw mulch applied by hand is more time intensive and potentially costly.
- Wind may limit application of straw and blow straw into undesired locations.
- May have to be removed prior to permanent seeding or prior to further earthwork.
- "Punching" of straw does not work in sandy soils, necessitating the use of tackifiers.
- Potential fugitive dust control issues associated with straw applications can occur. Application of a stabilizing emulsion or a water stream at the same time straw is being blown can reduce this problem.
- Use of plastic netting should be avoided in areas where wildlife may be entrapped and may be prohibited for projects in certain areas with sensitive wildlife species, especially reptiles and amphibians.

Implementation

- Straw should be derived from weed-free wheat, rice, or barley. Where required by the plans, specifications, permits, or environmental documents, native grass straw should be used.
- Use tackifier to anchor straw mulch to the soil on slopes.
- Crimping, punch roller-type rollers, or track walking may also be used to incorporate straw mulch into the soil on slopes. Track walking can be used where other methods are impractical.
- Avoid placing straw onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.
- Straw mulch with tackifier should not be applied during or immediately before rainfall.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Application Procedures

- When using a tackifier to anchor the straw mulch, roughen embankment or fill areas by rolling with a crimping or punching-type roller or by track walking before placing the straw mulch. Track walking should only be used where rolling is impractical.
- Apply straw at a rate of between 3,000 and 4,000 lb/acre, either by machine or by hand distribution and provide 100% ground cover. A lighter application is used for flat surfaces and a heavier application is used for slopes.
- Evenly distribute straw mulch on the soil surface.
- Anchoring straw mulch to the soil surface by "punching" it into the soil mechanically (incorporating) can be used in lieu of a tackifier.

- Methods for holding the straw mulch in place depend upon the slope steepness, accessibility, soil conditions, and longevity.

  - A tackifier acts to glue the straw fibers together and to the soil surface. The tackifier should be selected based on longevity and ability to hold the fibers in place. A tackifier is typically applied at a rate of 125 lb/acre. In windy conditions, the rates are typically 180 lb/acre.

  - On very small areas, a spade or shovel can be used to punch in straw mulch.

  - On slopes with soils that are stable enough and of sufficient gradient to safely support construction equipment without contributing to compaction and instability problems, straw can be "punched" into the ground using a knife blade roller or a straight bladed coulter, known commercially as a "crimper."

Costs

Average annual cost for installation and maintenance is included in the table below. Application by hand is more time intensive and potentially more costly.

BMP	Unit Cost per Acre
Straw mulch, crimped or punched	$2,458-$5,375
Straw mulch with tackifier	$1,823-$4,802

Source: Cost information received from individual product suppliers solicited by Geosyntec Consultants (2004).

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.

- The key consideration in inspection and maintenance is that the straw needs to last long enough to achieve erosion control objectives. Straw mulch as a stand-alone BMP is temporary and is not suited for long-term erosion control.

- Maintain an unbroken, temporary mulched ground cover while disturbed soil areas are inactive. Repair any damaged ground cover and re-mulch exposed areas.

- Reapplication of straw mulch and tackifier may be required to maintain effective soil stabilization over disturbed areas and slopes.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

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Soil Erosion by Water, Agricultural Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

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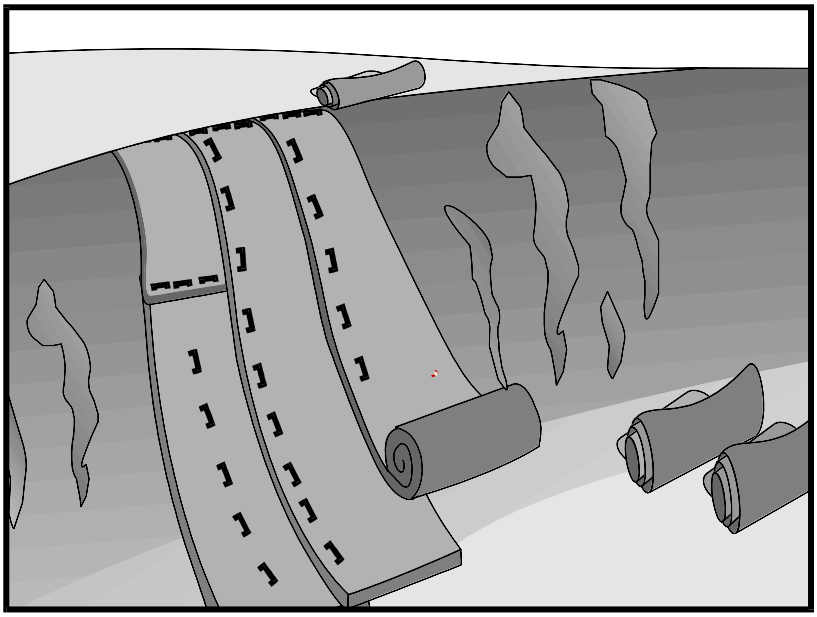
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Geotextiles and Mats EC-7



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

Description and Purpose

Mattings, or Rolled Erosion Control Products (RECPs), can be made of natural or synthetic materials or a combination of the two. RECPs are used to cover the soil surface to reduce erosion from rainfall impact, hold soil in place, and absorb and hold moisture near the soil surface. Additionally, RECPs may be used to stabilize soils until vegetation is established or to reinforce non-woody surface vegetation.

Suitable Applications

RECPs are typically applied on slopes where erosion hazard is high and vegetation will be slow to establish. Mattings are also used on stream banks, swales and other drainage channels where moving water at velocities between 3 ft/s and 6 ft/s are likely to cause scour and wash out new vegetation, and in areas where the soil surface is disturbed and where existing vegetation has been removed. RECPs may also be used when seeding cannot occur (e.g., late season construction and/or the arrival of an early rain season). RECPs should be considered when the soils are fine grained and potentially erosive. RECPs should be considered in the following situations.

- Steep slopes, generally steeper than 3:1 (H:V)
- Slopes where the erosion potential is high
- Slopes and disturbed soils where mulch must be anchored
- Disturbed areas where plants are slow to develop

- Channels with flows exceeding 3.3 ft/s
- Channels to be vegetated
- Stockpiles
- Slopes adjacent to water bodies

Limitations

- RECP installed costs are generally higher than other erosion control BMPs, limiting their use to areas where other BMPs are ineffective (e.g. channels, steep slopes).
- RECPs may delay seed germination, due to reduction in soil temperature.
- RECPs are generally not suitable for excessively rocky sites or areas where the final vegetation will be mowed (since staples and netting can catch in mowers). If a staple or pin cannot be driven into the soil because the underlying soil is too hard or rocky, then an alternative BMP should be selected.
- If used for temporary erosion control, RECPs should be removed and disposed of prior to application of permanent soil stabilization measures.
- The use of plastic should be limited to covering stockpiles or very small graded areas for short periods of time (such as through one imminent storm event) until more environmentally friendly measures, such as seeding and mulching, may be installed.
    - Plastic sheeting is easily vandalized, easily torn, photodegradable, and must be disposed of at a landfill.
    - Plastic sheeting results in 100% runoff, which may cause serious erosion problems in the areas receiving the increased flow.
- RECPs may have limitations based on soil type, slope gradient, or channel flow rate; consult the manufacturer for proper selection.
- Not suitable for areas that have foot traffic (tripping hazard) – e.g., pad areas around buildings under construction.
- RECPs that incorporate a plastic netting (e.g. straw blanket typically uses a plastic netting to hold the straw in place) may not be suitable near known wildlife habitat. Wildlife can become trapped in the plastic netting.
- RECPs may have limitations in extremely windy climates. However, when RECPs are properly trenched at the top and bottom and stapled in accordance with the manufacturer's recommendations, problems with wind can be minimized.

Geotextiles and Mats EC-7

Implementation

Material Selection

- Natural RECPs have been found to be effective where re-vegetation will be provided by re-seeding. The choice of material should be based on the size of area, side slopes, surface conditions such as hardness, moisture, weed growth, and availability of materials.

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

- The following natural and synthetic RECPs are commonly used:

Geotextiles

- Material can be a woven or a non-woven polypropylene fabric with minimum thickness of 0.06 in., minimum width of 12 ft and should have minimum tensile strength of 150 lbs (warp), 80 lbs (fill) in conformance with the requirements in ASTM Designation: D 4632. The permittivity of the fabric should be approximately 0.07 sec^{-1} in conformance with the requirements in ASTM Designation: D4491. The fabric should have an ultraviolet (UV) stability of 70 percent in conformance with the requirements in ASTM designation: D4355. Geotextile blankets must be secured in place with wire staples or sandbags and by keying into tops of slopes to prevent infiltration of surface waters under geotextile. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- Geotextiles may be reused if they are suitable for the use intended.

Plastic Covers

- Generally plastic sheeting should only be used as stockpile covering or for very small graded areas for short periods of time (such as through one imminent storm event). If plastic sheeting must be used, choose a plastic that will withstand photo degradation.

- Plastic sheeting should have a minimum thickness of 6 mils, and must be keyed in at the top of slope (when used as a temporary slope protection) and firmly held in place with sandbags or other weights placed no more than 10 ft apart. Seams are typically taped or weighted down their entire length, and there should be at least a 12 in. to 24 in. overlap of all seams. Edges should be embedded a minimum of 6 in. in soil (when used as a temporary slope protection).

- All sheeting must be inspected periodically after installation and after significant rainstorms to check for erosion, undermining, and anchorage failure. Any failures must be repaired immediately. If washout or breakages occur, the material should be re-installed after repairing the damage to the slope.

Erosion Control Blankets/Mats

- Biodegradable RECPs are typically composed of jute fibers, curled wood fibers, straw, coconut fiber, or a combination of these materials. In order for an RECP to be considered 100% biodegradable, the netting, sewing or adhesive system that holds the biodegradable mulch fibers together must also be biodegradable. See typical installation details at the end of this fact sheet.

- **Jute** is a natural fiber that is made into a yarn that is loosely woven into a biodegradable mesh. The performance of jute as a stand-alone RECP is low. Most other RECPs outperform jute as a temporary erosion control product and therefore jute is not commonly used. It is designed to be used in conjunction with vegetation. The material is supplied in rolled strips, which should be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Excelsior** (curled wood fiber) blanket material should consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 6 in. or longer. The excelsior blanket should be of consistent thickness. The wood fiber must be evenly distributed over the entire area of the blanket. The top surface of the blanket should be covered with a photodegradable extruded plastic mesh. The blanket should be smolder resistant without the use of chemical additives and should be non-toxic and non-injurious to plant and animal life. Excelsior blankets should be furnished in rolled strips, a minimum of 48 in. wide, and should have an average weight of 0.8 lb/yd^2, ±10 percent, at the time of manufacture. Excelsior blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Straw blanket** should be machine produced mats of straw with a lightweight biodegradable netting top layer. The straw should be attached to the netting with biodegradable thread or glue strips. The straw blanket should be of consistent thickness. The straw should be evenly distributed over the entire area of the blanket. Straw blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd^2. Straw blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Wood fiber blanket** is composed of biodegradable fiber mulch with extruded plastic netting held together with adhesives. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured to the ground with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Coconut fiber blanket** should be a machine produced mat of 100 percent coconut fiber with biodegradable netting on the top and bottom. The coconut fiber should be attached to the netting with biodegradable thread or glue strips. The coconut fiber blanket should be of consistent thickness. The coconut fiber should be evenly distributed over the entire area of the blanket. Coconut fiber blanket should be furnished in rolled strips with a minimum of 6.5 ft wide, a minimum of 80 ft. long and a minimum of 0.5 lb/yd^2. Coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Coconut fiber mesh** is a thin permeable membrane made from coconut or corn fiber that is spun into a yarn and woven into a biodegradable mat. It is designed to be used in conjunction with vegetation and typically has longevity of several years. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Straw coconut fiber blanket** should be machine produced mats of 70 percent straw and 30 percent coconut fiber with a biodegradable netting top layer and a biodegradable bottom net. The straw and coconut fiber should be attached to the netting with biodegradable thread or glue strips. The straw coconut fiber blanket should be of consistent thickness. The straw and coconut fiber should be evenly distributed over the entire area of the blanket. Straw coconut fiber blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd^2. Straw coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

■ Non-biodegradable RECPs are typically composed of polypropylene, polyethylene, nylon or other synthetic fibers. In some cases, a combination of biodegradable and synthetic fibers is used to construct the RECP. Netting used to hold these fibers together is typically non-biodegradable as well.

- **Plastic netting** is a lightweight biaxially oriented netting designed for securing loose mulches like straw or paper to soil surfaces to establish vegetation. The netting is photodegradable. The netting is supplied in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Plastic mesh** is an open weave geotextile that is composed of an extruded synthetic fiber woven into a mesh with an opening size of less than ¼ in. It is used with re-vegetation or may be used to secure loose fiber such as straw to the ground. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Synthetic fiber with netting** is a mat that is composed of durable synthetic fibers treated to resist chemicals and ultraviolet light. The mat is a dense, three dimensional mesh of synthetic (typically polyolefin) fibers stitched between two polypropylene nets. The mats are designed to be re-vegetated and provide a permanent composite system of soil, roots, and geomatrix. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Bonded synthetic fibers** consist of a three dimensional geomatrix nylon (or other synthetic) matting. Typically it has more than 90 percent open area, which facilitates root growth. It's tough root reinforcing system anchors vegetation and protects against hydraulic lift and shear forces created by high volume discharges. It can be installed over prepared soil, followed by seeding into the mat. Once vegetated, it becomes an invisible composite system of soil, roots, and geomatrix. The material is furnished in rolled strips that must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Combination synthetic and biodegradable RECPs** consist of biodegradable fibers, such as wood fiber or coconut fiber, with a heavy polypropylene net stitched to the top and a high strength continuous filament geomatrix or net stitched to the bottom. The material is designed to enhance re-vegetation. The material is furnished in rolled strips,

which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

Site Preparation

- Proper soil preparation is essential to ensure complete contact of the RECP with the soil. Soil Roughening is not recommended in areas where RECPs will be installed.
- Grade and shape the area of installation.
- Remove all rocks, clods, vegetation or other obstructions so that the installed blankets or mats will have complete, direct contact with the soil.
- Prepare seedbed by loosening 2 to 3 in. of topsoil.

Seeding/Planting

Seed the area before blanket installation for erosion control and re-vegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket installation, all areas disturbed during blanket installation must be re-seeded. Where soil filling is specified for turf reinforcement mats (TRMs), seed the matting and the entire disturbed area after installation and prior to filling the mat with soil.

Fertilize and seed in accordance with seeding specifications or other types of landscaping plans. The protective matting can be laid over areas where grass has been planted and the seedlings have emerged. Where vines or other ground covers are to be planted, lay the protective matting first and then plant through matting according to design of planting.

Check Slots

Check slots shall be installed as required by the manufacturer.

Laying and Securing Matting

- Before laying the matting, all check slots should be installed and the seedbed should be friable, made free from clods, rocks, and roots. The surface should be compacted and finished according to the requirements of the manufacturer's recommendations.
- Mechanical or manual lay down equipment should be capable of handling full rolls of fabric and laying the fabric smoothly without wrinkles or folds. The equipment should meet the fabric manufacturer's recommendations or equivalent standards.

Anchoring

- U-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes can be used to anchor mats and blankets to the ground surface.
- Wire staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- Metal stake pins should be 0.188 in. diameter steel with a 1.5 in. steel washer at the head of the pin, and 8 in. in length.
- Wire staples and metal stakes should be driven flush to the soil surface.

Installation on Slopes

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Begin at the top of the slope and anchor the blanket in a 6 in. deep by 6 in. wide trench. Backfill trench and tamp earth firmly.
- Unroll blanket down slope in the direction of water flow.
- Overlap the edges of adjacent parallel rolls 2 to 3 in. and staple every 3 ft (or greater, per manufacturer's specifications).
- When blankets must be spliced, place blankets end over end (shingle style) with 6 in. overlap. Staple through overlapped area, approximately 12 in. apart.
- Lay blankets loosely and maintain direct contact with the soil. Do not stretch.
- Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Staples should be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 (H:V) to 2:1 (H:V), require a minimum of 2 staples/yd^2. Moderate slopes, 2:1 (H:V) to 3:1 (H:V), require a minimum of 1 ½ staples/yd^2. Check manufacturer's specifications to determine if a higher density staple pattern is required.

Installation in Channels

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Dig initial anchor trench 12 in. deep and 6 in. wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 6 in. deep and 6 in. wide across the channel at 25 to 30 ft intervals along the channels.
- Cut longitudinal channel anchor trenches 4 in. deep and 4 in. wide along each side of the installation to bury edges of matting, whenever possible extend matting 2 to 3 in. above the crest of the channel side slopes.
- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 12 in. intervals. Note: matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 3 in.
- Secure these initial ends of mats with anchors at 12 in. intervals, backfill and compact soil.
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench. Unroll adjacent mats upstream in similar fashion, maintaining a 3 in. overlap.

- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 12 in. intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.
- Alternate method for non-critical installations: Place two rows of anchors on 6 in. centers at 25 to 30 ft. intervals in lieu of excavated check slots.
- Staple shingled lap spliced ends a minimum of 12 in. apart on 12 in. intervals.
- Place edges of outside mats in previously excavated longitudinal slots; anchor using prescribed staple pattern, backfill, and compact soil.
- Anchor, fill, and compact upstream end of mat in a 12 in. by 6 in. terminal trench.
- Secure mat to ground surface using U-shaped wire staples, geotextile pins, or wooden stakes.
- Seed and fill turf reinforcement matting with soil, if specified.

Soil Filling (if specified for turf reinforcement mat (TRM))

Installation should be in accordance with the manufacturer's recommendations. Typical installation guidelines are as follows:

- After seeding, spread and lightly rake ½-3/4 inches of fine topsoil into the TRM apertures to completely fill TRM thickness. Use backside of rake or other flat implement.
- Alternatively, if allowed by product specifications, spread topsoil using lightweight loader, backhoe, or other power equipment. Avoid sharp turns with equipment.
- Always consult the manufacturer's recommendations for installation.
- Do not drive tracked or heavy equipment over mat.
- Avoid any traffic over matting if loose or wet soil conditions exist.
- Use shovels, rakes, or brooms for fine grading and touch up.
- Smooth out soil filling just exposing top netting of mat.

Temporary Soil Stabilization Removal

- Temporary soil stabilization removed from the site of the work must be disposed of if necessary.

Costs

Installed costs can be relatively high compared to other BMPs. Approximate costs for installed materials are shown below:

Rolled Erosion Control Products		Installed Cost per Acre (2004)[1]	Estimated Cost per Acre (2009)[2]
Biodegradable	Jute Mesh	$6,000-$7,000	$6,600-$7,700
	Curled Wood Fiber	$8,000-$10,500	$8,800-$11,050
	Straw	$8,000-$10,500	$8,800-$11,050
	Wood Fiber	$8,000-$10,500	$8,800-$11,050
	Coconut Fiber	$13,000-$14,000	$14,300-$15,400
	Coconut Fiber Mesh	$30,000-$33,000	$33,000-$36,300
	Straw Coconut Fiber	$10,000-$12,000	$11,000-$13,200
Non-Biodegradable	Plastic Netting	$2,000-$2,200	$2,200-$2,220
	Plastic Mesh	$3,000-$3,500	$3,300-$3,850
	Synthetic Fiber with Netting	$34,000-$40,000	$37,400-$44,000
	Bonded Synthetic Fibers	$45,000-$55,000	$49,500-$60,500
	Combination with Biodegradable	$30,000-$36,000	$33,000-$39,600

1. Source: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004).

2. 2009 costs reflect a 10% escalation over year 2004 costs. Escalation based on informal survey of industry trends. Note: Expected cost increase is offset by competitive economic conditions.

Inspection and Maintenance

- RECPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident shall be repaired and BMPs reapplied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- If washout or breakage occurs, re-install the material after repairing the damage to the slope or channel.
- Make sure matting is uniformly in contact with the soil.
- Check that all the lap joints are secure.
- Check that staples are flush with the ground.

References

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005

Erosion Control Pilot Study Report, State of California Department of Transportation (Caltrans), June 2000.

Guides for Erosion and Sediment Controls in California, USDA Soils Conservation Service, January 1991.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

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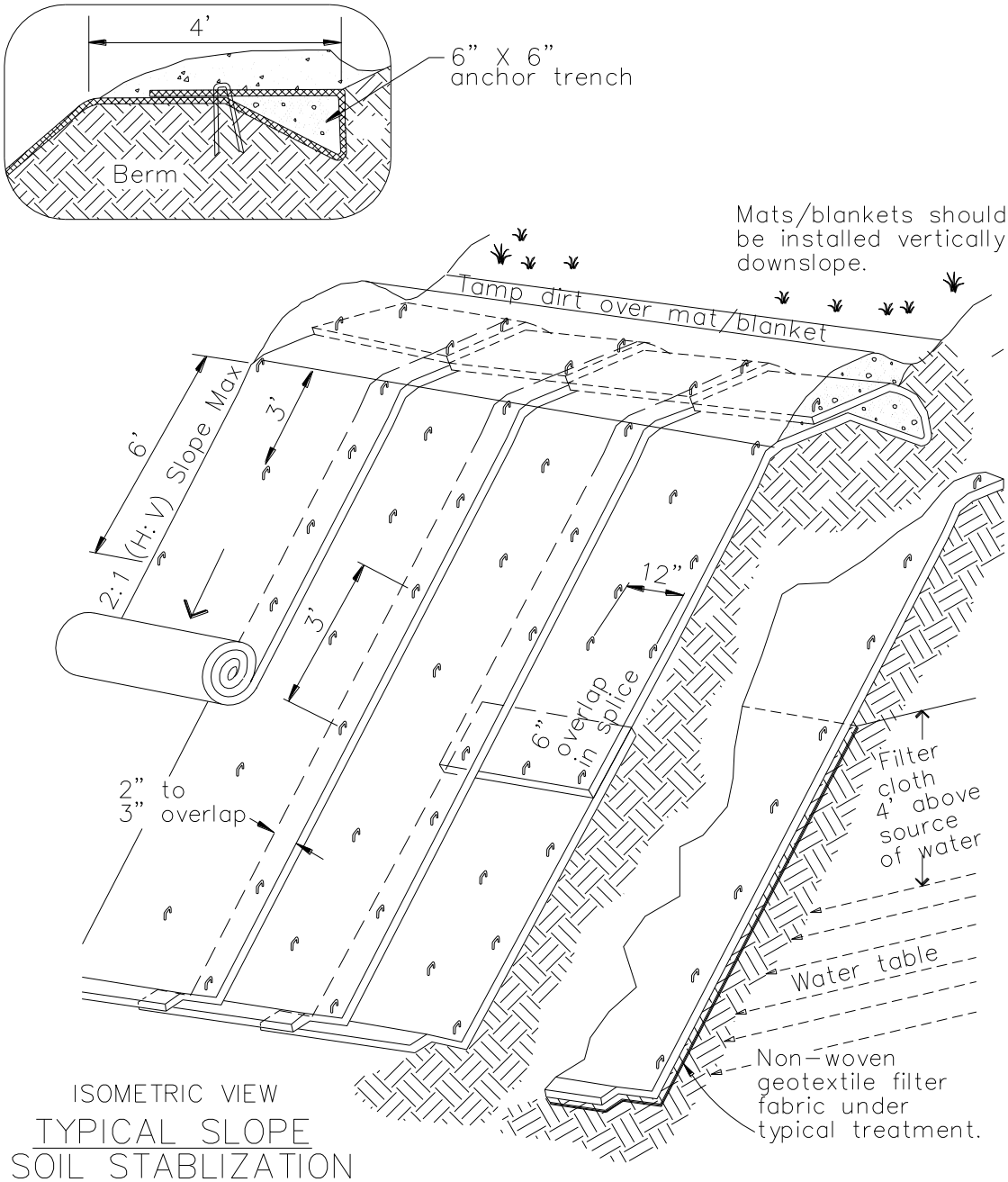
Geotextiles and Mats EC-7



ISOMETRIC VIEW

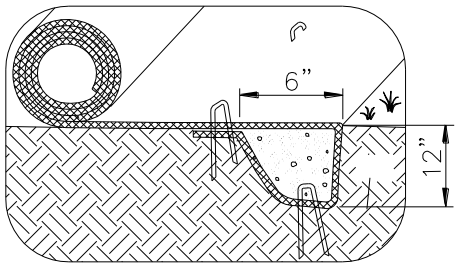
TYPICAL SLOPE
SOIL STABLIZATION
NTS

WET SLOPE LINING
NTS

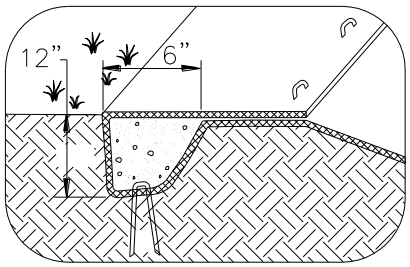
NOTES:

1. Slope surface shall be free of rocks, clods, sticks and grass. Mats/blankets shall have good soil contact.
2. Lay blankets loosely and stake or staple to maintain direct contact with the soil. Do not stretch.
3. Install per manufacturer's recommendations

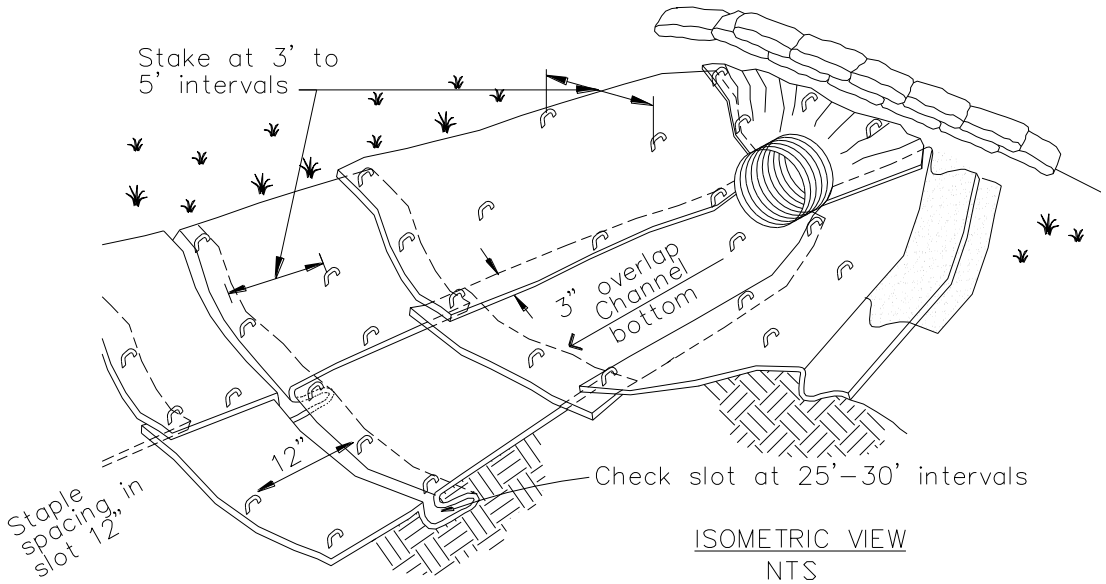
TYPICAL INSTALLATION DETAIL



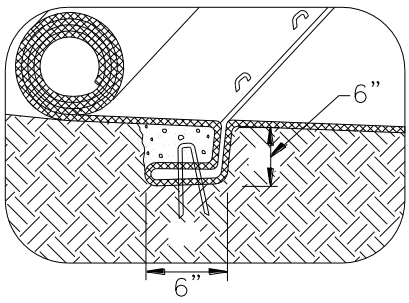
INITIAL CHANNEL ANCHOR TRENCH
NTS



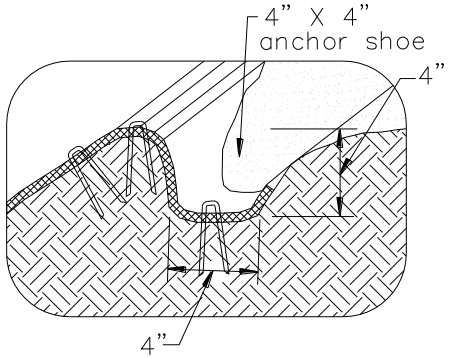
TERMINAL SLOPE AND CHANNEL ANCHOR TRENCH
NTS



ISOMETRIC VIEW
NTS



INTERMITTENT CHECK SLOT
NTS



LONGITUDINAL ANCHOR TRENCH
NTS

NOTES:
1. Check slots to be constructed per manufacturers specifications.
2. Staking or stapling layout per manufacturers specifications.
3. Install per manufacturer's recommendations

TYPICAL INSTALLATION DETAIL

Wood Mulching EC-8

Description and Purpose

Wood mulching consists of applying a mixture of shredded wood mulch, bark or compost to disturbed soils. The primary function of wood mulching is to reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff.

Suitable Applications

Wood mulching is suitable for disturbed soil areas requiring temporary protection until permanent stabilization is established.

Limitations

- Not suitable for use on slopes steeper than 3:1 (H:V). Best suited to flat areas or gentle slopes or 5:1 (H:V) or flatter.
- Wood mulch and compost may introduce unwanted species.
- Not suitable for areas exposed to concentrated flows.
- May need to be removed prior to further earthwork.

Implementation

Mulch Selection

There are many types of mulches. Selection of the appropriate type of mulch should be based on the type of application, site conditions, and compatibility with planned or future uses.

Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

Wood Mulching EC-8

Application Procedures

Prior to application, after existing vegetation has been removed, roughen embankment and fill areas by rolling with a device such as a punching type roller or by track walking. The construction application procedures for mulches vary significantly depending upon the type of mulching method specified. Two methods are highlighted here:

- Green Material: This type of mulch is produced by the recycling of vegetation trimmings such as grass, shredded shrubs, and trees. Methods of application are generally by hand although pneumatic methods are available.
  - Green material can be used as a temporary ground cover with or without seeding.
  - The green material should be evenly distributed on site to a depth of not more than 2 in.
- Shredded Wood: Suitable for ground cover in ornamental or revegetated plantings.
  - Shredded wood/bark is conditionally suitable. See note under limitations.
  - Distribute by hand or use pneumatic methods.
  - Evenly distribute the mulch across the soil surface to a depth of 2 to 3 in.
- Avoid mulch placement onto roads, sidewalks, drainage channels, existing vegetation, etc.

Costs

Average annual cost for installation and maintenance (3-4 months useful life) is around $4,000 per acre, but cost can increase if the source is not close to the project site.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident shall be repaired and BMPs reapplied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- Regardless of the mulching technique selected, the key consideration in inspection and maintenance is that the mulch needs to last long enough to achieve erosion control objectives. If the mulch is applied as a stand alone erosion control method over disturbed areas (without seed), it should last the length of time the site will remain barren or until final re-grading and revegetation.
- Where vegetation is not the ultimate cover, such as ornamental and landscape applications of bark or wood chips, inspection and maintenance should focus on longevity and integrity of the mulch.
- Reapply mulch when bare earth becomes visible.

Wood Mulching EC-8

References

Controlling Erosion of Construction Sites Agriculture Information Bulletin #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

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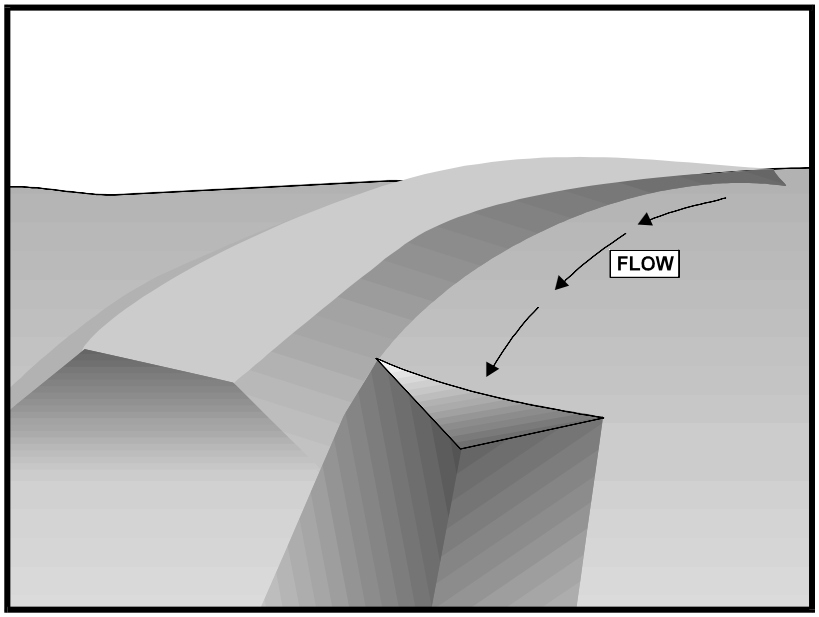
Earth Dikes and Drainage Swales EC-9



Description and Purpose

An earth dike is a temporary berm or ridge of compacted soil used to divert runoff or channel water to a desired location. A drainage swale is a shaped and sloped depression in the soil surface used to convey runoff to a desired location. Earth dikes and drainage swales are used to divert off site runoff around the construction site, divert runoff from stabilized areas and disturbed areas, and direct runoff into sediment basins or traps.

Suitable Applications

Earth dikes and drainage swales are suitable for use, individually or together, where runoff needs to be diverted from one area and conveyed to another.

- Earth dikes and drainage swales may be used:
  - To convey surface runoff down sloping land
  - To intercept and divert runoff to avoid sheet flow over sloped surfaces
  - To divert and direct runoff towards a stabilized watercourse, drainage pipe or channel
  - To intercept runoff from paved surfaces
  - Below steep grades where runoff begins to concentrate
  - Along roadways and facility improvements subject to flood drainage

Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Earth Dikes and Drainage Swales EC-9

- At the top of slopes to divert runon from adjacent or undisturbed slopes
- At bottom and mid slope locations to intercept sheet flow and convey concentrated flows
- Divert sediment laden runoff into sediment basins or traps

Limitations

Dikes should not be used for drainage areas greater than 10 acres or along slopes greater than 10 percent. For larger areas more permanent drainage structures should be built. All drainage structures should be built in compliance with local municipal requirements.

- Earth dikes may create more disturbed area on site and become barriers to construction equipment.
- Earth dikes must be stabilized immediately, which adds cost and maintenance concerns.
- Diverted stormwater may cause downstream flood damage.
- Dikes should not be constructed of soils that may be easily eroded.
- Regrading the site to remove the dike may add additional cost.
- Temporary drains and swales or any other diversion of runoff should not adversely impact upstream or downstream properties.
- Temporary drains and swales must conform to local floodplain management requirements.
- Earth dikes/drainage swales are not suitable as sediment trapping devices.
- It may be necessary to use other soil stabilization and sediment controls such as check dams, plastics, and blankets, to prevent scour and erosion in newly graded dikes, swales, and ditches.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in drainage swales.

Implementation

The temporary earth dike is a berm or ridge of compacted soil, located in such a manner as to divert stormwater to a sediment trapping device or a stabilized outlet, thereby reducing the potential for erosion and offsite sedimentation. Earth dikes can also be used to divert runoff from off site and from undisturbed areas away from disturbed areas and to divert sheet flows away from unprotected slopes.

An earth dike does not itself control erosion or remove sediment from runoff. A dike prevents erosion by directing runoff to an erosion control device such as a sediment trap or directing runoff away from an erodible area. Temporary diversion dikes should not adversely impact adjacent properties and must conform to local floodplain management regulations, and should not be used in areas with slopes steeper than 10%.

Slopes that are formed during cut and fill operations should be protected from erosion by runoff. A combination of a temporary drainage swale and an earth dike at the top of a slope can divert

runoff to a location where it can be brought to the bottom of the slope (see EC-11, Slope Drains). A combination dike and swale is easily constructed by a single pass of a bulldozer or grader and compacted by a second pass of the tracks or wheels over the ridge. Diversion structures should be installed when the site is initially graded and remain in place until post construction BMPs are installed and the slopes are stabilized.

Diversion practices concentrate surface runoff, increasing its velocity and erosive force. Thus, the flow out of the drain or swale must be directed onto a stabilized area or into a grade stabilization structure. If significant erosion will occur, a swale should be stabilized using vegetation, chemical treatment, rock rip-rap, matting, or other physical means of stabilization. Any drain or swale that conveys sediment laden runoff must be diverted into a sediment basin or trap before it is discharged from the site.

General

- Care must be applied to correctly size and locate earth dikes, drainage swales. Excessively steep, unlined dikes, and swales are subject to erosion and gully formation.
- Conveyances should be stabilized.
- Use a lined ditch for high flow velocities.
- Select flow velocity based on careful evaluation of the risks due to erosion of the measure, soil types, overtopping, flow backups, washout, and drainage flow patterns for each project site.
- Compact any fills to prevent unequal settlement.
- Do not divert runoff onto other property without securing written authorization from the property owner.
- When possible, install and utilize permanent dikes, swales, and ditches early in the construction process.
- Provide stabilized outlets.

Earth Dikes

Temporary earth dikes are a practical, inexpensive BMP used to divert stormwater runoff. Temporary diversion dikes should be installed in the following manner:

- All dikes should be compacted by earth moving equipment.
- All dikes should have positive drainage to an outlet.
- All dikes should have 2:1 or flatter side slopes, 18 in. minimum height, and a minimum top width of 24 in. Wide top widths and flat slopes are usually needed at crossings for construction traffic.
- The outlet from the earth dike must function with a minimum of erosion. Runoff should be conveyed to a sediment trapping device such as a Sediment Trap (SE-3) or Sediment Basin

(SE-2) when either the dike channel or the drainage area above the dike are not adequately stabilized.

- Temporary stabilization may be achieved using seed and mulching for slopes less than 5% and either rip-rap or sod for slopes in excess of 5%. In either case, stabilization of the earth dike should be completed immediately after construction or prior to the first rain.
- If riprap is used to stabilize the channel formed along the toe of the dike, the following typical specifications apply:

Channel Grade	Riprap Stabilization
0.5-1.0%	4 in. Rock
1.1-2.0%	6 in. Rock
2.1-4.0%	8 in. Rock
4.1-5.0%	8 in. -12 in. Riprap

- The stone riprap, recycled concrete, etc. used for stabilization should be pressed into the soil with construction equipment.
- Filter cloth may be used to cover dikes in use for long periods.
- Construction activity on the earth dike should be kept to a minimum.

Drainage Swales

Drainage swales are only effective if they are properly installed. Swales are more effective than dikes because they tend to be more stable. The combination of a swale with a dike on the downhill side is the most cost effective diversion.

Standard engineering design criteria for small open channel and closed conveyance systems should be used (see the local drainage design manual). Unless local drainage design criteria state otherwise, drainage swales should be designed as follows:

- No more than 5 acres may drain to a temporary drainage swale.
- Place drainage swales above or below, not on, a cut or fill slope.
- Swale bottom width should be at least 2 ft
- Depth of the swale should be at least 18 in.
- Side slopes should be 2:1 or flatter.
- Drainage or swales should be laid at a grade of at least 1 percent, but not more than 15 percent.
- The swale must not be overtopped by the peak discharge from a 10-year storm, irrespective of the design criteria stated above.

Earth Dikes and Drainage Swales EC-9

- Remove all trees, stumps, obstructions, and other objectionable material from the swale when it is built.
- Compact any fill material along the path of the swale.
- Stabilize all swales immediately. Seed and mulch swales at a slope of less than 5 percent, and use rip-rap or sod for swales with a slope between 5 and 15 percent. For temporary swales, geotextiles and mats (EC-7) may provide immediate stabilization.
- Irrigation may be required to establish sufficient vegetation to prevent erosion.
- Do not operate construction vehicles across a swale unless a stabilized crossing is provided.
- Permanent drainage facilities must be designed by a professional engineer (see the local drainage design criteria for proper design).
- At a minimum, the drainage swale should conform to predevelopment drainage patterns and capacities.
- Construct the drainage swale with a positive grade to a stabilized outlet.
- Provide erosion protection or energy dissipation measures if the flow out of the drainage swale can reach an erosive velocity.

Costs

- Cost ranges from $15 to $55 per ft for both earthwork and stabilization and depends on availability of material, site location, and access.
- Small dikes: $2.50 - $6.50/linear ft; Large dikes: $2.50/yd^3.
- The cost of a drainage swale increases with drainage area and slope. Typical swales for controlling internal erosion are inexpensive, as they are quickly formed during routine earthwork.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect ditches and berms for washouts. Replace lost riprap, damaged linings or soil stabilizers as needed.
- Inspect channel linings, embankments, and beds of ditches and berms for erosion and accumulation of debris and sediment. Remove debris and sediment and repair linings and embankments as needed.
- Temporary conveyances should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction

Earth Dikes and Drainage Swales EC-9

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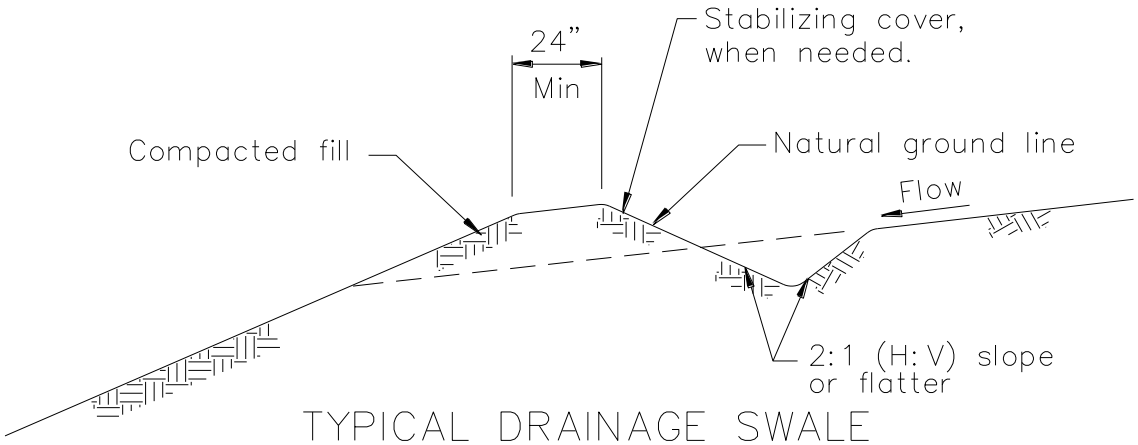
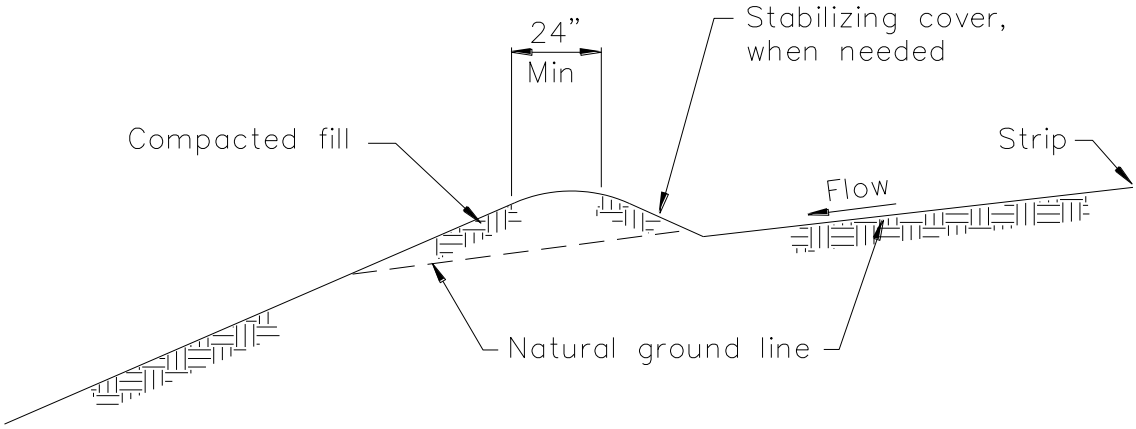
Earth Dikes and Drainage Swales EC-9



TYPICAL DRAINAGE SWALE
NOT TO SCALE

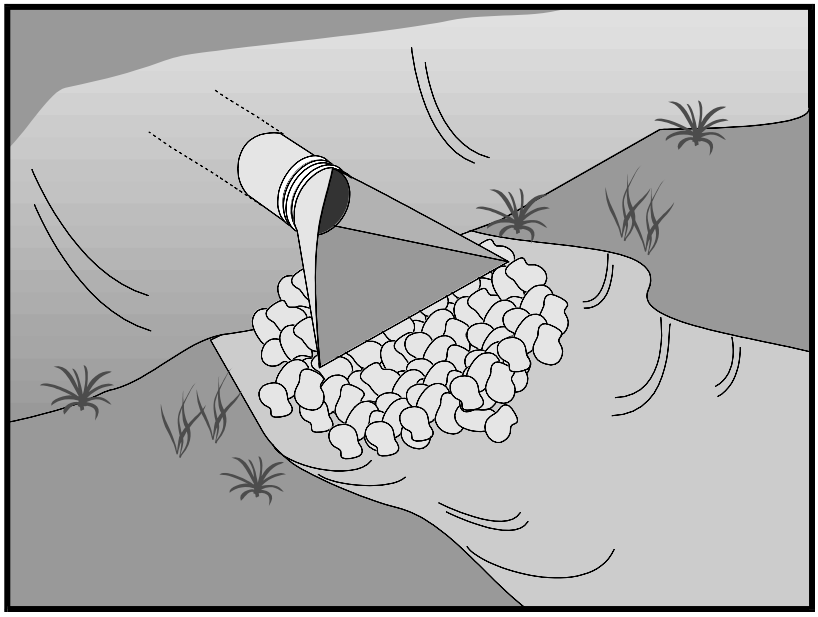
NOTES:

1. Stabilize inlet, outlets and slopes.
2. Properly compact the subgrade.



TYPICAL EARTH DIKE
NOT TO SCALE

Velocity Dissipation Devices EC-10



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble, which is placed at the outlet of a pipe or channel to prevent scour of the soil caused by concentrated, high velocity flows.

Suitable Applications

Whenever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This includes temporary diversion structures to divert runon during construction.

- These devices may be used at the following locations:
  - Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits, or channels.
  - Outlets located at the bottom of mild to steep slopes.
  - Discharge outlets that carry continuous flows of water.
  - Outlets subject to short, intense flows of water, such as flash floods.
  - Points where lined conveyances discharge to unlined conveyances

Limitations

- Large storms or high flows can wash away the rock outlet protection and leave the area susceptible to erosion.

- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in velocity dissipation devices.

Implementation

General

Outlet protection is needed where discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the immediate downstream reach. This practice protects the outlet from developing small eroded pools (plange pools), and protects against gully erosion resulting from scouring at a culvert mouth.

Design and Layout

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate, and velocity should be considered in the outlet design. Compliance to local and state regulations should also be considered while working in environmentally sensitive streambeds. General recommendations for rock size and length of outlet protection mat are shown in the rock outlet protection figure in this BMP and should be considered minimums. The apron length and rock size gradation are determined using a combination of the discharge pipe diameter and estimate discharge rate: Select the longest apron length and largest rock size suggested by the pipe size and discharge rate. Where flows are conveyed in open channels such as ditches and swales, use the estimated discharge rate for selecting the apron length and rock size. Flows should be same as the culvert or channel design flow but never the less than the peak 5 year flow for temporary structures planned for one rainy season, or the 10 year peak flow for temporary structures planned for two or three rainy seasons.

- There are many types of energy dissipaters, with rock being the one that is represented in the attached figure.
- Best results are obtained when sound, durable, and angular rock is used.
- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction. Grouted or wired tied rock riprap can minimize maintenance requirements.
- Rock outlet protection is usually less expensive and easier to install than concrete aprons or energy dissipaters. It also serves to trap sediment and reduce flow velocities.
- Carefully place riprap to avoid damaging the filter fabric.

- Stone 4 in. to 6 in. may be carefully dumped onto filter fabric from a height not to exceed 12 in.

- Stone 8 in. to 12 in. must be hand placed onto filter fabric, or the filter fabric may be covered with 4 in. of gravel and the 8 in. to 12 in. rock may be dumped from a height not to exceed 16 in.

- Stone greater than 12 in. shall only be dumped onto filter fabric protected with a layer of gravel with a thickness equal to one half the D_{50} rock size, and the dump height limited to twice the depth of the gravel protection layer thickness.

- For proper operation of apron: Align apron with receiving stream and keep straight throughout its length. If a curve is needed to fit site conditions, place it in upper section of apron.

- Outlets on slopes steeper than 10 percent should have additional protection.

Costs

Costs are low if material is readily available. If material is imported, costs will be higher. Average installed cost is $150 per device.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur. Minimize areas of standing water by removing sediment blockages and filling scour depressions.

- Inspect apron for displacement of the riprap and damage to the underlying fabric. Repair fabric and replace riprap that has washed away. If riprap continues to wash away, consider using larger material.

- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.

- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.

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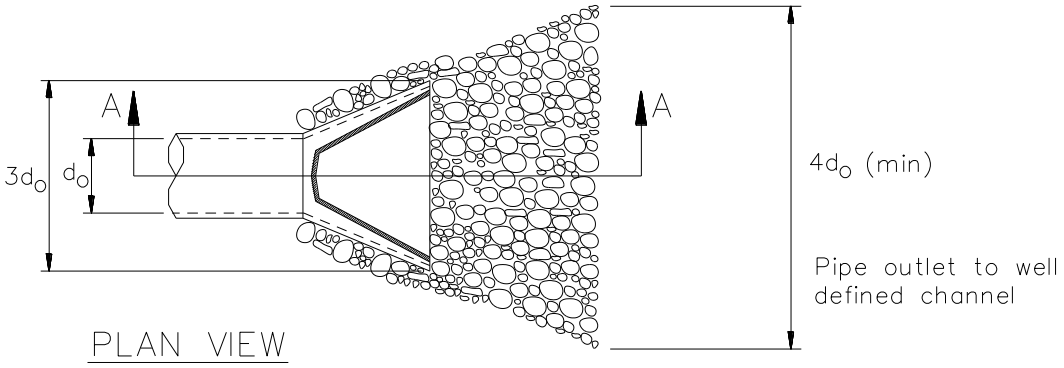
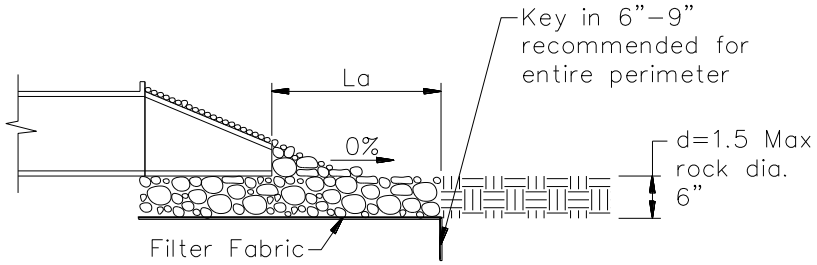
Velocity Dissipation Devices EC-10



PLAN VIEW

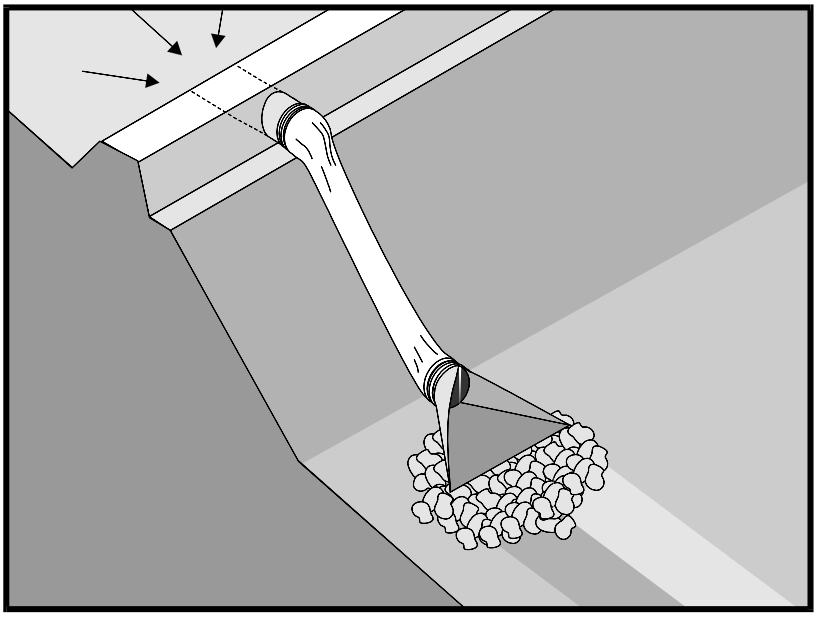


SECTION A–A

Pipe Diameter inches	Discharge ft³/s	Apron Length, La ft	Rip Rap D_{50} Diameter Min inches
12	5	10	4
	10	13	6
18	10	10	6
	20	16	8
	30	23	12
	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

For larger or higher flows consult a Registered Civil Engineer
Source: USDA - SCS

Slope Drains EC-11



Description and Purpose

A slope drain is a pipe used to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device, or stabilized area. Slope drains are used with earth dikes and drainage ditches to intercept and direct surface flow away from slope areas to protect cut or fill slopes.

Suitable Applications

- Where concentrated flow of surface runoff must be conveyed down a slope in order to prevent erosion.
- Drainage for top of slope diversion dikes or swales.
- Drainage for top of cut and fill slopes where water can accumulate.
- Emergency spillway for a sediment basin.

Limitations

Installation is critical for effective use of the pipe slope drain to minimize potential gully erosion.

- Maximum drainage area per slope drain is 10 acres. (For large areas use a paved chute, rock lined channel, or additional pipes.)
- Severe erosion may result when slope drains fail by overtopping, piping, or pipe separation.

Categories

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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-9 Earth Dike, Drainage Swales

- During large storms, pipe slope drains may become clogged or over charged, forcing water around the pipe and causing extreme slope erosion.

- If the sectional downdrain is not sized correctly, the runoff can spill over the drain sides causing gully erosion and potential failure of the structure.

- Dissipation of high flow velocities at the pipe outlet is required to avoid downstream erosion.

- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in energy dissipaters associated with slope drain outlets.

Implementation

General

The slope drain is applicable for any construction site where concentrated surface runoff can accumulate and must be conveyed down the slope in order to prevent erosion. The slope drain is effective because it prevents the stormwater from flowing directly down the slope by confining all the runoff into an enclosed pipe or channel. Due to the time lag between grading slopes and installation of permanent stormwater collection systems and slope stabilization measures, temporary provisions to intercept runoff are sometimes necessary. Particularly in steep terrain, slope drains can protect unstabilized areas from erosion.

Installation

The slope drain may be a rigid pipe, such as corrugated metal, a flexible conduit, or a lined terrace drain with the inlet placed on the top of a slope and the outlet at the bottom of the slope. This BMP typically is used in combination with a diversion control, such as an earth dike or drainage swale at the top of the slope.

The following criteria must be considered when siting slope drains.

- Permanent structures included in the project plans can often serve as construction BMPs if implemented early. However, the permanent structure must meet or exceed the criteria for the temporary structure.

- Inlet structures must be securely entrenched and compacted to avoid severe gully erosion.

- Slope drains must be securely anchored to the slope and must be adequately sized to carry the capacity of the design storm and associated forces.

- Outlets must be stabilized with riprap, concrete or other type of energy dissipator, or directed into a stable sediment trap or basin. See EC-10, Velocity Dissipation Devices.

- Debris racks are recommended at the inlet. Debris racks located several feet upstream of the inlet can usually be larger than racks at the inlet, and thus provide enhanced debris protection and less plugging.

- Safety racks are also recommended at the inlet and outlet of pipes where children or animals could become entrapped.

- Secure inlet and surround with dikes to prevent gully erosion and anchor pipe to slope.

Slope Drains EC-11

- When using slope drains, limit drainage area to 10 acres per pipe. For larger areas, use a rock lined channel or a series of pipes.
- Size to convey at least the peak flow of a 10-year storm. The design storm is conservative due to the potential impact of system failures.
- Maximum slope generally limited to 2:1 (H:V) as energy dissipation below steeper slopes is difficult.
- Direct surface runoff to slope drains with interceptor dikes. See BMP EC-9, Earth Dikes and Drainage Swales. Top of interceptor dikes should be 12 in. higher than the top of the slope drain.
- Slope drains can be placed on or buried underneath the slope surface.
- Recommended materials include both metal and plastic pipe, either corrugated or smooth wall. Concrete pipe can also be used.
- When installing slope drains:
  - Install slope drains perpendicular to slope contours.
  - Compact soil around and under entrance, outlet, and along length of pipe.
  - Securely anchor and stabilize pipe and appurtenances into soil.
  - Check to ensure that pipe connections are watertight.
  - Protect area around inlet with filter cloth. Protect outlet with riprap or other energy dissipation device. For high energy discharges, reinforce riprap with concrete or use reinforced concrete device.
  - Protect outlet of slope drains using a flared end section when outlet discharges to a flexible energy dissipation device.
  - A flared end section installed at the inlet will improve flow into the slope drain and prevent erosion at the pipe entrance. Use a flared end section with a 6 in. minimum toe plate to help prevent undercutting. The flared section should slope towards the pipe inlet.

Design and Layout

The capacity for temporary drains should be sufficient to convey at least the peak runoff from a 10-year rainfall event. The pipe size may be computed using the Rational Method or a method established by the local municipality. Higher flows must be safely stored or routed to prevent any offsite concentration of flow and any erosion of the slope. The design storm is purposely conservative due to the potential impacts associated with system failures.

As a guide, temporary pipe slope drains should not be sized smaller than shown in the following table:

Minimum Pipe Diameter (Inches)	Maximum Drainage Area (Acres)
12	1.0
18	3.0
21	5.0
24	7.0
30	10.0

Larger drainage areas can be treated if the area can be subdivided into areas of 10 acres or less and each area is treated as a separate drainage. Drainage areas exceeding 10 acres must be designed by a Registered Civil Engineer and approved by the agency that issued the grading permit.

Materials:

Soil type, rainfall patterns, construction schedule, local requirements, and available supply are some of the factors to be considered when selecting materials. The following types of slope drains are commonly used:

- **Rigid Pipe:** This type of slope drain is also known as a pipe drop. The pipe usually consists of corrugated metal pipe or rigid plastic pipe. The pipe is placed on undisturbed or compacted soil and secured onto the slope surface or buried in a trench. Concrete thrust blocks must be used when warranted by the calculated thrust forces. Collars should be properly installed and secured with metal strappings or watertight collars.

- **Flexible Pipe**: The flexible pipe slope drain consists of a flexible tube of heavy duty plastic, rubber, or composite material. The tube material is securely anchored onto the slope surface. The tube should be securely fastened to the metal inlet and outlet conduit sections with metal strappings or watertight collars.

- **Section Downdrains**: The section downdrain consists of pre-fabricated, section conduit of half round or third round material. The sectional downdrain performs similar to a flume or chute. The pipe must be placed on undisturbed or compacted soil and secured into the slope.

- **Concrete-lined Terrace Drain:** This is a concrete channel for draining water from a terrace on a slope to the next level. These drains are typically specified as permanent structures and if installed early, can serve as slope drains during construction, which should be designed according to local drainage design criteria.

Costs

- Cost varies based on pipe selection and selected outlet protection.

Corrugated Steel Pipes, Per Foot	
Size	Supplied and Installed Cost (No Trenching Included)
12”	$19.60 per LF
15”	$22.00
18”	$26.00
24”	$32.00
30”	$50.00
PVC Pipes, Per Foot	
Size	Supplied and Installed Cost (No Trenching Included)
12”	$24.50
14”	$49.00
16”	$51.00
18”	$54.00
20”	$66.00
24”	$93.00
30”	$130.00

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur. Minimize areas of standing water by removing sediment blockages and filling scour depressions.
- Inspect outlet for erosion and downstream scour. If eroded, repair damage and install additional energy dissipation measures. If downstream scour is occurring, it may be necessary to reduce flows being discharged into the channel unless other preventative measures are implemented.
- Insert inlet for clogging or undercutting. Remove debris from inlet to maintain flows. Repair undercutting at inlet and if needed, install flared section or rip rap around the inlet to prevent further undercutting.
- Inspect pipes for leakage. Repair leaks and restore damaged slopes.
- Inspect slope drainage for accumulations of debris and sediment.

- Remove built up sediment from entrances and outlets as required. Flush drains if necessary; capture and settle out sediment from discharge.
- Make sure water is not ponding onto inappropriate areas (e.g., active traffic lanes, material storage areas, etc.).
- Pipe anchors must be checked to ensure that the pipe remains anchored to the slope. Install additional anchors if pipe movement is detected.

References

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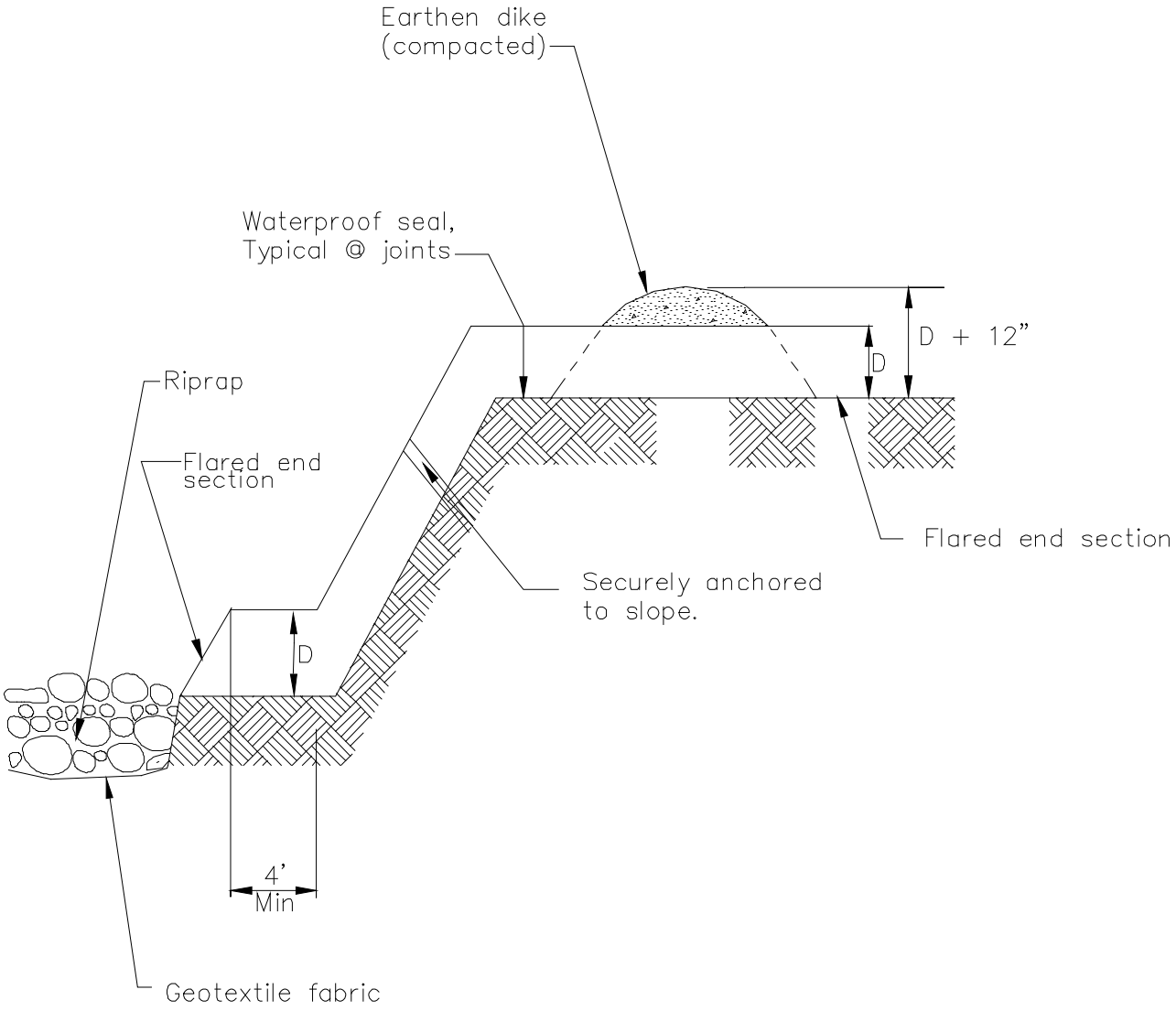
Slope Drains EC-11



TYPICAL SLOPE DRAIN
NOT TO SCALE

Streambank Stabilization EC-12

Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

Combination of erosion and sediment controls.

Description and Purpose

Stream channels, streambanks, and associated riparian areas are dynamic and sensitive ecosystems that respond to changes in land use activity. Streambank and channel disturbance resulting from construction activities can increase the stream's sediment load, which can cause channel erosion or sedimentation and have adverse affects on the biotic system. BMPs can reduce the discharge of sediment and other pollutants to minimize the impact of construction activities on watercourses. Streams on the 303(d) list and listed for sediment may require numerous measures to prevent any increases in sediment load to the stream.

Suitable Applications

These procedures typically apply to all construction projects that disturb or occur within stream channels and their associated riparian areas.

Limitations

Specific permit requirements or mitigation measures such as Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game supercede the guidance in this BMP.

- If numerical based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required. Streams listed as 303(d) impaired for sediment, silt, or turbidity, are required to

conduct sampling to verify that there is no net increase in sediment load due to construction activities.

Implementation

Planning

- Proper planning, design, and construction techniques can minimize impacts normally associated with in stream construction activities. Poor planning can adversely affect soil, fish, wildlife resources, land uses, or land users. Planning should take into account: scheduling; avoidance of in-stream construction; minimizing disturbance area and construction time period; using pre-disturbed areas; selecting crossing location; and selecting equipment.

Scheduling

- Construction activities should be scheduled according to the relative sensitivity of the environmental concerns and in accordance with EC-1, Scheduling. Scheduling considerations will be different when working near perennial streams vs. ephemeral streams and are as follows.

- When in-stream construction is conducted in a perennial stream, work should optimally be performed during the rainy season. This is because in the summer, any sediment-containing water that is discharged into the watercourse will cause a large change in both water clarity and water chemistry. During the rainy season, there is typically more and faster flowing water in the stream so discharges are diluted faster. However, should in-stream work be scheduled for summer, establishing an isolation area, or diverting the stream, will significantly decrease the amount of sediment stirred up by construction work. Construction work near perennial streams should optimally be performed during the dry season (see below).

- When working in or near ephemeral streams, work should be performed during the dry season. By their very nature, ephemeral streams are usually dry in the summer, and therefore, in-stream construction activities will not cause significant water quality problems. However, when tying up the site at the end of the project, wash any fines (see Washing Fines) that accumulated in the channel back into the bed material, to decrease pollution from the first rainstorm of the season.

- When working near ephemeral or perennial streams, erosion and sediment controls (see silt fences, straw bale barriers, etc.) should be implemented to keep sediment out of stream channel.

Minimize Disturbance

- Minimize disturbance through: selection of the narrowest crossing location; limiting the number of equipment trips across a stream during construction; and, minimizing the number and size of work areas (equipment staging areas and spoil storage areas). Place work areas at least 50 ft from stream channel. Field reconnaissance should be conducted during the planning stage to identify work areas.

Use of Pre-Disturbed Areas

- Locate project sites and work areas in areas disturbed by prior construction or other activity when possible.

Streambank Stabilization EC-12

Selection of Project Site

- Avoid steep and unstable banks, highly erodible or saturated soils, or highly fractured rock.
- Select project site that minimizes disturbance to aquatic species or habitat.

Equipment Selection

- Select equipment that reduces the amount of pressure exerted on the ground surface, and therefore, reduces erosion potential and/or use overhead or aerial access for transporting equipment across drainage channels. Use equipment that exerts ground pressures of less than 5 or 6 lb/in^2, where possible. Low ground pressure equipment includes: wide or high flotation tires (34 to 72 in. wide); dual tires; bogie axle systems; tracked machines; lightweight equipment; and, central tire inflation systems.

Streambank Stabilization

Preservation of Existing Vegetation

- Preserve existing vegetation in accordance with EC-2, Preservation of Existing Vegetation. In a streambank environment, preservation of existing vegetation provides the following benefits.

Water Quality Protection

- Vegetated buffers on slopes trap sediment and promote groundwater recharge. The buffer width needed to maintain water quality ranges from 15 to 100 ft. On gradual slopes, most of the filtering occurs within the first 30 ft. Steeper slopes require a greater width of vegetative buffer to provide water quality benefits.

Streambank Stabilization

- The root system of riparian vegetation stabilizes streambanks by increasing tensile strength in the soil. The presence of vegetation modifies the moisture condition of slopes (infiltration, evapo transpiration, interception) and increases bank stability.

Riparian Habitat

- Buffers of diverse riparian vegetation provide food and shelter for riparian and aquatic organisms. Minimizing impacts to fisheries habitat is a major concern when working near streams and rivers. Riparian vegetation provides shade, shelter, organic matter (leaf detritus and large woody debris), and other nutrients that are necessary for fish and other aquatic organisms. Buffer widths for habitat concerns are typically wider than those recommended for water quality concerns (100 to 1500 ft).
- When working near watercourses, it is important to understand the work site's placement in the watershed. Riparian vegetation in headwater streams has a greater impact on overall water quality than vegetation in downstream reaches. Preserving existing vegetation upstream is necessary to maintain water quality, minimize bank failure, and maximize riparian habitat, downstream of the work site.

Limitations

- Local county and municipal ordinances regarding width, extent and type of vegetative buffer required may exceed the specifications provided here; these ordinances should be investigated prior to construction.

Streambank Stabilization EC-12

Streambank Stabilization Specific Installation

- As a general rule, the width of a buffer strip between a road and the stream is recommended to be 50 ft plus four times the percent slope of the land, measured between the road and the top of stream bank.

Hydraulic Mulch

- Apply hydraulic mulch on disturbed streambanks above mean high water level in accordance with EC-3, Hydraulic Mulch to provide temporary soil stabilization.

Limitations

- Do not place hydraulic mulch or tackifiers below the mean high water level, as these materials could wash into the channel and impact water quality or possibly cause eutrophication (eutrophication is an algal bloom caused by excessively high nutrient levels in the water).

Hydroseeding

- Hydroseed disturbed streambanks in accordance with EC-4, Hydroseeding.

Limitations

- Do not place tackifiers or fertilizers below the mean high water level, as these materials could wash into the channel and impact water quality or possibly cause eutrophication.

Soil Binders

- Apply soil binders to disturbed streambanks in accordance with EC-5, Soil Binders.

Limitations

- Do not place soil binders below the mean high water level. Soil binder must be environmentally benign and non-toxic to aquatic organisms.

Straw Mulch

- Apply straw mulch to disturbed streambanks in accordance with EC-6, Straw Mulch.

Limitations

- Do not place straw mulch below the mean high water level, as this material could wash into the channel and impact water quality or possibly cause eutrophication.

Geotextiles and Mats

- Install geotextiles and mats as described in EC-7, Geotextiles and Mats, to stabilize disturbed channels and streambanks. Not all applications should be in the channel, for example, certain geotextile netting may snag fish gills and are not appropriate in fish bearing streams. Geotextile fabrics that are not biodegradable are not appropriate for in stream use. Additionally, geotextile fabric or blankets placed in channels must be adequate to sustain anticipated hydraulic forces.

Earth Dikes, Drainage Swales, and Lined Ditches

- Convey, intercept, or divert runoff from disturbed streambanks using EC-9, Earth Dikes and Drainage Swales.

Streambank Stabilization EC-12

Limitations

- Do not place earth dikes in watercourses, as these structures are only suited for intercepting sheet flow, and should not be used to intercept concentrated flow.

- Appropriately sized velocity dissipation devices (EC-10) must be placed at outlets to minimize erosion and scour.

Velocity Dissipation Devices

- Place velocity dissipation devices at outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits or channels in accordance with EC-10, Velocity Dissipation Devices.

Slope Drains

- Use slope drains to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device or stabilized area in accordance with EC-11, Slope Drains.

Limitations

- Appropriately sized outlet protection and velocity dissipation devices (EC-10) must be placed at outlets to minimize erosion and scour.

Streambank Sediment Control

Silt Fences

- Install silt fences in accordance with SE-1, Silt Fence, to control sediment. Silt fences should only be installed where sediment laden water can pond, thus allowing the sediment to settle out.

Fiber Rolls

- Install fiber rolls in accordance with SE-5, Fiber Rolls, along contour of slopes above the high water level to intercept runoff, reduce flow velocity, release the runoff as sheet flow and provide removal of sediment from the runoff. In a stream environment, fiber rolls should be used in conjunction with other sediment control methods such as SE-1, Silt Fence or SE-9 Straw Bale Barrier. Install silt fence, straw bale barrier, or other erosion control method along toe of slope above the high water level.

Gravel Bag Berm

- A gravel bag berm or barrier can be utilized to intercept and slow the flow of sediment laden sheet flow runoff in accordance with SE-6, Gravel Bag Berm. In a stream environment gravel bag barriers can allow sediment to settle from runoff before water leaves the construction site and can be used to isolate the work area from the live stream.

Limitations

- Gravel bag barriers are not recommended as a perimeter sediment control practice around streams.

Straw Bale Barrier

- Install straw bale barriers in accordance with SE-9, Straw Bale Barrier, to control sediment. Straw bale barriers should only be installed where sediment laden water can pond, thus allowing the sediment to settle out. Install a silt fence in accordance with SE-1, Silt Fence,

on down slope side of straw bale barrier closest to stream channel to provide added sediment control.

Rock Filter

Description and Purpose

Rock filters are temporary erosion control barriers composed of rock that is anchored in place. Rock filters detain the sediment laden runoff, retain the sediment, and release the water as sheet flow at a reduced velocity. Typical rock filter installations are illustrated at the end of this BMP.

Applications

- Near the toe of slopes that may be subject to flow and rill erosion.

Limitations

- Inappropriate for contributing drainage areas greater than 5 acres.
- Requires sufficient space for ponded water.
- Ineffective for diverting runoff because filters allow water to slowly seep through.
- Rock filter berms are difficult to remove when construction is complete.
- Unsuitable in developed areas or locations where aesthetics is a concern.

Specifications

- Rock: open graded rock, 0.75 to 5 in. for concentrated flow applications.
- Woven wire sheathing: 1 in. diameter, hexagonal mesh, galvanized 20gauge (used with rock filters in areas of concentrated flow).
- In construction traffic areas, maximum rock berm heights should be 12 in. Berms should be constructed every 300 ft on slopes less than 5%, every 200 ft on slopes between 5% and 10%, and every 100 ft on slopes greater than 10%.

Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Reshape berms as needed and replace lost or dislodged rock, and filter fabric.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.

K-rail

Description and Purpose

This is temporary sediment control that uses K-rails to form the sediment deposition area, or to isolate the near bank construction area. Install K-rails at toe of slope in accordance with procedures described in NS-5, Clear Water Diversion.

Barriers are placed end to end in a pre-designed configuration and gravel filled bags are used at the toe of the barrier and at their abutting ends to seal and prevent movement of sediment beneath or through the barrier walls.

Appropriate Applications

- This technique is useful at the toe of embankments, cuts or fills slopes.

Limitations

- The K-rail method should not be used to dewater a project site, as the barrier is not watertight.

Implementation

- Refer to NS-5, Clear Water Diversion, for implementation requirements.

Instream Construction Sediment Control

There are three different options currently available for reducing turbidity while working in a stream or river. The stream can be isolated from the area in which work is occurring by means of a water barrier, the stream can be diverted around the work site through a pipe or temporary channel, or one can employ construction practices that minimize sediment suspension.

Whatever technique is implemented, an important thing to remember is that dilution can sometimes be the solution. A probable "worst time" to release high TSS into a stream system might be when the stream is very low; summer low flow, for example. During these times, the flow may be low while the biological activity in the stream is very high. Conversely, the addition of high TSS or sediment during a big storm discharge might have a relatively low impact, because the stream is already turbid, and the stream energy is capable of transporting both suspended solids, and large quantities of bedload through the system. The optimum time to "pull" in-stream structures may be during the rising limb of a storm hydrograph.

Techniques to minimize Total Suspended Solids (TSS)

- **Padding** - Padding laid in the stream below the work site may trap some solids that are deposited in the stream during construction. After work is done, the padding is removed from the stream, and placed on the bank to assist in re-vegetation.

- **Clean, washed gravel** - Using clean, washed gravel decreases solid suspension, as there are fewer small particles deposited in the stream.

- **Excavation using a large bucket** - Each time a bucket of soil is placed in the stream, a portion is suspended. Approximately the same amount is suspended whether a small amount of soil is placed in the stream, or a large amount. Therefore, using a large excavator bucket instead of a small one, will reduce the total amount of soil that washes downstream.

- **Use of dozer for backfilling** - Using a dozer for backfilling instead of a backhoe follows the same principles – the fewer times soil is deposited in the stream, the less soil will be suspended.

- **Partial dewatering with a pump** - Partially dewatering a stream with a pump reduces the amount of water, and thus the amount of water that can suspend sediment.

Washing Fines

Definition and Purpose

- Washing fines is an "in-channel" sediment control method, which uses water, either from a water truck or hydrant, to wash stream fines that were brought to the surface of the channel bed during restoration, back into the interstitial spaces of the gravel and cobbles.

- The purpose of this technique is to reduce or eliminate the discharge of sediment from the channel bottom during the first seasonal flow. Sediment should not be allowed into stream channels; however, occasionally in-channel restoration work will involve moving or otherwise disturbing fines (sand and silt sized particles) that are already in the stream, usually below bankfull discharge elevation. Subsequent re-watering of the channel can result in a plume of turbidity and sedimentation.

- This technique washes the fines back into the channel bed. Bedload materials, including gravel cobbles, boulders and those fines, are naturally mobilized during higher storm flows. This technique is intended to delay the discharge until the fines would naturally be mobilized.

Appropriate Applications

- This technique should be used when construction work is required in channels. It is especially useful in intermittent or ephemeral streams in which work is performed "in the dry", and which subsequently become re-watered.

Limitations

- The stream must have sufficient gravel and cobble substrate composition.

- The use of this technique requires consideration of time of year and timing of expected stream flows.

- The optimum time for the use of this technique is in the fall, prior to winter flows.

- Consultation with, and approval from the Department of Fish and Game and the Regional Water Quality Control Board may be required.

Implementation

- Apply sufficient water to wash fines, but not cause further erosion or runoff.

- Apply water slowly and evenly to prevent runoff and erosion.

- Consult with Department of Fish and Game and the Regional Water Quality Control Board for specific water quality requirements of applied water (e.g. chlorine).

Streambank Stabilization EC-12

Inspection and Maintenance

- None necessary

Costs

Cost may vary according to the combination of practices implemented.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events until final stabilization is achieved.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

- Inspect and repair equipment (for damaged hoses, fittings, and gaskets).

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

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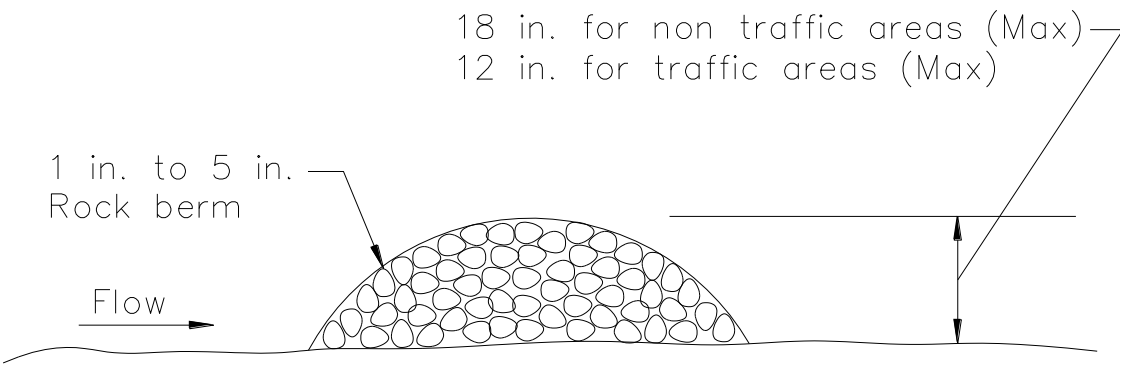
Streambank Stabilization EC-12



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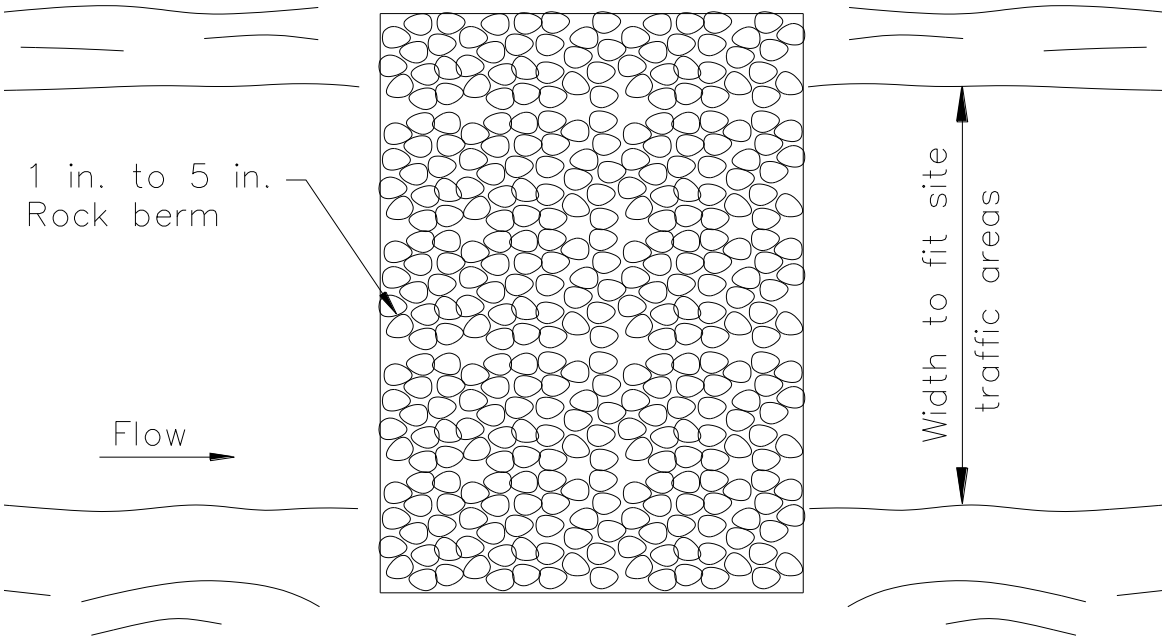

PLAN

TYPICAL ROCK FILTER
NOT TO SCALE

Compost Blanket EC-14

Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- EC-3 Hydraulic Mulch
- EC-4 Hydroseeding
- EC-5 Soil Binders
- EC-7 Geotextiles and Mats
- EC-8 Wood Mulching

Description and Purpose

A compost blanket is applied to slopes and earth disturbed areas to prevent erosion, and in some cases, increase infiltration and/or establish vegetation. The compost blanket can be applied by hand, conveyor system, compost spreader, or pneumatic delivery (blower) system. The blanket thickness is determined from the slope steepness and anticipated precipitation. A compost blanket protects the soil surface from raindrop erosion, particularly rills and gullies that may form under other methods of erosion control.

A compost blanket, if properly installed, can be very successful at vegetation establishment, weed suppression and erosion control. The compost blanket comes into direct contact with the underlying soil, reducing rill formation. Furthermore, compost provides organic matter and nutrients important for vegetation growth. The compost blanket provides soil structure that allows water to infiltrate the soil surface and retain moisture, which also promotes seed germination and vegetation growth, in addition to reducing runoff.

Compost is typically derived from combinations of feedstocks, biosolids, leaf and yard trimmings, manure, wood, or mixed solid waste. Many types of compost are products of municipal recycle or "Greenwaste" programs. Compost is organic and biodegradable and can be left onsite. There are many types of compost with a variety of properties with specific functions, and accordingly, compost selection is an important design consideration in the application of this type of erosion control.

Compost Blanket EC-14

Suitable Applications

A compost blanket is appropriate for slopes and earth disturbed areas requiring protection until permanent stabilization is established. A compost blanket can also used in combination with temporary and/or permanent seeding strategies to enhance plant establishment. Examples include:

- Rough-graded areas that will remain inactive for longer than 14 days
- Soil stockpiles
- Slopes with exposed soil between existing vegetation such as trees or shrubs
- Slopes planted with live, container-grown vegetation
- Disturbed areas where plants are slow to develop

A compost blanket is typically used on slopes of 2:1 (H:V) or gentler. However, a compost blanket can be effective when applied to slopes as steep as 1:1 (H:V) with appropriate design considerations including slope length, blanket thickness, adding components such as a tackifier, or using compost blankets in conjunction with other techniques, such as compost socks and berms or fiber rolls.

Compost can be pre-seeded prior to application to the soil (recommended by the EPA for construction site stormwater runoff control) or seeded after the blanket has been installed. The compost medium can also remove pollutants in stormwater including heavy metals; oil and grease; and hydrocarbons (USEPA, 1998).

Limitations

- Compost can potentially leach nutrients (dissolved phosphorus and nitrogen) into runoff and potentially impact water quality. Compost should not be used directly upstream from nutrient impaired waterbodies (Adams et. al, 2008).
- Compost may also contain other undesirable constituents that are detrimental to water quality. Carefully consider the qualifications and experience of any compost producer/supplier.
- A compost blanket applied by hand is more time intensive and potentially costly. Using a pneumatic blower truck is the recommended cost effective method of application.
- When blowers are used, the treatment areas should be within 300 ft of a road or surface capable of supporting trucks.
- Wind may limit application of compost and result in application to undesired locations.
- Compost blankets should not be applied in areas of concentrated flows.
- Steeper slopes may require additional blanket thickness and other stability measures such as using tackifiers or slope interruption devices (compost socks and berms, or fiber rolls). The same applies for sites with high precipitation totals or during the rainy season.

Compost Blanket EC-14

Implementation

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Compost Materials

- California Compost Regulations (Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3) define and require a quality of compost for application. Compost should comply with all physical and chemical requirements. Specific requirements are provided in Table 1 below, taken from Caltrans Standard Special Provision 10-1 (SSP 10-1), Erosion Control (Compost Blanket).

- The compost producer should be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility should certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.

- The compost producer should be a participant in United States Composting Council's Seal of Testing Assurance program.

- Compost moisture should be considered for composition quality and application purposes. A range of 30-50% is typical. Compost that is too dry is hard to apply and compost that is too wet is more difficult (and more expensive) to transport. For arid or semi-arid areas, or for application during the dry season, use compost with greater moisture content than areas with wetter climates. For wetter or more humid climates or for application during the wet season, drier composts can be used as the compost will absorb moisture from the ambient air.

- Organic content of the compost is also important and should range from 30 to 65% depending on site conditions.

- Compost should be high-quality mature compost. Immature compost can potentially leach nutrients.

- Compost should not be derived from mixed municipal solid waste and should be free of visible contaminants.

- Compost should not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Metal concentrations in compost should not exceed the maximum metal concentrations listed under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.

- Compost should not possess objectionable odors.

- Compost should be weed free.

Compost Blanket EC-14

Table 1. Physical/Chemical Requirements of Compost
Reference - Caltrans SSP-10 Erosion Control Blanket (Compost)

Property	Test Method	Requirement
pH	*TMECC 04.11-A Elastometric pH 1:5 Slurry Method pH Units	6.0–8.0
Soluble Salts	TMECC 04.10-A Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0-10.0
Moisture Content	TMECC 03.09-A Total Solids & Moisture at 70+/- 5 deg C % Wet Weight Basis	30-60
Organic Matter Content	TMECC 05.07-A Loss-On-Ignition Organic Matter Method (LOI) % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	80 or Above 80 or Above
Stability	TMECC 05.08-B Carbon Dioxide Evolution Rate mg CO_2-C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	100% Passing, 3 inch 90-100% Passing, 1 inch 65-100% Passing, 3/4 inch 0 - 75% Passing, 1/4 inch Maximum length 6 inches
Pathogen	TMECC 07.01-B Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Plastic, Glass and Metal % > 4mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles) % > 4mm fraction	None Detected

*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Installation

- Prior to compost application, prepare the slope by removing loose rocks, roots, stumps, and other debris greater than 2" in diameter. Prepare the slope area surface by scarifying or track walking/roughening if necessary.
- Select method to apply the compost blanket. A pneumatic blower is most cost effective and most adaptive in applying compost to steep, rough terrain, and hard to reach locations.
- A compost blanket thickness of 1" to 4" should be applied to slopes of 2:1 (H:V) or gentler, based on site-specific conditions. Increase blanket thickness with increased slope steepness and/or during installation during the rainy season (for example, 2" to 3" should be used for a

3:1 slope, while 1" to 2" can be used for a 4:1 slope). Erosion control using a compost blanket is not recommended for slopes greater than 1:1 (H:V).

- For steeper slopes, tackifiers should be utilized and/or other stabilization techniques employed. For example, compost socks or berms can be installed at intervals over the compost blanket (in a similar manner as Fiber Rolls, SE-5).
- Compost socks or berms (or equivalent linear sediment control BMP) should be placed at the top and/or bottom of the slope for additional erosion control performance.
- For optimum vegetation establishment, a blanket thickness of 1" to 2" is recommended. If vegetation establishment is not the primary function of the compost blanket, a thicker blanket may be recommended based on slope or rainfall conditions.
- Evenly distribute compost on the soil surface to the desired blanket thickness (1/2" to 4" as calculated prior based on site conditions and objectives). Even distribution is an important factor in preventing future rill and gully erosion.
- The compost blanket should extend 3 to 6 feet over the top of the shoulder of the slope. A compost sock or compost berm can be used at the top of the slope as an auxiliary technique to prevent runoff from flowing underneath the compost blanket.
- Use additional anchoring and erosion control BMPs in conjunction of the compost blanket as needed.

Costs

The cost associated with a compost blanket is similar to that of a straw mat and generally less expensive than a geotextile blanket (USEPA, 2009). Caltrans has provided a recent estimate for $5,000 to $8,000 per acre for application of an unseeded 1 inch compost blanket (Caltrans Compost Specifications, 2009). Recently obtained vendor costs indicate that proprietary blends of compost that are seeded and contain a nutrient rich "tackifier" can cost approximately $0.35 per square foot, or approximately $15,000 per acre for a 2 inch blanket. Application by hand is more time intensive and likely more costly.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident, another layer of compost should be reapplied as soon as possible. It may be necessary to install an additional type of stormwater BMP at the top of slope or as a slope interrupter to control flow, such as a fiber roll (SE-5) or compost sock (SE-11).
- Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- Limit or prohibit foot traffic to minimize damage to BMP or impede vegetation establishment.

Compost Blanket EC-14

References

An Analysis of Composting as an Environmental Remediation Technology, U.S. Environmental Protection Agency (USEPA), Solid Waste and Emergency Response (5305W), EPA530-R-8-008, 1998.

Characteristics of Compost: Moisture Holding and Water Quality Improvement, Center for Research in Water Resources, Kirchoff, C., Malina, J., and Barrett, M., 2003.

Compost Utilization for Erosion Control, The University of Georgia College of Agricultural and Environmental Sciences, pubs.caes.uga.edu/caespubs/pubcd/B1200.htm, Faucette, B. and Risse, M., 2009.

Demonstration Project Using Yard Debris Compost for Erosion Control, Final Report, presented to Metropolitan Service District, W&H Pacific, 1993.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, 2005.

Standard Special Provision 10-1, Erosion Control (Compost Blanket), California Department of Transportation (Caltrans). 2007 Update.

Evaluation of Environmental Benefits and Impacts of Compost and Industry Standard Erosion and Sediment Controls Measures Used in Construction Activities, Dissertation, Institute of Ecology, University of Georgia, Faucette, B., 2004.

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National Pollutant Discharge Elimination System (NPDES), Compost Blankets, U.S. Environmental Protection Agency (USEPA). http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=118, 2009.

Standard Specifications for Transportation Materials and Methods of Sampling and Testing Designation M10-03, Compost for Erosion/Sediment Control (Compost Blankets), Provisional, American Association of State Highway Transportation Officials (AASHTO), 2003.

Stormwater Best Management Practices (BMPs) Field Trials of Erosion Control Compost in Reclamation of Rock Quarry Operations, Nonpoint Source Protection Program CWA §319(h), Texas Commission on Environmental Quality, Adams, T., McFarland, A., Hauck, L., Barrett, M., and Eck, B., 2008.

Soil Preparation/Roughening EC-15

Description and Purpose

Soil Preparation/Roughening involves assessment and preparation of surface soils for BMP installation. This can include soil testing (for seed base, soil characteristics, or nutrients), as well as roughening surface soils by mechanical methods (including sheepsfoot rolling, track walking, scarifying, stair stepping, and imprinting) to prepare soil for additional BMPs, or to break up sheet flow. Soil Preparation can also involve tilling topsoil to prepare a seed bed and/or incorporation of soil amendments, to enhance vegetative establishment.

Suitable Applications

Soil preparation: Soil preparation is essential to proper vegetative establishment. In particular, soil preparation (i.e. tilling, raking, and amendment) is suitable for use in combination with any soil stabilization method, including RECPs or sod. Soil preparation should not be confused with roughening.

Roughening: Soil roughening is generally referred to as track walking (sometimes called imprinting) a slope, where treads from heavy equipment run parallel to the contours of the slope and act as mini terraces. Soil preparation is most effective when used in combination with erosion controls. Soil Roughening is suitable for use as a complementary process for controlling erosion on a site. Roughening is not intended to be used as a stand-alone BMP, and should be used with perimeter controls, additional erosion control measures, grade breaks, and vegetative establishment for maximum effectiveness. Roughening is intended to only affect surface soils and should not compromise slope stability or overall compaction. Suitable applications for soil roughening include:

Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-5 Soil Binders

EC-7 Geotextiles and Mats

Soil Preparation / Roughening EC-15

- Along any disturbed slopes, including temporary stockpiles, sediment basins, or compacted soil diversion berms and swales.

- Roughening should be used in combination with hydraulically applied stabilization methods, compost blanket, or straw mulch; but should not be used in combination with RECPs or sod because roughening is intended to leave terraces on the slope.

Limitations

- Preparation and roughening must take place prior to installing other erosion controls (such as hydraulically applied stabilizers) or sediment controls (such as fiber rolls) on the faces of slopes.

- In such cases where slope preparation is minimal, erosion control/revegetation BMPs that do not require extensive soil preparation - such as hydraulic mulching and seeding applications - should be employed.

- Consideration should be given to the type of erosion control BMP that follows surface preparation, as some BMPs are not designed to be installed over various types of tillage/roughening, i.e., RECPs (erosion control blankets) should not be used with soil roughening due to a "bridging" effect, which suspends the blanket above the seed bed.

- Surface roughness has an effect on the amount of mulch material that needs to be applied, which shows up as a general increase in mulch material due to an increase in surface area (Topographic Index -see EC-3 Hydraulic Mulching).

Implementation

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

General

A roughened surface can significantly reduce erosion. Based on tests done at the San Diego State Erosion Research Laboratory, various roughening techniques on slopes can result in a 12 - 76% reduction in the erosion rate versus smooth slopes.

Materials

Minimal materials are required unless amendments and/or seed are added to the soil. The majority of soil roughening/preparation can be done with equipment that is on hand at a normal construction site, such as bull dozers and compaction equipment.

Installation Guidelines

Soil Preparation

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.

- Based upon soil testing conducted, apply additional soil amendments (e.g. fertilizers, additional seed) to the soil to help with germination. Follow EC-4, Hydroseeding, when selecting and applying seed and fertilizers.

Soil Preparation / Roughening EC-15

Cut Slope Roughening:

- Stair-step grade or groove the cut slopes that are steeper than 3:1.
- Use stair-step grading on any erodible material soft enough to be ripped with a bulldozer. Slopes consisting of soft rock with some subsoil are particularly suited to stair-step grading.
- Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the "step" in toward the vertical wall.
- Do not make individual vertical cuts more than 2 feet (0.6 m) high in soft materials or more than 3 feet (0.9 m) high in rocky materials.
- Groove the slope using machinery to create a series of ridges and depressions that run across the slope, on the contour.

Fill Slope Roughening:

- Place on fill slopes with a gradient steeper than 3:1 in lifts not to exceed 8 inches (0.2 m), and make sure each lift is properly compacted.
- Ensure that the face of the slope consists of loose, uncompacted fill 4-6 inches (0.1-0.2 m) deep.
- Use grooving or tracking to roughen the face of the slopes, if necessary.
- Do not blade or scrape the final slope face.

Roughening for Slopes to be Mowed:

- Slopes which require mowing activities should not be steeper than 3:1.
- Roughen these areas to shallow grooves by track walking, scarifying, sheepsfoot rolling, or imprinting.
- Make grooves close together (less than 10 inches), and not less than 1 inch deep, and perpendicular to the direction of runoff (i.e., parallel to the slope contours).
- Excessive roughness is undesirable where mowing is planned.

Roughening With Tracked Machinery:

- Limit roughening with tracked machinery to soils with a sandy textural component to avoid undue compaction of the soil surface.
- Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back-blade during the final grading operation.
- Seed and mulch roughened areas as soon as possible to obtain optimum seed germination and growth.

Soil Preparation / Roughening EC-15

Costs

Costs are based on the additional labor of tracking or preparation of the slope plus the cost of any required soil amendment materials.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check the seeded slopes for signs of erosion such as rills and gullies. Fill these areas slightly above the original grade, then reseed and mulch as soon as possible.
- Inspect BMPs weekly during normal operations, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Non-Vegetative Stabilization EC-16

Description and Purpose

Non-vegetative stabilization methods are used for temporary or permanent stabilization of areas prone to erosion and should be used only where vegetative options are not feasible; examples include:

- Areas of vehicular or pedestrian traffic such as roads or paths;
- Arid environments where vegetation would not provide timely ground coverage, or would require excessive irrigation;
- Rocky substrate, infertile or droughty soils where vegetation would be difficult to establish; and
- Areas where vegetation will not grow adequately within the construction time frame.

There are several non-vegetative stabilization methods and selection should be based on site-specific conditions.

Decomposed Granite (DG) is a permanent erosion protection method that consists of a layer of stabilized decomposed granite placed over an erodible surface.

Degradable Mulches of various types (see EC-3, EC-6, EC-8) can be used for temporary non-vegetative stabilization; examples include straw mulch, compost, wood chips or hydraulic mulch.

Geotextiles and Mats can be used for temporary non-vegetative stabilization (see EC-7). These BMPs are typically manufactured from degradable or synthetic materials and are

Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TR	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

designed and specified based on their functional longevity, i.e., how long they will persist and provide erosion protection. All geotextiles and mats should be replaced when they exceed their functional longevity or when permanent stabilization methods are instituted.

Gravel Mulch is a non-degradable erosion control product that is composed of washed and screened coarse to very coarse gravel, 16 mm to 64 mm (0.6" - 2.5"), similar to an AASHTO No. 3 coarse aggregate.

Rock Slope Protection consists of utilizing large rock or rip-rap (4"- 24") to stabilize slopes with a high erosion potential and those subject to scour along waterways.

Soil Binders can be used for temporary non-vegetative stabilization (see EC-5). The key to their use is functional longevity. In most cases, the soil binder will need to be routinely monitored and re-applied to maintain an erosion-resistant coverage.

Suitable Applications

Non-vegetated stabilization methods are suitable for use on disturbed soil areas and on material stockpiles that need to be temporarily or permanently protected from erosion by water and wind. Non-vegetated stabilization should only be utilized when vegetation cannot be established in the required timeframe, due to soil or climactic conditions, or where vegetation may be a potential fire hazard.

Decomposed Granite (DG) and Gravel Mulch are suitable for use in areas where vegetation establishment is difficult, on flat surfaces, trails and pathways, and when used in conjunction with a stabilizer or tackifier, on shallow slopes (i.e., 10:1 [H:V]). DG and gravel can also be used on shallow rocky slopes where vegetation cannot be established for permanent erosion control.

Degradable Mulches can be used to cover and protect soil surfaces from erosion both in temporary and permanent applications. In many cases, the use of mulches by themselves requires routine inspection and re-application. See EC-3 Hydraulic Mulch, EC-6 Straw Mulch, EC-8 Wood Mulch, or EC-14 Compost Blankets for more information.

Geotextiles and Mats can be used as a temporary stand-alone soil stabilization method. Depending on material selection, geotextiles and mats can be a short-term (3 mos – 1 year) or long-term (1-2 years) temporary stabilization method. For more information on geotextiles and mats see EC-7 Geotextiles and Mats.

Rock Slope Protection can be used when the slopes are subject to scour or have a high erosion potential, such as slopes adjacent to flowing waterways or slopes subject to overflow from detention facilities (spillways).

Soil Binders can be used for temporary stabilization of stockpiles and disturbed areas not subject to heavy traffic. See EC-5 Soil Binders for more information.

Limitations

General

- Refer to EC-3, EC-6, EC-8, and EC-14 for limitations on use of mulches. Refer to EC-7 for limitations on use of geotextiles and mats. Refer to EC-5 for limitations on use of Soil Binders.

Non-Vegetative Stabilization EC-16

Decomposed Granite

- Not available in some geographic regions.
- If not tackified, material may be susceptible to erosion even on slight slopes (e.g., 30:1 [H:V]).
- Installed costs may be more expensive than vegetative stabilization methods.

Gravel Mulch

- Availability is limited in some geographic regions.
- If not properly screened and washed, can contain fine material that can erode and/or create dust problems.
- If inadequately sized, material may be susceptible to erosion on sloped areas.
- Pore spaces fill with dirt and debris over time; may provide a growing medium for weeds.

Rock Slope Protection

- Installation is labor intensive.
- Installed costs can be significantly higher than vegetative stabilization methods.
- Rounded stones may not be used on slopes greater than 2:1 [H:V].

Implementation

General

Non-vegetated stabilization should be used in accordance with the following general guidance:

- Should be used in conjunction with other BMPs, including drainage, erosion controls and sediment controls.
- Refer to EC-3, EC-6, EC-8, and EC-14 for implementation details for mulches. Refer to EC-7 for implementation details for geotextiles and mats. Refer to EC-5 for implementation details for soil binders.
- Non-vegetated stabilization measures should be implemented as soon as the disturbance in the areas they are intended to protect has ceased.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Decomposed Granite Stabilization

- If used for a road or path should be installed on a prepared base.
- Should be mixed with a stabilizer if used for roads or pathways, or on slope applications.
- Though porous it is recommended to prevent standing water on or next to a decomposed granite road or pathway.

Non-Vegetative Stabilization EC-16

Gravel Mulch

- Should be sized based on slope, rainfall, and upgradient run-on conditions. Stone size should be increased as potential for erosion increases (steeper slopes, high intensity rainfall).
- If permanent, a weed control fabric should be placed prior to installation.
- Should be installed at a minimum 2" depth.
- Should completely cover all exposed surfaces.

Rock Slope Protection

- Rock slope protection installation should follow Caltrans Standard Specification 72-2: Rock Slope Protection. Refer to the specification for rock conformity requirements and installation methods.
- When using rock slope protection, rock size and installation method should be specified by an Engineer.
- A geotextile fabric should be placed prior to installation.

Costs

- Costs are highly variable depending not only on technique chosen, but also on materials chosen within specific techniques. In addition, availability of certain materials will vary by region/location, which will also affect the cost. Costs of mulches, geotextiles and mats, and soil binders are presented in their respective fact sheets. Costs for decomposed granite, gravel mulch stabilization and rock slope protection may be higher depending on location and availability of materials. Caltrans has provided an estimate for gravel mulch of \$10 - \$15/yd^2 in flat areas and \$11 - \$23/yd^2 on side slopes.

Inspection and Maintenance

General

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- For permanent installation, require inspection periodically and after major storm events to look for signs of erosion or damage to the stabilization.
- All damage should be repaired immediately.
- Refer to EC-3, EC-6, EC-8, and EC-14 for inspection and maintenance requirements for mulches. Refer to EC-7 for inspection and maintenance requirements for geotextiles and mats. Refer to EC-5 for inspection and maintenance requirements for soil binders.

Decomposed Granite and Gravel Mulch Stabilization

- Rake out and add decomposed granite or gravel as needed to areas subject to rill erosion. Inspect upgradient drainage controls and repair/modify as necessary.

- Should remain stable under loose surface material. Any significant problem areas should be repaired to restore uniformity to the installation.

References

Arid Zone Forestry: A Guide for Field Technicians. Food and Agriculture Organization of the United Nations, 1989.

Design of Roadside Channels with Flexible Linings, Hydraulic Engineering Circular Number 15, Third Edition, Federal Highway Administration, 2007.

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Erosion and Sediment Control Handbook: A Guide for Protection of State Waters through the use of Best Management Practices during Land Disturbing Activities, Tennessee Department of Environment and Conservation, 2002.

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Maine Erosion and Sediment Control BMPs, DEPLW0588, Maine Department of Environmental Protection: Bureau of Land and Water Quality, 2003.

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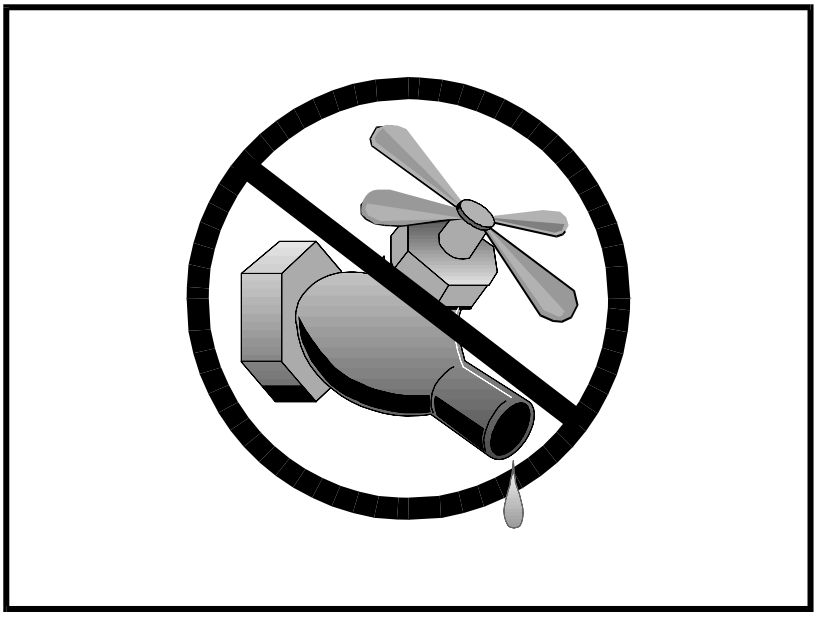
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Water Conservation Practices NS-1



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and the transport of pollutants offsite. These practices can reduce or eliminate non-stormwater discharges.

Suitable Applications

Water conservation practices are suitable for all construction sites where water is used, including piped water, metered water, trucked water, and water from a reservoir.

Limitations

- None identified.

Implementation

- Keep water equipment in good working condition.
- Stabilize water truck filling area.
- Repair water leaks promptly.
- Washing of vehicles and equipment on the construction site is discouraged.
- Avoid using water to clean construction areas. If water must be used for cleaning or surface preparation, surface should be swept and vacuumed first to remove dirt. This will minimize amount of water required.

Water Conservation Practices NS-1

- Direct construction water runoff to areas where it can soak into the ground or be collected and reused.
- Authorized non-stormwater discharges to the storm drain system, channels, or receiving waters are acceptable with the implementation of appropriate BMPs.
- Lock water tank valves to prevent unauthorized use.

Costs

The cost is small to none compared to the benefits of conserving water.

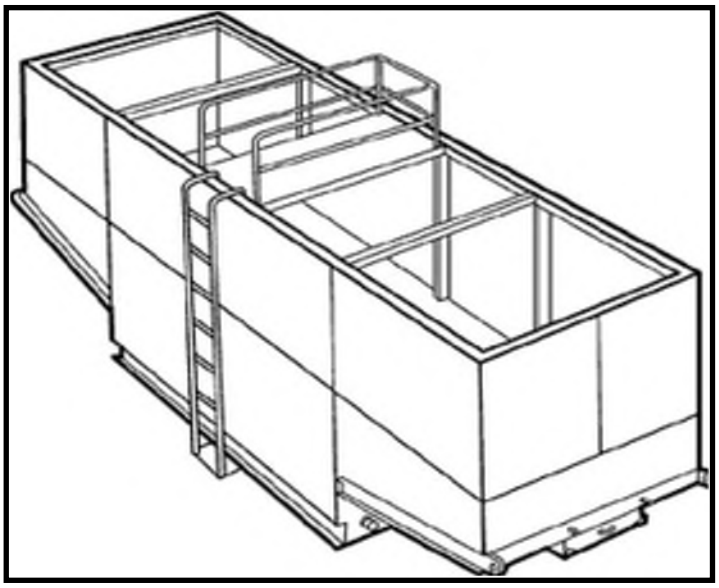
Inspection and Maintenance

- Inspect and verify that activity based BMPs are in place prior to the commencement of authorized non-stormwater discharges.
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges are occuring.
- Repair water equipment as needed to prevent unintended discharges.
  - Water trucks
  - Water reservoirs (water buffalos)
  - Irrigation systems
  - Hydrant connections

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Dewatering Operations NS-2



Categories		
EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
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Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

SE-5: Fiber Roll

SE-6: Gravel Bag Berm

Description and Purpose

Dewatering operations are practices that manage the discharge of pollutants when non-stormwater and accumulated precipitation (stormwater) must be removed from a work location to proceed with construction work or to provide vector control.

The General Permit incorporates Numeric Action Levels (NAL) for turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Discharges from dewatering operations can contain high levels of fine sediment that, if not properly treated, could lead to exceedances of the General Permit requirements or Basin Plan standards.

The dewatering operations described in this fact sheet are not Active Treatment Systems (ATS) and do not include the use of chemical coagulations, chemical flocculation or electrocoagulation.

Suitable Applications

These practices are implemented for discharges of non-stormwater from construction sites. Non-stormwaters include, but are not limited to, groundwater, water from cofferdams, water diversions, and waters used during construction activities that must be removed from a work area to facilitate construction.

Practices identified in this section are also appropriate for implementation when managing the removal of accumulated

precipitation (stormwater) from depressed areas at a construction site.

Stormwater mixed with non-stormwater should be managed as non-stormwater.

Limitations

- Dewatering operations will require, and should comply with applicable local and project-specific permits and regulations. In some areas, all dewatering activities, regardless of the discharge volume, require a dewatering permit.
- Site conditions will dictate design and use of dewatering operations.
- The controls discussed in this fact sheet primarily address sediment. Other secondary pollutant removal benefits are discussed where applicable.
- The controls detailed in this fact sheet only allow for minimal settling time for sediment particles. Use only when site conditions restrict the use of the other control methods.
- Avoid dewatering discharges where possible by using the water for dust control.

Implementation

- A Construction Site Monitoring Plan (CSMP) should be included in the project Stormwater Pollution Prevention Plan (SWPPP).
- Regional Water Quality Control Board (RWQCB) Regions may require notification and approval prior to any discharge of water from construction sites.
- The destination of discharge from dewatering activities will typically determine the type of permit required for the discharge. For example, when discharging to a water of the U.S., a dewatering permit may be required through the site's governing RWQCB. When discharging to a sanitary sewer or Municipal Separate Storm Sewer System (MS4), a permit may need to be obtained from the owner of the sanitary sewer or MS4 in addition to obtaining an RWQCB dewatering permit. Additional permits or permissions from other agencies may be required for dewatering cofferdams or diversions.
- Dewatering discharges should not cause erosion at the discharge point. Appropriate BMPs should be implemented to maintain compliance with all applicable permits.
- Maintain dewatering records in accordance with all local and project-specific permits and regulations.

Sediment Treatment

A variety of methods can be used to treat water during dewatering operations. Several devices are presented below and provide options to achieve sediment removal. The sediment particle size and permit or receiving water limitations on sediment or turbidity are key considerations for selecting sediment treatment option(s); in some cases, the use of multiple devices may be appropriate. Use of other enhanced treatment methods (i.e., introduction of chemicals or electric current to enhance flocculation and removal of sediment) must comply with: 1) for storm drain or surface water discharges, the requirements for Active Treatment Systems (see SE-11); or 2) for sanitary sewer discharges, the requirements of applicable sanitary sewer discharge permits.

Dewatering Operations NS-2

Sediment Basin (see also SE-2)

Description:

- A sediment basin is a temporary basin with a controlled release structure that is formed by excavation or construction of an embankment to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment basins are generally larger than Sediment Traps (SE-3) and have a designed outlet structure.

Appropriate Applications:

- Effective for the removal of trash, gravel, sand, silt, some metals that settle out with the sediment.

Implementation:

- Excavation and construction of related facilities is required.
- Temporary sediment basins should be fenced if safety is a concern.
- Outlet protection is required to prevent erosion at the outfall location.

Maintenance:

- Maintenance is required for safety fencing, vegetation, embankment, inlet and outlet, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

Sediment Trap (See also SE-3)

Description:

- A sediment trap is a temporary basin formed by excavation and/or construction of an earthen embankment across a waterway or low drainage area to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment traps are generally smaller than Sediment Basins (SE-2) and do not have a designed outlet (but do have a spillway or overflow).

Appropriate Applications:

Effective for the removal of large and medium sized particles (sand and gravel) and some metals that settle out with the sediment.

Implementation:

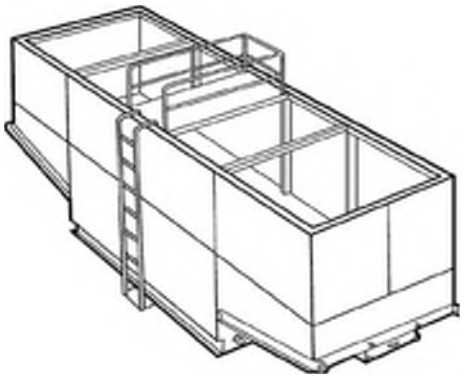
- Excavation and construction of related facilities is required.
- Trap inlets should be located to maximize the travel distance to the trap outlet.
- Use rock or vegetation to protect the trap outlets against erosion.

Maintenance:

- Maintenance is required for vegetation, embankment, inlet and outfall structures, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

Dewatering Operations NS-2

Weir Tanks



Description:

- A weir tank separates water and waste by using weirs. The configuration of the weirs (over and under weirs) maximizes the residence time in the tank and determines the waste to be removed from the water, such as oil, grease, and sediments.

Appropriate Applications:

- The tank removes trash, some settleable solids (gravel, sand, and silt), some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.
- Treatment capacity (i.e., volume and number of tanks) should provide at a minimum the required volume for discrete particle settling for treatment design flows.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal should be conducted by a licensed waste disposal company.

Dewatering Operations NS-2

Dewatering Tanks

Description:

- A dewatering tank removes debris and sediment. Flow enters the tank through the top, passes through a fabric filter, and is discharged through the bottom of the tank. The filter separates the solids from the liquids.

Appropriate Applications:

- The tank removes trash, gravel, sand, and silt, some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

Implementation:

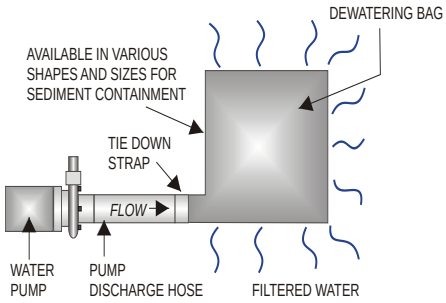
- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal should be conducted by licensed waste disposal company.

Dewatering Operations NS-2

Gravity Bag Filter



Description:

- A gravity bag filter, also referred to as a dewatering bag, is a square or rectangular bag made of non-woven geotextile fabric that collects gravel, sand, silt, and fines.

Appropriate Applications:

- Effective for the removal of sediments (gravel, sand, silt, and fines). Some metals are removed with the sediment.

Implementation:

- Water is pumped into one side of the bag and seeps through the top, bottom, and sides of the bag.
- Place filter bag on pavement or a gravel bed or paved surface. Avoid placing a dewatering bag on unprotected bare soil. If placing the bag on bare soil is unavoidable, a secondary barrier should be used, such as a rock filter bed placed beneath and beyond the edges of the bag to, prevent erosion and capture sediments that escape the bag.
- Perimeter control around the downstream end of the bag should be implemented. Secondary sediment controls are important especially in the initial stages of discharge, which tend to allow fines to pass through the bag.

Maintenance:

- Inspection of the flow conditions, bag condition, bag capacity, and the secondary barrier (as applicable) is required.
- Replace the bag when it no longer filters sediment or passes water at a reasonable rate.
- Caution should be taken when removing and disposing of the bag, to prevent the release of captured sediment
- Properly dispose of the bag offsite. If sediment is removed from the bag prior to disposal (bags can potentially be reused depending upon their condition), dispose of sediment in accordance with the general maintenance procedures described at the end of this BMP Fact Sheet.

Sand Media Particulate Filter

Description:

- Water is treated by passing it through canisters filled with sand media. Generally, sand filters provide a final level of treatment. They are often used as a secondary or higher level of treatment after a significant amount of sediment and other pollutants have been removed using other methods.

Appropriate Applications:

- Effective for the removal of trash, gravel, sand, and silt and some metals, as well as the reduction of biochemical oxygen demand (BOD) and turbidity.
- Sand filters can be used for stand-alone treatment or in conjunction with bag and cartridge filtration if further treatment is required.
- Sand filters can also be used to provide additional treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filters require regular service to monitor and maintain the level of the sand media. If subjected to high loading rates, filters can plug quickly.
- Venders generally provide data on maximum head loss through the filter. The filter should be monitored daily while in use, and cleaned when head loss reaches target levels.
- If cleaned by backwashing, the backwash water may need to be hauled away for disposal, or returned to the upper end of the treatment train for another pass through the series of dewatering BMPs.

Dewatering Operations NS-2

Pressurized Bag Filter

Description:

- A pressurized bag filter is a unit composed of single filter bags made from polyester felt material. The water filters through the unit and is discharged through a header. Vendors provide bag filters in a variety of configurations. Some units include a combination of bag filters and cartridge filters for enhanced contaminant removal.

Appropriate Applications:

- Effective for the removal of sediment (sand and silt) and some metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Oil absorbent bags are available for hydrocarbon removal.

- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filter bags require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

Dewatering Operations NS-2

Cartridge Filter

Description:

- Cartridge filters provide a high degree of pollutant removal by utilizing a number of individual cartridges as part of a larger filtering unit. They are often used as a secondary or higher (polishing) level of treatment after a significant amount of sediment and other pollutants are removed. Units come with various cartridge configurations (for use in series with bag filters) or with a larger single cartridge filtration unit (with multiple filters within).

Appropriate Applications:

- Effective for the removal of sediment (sand, silt, and some clays) and metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Hydrocarbons can effectively be removed with special resin cartridges.

- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance.

Maintenance:

- The cartridges require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

Costs

- Sediment control costs vary considerably depending on the dewatering and sediment treatment system that is selected. Pressurized filters tend to be more expensive than gravity settling, but are often more effective. Simple tanks are generally rented on a long-term basis (one or more months) and can range from $360 per month for a 1,000 gallon tank to $2,660 per month for a 10,000 gallon tank. Mobilization and demobilization costs vary considerably.

Inspection and Maintenance

- Inspect and verify that dewatering BMPs are in place and functioning prior to the commencement of activities requiring dewatering.

- Inspect dewatering BMPs daily while dewatering activities are being conducted.

Dewatering Operations NS-2

- Inspect all equipment before use. Monitor dewatering operations to ensure they do not cause offsite discharge or erosion.
- Sample dewatering discharges as required by the General Permit.
- Unit-specific maintenance requirements are included with the description of each unit.
- Sediment removed during the maintenance of a dewatering device may be either spread onsite and stabilized, or disposed of at a disposal site as approved by the owner.
- Sediment that is commingled with other pollutants should be disposed of in accordance with all applicable laws and regulations and as approved by the owner.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

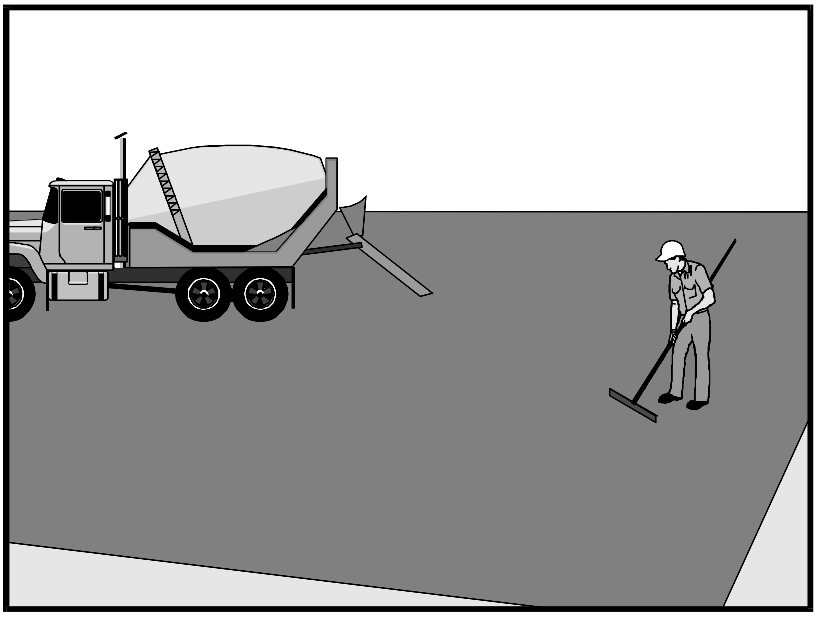
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003; Updated March 2004.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Labor Surcharge & Equipment Rental Rates, April 1, 2002 through March 31, 2003, California Department of Transportation (Caltrans).

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Paving and Grinding Operations NS-3



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☒

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent runon and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

The General Permit incorporates Numeric Action Levels (NAL) for pH and turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials associated with paving and grinding operations, including mortar, concrete, and cement and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute stormwater runoff or discharge to the storm drain system or watercourses.

Limitations

- Paving opportunities may be limited during wet weather.

  Discharges of freshly paved surfaces may raise pH to environmentally harmful levels and trigger permit violations.

Paving and Grinding Operations NS-3

Implementation

General

- Avoid paving during the wet season when feasible.
- Reschedule paving and grinding activities if rain is forecasted.
- Train employees and sub-contractors in pollution prevention and reduction.
- Store materials away from drainage courses to prevent stormwater runon (see WM-1, Material Delivery and Storage).
- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or to trap and filter sediment.
- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses. These materials should be stored consistent with WM-3, Stockpile Management.
- Disposal of PCC (Portland cement concrete) and AC (asphalt concrete) waste should be in conformance with WM-8, Concrete Waste Management.

Saw Cutting, Grinding, and Pavement Removal

- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- When paving involves AC, the following steps should be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:
  - AC grindings, pieces, or chunks used in embankments or shoulder backing should not be allowed to enter any storm drains or watercourses. Install inlet protection and perimeter controls until area is stabilized (i.e. cutting, grinding or other removal activities are complete and loose material has been properly removed and disposed of)or permanent controls are in place. Examples of temporary perimeter controls can be found in EC-9, Earth Dikes and Drainage Swales; SE-1, Silt Fence; SE-5, Fiber Rolls, or SE-13 Compost Socks and Berms
  - Collect and remove all broken asphalt and recycle when practical. Old or spilled asphalt should be recycled or disposed of properly.
- Do not allow saw-cut slurry to enter storm drains or watercourses. Residue from grinding operations should be picked up by a vacuum attachment to the grinding machine, or by sweeping, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also WM-8, Concrete Waste Management, and WM-10, Liquid Waste Management.
- Pavement removal activities should not be conducted in the rain.
- Collect removed pavement material by mechanical or manual methods. This material may be recycled for use as shoulder backing or base material.

Paving and Grinding Operations NS-3

- If removed pavement material cannot be recycled, transport the material back to an approved storage site.

Asphaltic Concrete Paving

- If paving involves asphaltic cement concrete, follow these steps:

  - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks. Vacuum or sweep loose sand and gravel and properly dispose of this waste by referring to WM-5, Solid Waste Management.

  - Old asphalt should be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.

Portland Cement Concrete Paving

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect waste materials by dry methods, such as sweeping or shoveling, and return to aggregate base stockpile or dispose of properly. Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in WM-8, Concrete Waste Management, or pump the water to the sanitary sewer if authorized by the local wastewater authority.

Sealing Operations

- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate should not be allowed to enter any storm drain or water courses. Apply temporary perimeter controls until structure is stabilized (i.e. all sealing operations are complete and cured and loose materials have been properly removed and disposed).

- Inlet protection (SE-10, Storm Drain Inlet Protection) should be used during application of seal coat, tack coat, slurry seal, and fog seal.

- Seal coat, tack coat, slurry seal, or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.

Paving Equipment

- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials and dispose of in accordance with the applicable regulations. See NS-10, Vehicle and Equipment Maintenance, WM-4, Spill Prevention and Control, and WM-10, Liquid Waste Management.

- Substances used to coat asphalt transport trucks and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.

- Paving equipment parked onsite should be parked over plastic to prevent soil contamination.

- Clean asphalt coated equipment offsite whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in WM-5, Solid Waste Management. Any cleaning onsite should follow NS-8, Vehicle and Equipment Cleaning.

Paving and Grinding Operations NS-3

Thermoplastic Striping

- Thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.
- Pre-heaters should be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move.
- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the stormwater drainage system, or watercourses.
- Melting tanks should be loaded with care and not filled to beyond six inches from the top to leave room for splashing.
- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.
- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Costs

- All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of paving and grinding operations.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sample stormwater runoff required by the General Permit.
- Keep ample supplies of drip pans or absorbent materials onsite.
- Inspect and maintain machinery regularly to minimize leaks and drips.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

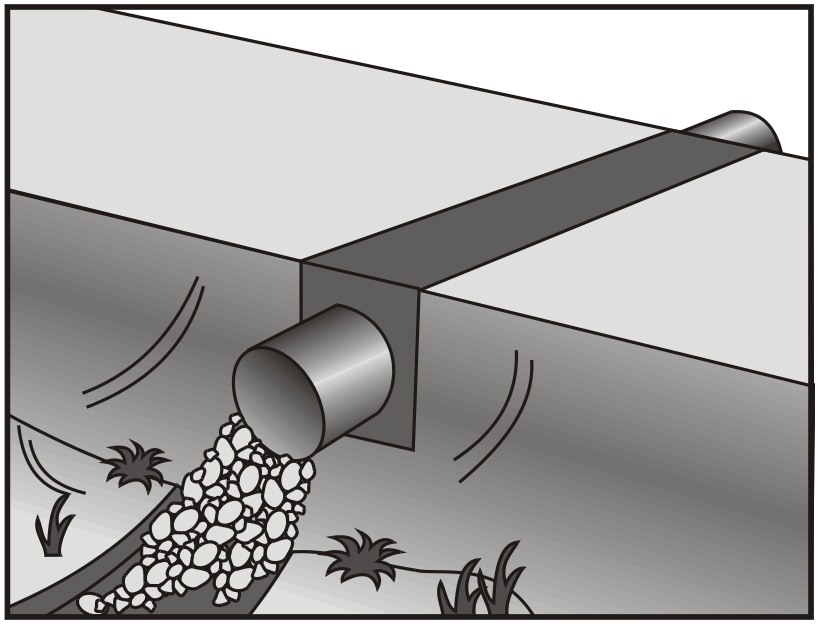
Paving and Grinding Operations NS-3

Hot Mix Asphalt-Paving Handbook AC 150/5370-14, Appendix I, U.S. Army Corps of Engineers, July 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Temporary Stream Crossing NS-4



Description and Purpose

A temporary stream crossing is a temporary culvert, ford or bridge placed across a waterway to provide access for construction purposes for a period of less than one year. Temporary access crossings are not intended to maintain traffic for the public. The temporary access will eliminate erosion and downstream sedimentation caused by vehicles.

Suitable Applications

Temporary stream crossings should be installed at all designated crossings of perennial and intermittent streams on the construction site, as well as for dry channels that may be significantly eroded by construction traffic.

Temporary streams crossings are installed at sites:

- Where appropriate permits have been secured (404 Permits, and 401 Certifications)
- Where construction equipment or vehicles need to frequently cross a waterway
- When alternate access routes impose significant constraints
- When crossing perennial streams or waterways causes significant erosion
- Where construction activities will not last longer than one year

Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Temporary Stream Crossing NS-4

- Where appropriate permits have been obtained for the stream crossing

Limitations

The following limitations may apply:

- Installation and removal will usually disturb the waterway.
- Installation may require Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game. If numerical-based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required.
- Installation may require dewatering or temporary diversion of the stream. See NS-2, Dewatering Operations and NS-5, Clear Water Diversion.
- Installation may cause a constriction in the waterway, which can obstruct flood flow and cause flow backups or washouts. If improperly designed, flow backups can increase the pollutant load through washouts and scouring.
- Use of natural or other gravel in the stream for construction of Cellular Confinement System (CCS) ford crossing will be contingent upon approval by fisheries agencies.
- Ford crossings may degrade water quality due to contact with vehicles and equipment.
- May be expensive for a temporary improvement.
- Requires other BMPs to minimize soil disturbance during installation and removal.
- Fords should only be used in dry weather.

Implementation

General

The purpose of this BMP is to provide a safe, erosion-free access across a stream for construction equipment. Minimum standards and specifications for the design, construction, maintenance, and removal of the structure should be established by an engineer registered in California. Temporary stream crossings may be necessary to prevent construction equipment from causing erosion of the stream and tracking sediment and other pollutants into the stream.

Temporary stream crossings are used as access points to construction sites when other detour routes may be too long or burdensome for the construction equipment. Often heavy construction equipment must cross streams or creeks, and detour routes may impose too many constraints such as being too narrow or poor soil strength for the equipment loadings. Additionally, the contractor may find a temporary stream crossing more economical for light–duty vehicles to use for frequent crossings, and may have less environmental impact than construction of a temporary access road.

Location of the temporary stream crossing should address:

- Site selection where erosion potential is low.

Temporary Stream Crossing NS-4

- Areas where the side slopes from site runoff will not spill into the side slopes of the crossing.

The following types of temporary stream crossings should be considered:

- **Culverts** – A temporary culvert is effective in controlling erosion but will cause erosion during installation and removal. A temporary culvert can be easily constructed and allows for heavy equipment loads.
- **Fords** - Appropriate during the dry season in arid areas. Used on dry washes and ephemeral streams, and low-flow perennial streams. CCS, a type of ford crossing, is also appropriate for use in streams that would benefit from an influx of gravels. A temporary ford provides little sediment and erosion control and is ineffective in controlling erosion in the stream channel. A temporary ford is the least expensive stream crossing and allows for maximum load limits. It also offers very low maintenance. Fords are more appropriate during the dry ice season and in arid areas of California.
- **Bridges** - Appropriate for streams with high flow velocities, steep gradients and where temporary restrictions in the channel are not allowed.

Design

During the long summer construction season in much of California, rainfall is infrequent and many streams are dry. Under these conditions, a temporary ford may be sufficient. A ford is not appropriate if construction will continue through the winter rainy season, if summer thunderstorms are likely, or if the stream flows during most of the year. Temporary culverts and bridges should then be considered and, if used, should be sized to pass a significant design storm (i.e., at least a 10-year storm). The temporary stream crossing should be protected against erosion, both to prevent excessive sedimentation in the stream and to prevent washout of the crossing.

Design and installation requires knowledge of stream flows and soil strength. Designs should be prepared under direction of, and approved by, a registered civil engineer and for bridges, a registered structural engineer. Both hydraulic and construction loading requirements should be considered with the following:

- Comply with any special requirements for culvert and bridge crossings, particularly if the temporary stream crossing will remain through the rainy season.
- Provide stability in the crossing and adjacent areas to withstand the design flow. The design flow and safety factor should be selected based on careful evaluation of the risks due to over topping, flow backups, or washout.
- Install sediment traps immediately downstream of crossings to capture sediments. See SE-3, Sediment Trap.
- Avoid oil or other potentially hazardous materials for surface treatment.
- Culverts are relatively easy to construct and able to support heavy equipment loads.
- Fords are the least expensive of the crossings, with maximum load limits.

Temporary Stream Crossing NS-4

- CCS crossing structures consist of clean, washed gravel and cellular confinement system blocks. CCS are appropriate for streams that would benefit from an influx of gravel; for example, salmonid streams, streams or rivers below reservoirs, and urban, channelized streams. Many urban stream systems are gravel-deprived due to human influences, such as dams, gravel mines, and concrete channels.
- CCS allow designers to use either angular or naturally occurring rounded gravel, because the cells provide the necessary structure and stability. In fact, natural gravel is optimal for this technique, because of the habitat improvement it will provide after removal of the CCS.
- A gravel depth of 6 to 12 in. for a CCS structure is sufficient to support most construction equipment.
- An advantage of a CCS crossing structure is that relatively little rock or gravel is needed, because the CCS provides the stability.
- Bridges are generally more expensive to design and construct, but provide the least disturbance of the streambed and constriction of the waterway flows.

Construction and Use

- Stabilize construction roadways, adjacent work area, and stream bottom against erosion.
- Construct during dry periods to minimize stream disturbance and reduce costs.
- Construct at or near the natural elevation of the streambed to prevent potential flooding upstream of the crossing.
- Install temporary erosion control BMPs in accordance with erosion control BMP fact sheets to minimize erosion of embankment into flow lines.
- Any temporary artificial obstruction placed within flowing water should only be built from material, such as clean gravel or sandbags, that will not introduce sediment or silt into the watercourse.
- Temporary water body crossings and encroachments should be constructed to minimize scour. Cobbles used for temporary water body crossings or encroachments should be clean, rounded river cobble.
- Vehicles and equipment should not be driven, operated, fueled, cleaned, maintained, or stored in the wet or dry portions of a water body where wetland vegetation, riparian vegetation, or aquatic organisms may be destroyed.
- The exterior of vehicles and equipment that will encroach on the water body within the project should be maintained free of grease, oil, fuel, and residues.
- Drip pans should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.

Temporary Stream Crossing NS-4

- Disturbance or removal of vegetation should not exceed the minimum necessary to complete operations. Precautions should be taken to avoid damage to vegetation by people or equipment. Disturbed vegetation should be replaced with the appropriate soil stabilization measures.

- Riparian vegetation, when removed pursuant to the provisions of the work, should be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation should be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble must be removed upon completion of project activities.

- Conceptual temporary stream crossings are shown in the attached figures.

Costs

Caltrans Construction Cost index for temporary bridge crossings is $45-$95/ft^2.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Check for blockage in the channel, sediment buildup or trapped debris in culverts, blockage behind fords or under bridges.

- Check for erosion of abutments, channel scour, riprap displacement, or piping in the soil.

- Check for structural weakening of the temporary crossings, such as cracks, and undermining of foundations and abutments.

- Remove sediment that collects behind fords, in culverts, and under bridges periodically.

- Replace lost or displaced aggregate from inlets and outlets of culverts and cellular confinement systems.

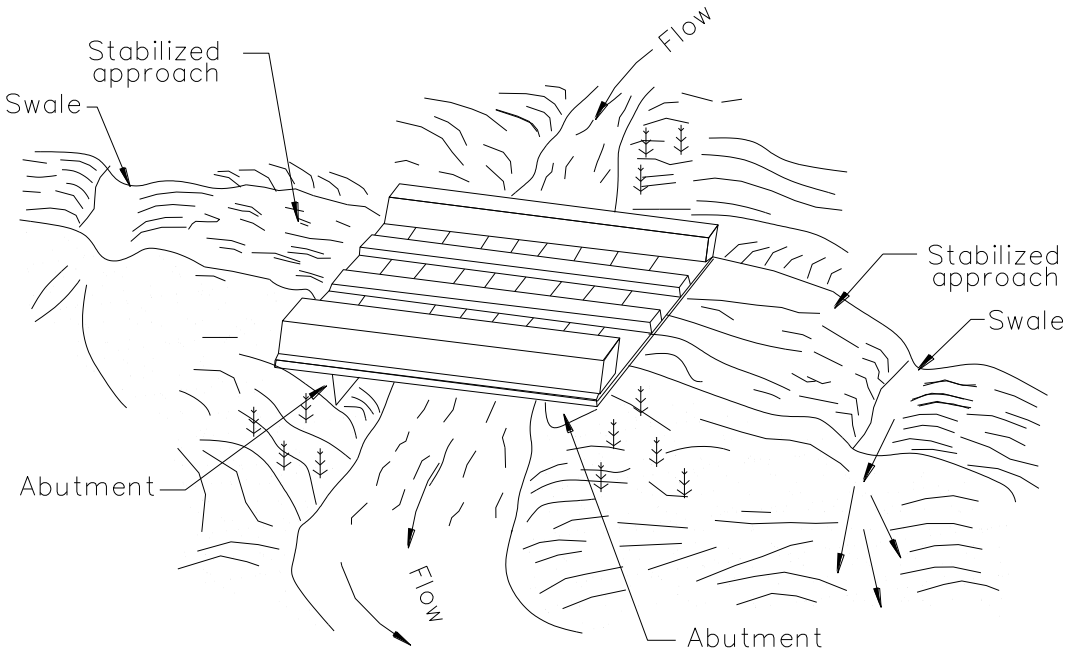
- Remove temporary crossing promptly when it is no longer needed.

References

California Bank and Shore Rock Slope Protection Design – Practitioners Guide and Field Evaluations of Riprap Methods, Caltrans Study No. F90TL03, October 2000.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

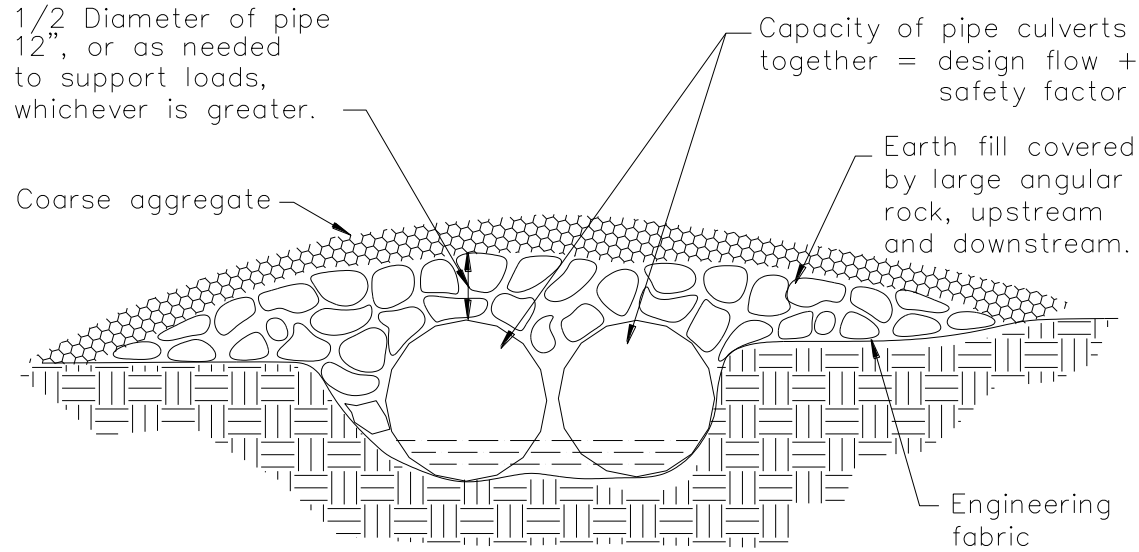
Temporary Stream Crossing NS-4



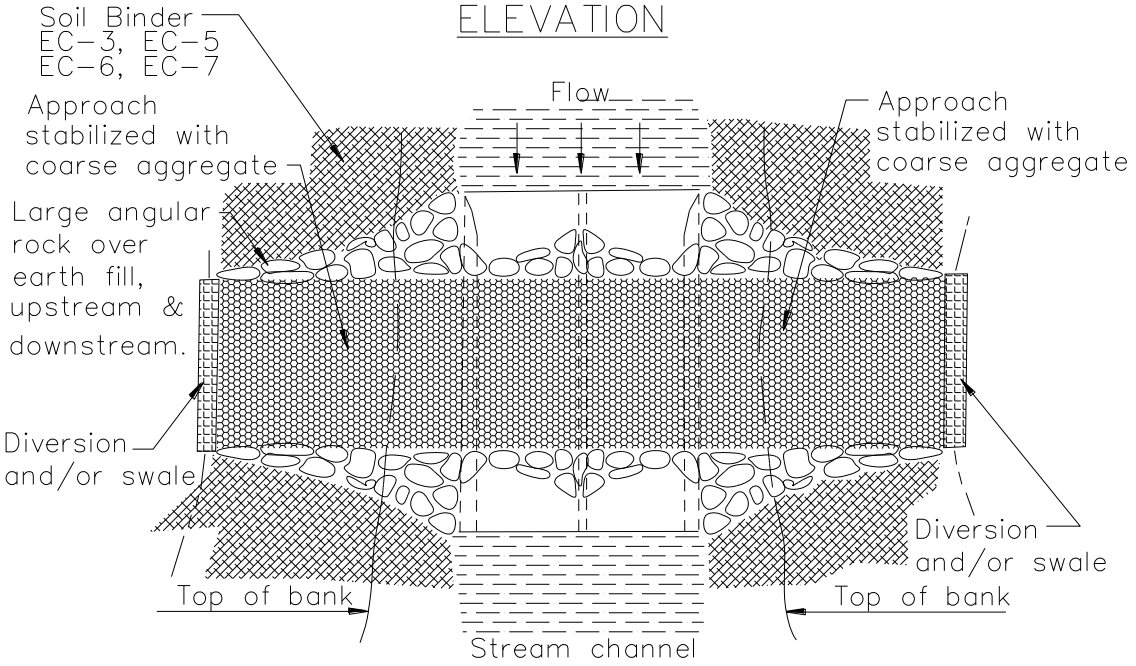
NOTE:
Surface flow of road diverted by swale and/or dike.

TYPICAL BRIDGE CROSSING
NOT TO SCALE

Temporary Stream Crossing NS-4



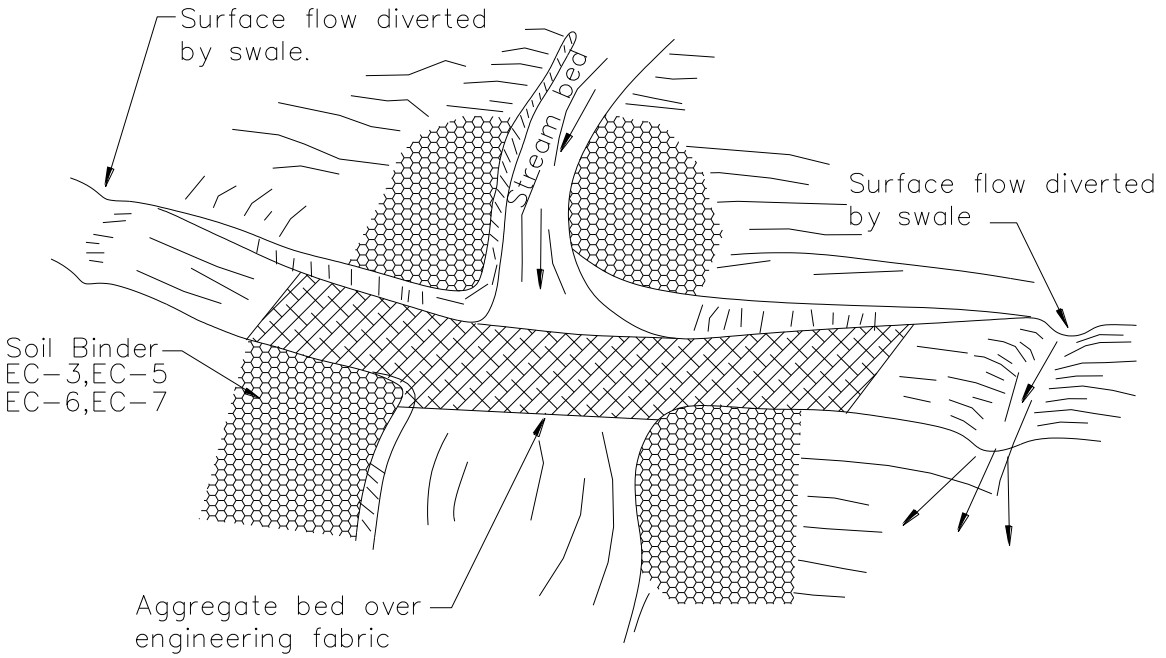
ELEVATION



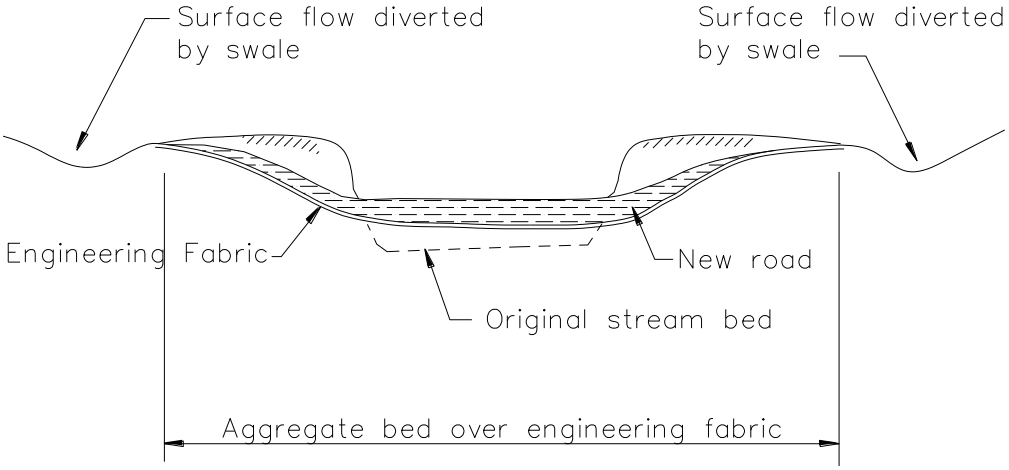
PLAN VIEW

TYPICAL CULVERT CROSSING
NOT TO SCALE

Temporary Stream Crossing NS-4

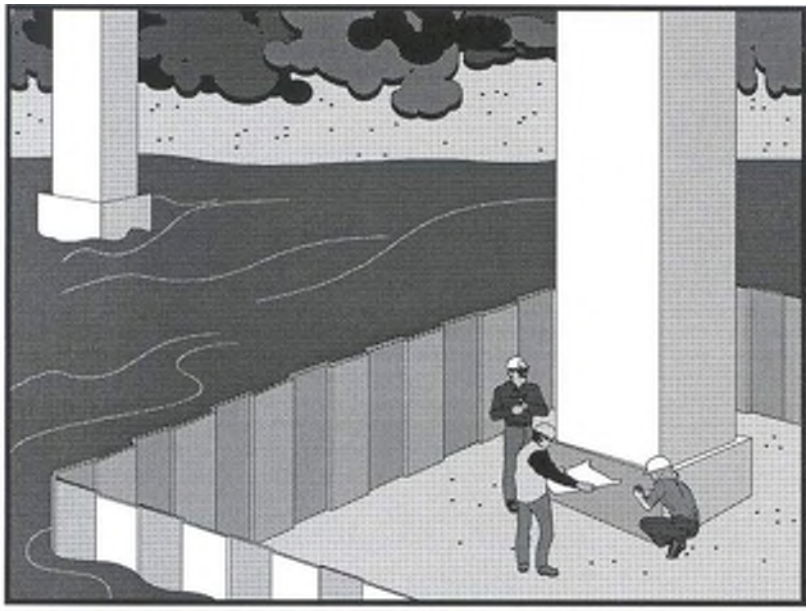


Aggregate approch
1:5 (V:H) Maximum slope on road



TYPICAL FORD CROSSING
NOT TO SCALE

Clear Water Diversion NS-5



Categories

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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Description and Purpose

Clear water diversion consists of a system of structures and measures that intercept clear surface water runoff upstream of a project, transport it around the work area, and discharge it downstream with minimal water quality degradation from either the project construction operations or the construction of the diversion. Clear water diversions are used in a waterway to enclose a construction area and reduce sediment pollution from construction work occurring in or adjacent to water. Structures commonly used as part of this system include diversion ditches, berms, dikes, slope drains, rock, gravel bags, wood, aqua barriers, cofferdams, filter fabric or turbidity curtains, drainage and interceptor swales, pipes, or flumes.

Suitable Applications

A clear water diversion is typically implemented where appropriate permits (1601 Agreement) have been secured and work must be performed in a flowing stream or water body.

- Clear water diversions are appropriate for isolating construction activities occurring within or near a water body such as streambank stabilization, or culvert, bridge, pier or abutment installation. They may also be used in combination with other methods, such as clear water bypasses and/or pumps.
- Pumped diversions are suitable for intermittent and low flow streams.
- Excavation of a temporary bypass channel, or passing the flow through a heavy pipe (called a “flume”) with a trench

excavated under it, is appropriate for the diversion of streams less than 20 ft wide, with flow rates less than 100 cfs.

- Clear water diversions incorporating clean washed gravel may be appropriate for use in salmonid spawning streams.

Limitations

- Diversion and encroachment activities will usually disturb the waterway during installation and removal of diversion structures.
- Installation may require Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game. If numerical-based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required.
- Diversion and encroachment activities may constrict the waterway, which can obstruct flood flows and cause flooding or washouts. Diversion structures should not be installed without identifying potential impacts to the stream channel.
- Diversion or isolation activities are not appropriate in channels where there is insufficient stream flow to support aquatic species in the area dewatered as a result of the diversion.
- Diversion or isolation activities are inappropriate in deep water unless designed or reviewed by an engineer registered in California.
- Diversion or isolation activities should not completely dam stream flow.
- Dewatering and removal may require additional sediment control or water treatment. See NS-2, Dewatering Operations.
- Not appropriate if installation, maintenance, and removal of the structures will disturb sensitive aquatic species of concern.

Implementation

General

- Implement guidelines presented in EC-12, Streambank Stabilization to minimize impacts to streambanks.
- Where working areas encroach on flowing streams, barriers adequate to prevent the flow of muddy water into streams should be constructed and maintained between working areas and streams. During construction of the barriers, muddying of streams should be held to a minimum.
- Diversion structures must be adequately designed to accommodate fluctuations in water depth or flow volume due to tides, storms, flash floods, etc.
- Heavy equipment driven in wet portions of a water body to accomplish work should be completely clean of petroleum residue, and water levels should be below the fuel tanks, gearboxes, and axles of the equipment unless lubricants and fuels are sealed such that inundation by water will not result in discharges of fuels, oils, greases, or hydraulic fluids.

Clear Water Diversion NS-5

- Excavation equipment buckets may reach out into the water for the purpose of removing or placing fill materials. Only the bucket of the crane/ excavator/backhoe may operate in a water body. The main body of the crane/excavator/backhoe should not enter the water body except as necessary to cross the stream to access the work site.

- Stationary equipment such as motors and pumps located within or adjacent to a water body, should be positioned over drip pans.

- When any artificial obstruction is being constructed, maintained, or placed in operation, sufficient water should, at all times, be allowed to pass downstream to maintain aquatic life.

- Equipment should not be parked below the high water mark unless allowed by a permit.

- Disturbance or removal of vegetation should not exceed the minimum necessary to complete operations. Precautions should be taken to avoid damage to vegetation by people or equipment. Disturbed vegetation should be replaced with the appropriate erosion control measures.

- Riparian vegetation approved for trimming as part of the project should be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation should be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble should be removed upon completion of project activities.

- Drip pans should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.

- Where possible, avoid or minimize diversion and encroachment impacts by scheduling construction during periods of low flow or when the stream is dry. Scheduling should also consider seasonal releases of water from dams, fish migration and spawning seasons, and water demands due to crop irrigation.

- Construct diversion structures with materials free of potential pollutants such as soil, silt, sand, clay, grease, or oil.

Temporary Diversions and Encroachments

- Construct diversion channels in accordance with EC-9, Earth Dikes and Drainage Swales.

- In high flow velocity areas, stabilize slopes of embankments and diversion ditches using an appropriate liner, in accordance with EC-7, Geotextiles and Mats, or use rock slope protection.

- Where appropriate, use natural streambed materials such as large cobbles and boulders for temporary embankment and slope protection, or other temporary soil stabilization methods.

- Provide for velocity dissipation at transitions in the diversion, such as the point where the stream is diverted to the channel and the point where the diverted stream is returned to its natural channel. See also EC-10, Velocity Dissipation Devices.

Clear Water Diversion NS-5

Temporary Dry Construction Areas

- When dewatering behind temporary structures to create a temporary dry construction area, such as cofferdams, pass pumped water through a sediment-settling device, such as a portable tank or settling basin, before returning water to the water body. See also NS-2, Dewatering Operations.

- Any substance used to assemble or maintain diversion structures, such as form oil, should be non-toxic and non-hazardous.

- Any material used to minimize seepage underneath diversion structures, such as grout, should be non-toxic, non-hazardous, and as close to a neutral pH as possible.

Comparison of Diversion and Isolation Techniques:

- Gravel bags are relatively inexpensive, but installation and removal can be labor intensive. It is also difficult to dewater the isolated area. Sandbags should not be used for this technique in rivers or streams, as sand should never be put into or adjacent to a stream, even if encapsulated in geotextile.

- Gravel Bag Berms (SE-6) used in conjunction with an impermeable membrane are cost effective, and can be dewatered relatively easily. If spawning gravel is used, the impermeable membrane can be removed from the stream, and the gravel can be spread out and left as salmonid spawning habitat if approved in the permit. Only clean, washed gravel should be used for both the gravel bag and gravel berm techniques.

- Cofferdams are relatively expensive, but frequently allow full dewatering. Also, many options now available are relatively easy to install.

- Sheet pile enclosures are a much more expensive solution, but do allow full dewatering. This technique is not well suited to small streams, but can be effective on large rivers or lakes, and where staging and heavy equipment access areas are available.

- K-rails are an isolation method that does not allow full dewatering, but can be used in small to large watercourses, and in fast-water situations.

- A relatively inexpensive isolation method is filter fabric isolation. This method involves placement of gravel bags or continuous berms to 'key-in' the fabric, and subsequently staking the fabric in place. This method should be used in relatively calm water, and can be used in smaller streams. Note that this is not a dewatering method, but rather a sediment isolation method.

- Turbidity curtains should be used where sediment discharge to a stream is unavoidable. They can also be used for in-stream construction, when dewatering an area is not required.

- When used in watercourses or streams, cofferdams must be used in accordance with permit requirements.

- Manufactured diversion structures should be installed following manufacturer's specifications.

- Filter fabric and turbidity curtain isolation installation methods can be found in the specific technique descriptions that follow.

Filter Fabric Isolation Technique

Definition and Purpose

A filter fabric isolation structure is a temporary structure built into a waterway to enclose a construction area and reduce sediment pollution from construction work in or adjacent to water. This structure is composed of filter fabric, gravel bags, and steel t-posts.

Appropriate Applications

- Filter fabric may be used for construction activities such as streambank stabilization, or culvert, bridge, pier or abutment installation. It may also be used in combination with other methods, such as clean water bypasses and/or pumps.
- Filter fabric isolation is relatively inexpensive. This method involves placement of gravel bags or continuous berms to 'key-in' the fabric, and subsequently staking the fabric in place.
- If spawning gravel is used, all other components of the isolation can be removed from the stream, and the gravel may be spread out and left as salmonid spawning habitat if approved in the permit. Whether spawning gravel or other types of gravel are used, only clean washed gravel should be used as infill for the gravel bags or continuous berm.
- This method should be used in relatively calm water, and can be used in smaller streams. This is not a dewatering method, but rather a sediment isolation method.
- Water levels inside and outside the fabric curtain must be about the same, as differential heads will cause the curtain to collapse.

Limitations

- Do not use if the installation, maintenance and removal of the structures will disturb sensitive aquatic species of concern.
- Filter fabrics are not appropriate for projects where dewatering is necessary.
- Filter fabrics are not appropriate to completely dam stream flow.

Design and Installation

- For the filter fabric isolation method, a non-woven or heavy-duty fabric is recommended over standard silt fence. Using rolled geotextiles allows non-standard widths to be used.
- Anchor filter fabric with gravel bags filled with clean, washed gravel. Do not use sand. If a bag should split open, the gravel can be left in the stream, where it can provide aquatic habitat benefits. If a sandbag splits open in a watercourse, the sand could cause a decrease in water quality, and could bury sensitive aquatic habitat.
- Another anchor alternative is a continuous berm, made with the Continuous Berm Machine. This is a gravel-filled bag that can be made in very long segments. The length of the berms is usually limited to 18 ft for ease of handling (otherwise, it gets too heavy to move).

- Place the fabric on the bottom of the stream, and place either a bag of clean, washed gravel or a continuous berm over the bottom of the silt fence fabric, such that a bag-width of fabric lies on the stream bottom. The bag should be placed on what will be the outside of the isolation area.
- Pull the fabric up, and place a metal t-post immediately behind the fabric, on the inside of the isolation area; attach the silt fence to the post with three diagonal nylon ties.
- Continue placing fabric as described above until the entire work area has been isolated, staking the fabric at least every 6 ft.

Inspection and Maintenance

- Immediately repair any gaps, holes or scour.
- Remove and properly dispose of sediment buildup.
- Remove BMP upon completion of construction activity. Recycle or reuse if applicable.
- Revegetate areas disturbed by BMP removal if needed.

Turbidity Curtain Isolation Technique

Definition and Purpose

A turbidity curtain is a fabric barrier used to isolate the near shore work area. The barriers are intended to confine the suspended sediment. The curtain is a floating barrier, and thus does not prevent water from entering the isolated area; rather, it prevents suspended sediment from getting out.

Appropriate Applications

Turbidity curtains should be used where sediment discharge to a stream is unavoidable. They are used when construction activities adjoin quiescent waters, such as lakes, ponds, and slow flowing rivers. The curtains are designed to deflect and contain sediment within a limited area and provide sufficient retention time so that the sediment particles will fall out of suspension.

Limitations

- Turbidity curtains should not be used in flowing water; they are best suited for use in ponds, lakes, and very slow-moving rivers.
- Turbidity curtains should not be placed across the width of a channel.
- Removing sediment that has been deflected and settled out by the curtain may create a discharge problem through the resuspension of particles and by accidental dumping by the removal equipment.

Design and Installation

- Turbidity curtains should be oriented parallel to the direction of flow.
- The curtain should extend the entire depth of the watercourse in calm-water situations.
- In wave conditions, the curtain should extend to within 1 ft of the bottom of the watercourse, such that the curtain does not stir up sediment by hitting the bottom repeatedly. If it is

desirable for the curtain to reach the bottom in an active-water situation, a pervious filter fabric may be used for the bottom 1 ft.

- The top of the curtain should consist of flexible flotation buoys, and the bottom should be held down by a load line incorporated into the curtain fabric. The fabric should be a brightly colored impervious mesh.
- The curtain should be held in place by anchors placed at least every 100 ft.
- First, place the anchors, then tow the fabric out in a furled condition, and connect to the anchors. The anchors should be connected to the flotation devices, and not to the bottom of the curtain. Once in place, cut the furling lines, and allow the bottom of the curtain to sink.
- Consideration must be given to the probable outcome of the removal procedure. It must be determined if it will create more of a sediment problem through re-suspension of the particles or by accidental dumping of material during removal. It is recommended that the soil particles trapped by the turbidity curtain only be removed if there has been a significant change in the original contours of the affected area in the watercourse.
- Particles should always be allowed to settle for a minimum of 6 to 12 hours prior to their removal or prior to removal of the turbidity curtain.

Maintenance and Inspection:

- The curtain should be inspected for holes or other problems, and any repairs needed should be made promptly.
- Allow sediment to settle for 6 to 12 hours prior to removal of sediment or curtain. This means that after removing sediment, wait an additional 6 to 12 hours before removing the curtain.
- To remove, install furling lines along the curtain, detach from anchors, and tow out of the water.

K-rail River Isolation

Definition and Purpose

This temporary sediment control or stream isolation method uses K-rails to form the sediment deposition area, or to isolate the in-stream or near-bank construction area.

Barriers are placed end-to-end in a pre-designed configuration and gravel-filled bags are used at the toe of the barrier and at their abutting ends to seal and prevent movement of sediment beneath or through the barrier walls.

Appropriate Applications

The K-rail isolation can be used in streams with higher water velocities than many other isolation techniques.

- This technique is also useful at the toe of embankments, and cut or fill slopes.

Clear Water Diversion NS-5

Limitations

- The K-rail method should not be used to dewater a project site, as the barrier is not watertight.

Design and Installation

- To create a floor for the K-rail, move large rocks and obstructions. Place washed gravel and gravel-filled bags to create a level surface for K-rails to sit. Washed gravel should always be used.
- Place the bottom two K-rails adjacent to each other, and parallel to the direction of flow; fill the center portion with gravel bags. Then place the third K-rail on top of the bottom two. There should be sufficient gravel bags between the bottom K-rails such that the top rail is supported by the gravel. Place plastic sheeting around the K-rails, and secure at the bottom with gravel bags.
- Further support can be added by pinning and cabling the K-rails together. Also, large riprap and boulders can be used to support either side of the K-rail, especially where there is strong current.

Inspection and Maintenance:

- The barrier should be inspected and any leaks, holes, or other problems should be addressed immediately.
- Sediment should be allowed to settle for at least 6 to 12 hours prior to removal of sediment, and for 6 to 12 hours prior to removal of the barrier.

Stream Diversions

The selection of which stream diversion technique to use will depend upon the type of work involved, physical characteristics of the site, and the volume of water flowing through the project.

Advantages of a Pumped Diversion

- Downstream sediment transport can be nearly eliminated.
- Dewatering of the work area is possible.
- Pipes can be moved around to allow construction operations.
- The dams can serve as temporary access to the site.
- Increased flows can be managed by adding more pumping capacity.

Disadvantages of a Pumped Diversion

- Flow volume is limited by pump capacity.
- A pumped diversion requires 24 hour monitoring of pumps.
- Sudden rain could overtop dams.
- Erosion at the outlet.

Clear Water Diversion NS-5

- Minor in-stream disturbance is required to install and remove dams.

Advantages of Excavated Channels and Flumes

- Excavated channels isolate work from water flow and allow dewatering.
- Excavated channels can handle larger flows than pumps.

Disadvantages of Excavated Channels and Flumes

- Bypass channel or flume must be sized to handle flows, including possible floods.
- Channels must be protected from erosion.
- Flow diversion and re-direction with small dams involves in-stream disturbance and mobilization of sediment.

Design and Installation

- Installation guidelines will vary based on existing site conditions and type of diversion used.
- Pump capacity must be sufficient for design flow.
- A standby pump is required in case a primary pump fails.
- Dam materials used to create dams upstream and downstream of diversion should be erosion resistant; materials such as steel plate, sheet pile, sandbags, continuous berms, inflatable water bladders, etc., would be acceptable.

When constructing a diversion channel, begin excavation of the channel at the proposed downstream end, and work upstream. Once the watercourse to be diverted is reached and the excavated channel is stable, breach the upstream end and allow water to flow down the new channel. Once flow has been established in the diversion channel, install the diversion weir in the main channel; this will force all water to be diverted from the main channel.

Inspection and Maintenance

- Pumped diversions require 24 hour monitoring of pumps.
- Inspect embankments and diversion channels for damage to the linings, accumulating debris, sediment buildup, and adequacy of the slope protection. Remove debris and repair linings and slope protection as required. Remove holes, gaps, or scour.
- Upon completion of work, the diversion or isolation structure should be removed and flow should be redirected through the new culvert or back into the original stream channel. Recycle or reuse if applicable.
- Revegetate areas disturbed by BMP removal if needed.

Costs

Costs of clear water diversion vary considerably and can be very high.

Clear Water Diversion NS-5

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

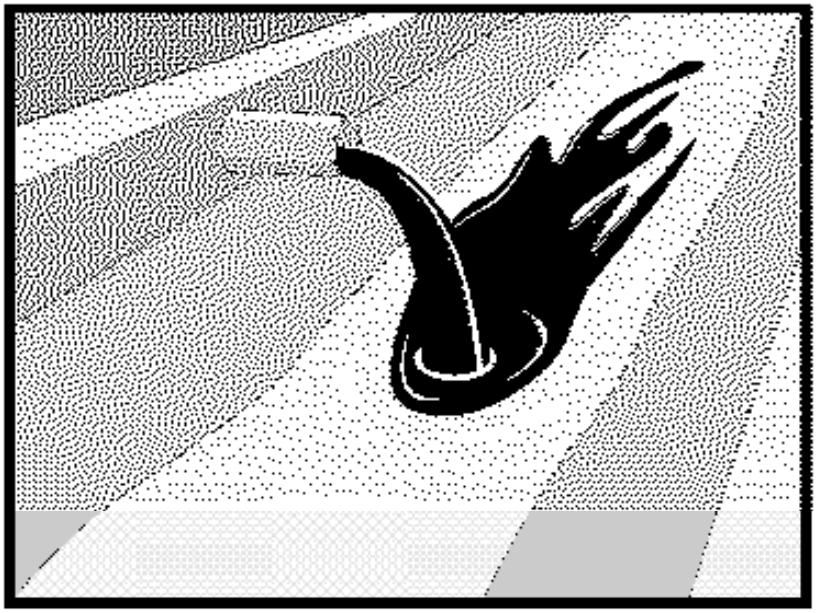
- Refer to BMP-specific inspection and maintenance requirements.

References

California Bank and Shore Rock Slope Protection Design – Practitioners Guide and Field Evaluations of Riprap Methods, Caltrans Study No. F90TL03, October, 2000.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Illicit Connection/Discharge NS-6



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Procedures and practices designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site and report incidents.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Illicit connection/discharge and reporting is applicable anytime an illicit connection or discharge is discovered or illegally dumped material is found on the construction site.

Limitations

Illicit connections and illegal discharges or dumping, for the purposes of this BMP, refer to discharges and dumping caused by parties other than the contractor. If pre-existing hazardous materials or wastes are known to exist onsite, they should be identified in the SWPPP and handled as set forth in the SWPPP.

Implementation

Planning

- Review the SWPPP. Pre-existing areas of contamination should be identified and documented in the SWPPP.
- Inspect site before beginning the job for evidence of illicit connections, illegal dumping or discharges. Document any pre-existing conditions and notify the owner.

Illicit Connection/Discharge NS-6

- Inspect site regularly during project execution for evidence of illicit connections, illegal dumping or discharges.
- Observe site perimeter for evidence for potential of illicitly discharged or illegally dumped material, which may enter the job site.

Identification of Illicit Connections and Illegal Dumping or Discharges

- **General –** unlabeled and unidentifiable material should be treated as hazardous.
- **Solids** - Look for debris, or rubbish piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.
- **Liquids** - signs of illegal liquid dumping or discharge can include:
  - Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Abnormal water flow during the dry weather season
- **Urban Areas** - Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:
  - Abnormal water flow during the dry weather season
  - Unusual flows in sub drain systems used for dewatering
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Excessive sediment deposits, particularly adjacent to or near active offsite construction projects
- **Rural Areas** - Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:
  - Abnormal water flow during the non-irrigation season
  - Non-standard junction structures
  - Broken concrete or other disturbances at or near junction structures

Reporting

Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery. For illicit connections or discharges to the storm drain system, notify the local stormwater management agency. For illegal dumping, notify the local law enforcement agency.

Cleanup and Removal

The responsibility for cleanup and removal of illicit or illegal dumping or discharges will vary by location. Contact the local stormwater management agency for further information.

Illicit Connection/Discharge NS-6

Costs

Costs to look for and report illicit connections and illegal discharges and dumping are low. The best way to avoid costs associated with illicit connections and illegal discharges and dumping is to keep the project perimeters secure to prevent access to the site, to observe the site for vehicles that should not be there, and to document any waste or hazardous materials that exist onsite before taking possession of the site.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect the site regularly to check for any illegal dumping or discharge.
- Prohibit employees and subcontractors from disposing of non-job related debris or materials at the construction site.
- Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery.

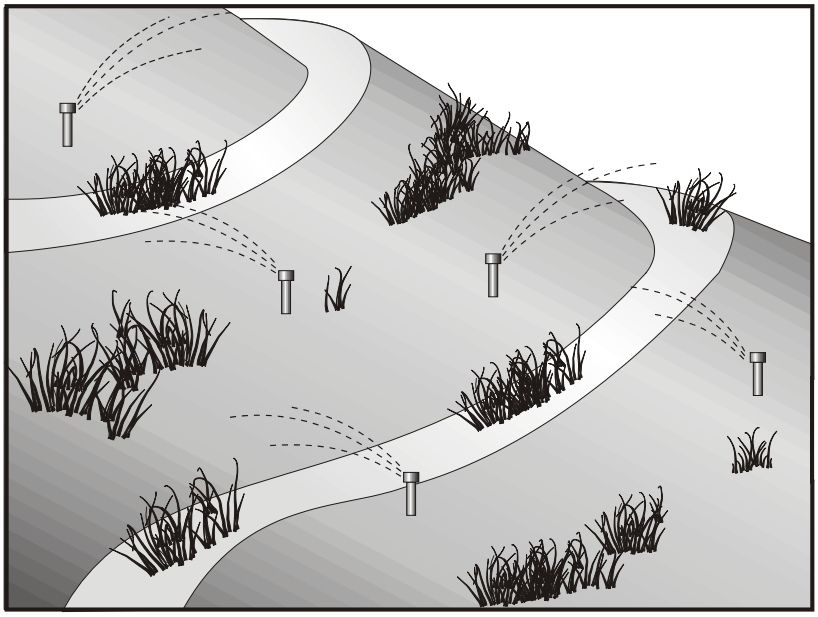
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Potable Water / Irrigation NS-7



Categories

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Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Potable Water/Irrigation consists of practices and procedures to manage the discharge of potential pollutants generated during discharges from irrigation water lines, landscape irrigation, lawn or garden watering, planned and unplanned discharges from potable water sources, water line flushing, and hydrant flushing.

Suitable Applications

Implement this BMP whenever potable water or irrigation water discharges occur at or enter a construction site.

Limitations

None identified.

Implementation

- Direct water from offsite sources around or through a construction site, where feasible, in a way that minimizes contact with the construction site.
- Discharges from water line flushing should be reused for landscaping purposes where feasible.
- Shut off the water source to broken lines, sprinklers, or valves as soon as possible to prevent excess water flow.
- Protect downstream stormwater drainage systems and watercourses from water pumped or bailed from trenches excavated to repair water lines.

Potable Water / Irrigation NS-7

- Inspect irrigated areas within the construction limits for excess watering. Adjust watering times and schedules to ensure that the appropriate amount of water is being used and to minimize runoff. Consider factors such as soil structure, grade, time of year, and type of plant material in determining the proper amounts of water for a specific area.

Costs

Cost to manage potable water and irrigation are low and generally considered to be a normal part of related activities.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events..
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Repair broken water lines as soon as possible.
- Inspect irrigated areas regularly for signs of erosion and/or discharge.

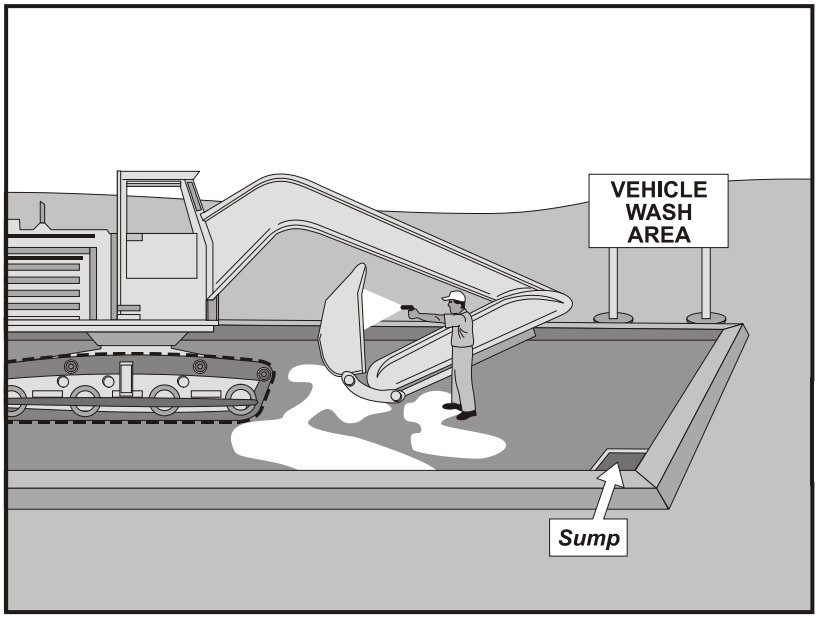
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle and Equipment Cleaning NS-8



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Legend:

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☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

Vehicle and Equipment Cleaning NS-8

- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried, and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
  - Located away from storm drain inlets, drainage facilities, or watercourses
  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runon and runoff
  - Configured with a sump to allow collection and disposal of wash water
  - No discharge of wash waters to storm drains or watercourses
  - Used only when necessary
- When cleaning vehicles and equipment with water:
  - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
  - Use positive shutoff valve to minimize water usage
  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

Vehicle and Equipment Cleaning NS-8

Inspection and Maintenance

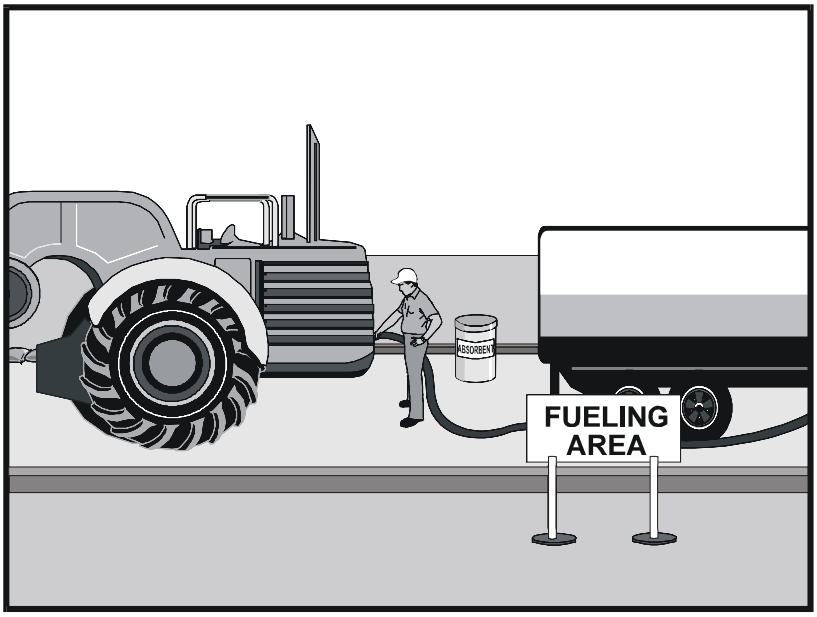
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspection and maintenance is minimal, although some berm repair may be necessary.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed.
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

Vehicle and Equipment Fueling NS-9



Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/ Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.
- Discourage "topping-off" of fuel tanks.

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Vehicle and Equipment Fueling NS-9

- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should be disposed of properly after use.
- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.
- Dedicated fueling areas should be protected from stormwater runon and runoff, and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent runon, runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.

Vehicle and Equipment Fueling NS-9

- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

References

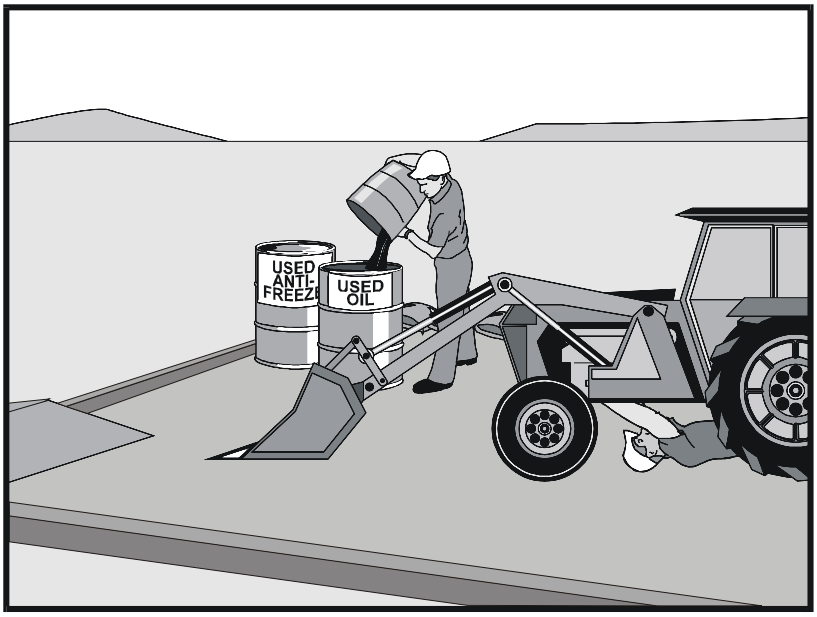
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle & Equipment Maintenance NS-10



Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8,

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Vehicle & Equipment Maintenance NS-10

Vehicle and Equipment Cleaning, and NS-9, Vehicle and Equipment Fueling.

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runon and runoff, and should be located at least 50 ft from downstream drainage facilities and watercourses.
- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- Drip pans or plastic sheeting should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.
- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.

Vehicle & Equipment Maintenance NS-10

- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an "environmentally friendly" label.
- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.
- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like,-trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

Vehicle & Equipment Maintenance NS-10

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Keep ample supplies of spill cleanup materials onsite.
- Maintain waste fluid containers in leak proof condition.
- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

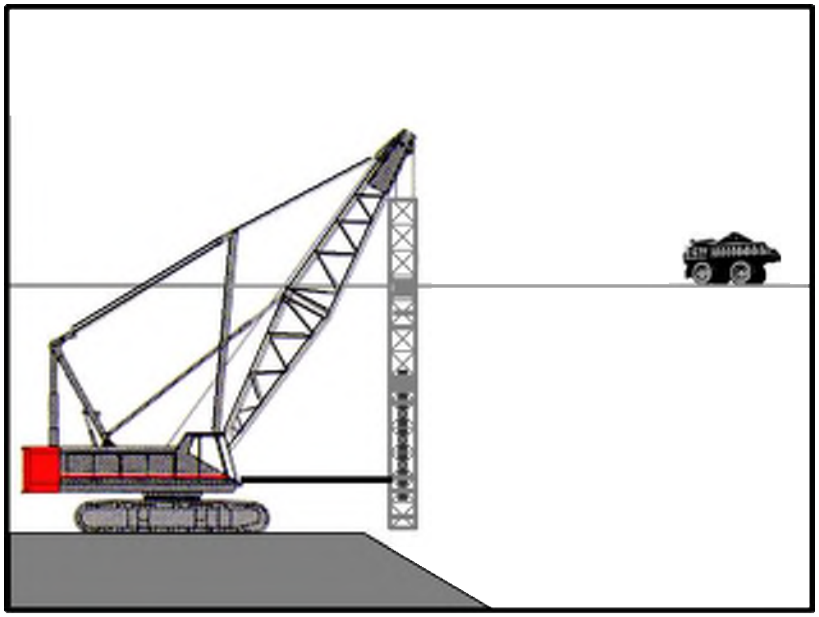
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Pile Driving Operations NS-11



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

Description and Purpose

The construction and retrofit of bridges and retaining walls often include driving piles for foundation support and shoring operations. Driven piles are typically constructed of precast concrete, steel, or timber. Driven sheet piles are also used for shoring and cofferdam construction. Proper control and use of equipment, materials, and waste products from pile driving operations will reduce or eliminate the discharge of potential pollutants to the storm drain system, watercourses, and waters of the United States.

Suitable Applications

These procedures apply to all construction sites near or adjacent to a watercourse or groundwater where permanent and temporary pile driving (impact and vibratory) takes place, including operations using pile shells as well as construction of cast-in-steel-shell and cast-in-drilled-hole piles.

Limitations

None identified.

Implementation

- Use drip pans or absorbent pads during vehicle and equipment operation, maintenance, cleaning, fueling, and storage. Refer to NS-8, Vehicle and Equipment Cleaning, NS-9, Vehicle and Equipment Fueling, and NS-10, Vehicle and Equipment Maintenance.

Pile Driving Operations NS-11

- Have spill kits and cleanup materials available at all locations of pile driving. Refer to WM-4, Spill Prevention and Control.
- Equipment that is stored or in use in streambeds, or on docks, barges, or other structures over water bodies should be kept leak free.
- Park equipment over plastic sheeting or equivalent where possible. Plastic is not a substitute for drip pans or absorbent pads. The storage or use of equipment in streambeds or other bodies of water must comply with all applicable permits.
- Implement other BMPs as applicable, such as NS-2, Dewatering Operations, WM-5, Solid Waste Management, WM-6, Hazardous Waste Management, and WM-10, Liquid Waste Management.
- When not in use, store pile-driving equipment away from concentrated flows of stormwater, drainage courses, and inlets. Protect hammers and other hydraulic attachments from runon and runoff by placing them on plywood and covering them with plastic or a comparable material prior to the onset of rain.
- Use less hazardous products, e.g., vegetable oil, when practicable.

Costs

All of the above measures can be low cost.

Inspection and Maintenance

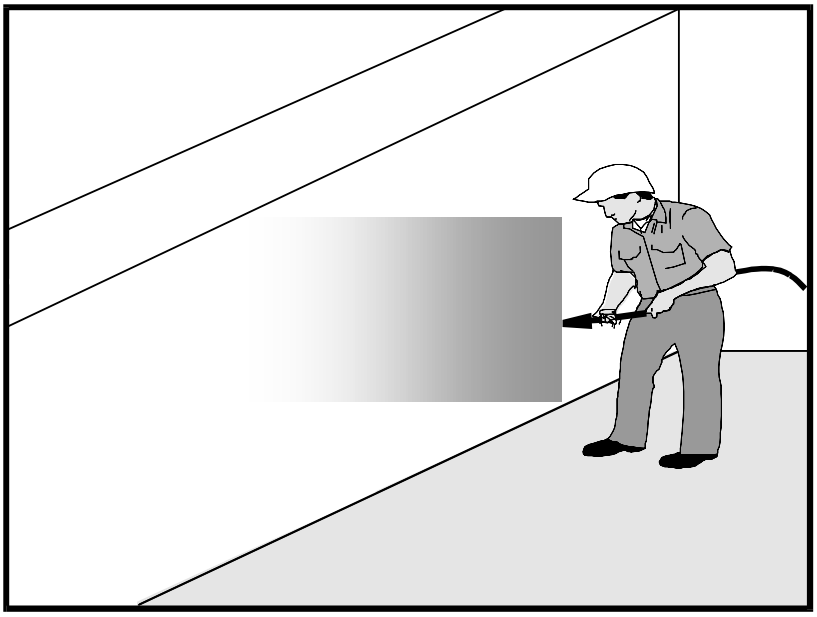
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect equipment every day at startup and repair equipment as needed (i.e., worn or damaged hoses, fittings, and gaskets). Recheck equipment at shift changes or at the end of the day and scheduled repairs as needed.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Concrete Curing NS-12



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Concrete curing is used in the construction of structures such as bridges, retaining walls, pump houses, large slabs, and structured foundations. Concrete curing includes the use of both chemical and water methods.

Concrete and its associated curing materials have basic chemical properties that can raise the pH of water to levels outside of the permitted range. Discharges of stormwater and non-stormwater exposed to concrete during curing may have a high pH and may contain chemicals, metals, and fines. The General Permit incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Proper procedures and care should be taken when managing concrete curing materials to prevent them from coming into contact with stormwater flows, which could result in a high pH discharge.

Suitable Applications

Suitable applications include all projects where Portland Cement Concrete (PCC) and concrete curing chemicals are placed where they can be exposed to rainfall, runoff from other areas, or where runoff from the PCC will leave the site.

Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Concrete Curing NS-12

Implementation

Chemical Curing

- Avoid over spray of curing compounds.
- Minimize the drift by applying the curing compound close to the concrete surface. Apply an amount of compound that covers the surface, but does not allow any runoff of the compound.
- Use proper storage and handling techniques for concrete curing compounds. Refer to WM-1, Material Delivery and Storage.
- Protect drain inlets prior to the application of curing compounds.
- Refer to WM-4, Spill Prevention and Control.

Water Curing for Bridge Decks, Retaining Walls, and other Structures

- Direct cure water away from inlets and watercourses to collection areas for evaporation or other means of removal in accordance with all applicable permits. See WM-8 Concrete Waste Management.
- Collect cure water at the top of slopes and transport to a concrete waste management area in a non-erosive manner. See EC-9 Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Utilize wet blankets or a similar method that maintains moisture while minimizing the use and possible discharge of water.

Education

- Educate employees, subcontractors, and suppliers on proper concrete curing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete curing procedures.

Costs

All of the above measures are generally low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

Concrete Curing NS-12

- Sample non-stormwater discharges and stormwater runoff that contacts uncured and partially cured concrete as required by the General Permit.
- Ensure that employees and subcontractors implement appropriate measures for storage, handling, and use of curing compounds.
- Inspect cure containers and spraying equipment for leaks.

References

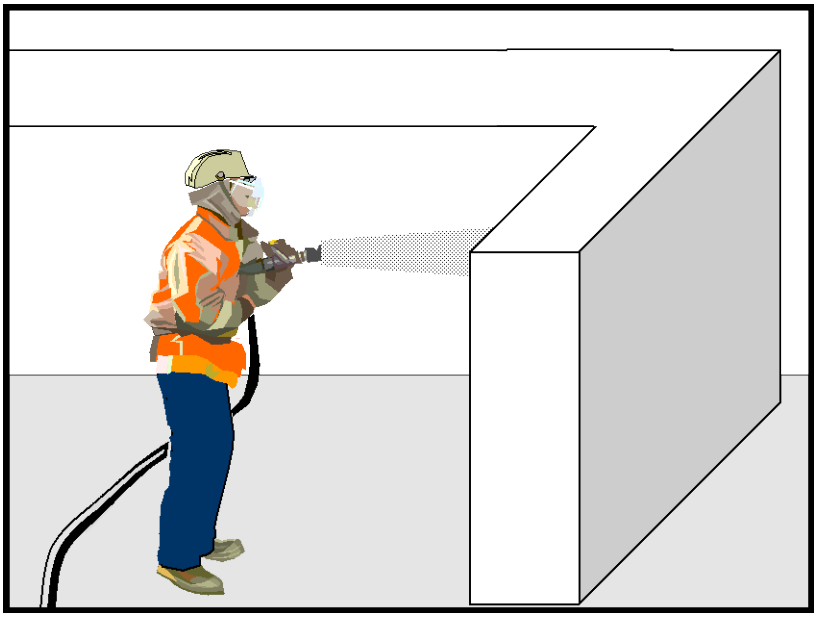
Blue Print for a Clean Bay-Construction-Related Industries: Best Management Practices for Stormwater Pollution Prevention; Santa Clara Valley Non Point Source Pollution Control Program, 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Concrete Finishing NS-13



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Concrete finishing methods are used for bridge deck rehabilitation, paint removal, curing compound removal, and final surface finish appearances. Methods include sand blasting, shot blasting, grinding, or high pressure water blasting. Stormwater and non-stormwater exposed to concrete finishing by-products may have a high pH and may contain chemicals, metals, and fines. Proper procedures and implementation of appropriate BMPs can minimize the impact that concrete-finishing methods may have on stormwater and non-stormwater discharges.

The General Permit incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Concrete and its associated curing materials have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures apply to all construction locations where concrete finishing operations are performed.

Concrete Finishing NS-13

Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

- Collect and properly dispose of water from high-pressure water blasting operations.
- Collect contaminated water from blasting operations at the top of slopes. Transport or dispose of contaminated water while using BMPs such as those for erosion control. Refer to EC-9, Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Direct water from blasting operations away from inlets and watercourses to collection areas for infiltration or other means of removal (dewatering). Refer to NS-2 Dewatering Operations.
- Protect inlets during sandblasting operations. Refer to SE-10, Storm Drain Inlet Protection.
- Refer to WM-8, Concrete Waste Management for disposal of concrete debris.
- Minimize the drift of dust and blast material as much as possible by keeping the blasting nozzle close to the surface.
- When blast residue contains a potentially hazardous waste, refer to WM-6, Hazardous Waste Management.

Education

- Educate employees, subcontractors, and suppliers on proper concrete finishing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete finishing procedures.

Costs

These measures are generally of low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts concrete dust and debris as required by the General Permit.

- Sweep or vacuum up debris from sandblasting at the end of each shift.
- At the end of each work shift, remove and contain liquid and solid waste from containment structures, if any, and from the general work area.
- Inspect containment structures for damage prior to use and prior to onset of forecasted rain.

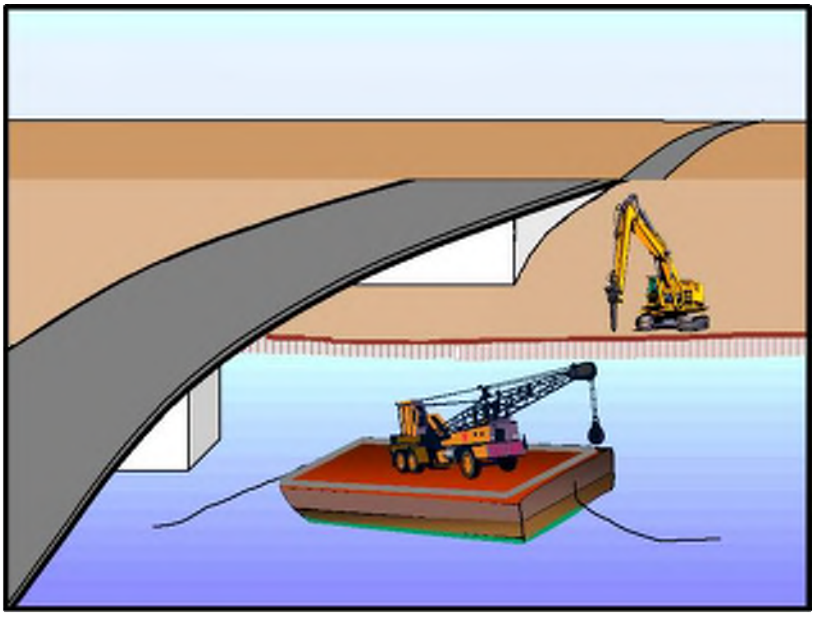
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Material Over Water NS-14



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
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Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Procedures for the proper use, storage, and disposal of materials and equipment on barges, boats, temporary construction pads, or similar locations that minimize or eliminate the discharge of potential pollutants to a watercourse.

Suitable Applications

Applies where materials and equipment are used on barges, boats, docks, and other platforms over or adjacent to a watercourse including waters of the United States. These procedures should be implemented for construction materials and wastes (solid and liquid), soil or dredging materials, or any other materials that may cause or contribute to exceedances of water quality standards.

Limitations

Dredge and fill activities are regulated by the US Army Corps of Engineers and Regional Boards under Section 404/401 of the Clean Water Act.

Implementation

- Refer to WM-1, Material Delivery and Storage and WM-4, Spill Prevention and Control.
- Use drip pans and absorbent materials for equipment and vehicles and ensure that an adequate supply of spill clean up materials is available.
- Drip pans should be placed under all vehicles and equipment placed on docks, barges, or other structures over

Material Over Water NS-14

water bodies when the vehicle or equipment is expected to be idle for more than 1 hour.

- Maintain equipment in accordance with NS-10, Vehicle and Equipment Maintenance. If a leaking line cannot be repaired, remove equipment from over the water.
- Provide watertight curbs or toe boards to contain spills and prevent materials, tools, and debris from leaving the barge, platform, dock, etc.
- Secure all materials to prevent discharges to receiving waters via wind.
- Identify types of spill control measures to be employed, including the storage of such materials and equipment. Ensure that staff is trained regarding the use of the materials, deployment and access of control measures, and reporting measures.
- In case of spills, contact the local Regional Board as soon as possible but within 48 hours.
- Refer to WM-5, Solid Waste Management (non-hazardous) and WM-6, Hazardous Waste Management. Ensure the timely and proper removal of accumulated wastes
- Comply with all necessary permits required for construction within or near the watercourse, such as Regional Water Quality Control Board, U.S. Army Corps of Engineers, Department of Fish and Game or and other local permitting.
- Discharges to waterways should be reported to the Regional Water Quality Control Board immediately upon discovery. A written discharge notification must follow within 7 days. Follow the spill reporting procedures contained in SWPPP.

Costs

These measures are generally of low to moderate cost. Exceptions are areas for temporary storage of materials, engine fluids, or wastewater pump out.

Inspection and Maintenance

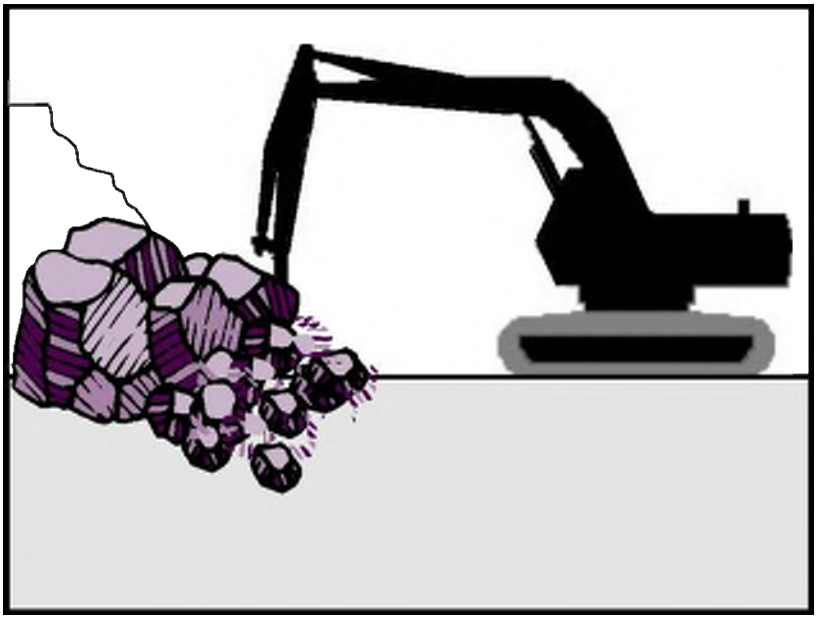
- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Ensure that employees and subcontractors implement the appropriate measures for storage and use of materials and equipment.
- Inspect and maintain all associated BMPs and perimeter controls to ensure continuous protection of the water courses, including waters of the United States.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Demolition Adjacent to Water NS-15



Description and Purpose

Procedures to protect water bodies from debris and wastes associated with structure demolition or removal over or adjacent to watercourses.

Suitable Applications

Full bridge demolition and removal, partial bridge removal (barrier rail, edge of deck) associated with bridge widening projects, concrete channel removal, or any other structure removal that could potentially affect water quality.

Limitations

None identified.

Implementation

- Refer to NS-5, Clear Water Diversion, to direct water away from work areas.
- Use attachments on construction equipment such as backhoes to catch debris from small demolition operations.
- Use covers or platforms to collect debris.
- Platforms and covers are to be approved by the owner.
- Stockpile accumulated debris and waste generated during demolition away from watercourses and in accordance with WM-3, Stockpile Management.
- Ensure safe passage of wildlife, as necessary.

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Demolition Adjacent to Water NS-15

- Discharges to waterways shall be reported to the Regional Water Quality Control Board immediately upon discovery. A written discharge notification must follow within 7 days. Follow the spill reporting procedures in the SWPPP.

- For structures containing hazardous materials, i.e., lead paint or asbestos, refer to BMP WM-6, Hazardous Waste Management. For demolition work involving soil excavation around lead-painted structures, refer to WM-7, Contaminated Soil Management.

Costs

Cost may vary according to the combination of practices implemented.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Any debris-catching devices shall be emptied regularly. Collected debris shall be removed and stored away from the watercourse and protected from runon and runoff.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Temporary Batch Plants NS-16

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

The construction of roads, bridges, retaining walls, and other large structures in remote areas, often requires temporary batch plant facilities to manufacture Portland Cement Concrete (PCC) or asphalt cement (AC). Temporary batch plant facilities typically consist of silos containing fly ash, lime, and cement; heated tanks of liquid asphalt; sand and gravel material storage areas; mixing equipment; above ground storage tanks containing concrete additives and water; and designated areas for sand and gravel truck unloading, concrete truck loading, and concrete truck washout. Proper control and use of equipment, materials, and waste products from temporary batch plant facilities will reduce the discharge of potential pollutants to the storm drain system or watercourses, reduce air emissions, and mitigate noise impacts.

The General Permit draft incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements). Many types of batch plant materials, including mortar, concrete, cement and block and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows which may cause an exceedance of the General Permit requirements.

Suitable Applications

These procedures typically apply to construction sites where temporary batch plant facilities are used; however, some of the

practices described are applicable to construction sites with general concrete use.

Limitations

The General Permit for discharges of stormwater associated with industrial activities (General Industrial Permit) may be applicable to temporary batch plants.

Specific permit requirements or mitigation measures such as Air Resources Board (ARB), Air Quality Management District (AQMD), Air Pollution Control District (APCD, Regional Water Quality Control Board (RWQCB), county ordinances and city ordinances may require alternative mitigation measures for temporary batch plants. Contact the local regulatory agencies to determine if a permit is required.

Implementation

Planning

- Temporary batch plants may be subject to the General Industrial Permit. To obtain a copy of this permit and the application forms, visit http://www.waterboards.ca.gov or contact the State Water Resources Control Board.
- Proper planning, design, and construction of temporary batch plants should be implemented to minimize potential water quality, air pollution, and noise impacts associated with temporary batch plants.
- BMPs and a Construction Site Monitoring Plan (CSMP) should be included in the project Stormwater Pollution Prevention Plan (SWPPP). BMPs should be implemented, inspected, and maintained in accordance with these plans.
- Temporary batch plants should be managed to comply with AQMD Statewide Registration Program and/or local AQMD Portable Equipment Registration requirements.
- Construct temporary batch plants downwind of existing developments whenever possible.
- Placement of access roads should be planned to mitigate water and air quality impacts.

Layout and Design

- Temporary batch plants should be properly located and designed to mitigate water quality impacts to receiving water bodies. Batch plants should be located away from watercourses, drainage courses, and drain inlets. Batch plants should be located to minimize the potential for stormwater runon onto the site.
- Temporary batch plant facilities (including associated stationary equipment and stockpiles) should be located at least 300 ft from any recreational area, school, residence, or other structure not associated with the construction project.
- Construct continuous interior AC or PCC berms around batch plant equipment (mixing equipment, silos, concrete drop points, conveyor belts, admixture tanks, etc.) to facilitate proper containment and cleanup of releases. Rollover or flip top curbs or dikes should be placed at ingress and egress points (SE-12, Temporary Silt Dike).
- Direct runoff from the paved or unpaved portion of the batch plant into a sump and pipe to a lined washout area or dewatering tank.

Temporary Batch Plants NS-16

- Direct stormwater and non-stormwater runoff from unpaved portions of batch plant facility to catchment ponds or tanks.
- Construct and remove concrete washout facilities in accordance with WM-8, Concrete Waste Management.
- Layout of a typical batch plant and associated BMP is located at the end of this BMP fact sheet.

Operational Procedures

- Washout of concrete trucks should be conducted in a designated area in accordance with WM-8, Concrete Waste Management.
- Do not dispose of concrete into drain inlets, the stormwater drainage system, or watercourses.
- Washing of concrete mixing and transport equipment (including concrete truck washout) should occur in a designated area in accordance with WM-8, Concrete Waste Management.
- Washing equipment, tools, or vehicles to remove PCC should be conducted in accordance with NS-7, Potable Water/Irrigation, NS-8, Vehicle and Equipment Cleaning, and WM-8, Concrete Waste Management..
- All dry material transfer points should be ducted through a fabric or cartridge type filter unless there are no visible emissions from the transfer point.
- Equip all bulk storage silos, including auxiliary bulk storage trailers, with fabric or cartridge type filter(s).
- Maintain silo vent filters in proper operating condition.
- Equip silos and auxiliary bulk storage trailers with dust-tight service hatches.
- Fabric dust collection system should be capable of controlling particulate matter in accordance with the California Air Resources Control Board and local Air Pollution Control District Regulations.
- Fabric dust collectors (except for vent filters) should be equipped with an operational pressure differential gauge to measure the pressure drop across the filters.
- All transfer points should be equipped with a wet suppression system to control fugitive particulate emissions unless there are no visible emissions.
- All conveyors should be covered, unless the material being transferred results in no visible emissions.
- There should be no visible emissions beyond the property line, while the equipment is being operated.
- Collect dust emissions from the loading of open-bodied trucks, at the drip point of dry batch plants, or dust emissions from the drum feed for central mix plants.

Temporary Batch Plants NS-16

- Equip silos and auxiliary bulk storage trailers with a visible and/or audible warning mechanism to warn operators that the silo or trailer is full.

- All open-bodied vehicles transporting material should be loaded with a final layer of wet sand and the truck should be covered with a tarp to reduce emissions.

Tracking Control

- Plant roads (batch truck and material delivery truck roads) and areas between stockpiles and conveyor hoppers should be stabilized (TC-2, Stabilized Construction Roadway), watered, treated with dust-suppressant chemicals (WE-1, Wind Erosion Control), or paved with a cohesive hard surface that can be repeatedly swept, maintained intact, and cleaned as necessary to control dust emissions.

- Trucks should not track PCC from plants onto public roads. Use appropriate practices from TC-1, Stabilized Construction Entrance/Exit, to prevent tracking.

Materials Storage

- WM-1, Material Delivery and Storage, should be implemented at all batch plants using concrete components or compounds. An effective strategy is to cover and contain materials.

- WM-2, Material Use should be conducted in a way to minimize or eliminate the discharge of materials to storm drain system or watercourse.

- Ensure that finer materials are not dispersed into the air during operations, such as unloading of cement delivery trucks.

- Stockpiles should be covered and enclosed with perimeter sediment barriers per WM-3, Stockpile Management. Uncovered stockpiles should be sprayed with water and/or dust-suppressant chemicals as necessary to control dust emissions, unless the stockpiled material results in no visible emissions. An operable stockpile watering system should be onsite at all times.

- Store bagged and boxed materials on pallets and cover or store in a completely enclosed storage area on non-working days and prior to rain.

- Minimize stockpiles of demolished PCC by recycling them in a timely manner.

- Provide secondary containment for liquid materials (WM-1, Material Delivery and Storage, WM-10, Liquid Waste Management). Containment should provide sufficient volume to contain precipitation from a 25-year storm plus 10% of the aggregate volume of all containers or plus 100% of the largest container, whichever is greater.

- Handle solid and liquid waste in accordance with WM-5, Solid Waste Management, WM-10, Liquid Waste Management, and WM-8, Concrete Waste Management.

- Maintain adequate supplies of spill cleanup materials and train staff to respond to spills per WM-4, Spill Prevention and Control.

- Immediately contain and clean up spilled cement and fly ash and contain.

Temporary Batch Plants NS-16

Equipment Maintenance

- Equipment should be maintained to prevent fluid leaks and spills per NS-9, Vehicle and Equipment Fueling, and NS-10, Vehicle and Equipment Maintenance.
- Maintain adequate supplies of spill cleanup materials and train staff to respond to spills per WM-4, Spill Prevention and Control.
- Incorporate other BMPs such as WM-5, Solid Waste Management, WM-6, Hazardous Waste Management, and WM-10, Liquid Waste Management.

Costs

Costs will vary depending on the size of the facility and combination of BMPs implemented.

Inspection and Maintenance

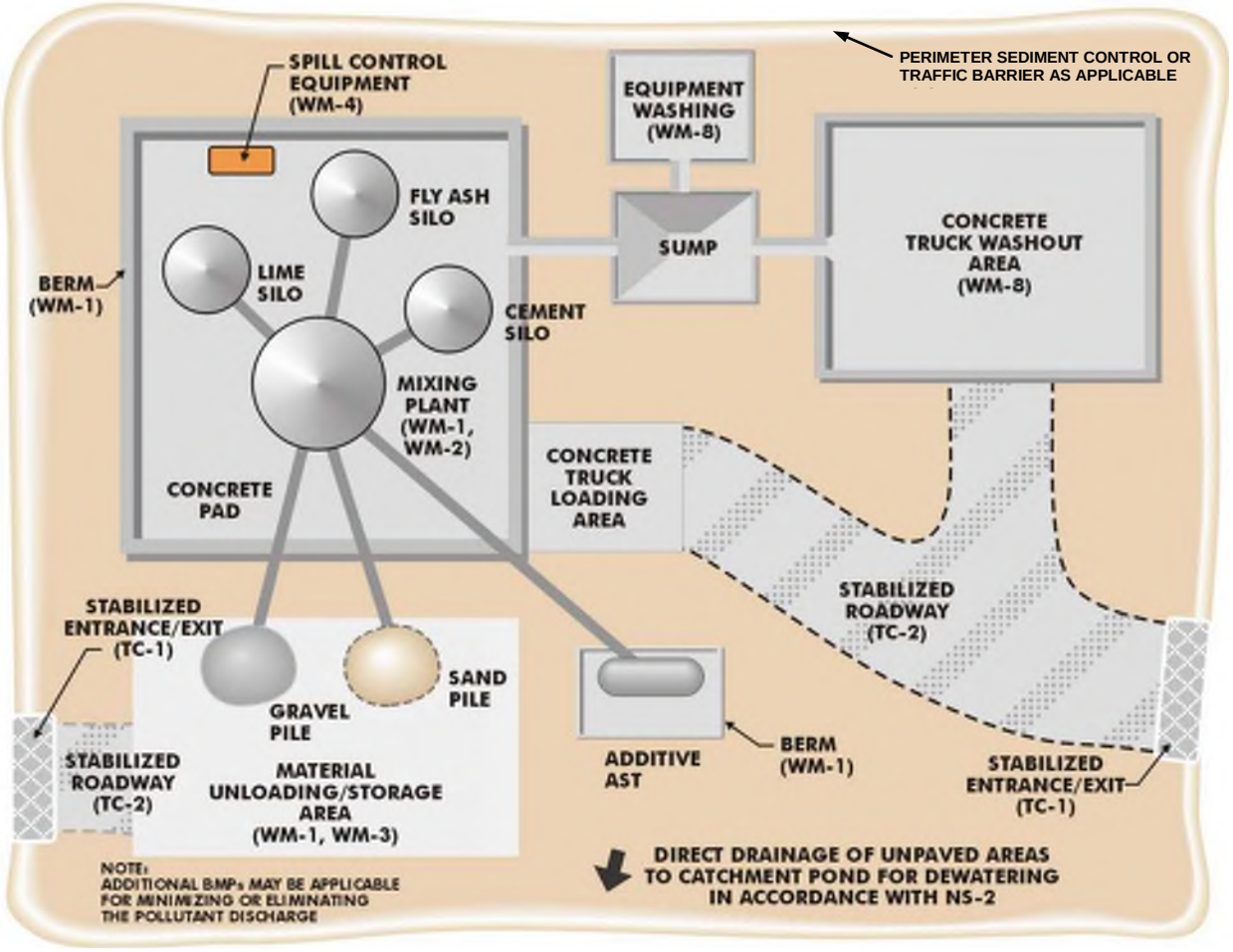
- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts cementitious materials or fly ash as required by the General Permit.
- Inspect and repair equipment (for damaged hoses, fittings, and gaskets).
- Inspect and maintain a Stabilized Construction Entrance/Exit (TC-1) as needed.
- Inspect and maintain stabilized haul roads as needed (TC-2, Stabilized Construction Roadway).
- Inspect and maintain materials and waste storage areas as needed.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

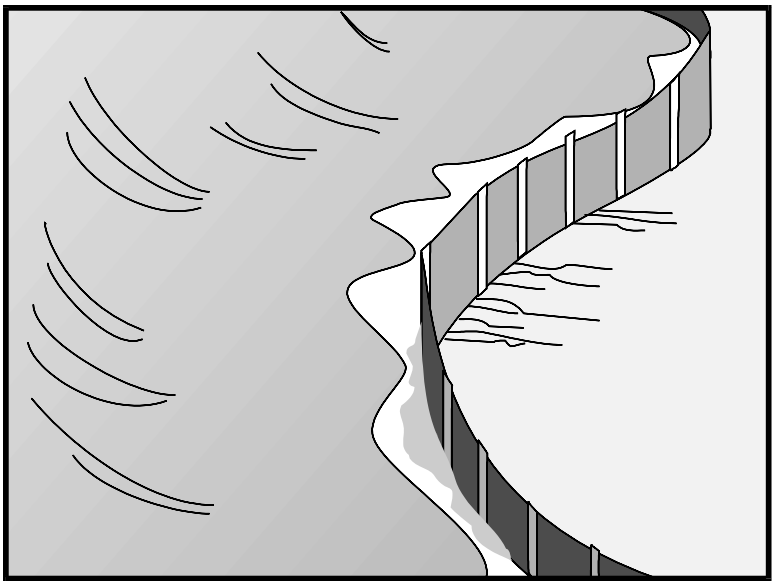
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Temporary Batch Plants NS-16



Typical Temporary Batch

Silt Fence SE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Description and Purpose

A silt fence is made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains water, promoting sedimentation of coarse sediment behind the fence. Silt fence does not retain soil fine particles like clays or silts.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (SE-10). Silt fences should not be used in locations where the flow is concentrated. Silt fences should always be used in combination with erosion controls. Suitable applications include:

- At perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Around inlets.
- Below other small cleared areas.

Targeted Constituents

Sediment (coarse sediment)	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm SE-12 Manufactured Linear Sediment Controls

SE-13 Compost Socks and Berms

SE-14 Biofilter Bags

Silt Fence SE-1

Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard.
- Do not use silt fence to divert water flows or place across any contour line.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Must be trenched and keyed in.
- Not intended for use as a substitute for Fiber Rolls (SE-5), when fiber rolls are being used as a slope interruption device.
- Do not use on slopes subject to creeping, slumping, or landslides.

Implementation

General

A silt fence is a temporary sediment barrier consisting of woven geotextile stretched across and attached to supporting posts, trenched-in, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap coarse sediment by intercepting and detaining sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

The following layout and installation guidance can improve performance and should be followed:

- Silt fence should be used in combination with erosion controls up-slope in order to provide the most effective sediment control.
- Silt fence alone is not effective at reducing turbidity. (Barrett and Malina, 2004)
- Designers should consider diverting sediment laden water to a temporary sediment basin or trap. (EPA, 2012)
- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft^2 of ponding area should be provided for every acre draining to the fence.
- Efficiency of silt fences is primarily dependent on the detention time of the runoff behind the control. (Barrett and Malina, 2004)
- The drainage area above any fence should not exceed a quarter of an acre. (Rule of Thumb-100-feet of silt fence per 10,000 square feet of disturbed area.) (EPA 2012)

- The maximum length of slope draining to any point along the silt fence should be 100 ft per foot of silt fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.
- Silt fences should remain in place until the disturbed area draining to the silt fence is permanently stabilized, after which, the silt fence fabric and posts should be removed and properly disposed.
- J-Hooks, which have ends turning up the slope to break up long runs of fence and provide multiple storage areas that work like mini-retention areas, may be used to increase the effectiveness of silt fence.
- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

Design and Layout

In areas where high winds are anticipated the fence should be supported by a plastic or wire mesh. The geotextile fabric of the silt fence should contain ultraviolet inhibitors and stabilizers to provide longevity equivalent to the project life or replacement schedule.

- Layout in accordance with the attached figures.
- For slopes that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to protect silt fence from rocks (e.g., rockfall netting) ensure the integrity of the silt fence installation.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
  - Fabric is reinforced with wire backing or additional support.
  - Posts are spaced closer than pre-manufactured, standard silt fence products.
- Use is generally limited to areas affected by high winds.
- Area draining to fence produces moderate sediment loads.

Materials

Standard Silt Fence

- Silt fence material should be woven geotextile with a minimum width of 36 in. The fabric should conform to the requirements in ASTM designation D6461.
- Wooden stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the

thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

Heavy-Duty Silt Fence

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts instead of wood stakes.

Installation Guidelines – Traditional Method

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).
- Bottom of the silt fence should be keyed-in a minimum of 12 in.
- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.
- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench.
- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.
- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.
- The trench should be backfilled with native material and compacted.
- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.
- Cross barriers should be a minimum of 1/3 and a maximum of ½ the height of the linear barrier.
- See typical installation details at the end of this fact sheet.

Silt Fence SE-1

Installation Guidelines - Static Slicing Method

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 inches into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the geotextile is installed, the soil is compacted using tractor tires.
- This method will not work with pre-fabricated, wire backed silt fence.
- Benefits:
    - Ease of installation (most often done with a 2 person crew).
    - Minimal soil disturbance.
    - Better level of compaction along fence, less susceptible to undercutting
    - Uniform installation.
- Limitations:
    - Does not work in shallow or rocky soils.
    - Complete removal of geotextile material after use is difficult.
    - Be cautious when digging near potential underground utilities.

Costs

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.
- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is $7 per linear foot based on vendor research. Range of cost is $3.50 - $9.10 per linear foot.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair undercut silt fences.
- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches 1/3 of the barrier height.
- Silt fences should be left in place until the upgradient area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.

- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Monitoring Data on Effectiveness of Sediment Control Techniques, Proceedings of World Water and Environmental Resources Congress, Barrett M. and Malina J. 2004.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, and Inventory of Current Practices (Draft), USEPA, 1990.

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Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

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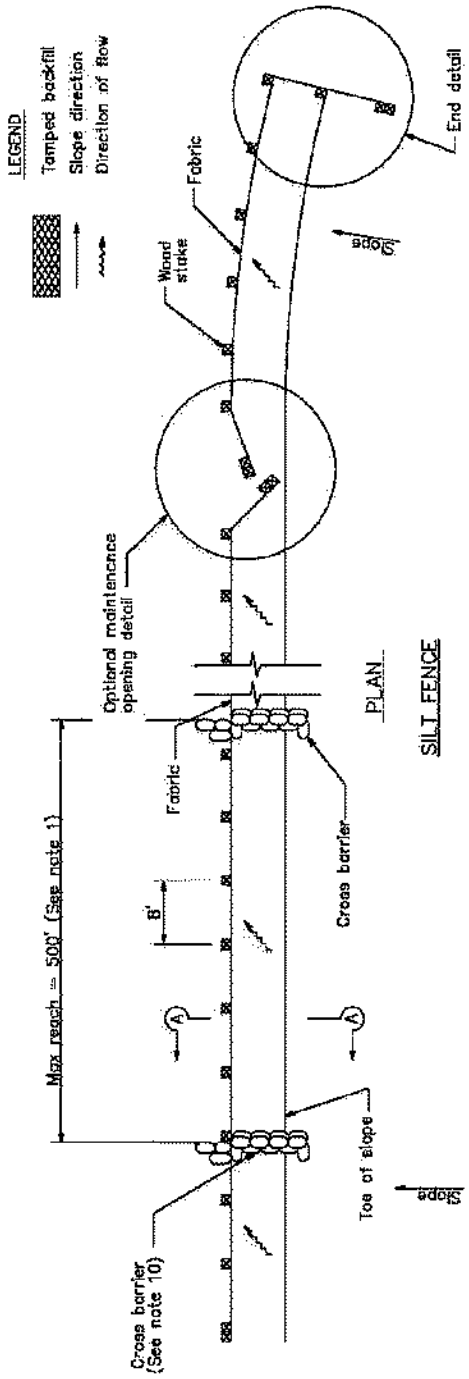
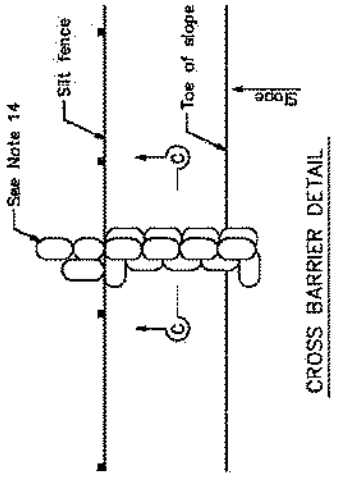
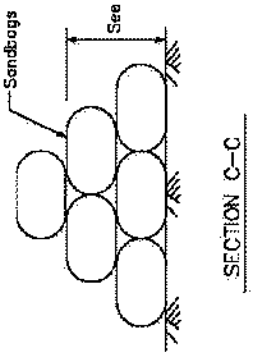
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Silt Fence SE-1



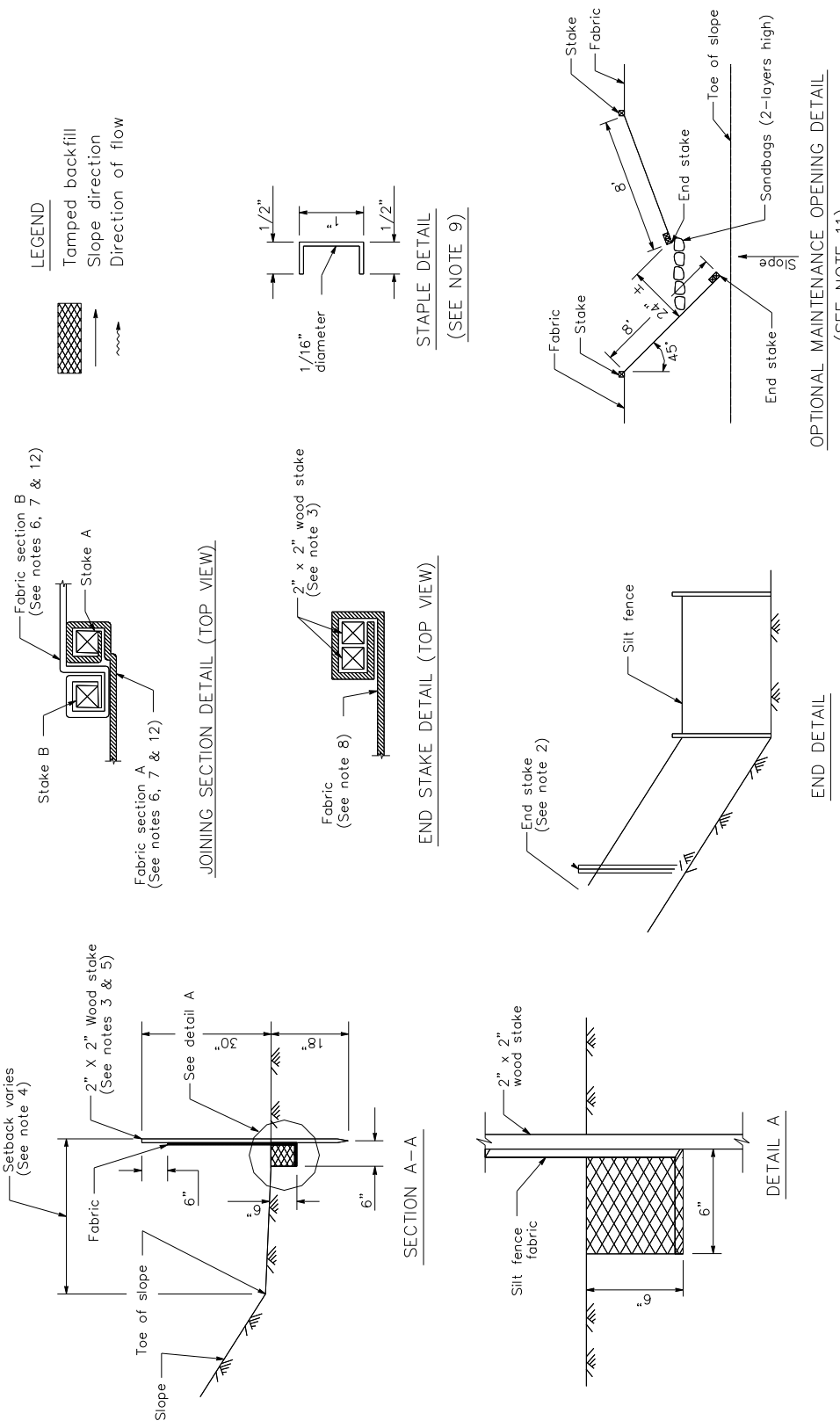




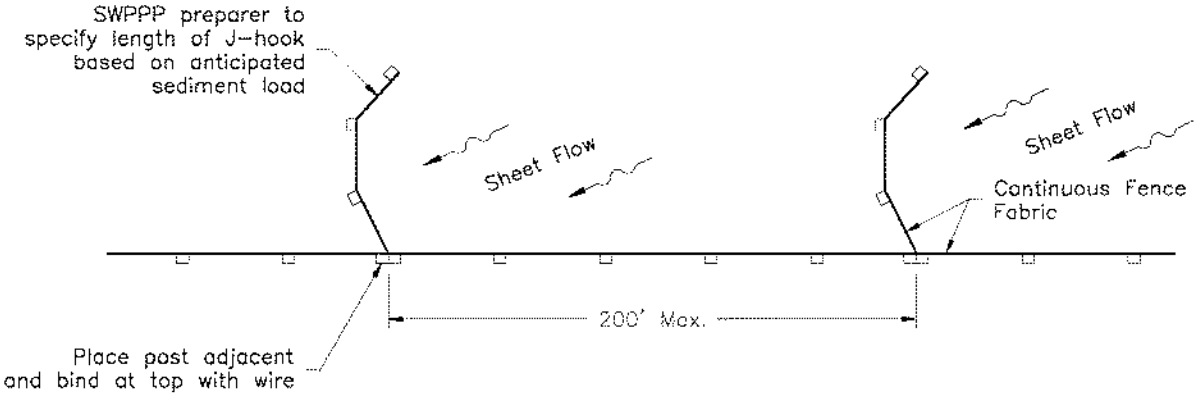
NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 500'.
2. The last 8'–0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'–0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow–through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.
14. Add 3–4 bags to cross barrier on downgradient side of silt fence as needed to prevent bypass or undermining and as allowable based on site limits of disturbance.

Silt Fence SE-1



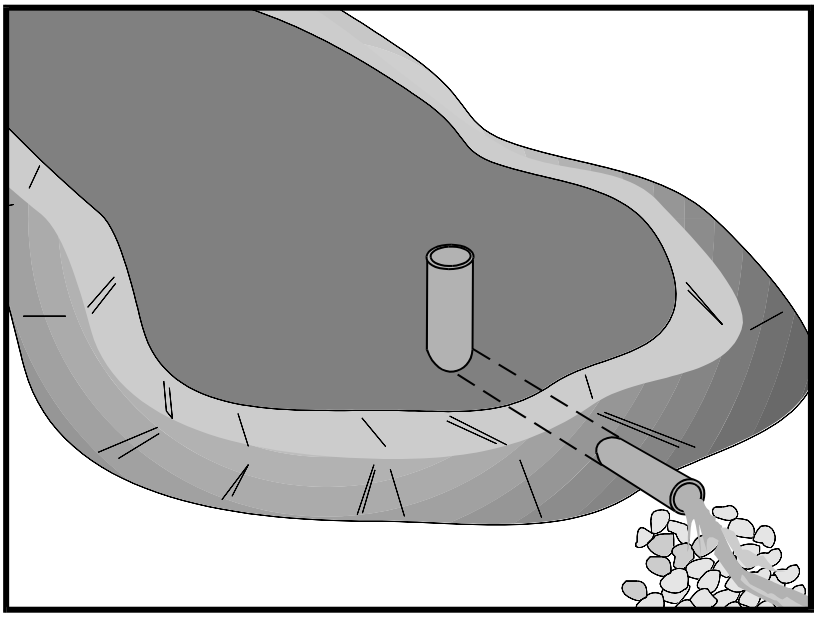
Silt Fence SE-1



Plan

J-HOOK

Sediment Basin SE-2



Description and Purpose

A sediment basin is a temporary basin formed by excavation or by constructing an embankment so that sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out before the runoff is released.

Sediment basin design guidance presented in this fact sheet is intended to provide options, methods, and techniques to optimize temporary sediment basin performance and basin sediment removal. Basin design guidance provided in this fact sheet is not intended to guarantee basin effluent compliance with numeric discharge limits (numeric action levels or numeric effluent limits for turbidity). Compliance with discharge limits requires a thoughtful approach to comprehensive BMP planning, implementation, and maintenance. Therefore, optimally designed and maintained sediment basins should be used in conjunction with a comprehensive system of BMPs that includes:

- Diverting runoff from undisturbed areas away from the basin
- Erosion control practices to minimize disturbed areas on-site and to provide temporary stabilization and interim sediment controls (e.g., stockpile perimeter control, check dams, perimeter controls around individual lots) to reduce the basin's influent sediment concentration.

At some sites, sediment basin design enhancements may be required to adequately remove sediment. Traditional

Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-3 Sediment Trap (for smaller areas)

Sediment Basin SE-2

(a.k.a. "physical") enhancements such as alternative outlet configurations or flow deflection baffles increase detention time and other techniques such as outlet skimmers preferentially drain flows with lower sediment concentrations. These "physical" enhancement techniques are described in this fact sheet. To further enhance sediment removal particularly at sites with fine soils or turbidity sensitive receiving waters, some projects may need to consider implementing Active Treatment Systems (ATS) whereby coagulants and flocculants are used to enhance settling and removal of suspended sediments. Guidance on implementing ATS is provided in SE-11.

Suitable Applications

Sediment basins may be suitable for use on larger projects with sufficient space for constructing the basin. Sediment basins should be considered for use:

- Where sediment-laden water may enter the drainage system or watercourses
- On construction projects with disturbed areas during the rainy season
- At the outlet of disturbed watersheds between 5 acres and 75 acres and evaluated on a site by site basis
- Where post construction detention basins are required
- In association with dikes, temporary channels, and pipes used to convey runoff from disturbed areas

Limitations

Sediment basins must be installed only within the property limits and where failure of the structure will not result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities. In addition, sediment basins are attractive to children and can be very dangerous. Local ordinances regarding health and safety must be adhered to. If fencing of the basin is required, the type of fence and its location should be shown in the SWPPP and in the construction specifications.

- As a general guideline, sediment basins are suitable for drainage areas of 5 acres or more, but not appropriate for drainage areas greater than 75 acres. However, the tributary area should be evaluated on a site by site basis.
- Sediment basins may become an "attractive nuisance" and care must be taken to adhere to all safety practices. If safety is a concern, basin may require protective fencing.
- Sediment basins designed according to this fact sheet are only effective in removing sediment down to about the silt size fraction. Sediment-laden runoff with smaller size fractions (fine silt and clay) may not be adequately treated unless chemical (or other appropriate method) treatment is used in addition to the sediment basin.
- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft or more must obtain approval from California Department of Water Resources Division of Safety of Dams (http://www.water.ca.gov/damsafety/).

Sediment Basin SE-2

- Water that stands in sediment basins longer than 96 hours may become a source of mosquitoes (and midges), particularly along perimeter edges, in shallow zones, in scour or below-grade pools, around inlet pipes, along low-flow channels, and among protected habitats created by emergent or floating vegetation (e.g. cattails, water hyacinth), algal mats, riprap, etc.
- Basins require large surface areas to permit settling of sediment. Size may be limited by the available area.

Implementation

General

A sediment basin is a controlled stormwater release structure formed by excavation or by construction of an embankment of compacted soil across a drainage way, or other suitable location. It is intended to trap sediment before it leaves the construction site. The basin is a temporary measure expected to be used during active construction in most cases and is to be maintained until the site area is permanently protected against erosion or a permanent detention basin is constructed.

Sediment basins are suitable for nearly all types of construction projects. Whenever possible, construct the sediment basins before clearing and grading work begins. Basins should be located at the stormwater outlet from the site but not in any natural or undisturbed stream. A typical application would include temporary dikes, pipes, and/or channels to convey runoff to the basin inlet.

Many development projects in California are required by local ordinances to provide a stormwater detention basin for post-construction flood control, desilting, or stormwater pollution control. A temporary sediment basin may be constructed by rough grading the post-construction control basins early in the project.

Sediment basins if properly designed and maintained can trap a significant amount of the sediment that flows into them. However, traditional basins do not remove all inflowing sediment. Therefore, they should be used in conjunction with erosion control practices such as temporary seeding, mulching, diversion dikes, etc., to reduce the amount of sediment flowing into the basin.

Planning

To improve the effectiveness of the basin, it should be located to intercept runoff from the largest possible amount of disturbed area. Locations best suited for a sediment basin are generally in lower elevation areas of the site (or basin tributary area) where site drainage would not require significant diversion or other means to direct water to the basin but outside jurisdictional waterways. However, as necessary, drainage into the basin can be improved by the use of earth dikes and drainage swales (see BMP EC-9). . The basin should not be located where its failure would result in the loss of life or interruption of the use or service of public utilities or roads.

Construct before clearing and grading work begins when feasible.

- Do not locate the basin in a jurisdictional stream.

Sediment Basin SE-2

- Basin sites should be located where failure of the structure will not cause loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities.
- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft must obtain approval from the Division of Dam Safety. Local dam safety requirements may be more stringent.
- Limit the contributing area to the sediment basin to only the runoff from the disturbed soil areas. Use temporary concentrated flow conveyance controls to divert runoff from undisturbed areas away from the sediment basin.
- The basin should be located: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where post-construction (permanent) detention basins will be constructed, and (3) where the basins can be maintained on a year-round basis to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area, and to maintain the basin to provide the required capacity.

Design

When designing a sediment basin, designers should evaluate the site constraints that could affect the efficiency of the BMP. Some of these constraints include: the relationship between basin capacity, anticipated sediment load, and freeboard, available footprint for the basin, maintenance frequency and access, and hydraulic capacity and efficiency of the temporary outlet infrastructure. Sediment basins should be designed to maximize sediment removal and to consider sediment load retained by the basin as it affects basin performance.

Three Basin Design Options (Part A) are presented below along with a Typical Sediment/Detention Basin Design Methodology (Part B). Regardless of the design option that is selected, designers also need to evaluate the sediment basin capacity with respect to sediment accumulation (See "*Step 3. Evaluate the Capacity of the Sediment Basin"),* and should incorporate approaches identified in "*Step 4. Other Design Considerations*" to enhance basin performance.

A) Basin Design Options:

Option 1:

Design sediment basin(s) using the standard equation:

$$A_s = \frac{1.2Q}{V_s} \qquad \text{(Eq. 1)}$$

Where:

A_s = Minimum surface area for trapping soil particles of a certain size

V_s = Settling velocity of the design particle size chosen (V_s = 0.00028 ft/s for a design particle size of 0.01 mm at 68°F)

1.2 = Factor of safety recommended by USEPA to account for the reduction in basin efficiency caused due to turbulence and other non ideal conditions.

$Q = CIA$ (Eq.2)

Where

Q = Peak basin influent flow rate measured in cubic feet per second (ft^3/s)

C = Runoff coefficient (unitless)

I = Peak rainfall intensity for the 10-year, 6-hour rain event (in/hr)

A = Area draining into the sediment basin in acres

The design particle size should be the smallest soil grain size determined by wet sieve analysis, or the fine silt sized (0.01 mm [or 0.0004 in.]) particle, and the Vs used should be 100 percent of the calculated settling velocity.

This sizing basin method is dependent on the outlet structure design or the total basin length with an appropriate outlet. If the designer chooses to utilize the outlet structure to control the flow duration in the basin, the basin length (distance between the inlet and the outlet) should be a minimum of twice the basin width; the depth should not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity). If the designer chooses to utilize the basin length (with appropriate basin outlet) to control the flow duration in the basin, the basin length (distance between the inlet and the outlet) should be a specifically designed to capture 100% of the design particle size; the depth should not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity).

Basin design guidance provided herein assumes standard water properties (e.g., estimated average water temperature, kinematic viscosity, etc.) as a basis of the design. Designers can use an alternative design (Option 3) with site specific water properties as long as the design is as protective as Option 1.

The design guidance uses the peak influent flow rate to size sediment basins. Designers can use an alternative design (Option 3) with site specific average flow rates as long as the design is as protective as Option 1.

The basin should be located on the site where it can be maintained on a year-round basis and should be maintained on a schedule to retain the 2 ft of capacity.

Option 2:

Design pursuant to local ordinance for sediment basin design and maintenance, provided that the design efficiency is as protective or more protective of water quality than Option 1.

Option 3:

The use of an equivalent surface area design or equation provided that the design efficiency is as protective or more protective of water quality than Option 1.

B) Typical Sediment/Detention Basin Design Methodology:

Design of a sediment basin requires the designer to have an understanding of the site constraints, knowledge of the local soil (e.g., particle size distribution of potentially contributing soils), drainage area of the basin, and local hydrology. Designers should not assume that a sediment basin for location A is applicable to location B. Therefore, designers can use this factsheet as guidance but will need to apply professional judgment and knowledge of the site to design an effective and efficient sediment basin. The following provides a general overview of typical design methodologies:

Step 1. Hydrologic Design

- Evaluate the site constraints and assess the drainage area for the sediment basin. Designers should consider on- and off-site flows as well as changes in the drainage area associated with site construction/disturbance. To minimize additional construction during the course of the project, the designer should consider identifying the maximum drainage area when calculating the basin dimensions.

- If a local hydrology manual is not available it is recommended to follow standard rational method procedures to estimate the flow rate. The references section of this factsheet provides a reference to standard hydrology textbooks that can provide standard methodologies. If local rainfall depths are not available, values can be obtained from standard precipitation frequency maps from NOAA (downloaded from http://www.wrcc.dri.edu/pcpnfreq.html).

Step 2. Hydraulic Design

- Calculate the surface area required for the sediment basin using Equation 1. In which the flow rate is estimated for a 10-yr 6-hr event using rational method procedure listed in local hydrology manual and Vs is estimated using Stokes Law presented in Equation 3.

$V_s = 2.81d^2$ (Eq.3)

Where

V_s = Settling velocity in feet per second at 68˚F

d = diameter of sediment particle in millimeters (smallest soil grain size determined by wet sieve analysis or fine silt (0.01 mm [or 0.0004 in.])

- In general the basin outlet design requires an iterative trial and error approach that considered the maximum water surface elevation, the elevation versus volume (stage-storage) relationship, the elevation verses basin outflow (a.k.a.-discharge) relationship, and the estimated inflow hydrograph. To adequately design the basins to settle sediment, the outlet configuration and associated outflow rates can be estimated by numerous methodologies. The following provides some guidance for design the basin outlet:

  - An outlet should have more than one orifice.

  - An outlet design typically utilizes multiple horizontal rows of orifices (approximately 3 or more) with at least 2 orifices per row (see Figures 1 and 2 at the end of this fact sheet).

- Orifices can vary in shape.
- Select the appropriate orifice diameter and number of perforations per row with the objective of minimizing the number of rows while maximizing the detention time.
- The diameter of each orifice is typically a maximum of 3-4 inches and a minimum of 0.25-0.5 inches.
- If a rectangular orifice is used, it is recommended to have minimum height of 0.5 inches and a maximum height of 6 inches.
- Rows are typically spaced at three times the diameter center to center vertically with a minimum distance of approximately 4 inches on center and a maximum distance of 1 foot on center.
- To estimate the outflow rate, each row is calculated separately based on the flow through a single orifice then multiplied by the number of orifices in the row. This step is repeated for each of the rows. Once all of the orifices are estimated, the total outflow rate versus elevation (stage-discharge curve) is developed to evaluate the detention time within the basin.
- Flow through a single orifice can be estimated using an Equation 4:

$$Q = BC'A(2gH)^{0.5} \qquad \text{(Eq.4)}$$

Where
Q = Outflow rate in ft^3/s
C′ = Orifice coefficient (unitless)
A = Area of the orifice (ft^2)
g = acceleration due to gravity (ft^3/s)
H = Head above the orifice (ft)
B = Anticipated Blockage or clogging factor (unitless), It is dependent on anticipated sediment and debris load, trash rack configuration etc, so the value is dependent on design engineers professional judgment and/or local requirements (B is never greater than 1 and a value of 0.5 is generally used)

- Care must be taken in the selection of orifice coefficient ("C′"); 0.60 is most often recommended and used. However, based on actual tests, Young and Graziano (1989), "Outlet Hydraulics of Extended Detention Facilities for Northern Virginia Planning District Commission", recommends the following:
  - C′ = 0.66 for thin materials; where the thickness is equal to or less than the orifice diameter, or
  - C′ = 0.80 when the material is thicker than the orifice diameter
- If different sizes of orifices are used along the riser then they have to be sized such that not more than 50 percent of the design storm event drains in one-third of the drawdown time (to provide adequate settling time for events smaller than the design storm event)

and the entire volume drains within 96 hours or as regulated by the local vector control agency. If a basin fails to drain within 96 hours, the basin must be pumped dry.

- Because basins are not maintained for infiltration, water loss by infiltration should be disregarded when designing the hydraulic capacity of the outlet structure.

- Floating Outlet Skimmer: The floating skimmer (see Figure 3 at the end of this fact sheet is an alternative outlet configuration (patented) that drains water from upper portion of the water column. This configuration has been used for temporary and permanent basins and can improve basin performance by eliminating bottom orifices which have the potential of discharging solids. Some design considerations for this alternative outlet device includes the addition of a sand filter or perforated under drain at the low point in the basin and near the floating skimmer. These secondary drains allow the basin to fully drain. More detailed guidelines for sizing the skimmer can be downloaded from http://www.fairclothskimmer.com/.

- Hold and Release Valve: An ideal sediment/detention basin would hold all flows to the design storm level for sufficient time to settle solids, and then slowly release the storm water. Implementing a reliable valve system for releasing detention basins is critical to eliminate the potential for flooding in such a system. Some variations of hold and release valves include manual valves, bladder devices or electrically operated valves. When a precipitation event is forecast, the valve would be close for the duration of the storm and appropriate settling time. When the settling duration is met (approximately 24 or 48 hours), the valve would be opened and allow the stormwater to be released at a rate that does not resuspend settled solids and in a non-erosive manner. If this type of system is used the valve should be designed to empty the entire basin within 96 hours or as stipulated by local vector control regulations.

Step 3. Evaluate the Capacity of the Sediment Basin

- Typically, sediment basins do not perform as designed when they are not properly maintained or the sediment yield to the basin is larger than expected. As part of a good sediment basin design, designers should consider maintenance cycles, estimated soil loss and/or sediment yield, and basin sediment storage volume. The two equations below can be used to quantify the amount of soil entering the basin.

- The Revised Universal Soil Loss Equation (RUSLE, Eq.5) can be used to estimate annual soil loss and the Modified Universal Soil Equation (MUSLE, Eq.6) can be used to estimate sediment yield from a single storm event.

$$A = R \times K \times LS \times C \times P \qquad \text{(Eq.5)}$$

$$Y = 95 \times q_p^{0.56} \times K \times LS \times C \times P \qquad \text{(Eq.6)}$$

Where:

A = annual soil loss, tons/acre-year

R = rainfall erosion index, in 100 ft.tons/acre.in/hr

K = soil erodibility factor, tons/acre per unit of R

LS = slope length and steepness factor (unitless)

C = vegetative cover factor (unitless)

P = erosion control practice factor (unitless)

Y = single storm sediment yield in tons

Q = runoff volume in acre-feet

q_p = peak flow in cfs

- Detailed descriptions and methodologies for estimating the soil loss can be obtained from standard hydrology text books (See References section).
- Determination of the appropriate equation should consider construction duration and local environmental factors (soils, hydrology, etc.). For example, if a basin is planned for a project duration of 1 year and the designer specifies one maintenance cycle, RUSLE could be used to estimate the soil loss and thereby the designer could indicate that the sediment storage volume would be half of the soil loss value estimated. As an example for use of MUSLE, a project may have a short construction duration thereby requiring fewer maintenance cycles and a reduced sediment storage volume. MUSLE would be used to estimate the anticipated soil loss based on a specific storm event to evaluate the sediment storage volume and appropriate maintenance frequency.
- The soil loss estimates are an essential step in the design and it is essential that the designer provide construction contractors with enough information to understand maintenance frequency and/or depths within the basin that would trigger maintenance. Providing maintenance methods, frequency and specification should be included in design bid documents such as the SWPPP Site Map.
- Once the designer has quantified the amount of soil entering the basin, the depth required for sediment storage can be determined by dividing the estimated sediment loss by the surface area of the basin.

Step 4. Other Design Considerations

- Consider designing the volume of the settling zone for the total storm volume associated with the 2-year event or other appropriate design storms specified by the local agency. This volume can be used as a guide for sizing the basin without iterative routing calculations. The depth of the settling zone can be estimated by dividing the estimated 2-yr storm volume by the surface area of the basin.
- The basin volume consists of two zones:
  - A sediment storage zone at least 1 ft deep.
  - A settling zone at least 2 ft deep.

- The basin depth must be no less than 3 ft (not including freeboard).

- Proper hydraulic design of the outlet is critical to achieving the desired performance of the basin. The outlet should be designed to drain the basin within 24 to 96 hours (also referred to as "drawdown time"). The 24-hour limit is specified to provide adequate settling time; the 96-hour limit is specified to mitigate vector control concerns.

- Confirmation of the basin performance can be evaluated by routing the design storm (10-yr 6-hr, or as directed by local regulations) through the basin based on the basin volume (stage-storage curve) and the outlet design (stage-discharge curve based on the orifice configuration or equivalent outlet design).

- Sediment basins, regardless of size and storage volume, should include features to accommodate overflow or bypass flows that exceed the design storm event.

  - Include an emergency spillway to accommodate flows not carried by the principal spillway. The spillway should consist of an open channel (earthen or vegetated) over undisturbed material (not fill) or constructed of a non-erodible riprap (or equivalent protection) on fill slopes.

  - The spillway control section, which is a level portion of the spillway channel at the highest elevation in the channel, should be a minimum of 20 ft in length.

- Rock, vegetation or appropriate erosion control should be used to protect the basin inlet, outlet, and slopes against erosion.

- The total depth of the sediment basin should include the depth required for sediment storage, depth required for settling zone and freeboard of at least 1 foot or as regulated by local flood control agency for a flood event specified by the local agency.

- The basin alignment should be designed such that the length of the basin is more than twice the width of the basin; the length should be determined by measuring the distance between the inlet and the outlet. If the site topography does not allow for this configuration baffles should be installed so that the ratio is satisfied. If a basin has more than one inflow point, any inflow point that conveys more than 30 percent of the total peak inflow rate has to meet the required length to width ratio.

- An alternative basin sizing method proposed by Fifield (2004) can be consulted to estimate an alternative length to width ratio and basin configuration. These methods can be considered as part of Option 3 which allows for alternative designs that are protective or more protective of water quality.

- Baffles (see Figure 4 at the end of this fact sheet) can be considered at project sites where the existing topography or site constraints limit the length to width ratio. Baffles should be constructed of earthen berms or other structural material within the basin to divert flow in the basin, thus increasing the effective flow length from the basin inlet to the outlet riser. Baffles also reduce the change of short circuiting and allows for settling throughout the basin.

- Baffles are typically constructed from the invert of the basin to the crest of the emergency spillway (i.e., design event flows are meant to flow around the baffles and flows greater than the design event would flow over the baffles to the emergency spillway).
- Use of other materials for construction of basin baffles (such as silt fence) may not be appropriate based on the material specifications and will require frequent maintenance (maintain after every storm event). Maintenance may not be feasible when required due to flooded conditions resulting from frequent (i.e., back to back) storm events. Use of alternative baffle materials should not deviate from the intended purpose of the material, as described by the manufacturer.
- Sediment basins are best used in conjunction with erosion controls.
- Basins with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and basins capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the basin outlet and bypass structures.
- A forebay, constructed upstream of the basin, may be provided to remove debris and larger particles.
- The outflow from the sediment basin should be provided with velocity dissipation devices (see BMP EC-10) to prevent erosion and scouring of the embankment and channel.
- The principal outlet should consist of a corrugated metal, high density polyethylene (HDPE), or reinforced concrete riser pipe with dewatering holes and an anti-vortex device and trash rack attached to the top of the riser, to prevent floating debris from flowing out of the basin or obstructing the system. This principal structure should be designed to accommodate the inflow design storm.
- A rock pile or rock-filled gabions can serve as alternatives to the debris screen, although the designer should be aware of the potential for extra maintenance involved should the pore spaces in the rock pile clog.
- The outlet structure should be placed on a firm, smooth foundation with the base securely anchored with concrete or other means to prevent floatation.
- Attach riser pipe (watertight connection) to a horizontal pipe (barrel). Provide anti-seep collars on the barrel.
- Cleanout level should be clearly marked on the riser pipe.

Installation

- Securely anchor and install an anti-seep collar on the outlet pipe/riser and provide an emergency spillway for passing major floods (see local flood control agency).
- Areas under embankments must be cleared and stripped of vegetation.

- Chain link fencing should be provided around each sediment basin to prevent unauthorized entry to the basin or if safety is a concern.

Costs

The cost of a sediment basin is highly variable and is dependent of the site configuration. To decrease basin construction costs, designers should consider using existing site features such as berms or depressed area to site the sediment basin. Designers should also consider potential savings associated with designing the basin to minimize the number of maintenance cycles and siting the basin in a location where a permanent BMP (e.g., extended detention basin) is required for the project site.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level and as required by local requirements. It is recommended that at a minimum, basins be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Examine basin banks for seepage and structural soundness.
- Check inlet and outlet structures and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Check inlet and outlet area for erosion and stabilize if required.
- Check fencing for damage and repair as needed.
- Sediment that accumulates in the basin must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-half the designated sediment storage volume. Sediment removed during maintenance should be managed properly. The sediment should be appropriately evaluated and used or disposed of accordingly. Options include: incorporating sediment into earthwork on the site (only if there is no risk that sediment is contaminated); or off-site export/disposal at an appropriate location (e.g., sediment characterization and disposal to an appropriate landfill).
- Remove standing water from basin within 96 hours after accumulation.
- If the basin does not drain adequately (e.g., due to storms that are more frequent or larger than the design storm or other unforeseen site conditions), dewatering should be conducted in accordance with appropriate dewatering BMPs (see NS-2) and in accordance with local permits as applicable.
- To minimize vector production:
  - Remove accumulation of live and dead floating vegetation in basins during every inspection.
  - Remove excessive emergent and perimeter vegetation as needed or as advised by local or state vector control agencies.

Sediment Basin SE-2

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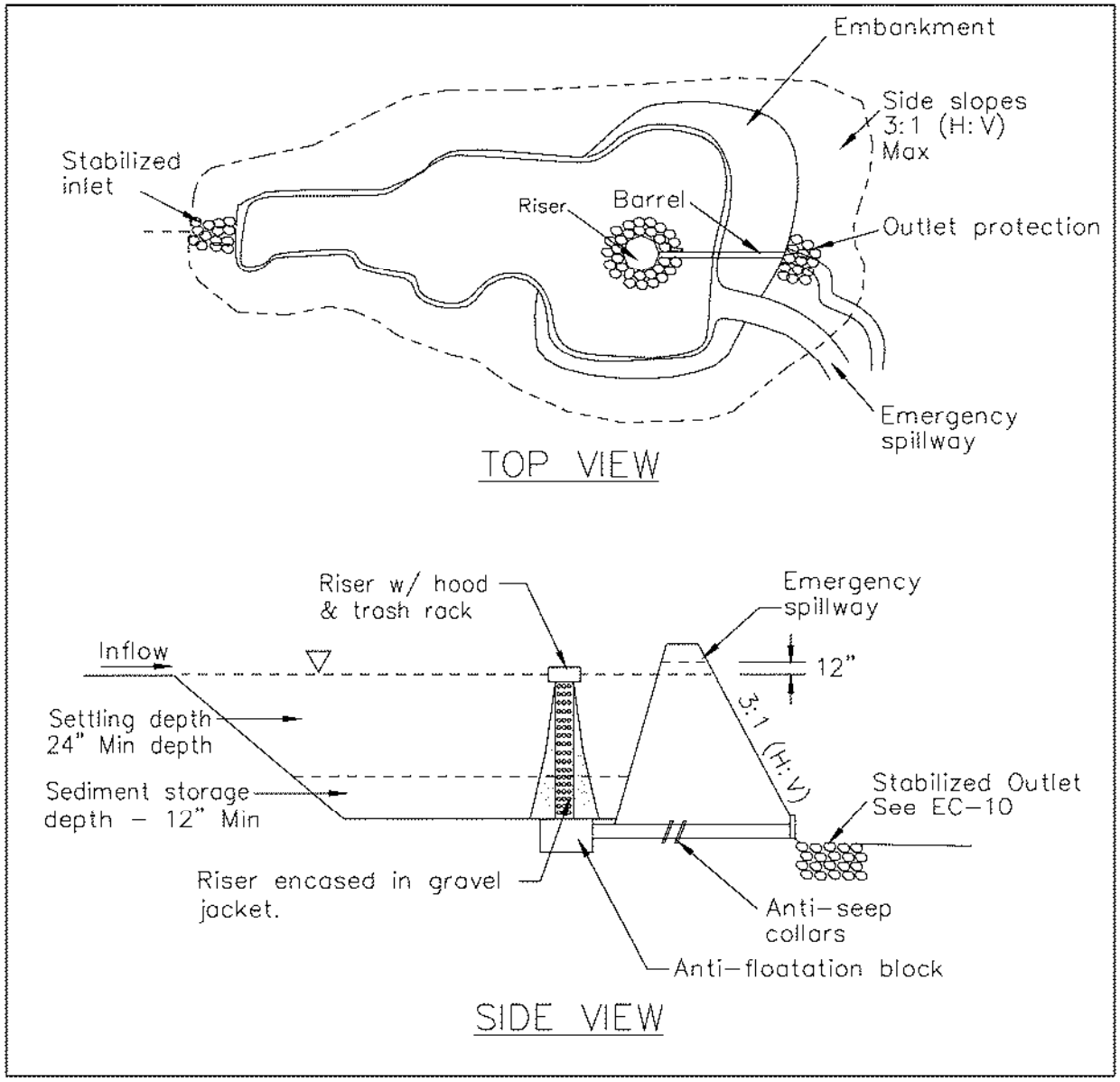


FIGURE 1: TYPICAL TEMPORARY SEDIMENT BASIN
MULTIPLE ORIFICE DESIGN
NOT TO SCALE

Sediment Basin SE-2

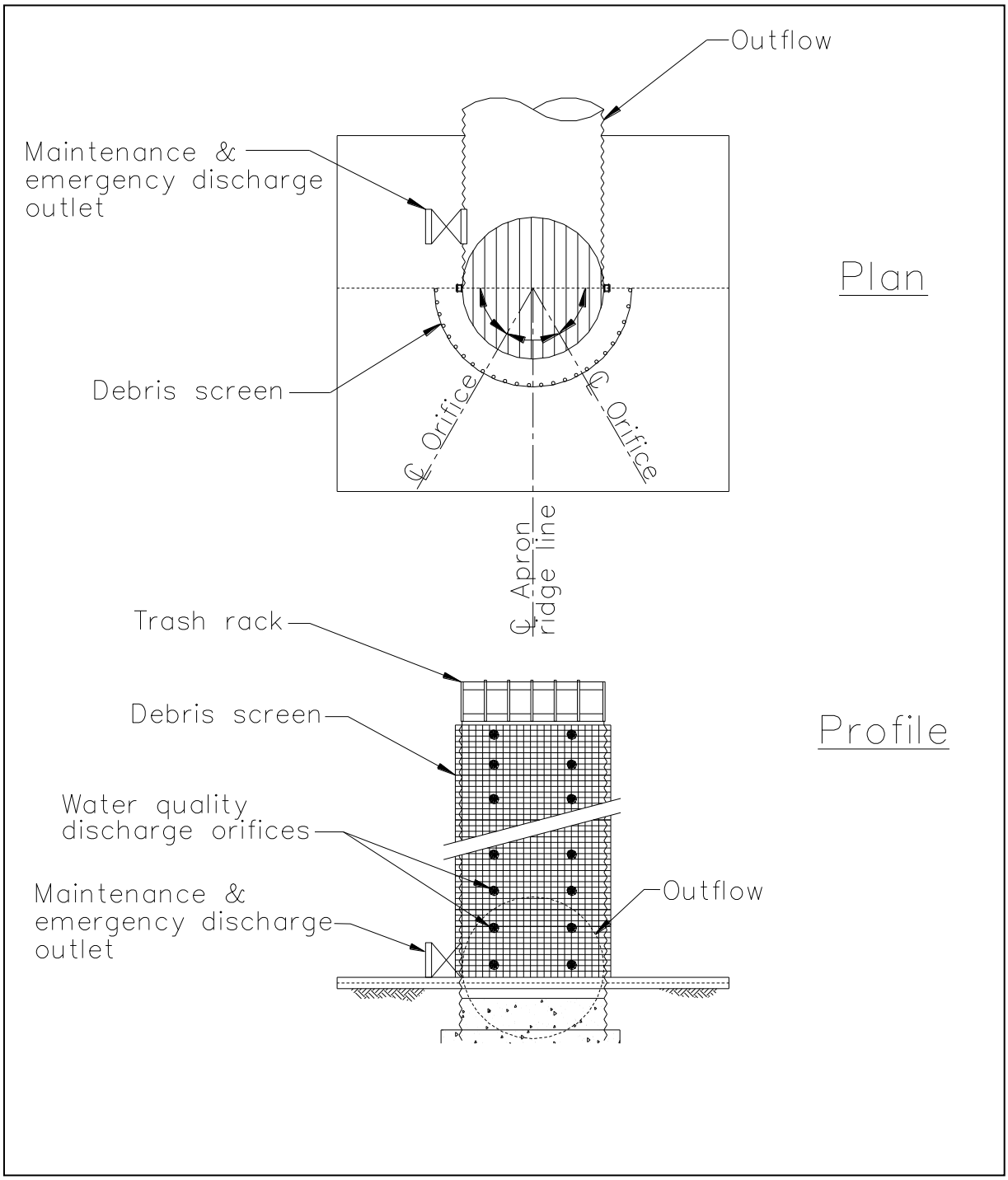


FIGURE 2: MULTIPLE ORIFICE OUTLET RISER

NOT TO SCALE

Sediment Basin SE-2

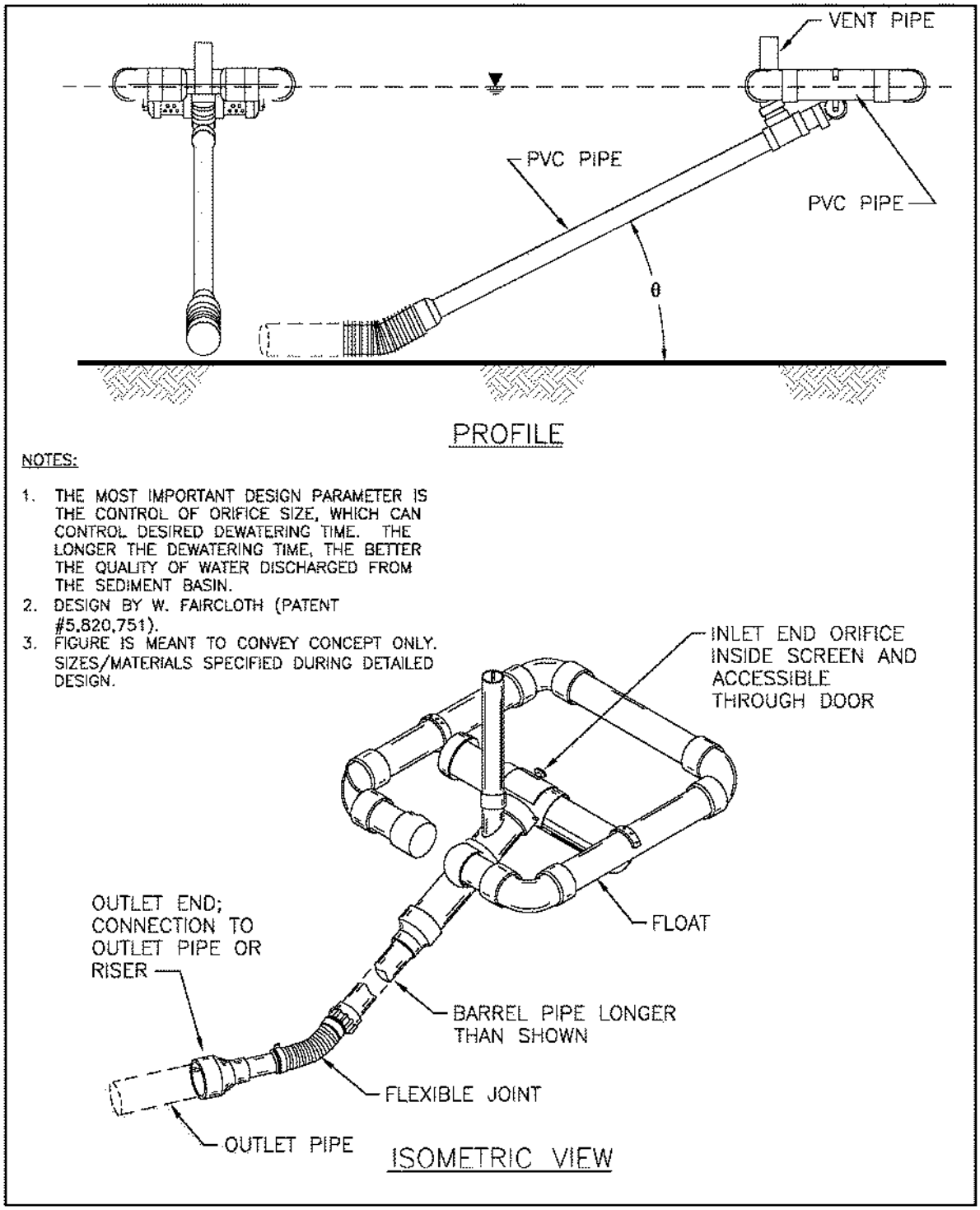


FIGURE 3: TYPICAL SKIMMER
NOT TO SCALE

Sediment Basin SE-2

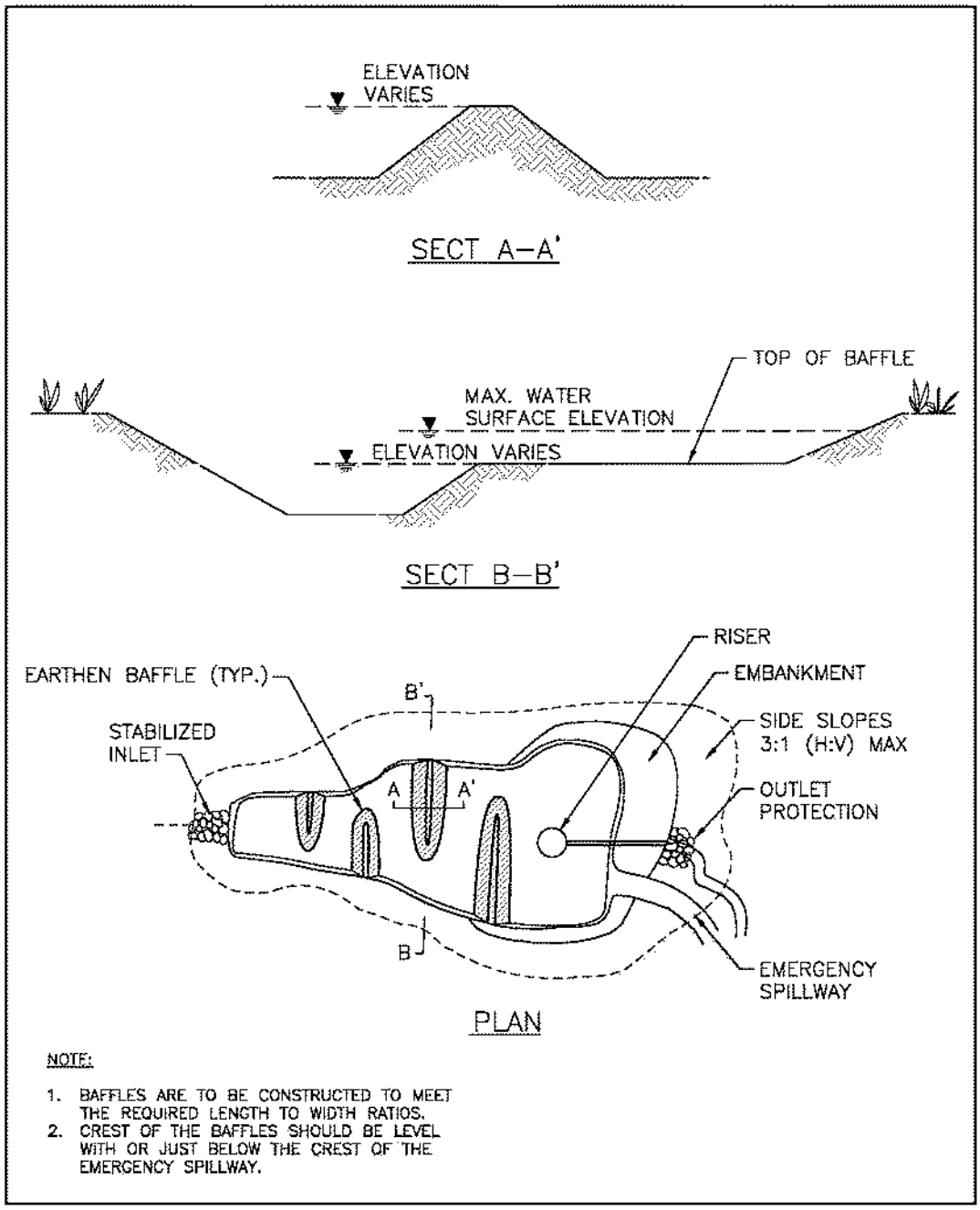
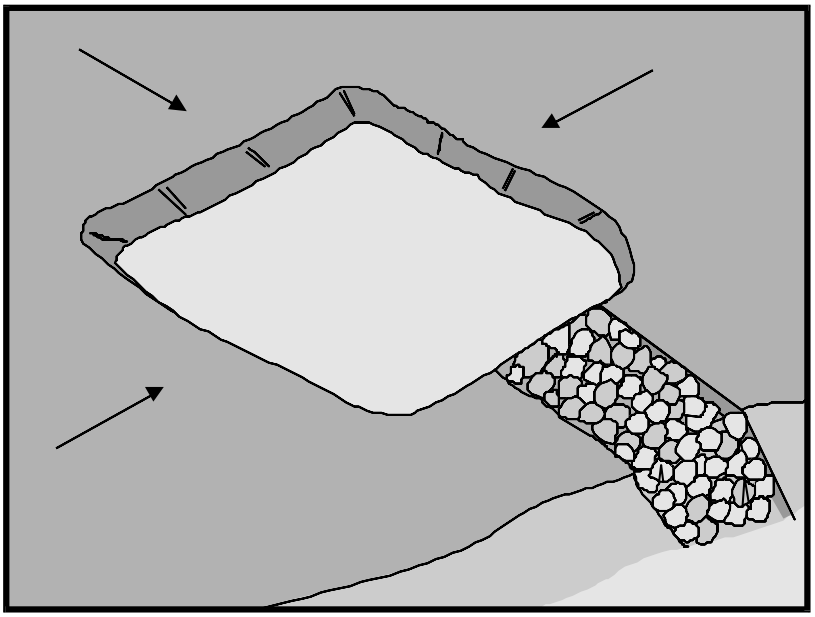


FIGURE 4: TYPICAL TEMPORARY SEDIMENT BASIN WITH BAFFLES
NOT TO SCALE

Sediment Trap SE-3



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-2 Sediment Basin (for larger areas)

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Description and Purpose

A sediment trap is a containment area where sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out or before the runoff is discharged by gravity flow. Sediment traps are formed by excavating or constructing an earthen embankment across a waterway or low drainage area.

Trap design guidance provided in this fact sheet is not intended to guarantee compliance with numeric discharge limits (numeric action levels or numeric effluent limits for turbidity). Compliance with discharge limits requires a thoughtful approach to comprehensive BMP planning, implementation, and maintenance. Therefore, optimally designed and maintained sediment traps should be used in conjunction with a comprehensive system of BMPs.

Suitable Applications

Sediment traps should be considered for use:

- At the perimeter of the site at locations where sediment-laden runoff is discharged offsite.
- At multiple locations within the project site where sediment control is needed.
- Around or upslope from storm drain inlet protection measures.
- Sediment traps may be used on construction projects where the drainage area is less than 5 acres. Traps would be

placed where sediment-laden stormwater may enter a storm drain or watercourse. SE-2, Sediment Basins, must be used for drainage areas greater than 5 acres.

- As a supplemental control, sediment traps provide additional protection for a water body or for reducing sediment before it enters a drainage system.

Limitations

- Requires large surface areas to permit infiltration and settling of sediment.
- Not appropriate for drainage areas greater than 5 acres.
- Only removes large and medium sized particles and requires upstream erosion control.
- Attractive and dangerous to children, requiring protective fencing.
- Conducive to vector production.
- Should not be located in live streams.

Implementation

Design

A sediment trap is a small temporary ponding area, usually with a gravel outlet, formed by excavation or by construction of an earthen embankment. Its purpose is to collect and store sediment from sites cleared or graded during construction. It is intended for use on small drainage areas with no unusual drainage features and projected for a quick build-out time. It should help in removing coarse sediment from runoff. The trap is a temporary measure with a design life of approximately six months to one year and is to be maintained until the site area is permanently protected against erosion by vegetation and/or structures.

Sediment traps should be used only for small drainage areas. If the contributing drainage area is greater than 5 acres, refer to SE-2, Sediment Basins, or subdivide the catchment area into smaller drainage basins.

Sediment usually must be removed from the trap after each rainfall event. The SWPPP should detail how this sediment is to be disposed, such as in fill areas onsite, or removal to an approved offsite dump. Sediment traps used as perimeter controls should be installed before any land disturbance takes place in the drainage area.

Sediment traps are usually small enough that a failure of the structure would not result in a loss of life, damage to home or buildings, or interruption in the use of public roads or utilities. However, sediment traps are attractive to children and can be dangerous. The following recommendations should be implemented to reduce risks:

- Install continuous fencing around the sediment trap or pond. Consult local ordinances regarding requirements for maintaining health and safety.
- Restrict basin side slopes to 3:1 or flatter.

Sediment trap size depends on the type of soil, size of the drainage area, and desired sediment removal efficiency (see SE-2, Sediment Basin). As a rule of thumb, the larger the basin volume

the greater the sediment removal efficiency. Sizing criteria are typically established under the local grading ordinance or equivalent. The runoff volume from a 2-year storm is a common design criteria for a sediment trap. The sizing criteria below assume that this runoff volume is 0.042 acre-ft/acre (0.5 in. of runoff). While the climatic, topographic, and soil type extremes make it difficult to establish a statewide standard, the following criteria should trap moderate to high amounts of sediment in most areas of California:

- Locate sediment traps as near as practical to areas producing the sediment.
- Trap should be situated according to the following criteria: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where failure would not cause loss of life or property damage, and (3) to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area.
- Trap should be sized to accommodate a settling zone and sediment storage zone with recommended minimum volumes of 67 yd^3/acre and 33 yd^3/acre of contributing drainage area, respectively, based on 0.5 in. of runoff volume over a 24-hour period. In many cases, the size of an individual trap is limited by available space. Multiple traps or additional volume may be required to accommodate specific rainfall, soil, and site conditions.
- Traps with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and traps capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the trap outlet and bypass structures.
- The outlet pipe or open spillway must be designed to convey anticipated peak flows.
- Use rock or vegetation to protect the trap outlets against erosion.
- Fencing should be provided to prevent unauthorized entry.

Installation

Sediment traps can be constructed by excavating a depression in the ground or creating an impoundment with a small embankment. Sediment traps should be installed outside the area being graded and should be built prior to the start of the grading activities or removal of vegetation. To minimize the area disturbed by them, sediment traps should be installed in natural depressions or in small swales or drainage ways. The following steps must be followed during installation:

- The area under the embankment must be cleared, grubbed, and stripped of any vegetation and root mat. The pool area should be cleared.
- The fill material for the embankment must be free of roots or other woody vegetation as well as oversized stones, rocks, organic material, or other objectionable material. The embankment may be compacted by traversing with equipment while it is being constructed.
- All cut-and-fill slopes should be 3:1 or flatter.
- When a riser is used, all pipe joints must be watertight.

Sediment Trap SE-3

- When a riser is used, at least the top two-thirds of the riser should be perforated with 0.5 in. diameter holes spaced 8 in. vertically and 10 to 12 in. horizontally. See SE-2, Sediment Basin.
- When an earth or stone outlet is used, the outlet crest elevation should be at least 1 ft below the top of the embankment.
- When crushed stone outlet is used, the crushed stone used in the outlet should meet AASHTO M43, size No. 2 or 24, or its equivalent such as MSHA No. 2. Gravel meeting the above gradation may be used if crushed stone is not available.

Costs

Average annual cost per installation and maintenance (18 month useful life) is $0.73 per ft^3 ($1,300 per drainage acre). Maintenance costs are approximately 20% of installation costs.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect outlet area for erosion and stabilize if required.
- Inspect trap banks for seepage and structural soundness, repair as needed.
- Inspect outlet structure and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Inspect fencing for damage and repair as needed.
- Inspect the sediment trap for area of standing water during every visit. Corrective measures should be taken if the BMP does not dewater completely in 96 hours or less to prevent vector production.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the trap capacity. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed of at an appropriate location.
- Remove vegetation from the sediment trap when first detected to prevent pools of standing water and subsequent vector production.
- BMPs that require dewatering shall be continuously attended while dewatering takes place. Dewatering BMPs per NS-2 shall be implemented at all times during dewatering activities.

References

Brown, W., and T. Schueler. The Economics of Stormwater BMPs in the Mid-Atlantic Region. Prepared for Chesapeake Research Consortium, Edgewater, MD, by the Center for Watershed Protection, Ellicott City, MD, 1997.

Draft – Sedimentation and Erosion Control, an Inventory of Current Practices, USEPA, April 1990.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Metzger, M.E., D.F. Messer, C.L. Beitia, C.M. Myers, and V.L. Kramer, The Dark Side of Stormwater Runoff Management: Disease Vectors Associated with Structural BMPs, 2002.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

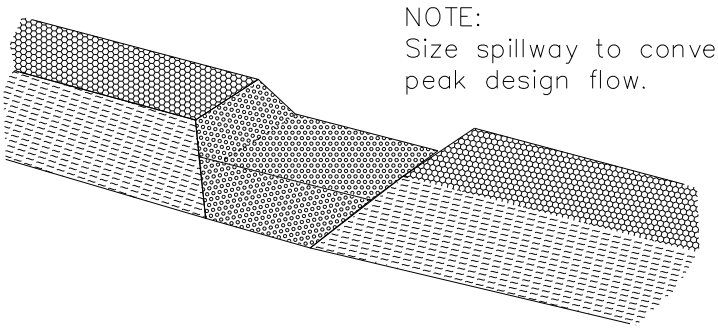
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

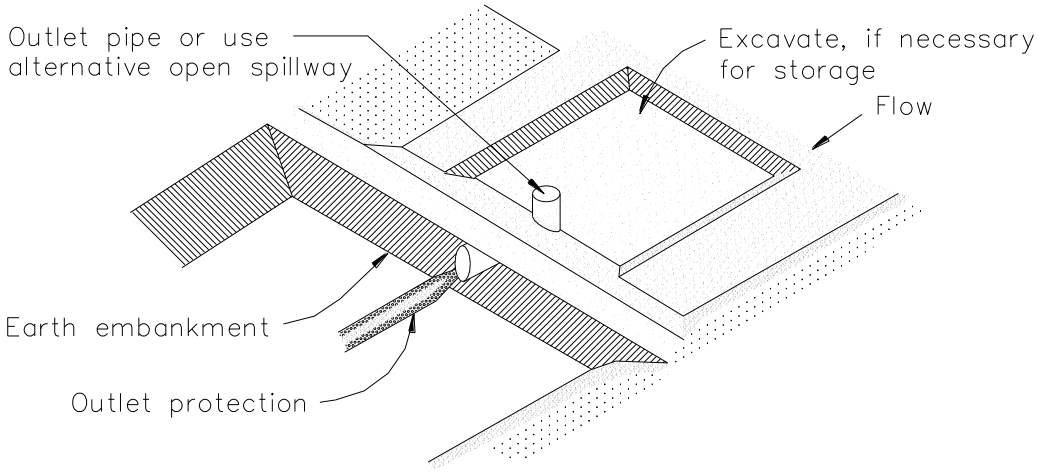
U.S. Environmental Protection Agency (USEPA). Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters. EPA 840-B-9-002. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1993.

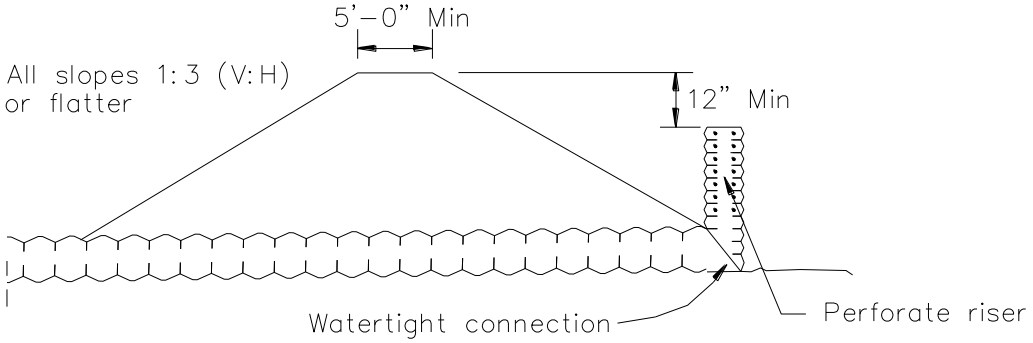
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Sediment Trap SE-3



TYPICAL OPEN SPILLWAY

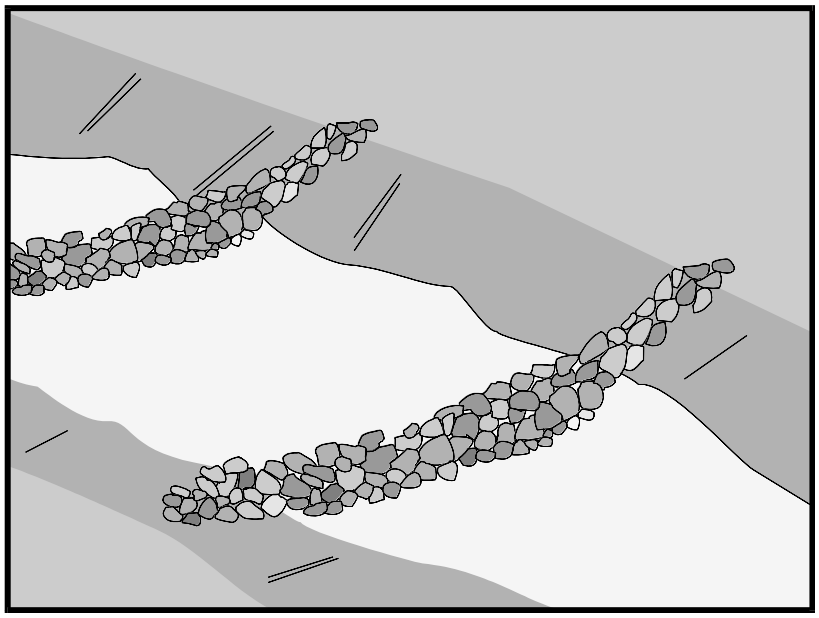




EMBANKMENT SECTION THRU RISER

TYPICAL SEDIMENT TRAP
NOT TO SCALE

Check Dams SE-4



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- SE-5 Fiber Rolls
- SE-6 Gravel Bag Berm
- SE-8 Sandbag Barrier
- SE-12 Manufactured Linear Sediment Controls
- SE-14 Biofilter Bags

Description and Purpose

A check dam is a small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or other proprietary products, placed across a constructed swale or drainage ditch. Check dams reduce the effective slope of the channel, thereby reducing scour and channel erosion by reducing flow velocity and increasing residence time within the channel, allowing sediment to settle.

Suitable Applications

Check dams may be appropriate in the following situations:

- To promote sedimentation behind the dam.
- To prevent erosion by reducing the velocity of channel flow in small intermittent channels and temporary swales.
- In small open channels that drain 10 acres or less.
- In steep channels where stormwater runoff velocities exceed 5 ft/s.
- During the establishment of grass linings in drainage ditches or channels.
- In temporary ditches where the short length of service does not warrant establishment of erosion-resistant linings.
- To act as a grade control structure.

Check Dams SE-4

Limitations

- Not to be used in live streams or in channels with extended base flows.
- Not appropriate in channels that drain areas greater than 10 acres.
- Not appropriate in channels that are already grass-lined unless erosion potential or sediment-laden flow is expected, as installation may damage vegetation.
- Require extensive maintenance following high velocity flows.
- Promotes sediment trapping which can be re-suspended during subsequent storms or removal of the check dam.
- Do not construct check dams with straw bales or silt fence.
- Water suitable for mosquito production may stand behind check dams, particularly if subjected to daily non-stormwater discharges.

Implementation

General

Check dams reduce the effective slope and create small pools in swales and ditches that drain 10 acres or less. Using check dams to reduce channel slope reduces the velocity of stormwater flows, thus reducing erosion of the swale or ditch and promoting sedimentation. Thus, check dams are dual-purpose and serve an important role as erosion controls as well as as sediment controls. Note that use of 1-2 isolated check dams for sedimentation will likely result in little net removal of sediment because of the small detention time and probable scour during longer storms. Using a series of check dams will generally increase their effectiveness. A sediment trap (SE-3) may be placed immediately upstream of the check dam to increase sediment removal efficiency.

Design and Layout

Check dams work by decreasing the effective slope in ditches and swales. An important consequence of the reduced slope is a reduction in capacity of the ditch or swale. This reduction in capacity should be considered when using this BMP, as reduced capacity can result in overtopping of the ditch or swale and resultant consequences. In some cases, such as a "permanent" ditch or swale being constructed early and used as a "temporary" conveyance for construction flows, the ditch or swale may have sufficient capacity such that the temporary reduction in capacity due to check dams is acceptable. When check dams reduce capacities beyond acceptable limits, either:

- Don't use check dams. Consider alternative BMPs, or.
- Increase the size of the ditch or swale to restore capacity.

Maximum slope and velocity reduction is achieved when the toe of the upstream dam is at the same elevation as the top of the downstream dam (see "Spacing Between Check Dams" detail at the end of this fact sheet). The center section of the dam should be lower than the edge sections (at least 6 inches), acting as a spillway, so that the check dam will direct flows to the center of

Check Dams SE-4

the ditch or swale (see "Typical Rock Check Dam" detail at the end of this fact sheet). Bypass or side-cutting can occur if a sufficient spillway is not provided in the center of the dam.

Check dams are usually constructed of rock, gravel bags, sandbags, and fiber rolls. A number of products can also be used as check dams (e.g. HDPE check dams, temporary silt dikes (SE-12)), and some of these products can be removed and reused. Check dams can also be constructed of logs or lumber, and have the advantage of a longer lifespan when compared to gravel bags, sandbags, and fiber rolls. Check dams should not be constructed from straw bales or silt fences, since concentrated flows quickly wash out these materials.

Rock check dams are usually constructed of 8 to 12 in. rock. The rock is placed either by hand or mechanically, but never just dumped into the channel. The dam should completely span the ditch or swale to prevent washout. The rock used should be large enough to stay in place given the expected design flow through the channel. It is recommended that abutments be extended 18 in. into the channel bank. Rock can be graded such that smaller diameter rock (e.g. 2-4 in) is located on the upstream side of larger rock (holding the smaller rock in place); increasing residence time.

Log check dams are usually constructed of 4 to 6 in. diameter logs, installed vertically. The logs should be embedded into the soil at least 18 in. Logs can be bolted or wired to vertical support logs that have been driven or buried into the soil.

See fiber rolls, SE-5, for installation of fiber roll check dams.

Gravel bag and sand bag check dams are constructed by stacking bags across the ditch or swale, shaped as shown in the drawings at the end of this fact sheet (see "Gravel Bag Check Dam" detail at the end of this fact sheet).

Manufactured products, such as temporary silt dikes (SE-12), should be installed in accordance with the manufacturer's instructions. Installation typically requires anchoring or trenching of products, as well as regular maintenance to remove accumulated sediment and debris.

If grass is planted to stabilize the ditch or swale, the check dam should be removed when the grass has matured (unless the slope of the swales is greater than 4%).

The following guidance should be followed for the design and layout of check dams:

- Install the first check dam approximately 16 ft from the outfall device and at regular intervals based on slope gradient and soil type.
- Check dams should be placed at a distance and height to allow small pools to form between each check dam.
- For multiple check dam installation, backwater from a downstream check dam should reach the toes of the upstream check dam.
- A sediment trap provided immediately upstream of the check dam will help capture sediment. Due to the potential for this sediment to be resuspended in subsequent storms, the sediment trap should be cleaned following each storm event.

Check Dams SE-4

- High flows (typically a 2-year storm or larger) should safely flow over the check dam without an increase in upstream flooding or damage to the check dam.
- Where grass is used to line ditches, check dams should be removed when grass has matured sufficiently to protect the ditch or swale.

Materials

- Rock used for check dams should typically be 8-12 in rock and be sufficiently sized to stay in place given expected design flows in the channel. Smaller diameter rock (e.g. 2 to 4 in) can be placed on the upstream side of larger rock to increase residence time.
- Gravel bags used for check dams should conform to the requirements of SE-6, Gravel Bag Berms.
- Sandbags used for check dams should conform to SE-8, Sandbag Barrier.
- Fiber rolls used for check dams should conform to SE-5, Fiber Rolls.
- Temporary silt dikes used for check dams should conform to SE-12, Temporary Silt Dikes.

Installation

- Rock should be placed individually by hand or by mechanical methods (no dumping of rock) to achieve complete ditch or swale coverage.
- Tightly abut bags and stack according to detail shown in the figure at the end of this section (pyramid approach). Gravel bags and sandbags should not be stacked any higher than 3 ft.
- Upper rows or gravel and sand bags shall overlap joints in lower rows.
- Fiber rolls should be trenched in, backfilled, and firmly staked in place.
- Install along a level contour.
- HDPE check dams, temporary silt dikes, and other manufactured products should be used and installed per manufacturer specifications.

Costs

Cost consists of labor costs if materials are readily available (such as gravel on-site). If material must be imported, costs will increase. For other material and installation costs, see SE-5, SE-6, SE-8, SE-12, and SE-14.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Replace missing rock, bags, rolls, etc. Replace bags or rolls that have degraded or have become damaged.

Check Dams SE-4

- If the check dam is used as a sediment capture device, sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- If the check dam is used as a grade control structure, sediment removal is not required as long as the system continues to control the grade.
- Inspect areas behind check dams for pools of standing water, especially if subjected to daily non-stormwater discharges.
- Remove accumulated sediment prior to permanent seeding or soil stabilization.
- Remove check dam and accumulated sediment when check dams are no longer needed.

References

Draft – Sedimentation and Erosion Control, and Inventory of Current Practices, USEPA, April 1990.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

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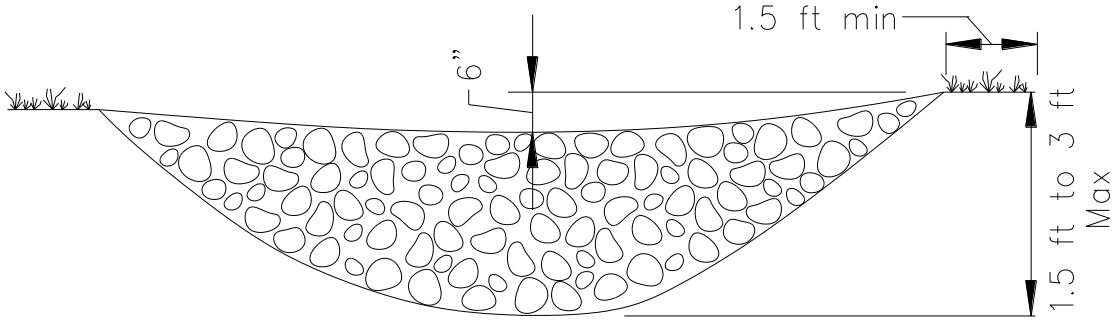
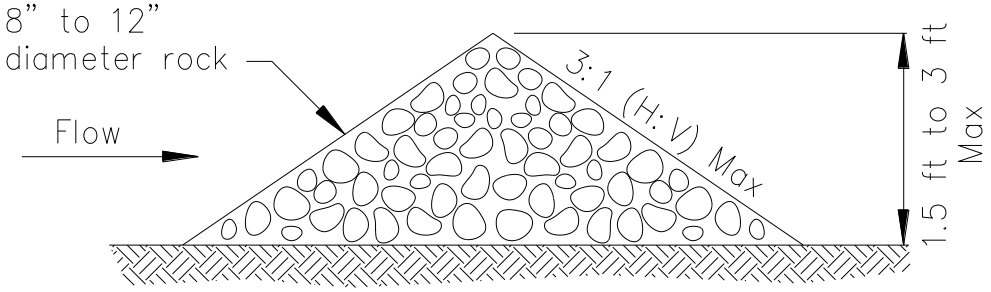
Check Dams SE-4

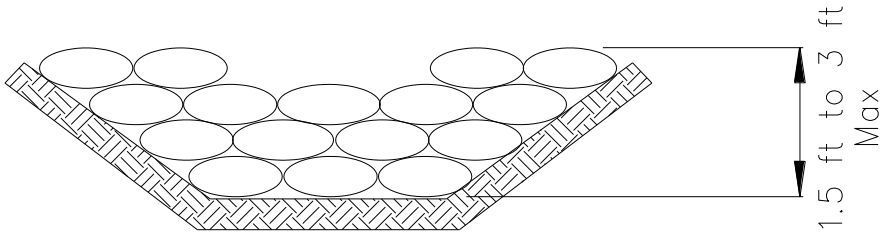


ELEVATION



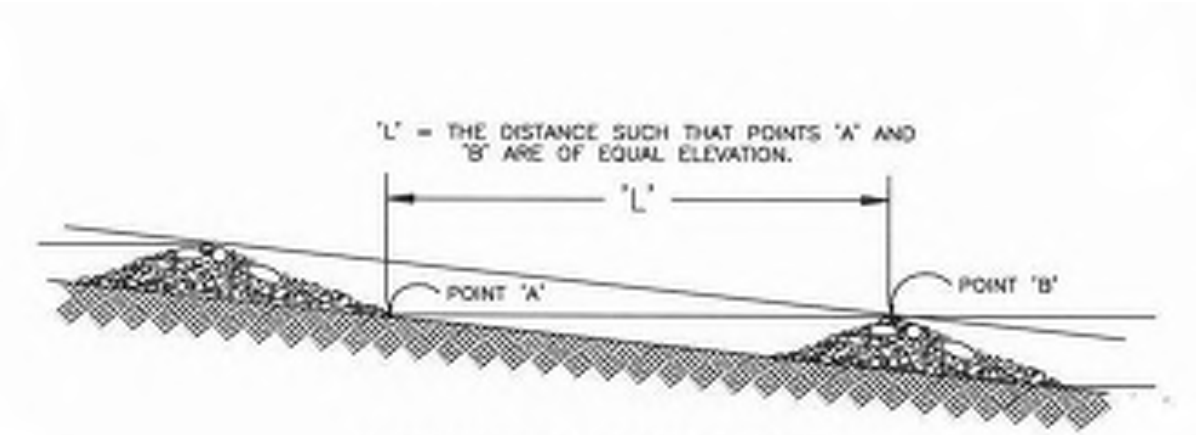
TYPICAL ROCK CHECK DAM SECTION

ROCK CHECK DAM
NOT TO SCALE



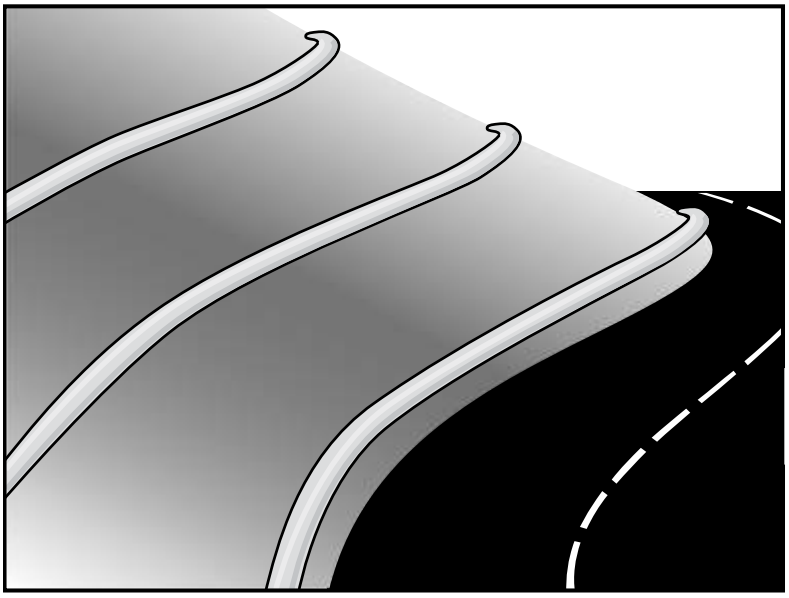
GRAVEL BAG CHECK DAM ELEVATION
NOT TO SCALE

Check Dams SE-4



SPACING BETWEEN CHECK DAMS

Fiber Rolls SE-5



Description and Purpose

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-12 Manufactured Linear Sediment Controls

SE-14 Biofilter Bags

Fiber Rolls SE-5

- Around temporary stockpiles.

Limitations

- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

Implementation

Fiber Roll Materials

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

Installation

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be ¼ to 1/3 of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
- Start building trenches and installing rolls from the bottom of the slope and work up.
- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into the trench.
  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.
- See typical fiber roll installation details at the end of this fact sheet.

Removal

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradeable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.
- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs

Material costs for regular fiber rolls range from $20 - $30 per 25 ft roll.

Material costs for PAM impregnated fiber rolls range between 7.00-$9.00 per linear foot, based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed

in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

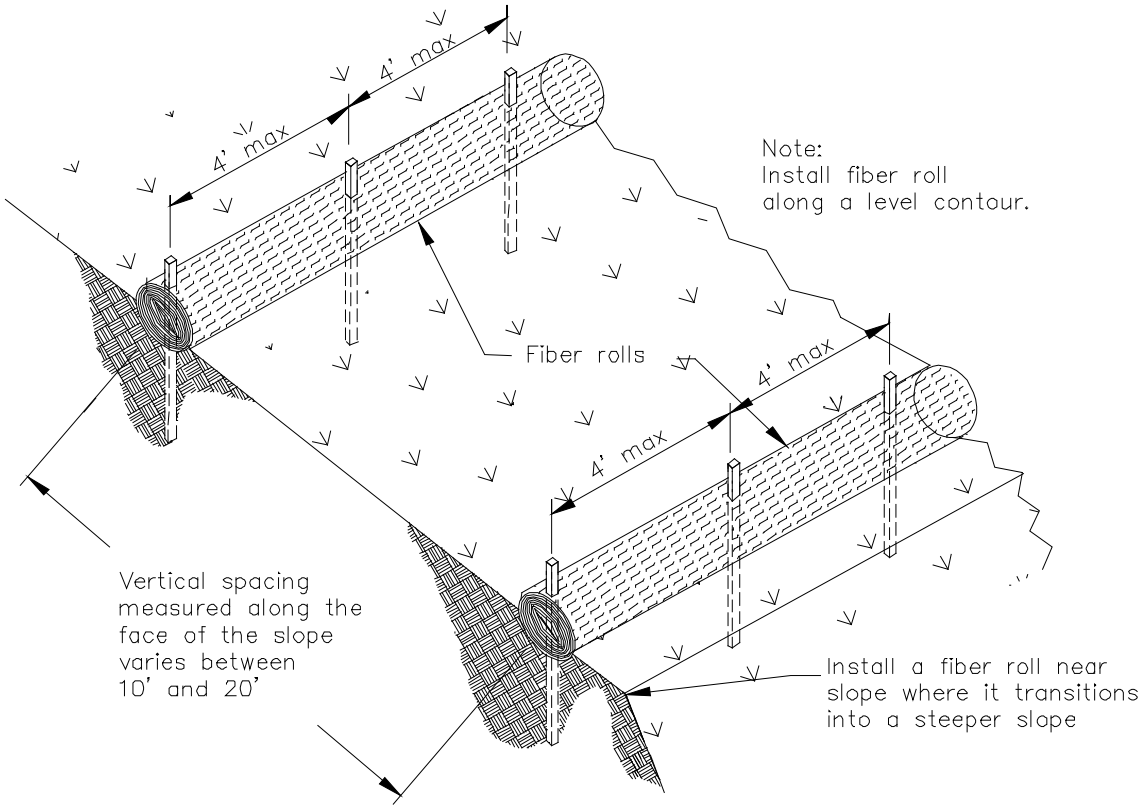
- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.
- Repair any rills or gullies promptly.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Fiber Rolls SE-5



TYPICAL FIBER ROLL INSTALLATION
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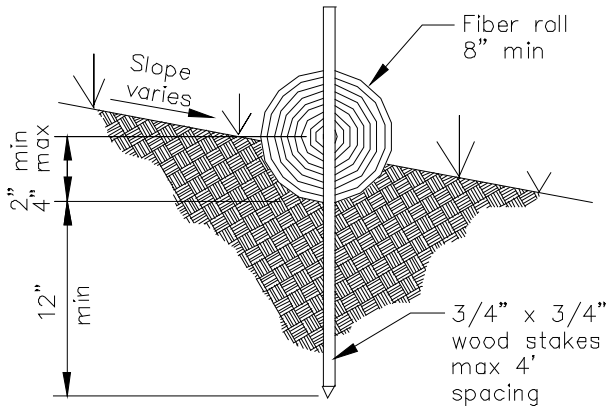
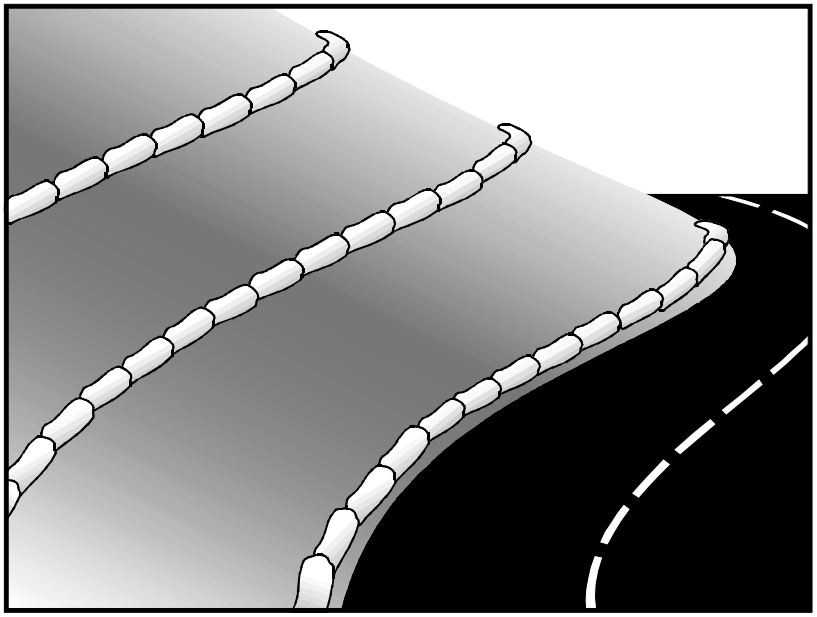


ENTRENCHMENT DETAIL
N.T.S.

Gravel Bag Berm SE-6



Description and Purpose

A gravel bag berm is a series of gravel-filled bags placed on a level contour to intercept sheet flows. Gravel bags pond sheet flow runoff, allowing sediment to settle out, and release runoff slowly as sheet flow, preventing erosion.

Suitable Applications

Gravel bag berms may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As a linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence
SE-5 Fiber Roll
SE-8 Sandbag Barrier
SE-12 Temporary Silt Dike
SE-14 Biofilter Bags

Gravel Bag Berm SE-6

- At the top of slopes to divert runoff away from disturbed slopes.
- As chevrons (small check dams) across mildly sloped construction roads. For use check dam use in channels, see SE-4, Check Dams.

Limitations

- Gravel berms may be difficult to remove.
- Removal problems limit their usefulness in landscaped areas.
- Gravel bag berm may not be appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the berm, possibly causing flooding if sufficient space does not exist.
- Degraded gravel bags may rupture when removed, spilling contents.
- Installation can be labor intensive.
- Durability of gravel bags is somewhat limited and bags may need to be replaced when installation is required for longer than 6 months.
- Easily damaged by construction equipment.
- When used to detain concentrated flows, maintenance requirements increase.

Implementation

General

A gravel bag berm consists of a row of open graded gravel-filled bags placed on a level contour. When appropriately placed, a gravel bag berm intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. The open graded gravel in the bags is porous, which allows the ponded runoff to flow slowly through the bags, releasing the runoff as sheet flows. Gravel bag berms also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils. Gravel bag berms are similar to sand bag barriers, but are more porous. Generally, gravel bag berms should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate gravel bag berms on level contours.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Gravel bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Gravel bags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

Gravel Bag Berm SE-6

Slope inclination 2:1 (H:V) or greater: Gravel bags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the gravel bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the gravel bag berm to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, gravel bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the gravel bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- In Non-Traffic Areas:
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Top width = 12 in. minimum for one or two layer construction
  - Side slopes = 2:1 (H:V) or flatter
- In Construction Traffic Areas:
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Top width = 12 in. minimum for one or two layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- Butt ends of bags tightly.
- On multiple row, or multiple layer construction, overlap butt joints of adjacent row and row beneath.
- Use a pyramid approach when stacking bags.

Materials

- ***Bag Material:*** Bags should be woven polypropylene, polyethylene or polyamide fabric or burlap, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.

Gravel Bag Berm SE-6

- ***Bag Size:*** Each gravel-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.

- ***Fill Material:*** Fill material should be 0.5 to 1 in. crushed rock, clean and free from clay, organic matter, and other deleterious material, or other suitable open graded, non-cohesive, porous gravel.

Costs

Material costs for gravel bags are average and are dependent upon material availability. $2.50-3.00 per filled gravel bag is standard based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Gravel bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.

- Reshape or replace gravel bags as needed.

- Repair washouts or other damage as needed.

- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.

- Remove gravel bag berms when no longer needed and recycle gravel fill whenever possible and properly dispose of bag material. Remove sediment accumulation and clean, re-grade, and stabilize the area.

References

Handbook of Steel Drainage and Highway Construction, American Iron and Steel Institute, 1983.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Pollution Plan Handbook, First Edition, State of California, Department of Transportation Division of New Technology, Materials and Research, October 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Street Sweeping and Vacuuming SE-7

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.

Street Sweeping and Vacuuming SE-7

- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

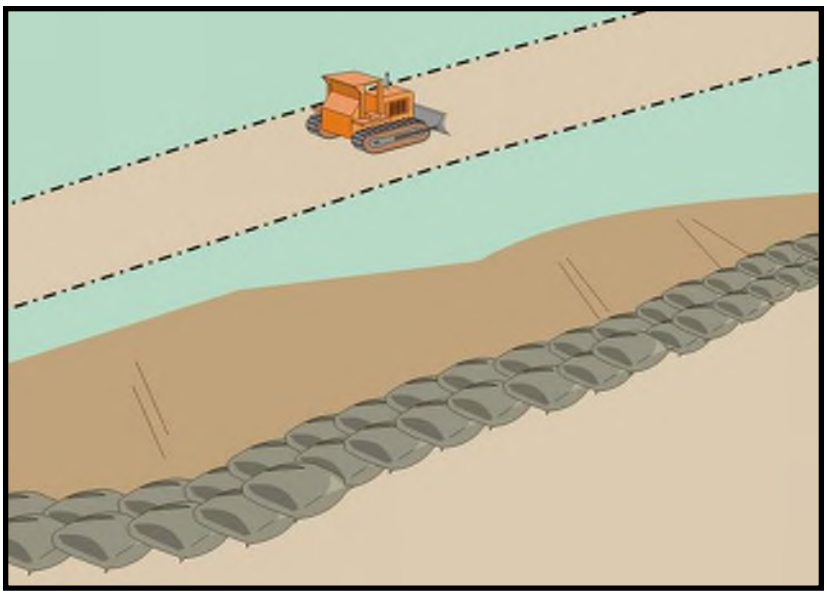
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Sandbag Barrier SE-8



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Description and Purpose

A sandbag barrier is a series of sand-filled bags placed on a level contour to intercept or to divert sheet flows. Sandbag barriers placed on a level contour pond sheet flow runoff, allowing sediment to settle out.

Suitable Applications

Sandbag barriers may be a suitable control measure for the applications described below. It is important to consider that sand bags are less porous than gravel bags and ponding or flooding can occur behind the barrier. Also, sand is easily transported by runoff if bags are damaged or ruptured. The SWPPP Preparer should select the location of a sandbag barrier with respect to the potential for flooding, damage, and the ability to maintain the BMP.

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes.
  - As sediment traps at culvert/pipe outlets.
  - Below other small cleared areas.
  - Along the perimeter of a site.
  - Down slope of exposed soil areas.
  - Around temporary stockpiles and spoil areas.
  - Parallel to a roadway to keep sediment off paved areas.
  - Along streams and channels.

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-12 Manufactured Linear Sediment Controls

SE-14 Biofilter Bags

Sandbag Barrier SE-8

- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
  - At the top of slopes to divert runoff away from disturbed slopes.
  - As check dams across mildly sloped construction roads.

Limitations

- It is necessary to limit the drainage area upstream of the barrier to 5 acres.
- Sandbags are not intended to be used as filtration devices.
- Easily damaged by construction equipment.
- Degraded sandbags may rupture when removed, spilling sand.
- Installation can be labor intensive.
- Durability of sandbags is somewhat limited and bags will need to be replaced when there are signs of damage or wear.
- Burlap should not be used for sandbags.

Implementation

General

A sandbag barrier consists of a row of sand-filled bags placed on a level contour. When appropriately placed, a sandbag barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. Sand-filled bags have limited porosity, which is further limited as the fine sand tends to quickly plug with sediment, limiting or completely blocking the rate of flow through the barrier. If a porous barrier is desired, consider SE-1, Silt Fence, SE-5, Fiber Rolls, SE-6, Gravel Bag Berms or SE-14, Biofilter Bags. Sandbag barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets which erode rills, and ultimately gullies, into disturbed, sloped soils. Sandbag barriers are similar to gravel bag berms, but less porous. Generally, sandbag barriers should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate sandbag barriers on a level contour.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Sandbags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Sandbags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

Sandbag Barrier SE-8

- Slope inclination 2:1 (H:V) or greater: Sandbags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the sandbag barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, sand bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the sand bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- Butt ends of bags tightly.
- Overlap butt joints of row beneath with each successive row.
- Use a pyramid approach when stacking bags.
- In non-traffic areas
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Side slope = 2:1 (H:V) or flatter
- In construction traffic areas
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- See typical sandbag barrier installation details at the end of this fact sheet.

Materials

- ***Sandbag Material:*** Sandbag should be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355. Use of burlap is not an acceptable substitute, as sand can more easily mobilize out of burlap.
- ***Sandbag Size:*** Each sand-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.

Sandbag Barrier SE-8

- ***Fill Material:*** All sandbag fill material should be non-cohesive, Class 3 (Caltrans Standard Specification, Section 25) or similar permeable material free from clay and deleterious material, such as recycled concrete or asphalt.

Costs

Empty sandbags cost $0.25 - $0.75. Average cost of fill material is $8 per yd^3. Additional labor is required to fill the bags. Pre-filled sandbags are more expensive at $1.50 - $2.00 per bag. These costs are based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sandbags exposed to sunlight will need to be replaced every two to three months due to degradation of the bags.
- Reshape or replace sandbags as needed.
- Repair washouts or other damage as needed.
- Sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove sandbags when no longer needed and recycle sand fill whenever possible and properly dispose of bag material. Remove sediment accumulation, and clean, re-grade, and stabilize the area.

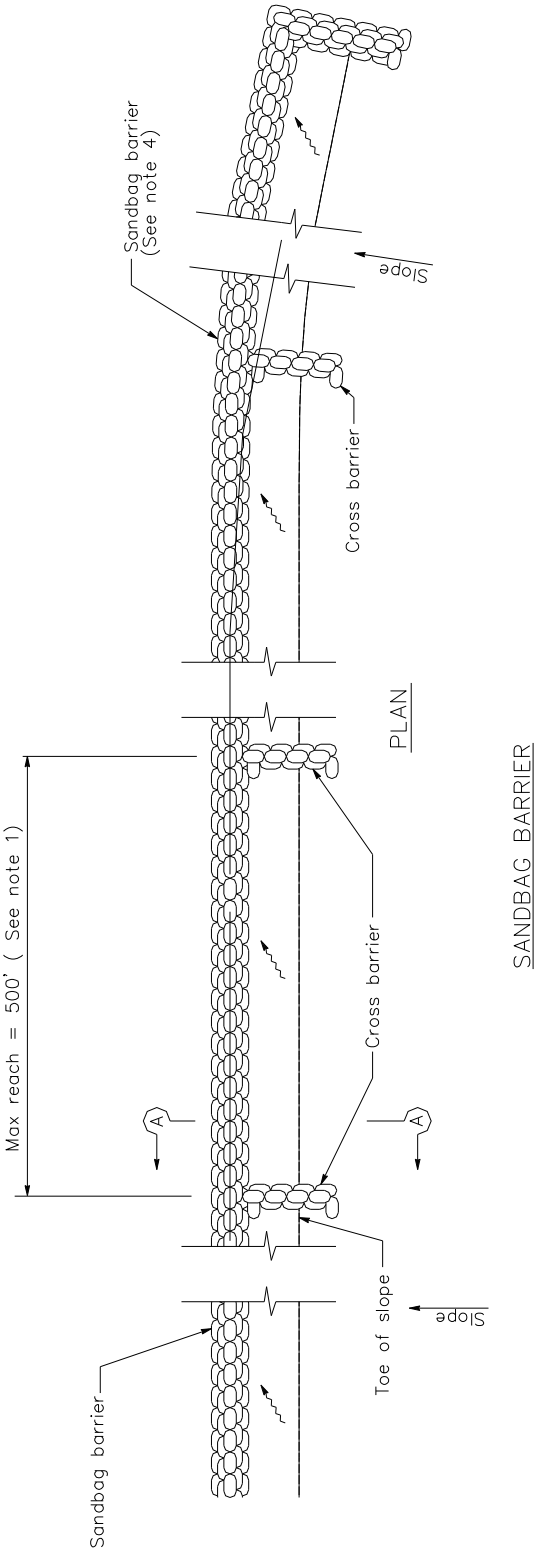
References

Standard Specifications for Construction of Local Streets and Roads, California Department of Transportation (Caltrans), July 2002.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Sandbag Barrier SE-8

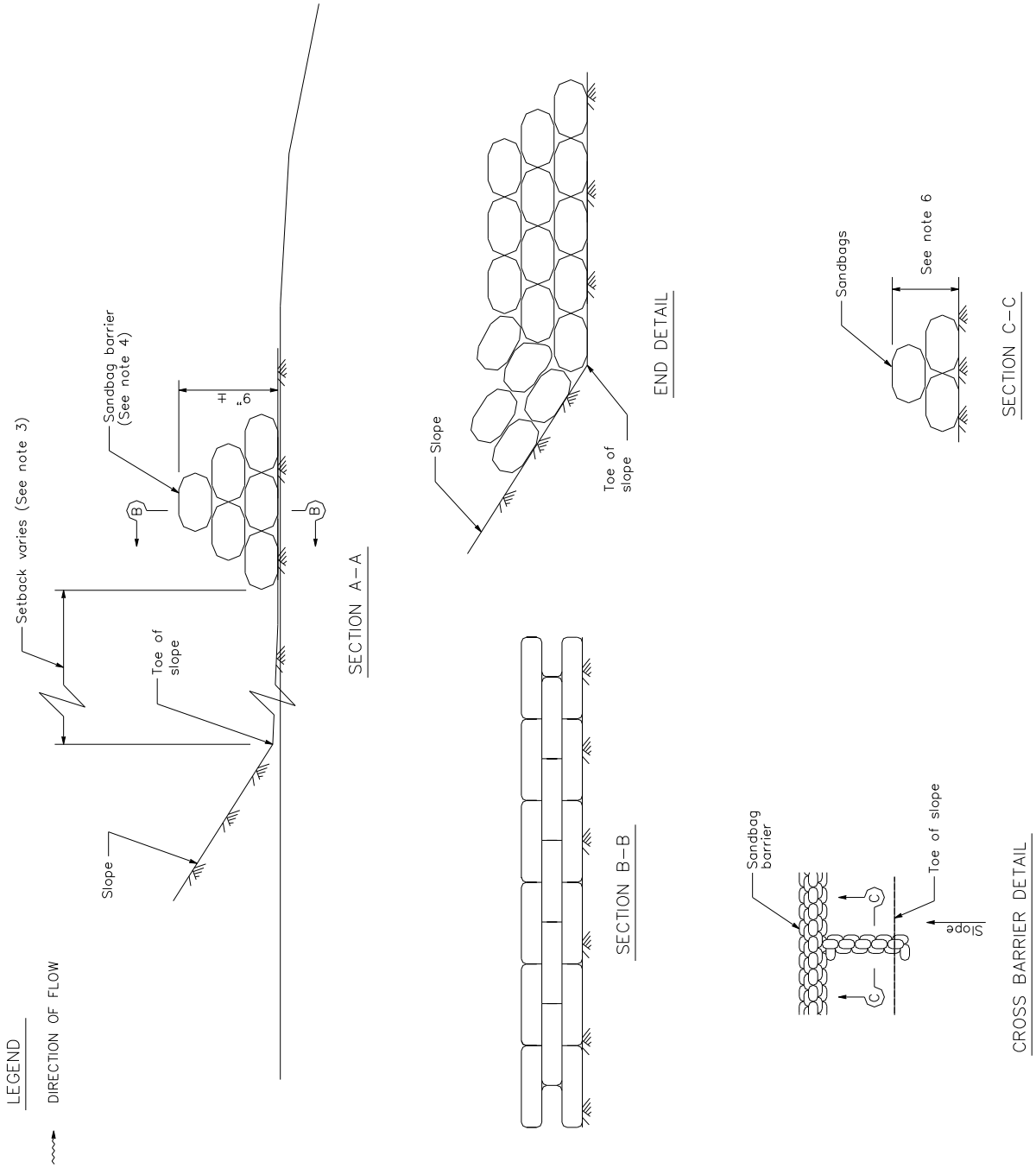


SANDBAG BARRIER

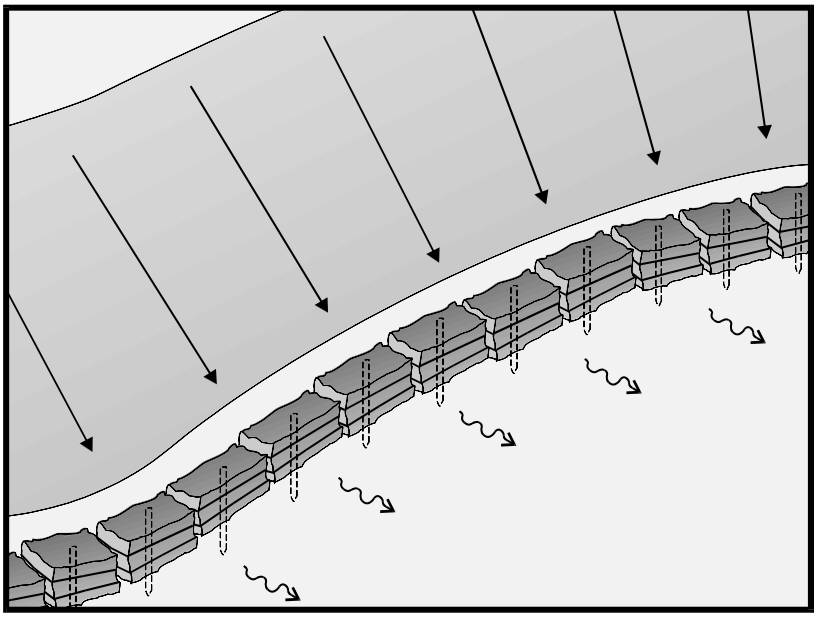
NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. Place sandbags tightly.
3. Dimension may vary to fit field condition.
4. Sandbag barrier shall be a minimum of 3 bags high.
5. The end of the barrier shall be turned up slope.
6. Cross barriers shall be a min of 1/2 and a max of 2/3 the height of the linear barrier.
7. Sandbag rows and layers shall be staggered to eliminate gaps.

Sandbag Barrier SE-8



Straw Bale Barrier SE-9



Description and Purpose

A straw bale barrier is a series of straw bales placed on a level contour to intercept sheet flows. Straw bale barriers pond sheet-flow runoff, allowing sediment to settle out.

Suitable Applications

Straw bale barriers may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow

Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence
SE-5 Fiber Rolls
SE-6 Gravel Bag Berm
SE-8 Sandbag Barrier
SE-12 Temporary Silt Dike
SE-14 Biofilter Bags

Straw Bale Barrier SE-9

- At the top of slopes to divert runoff away from disturbed slopes
- As check dams across mildly sloped construction roads

Limitations

Straw bale barriers:

- Are not to be used for extended periods of time because they tend to rot and fall apart
- Are suitable only for sheet flow on slopes of 10 % or flatter
- Are not appropriate for large drainage areas, limit to one acre or less
- May require constant maintenance due to rotting
- Are not recommended for concentrated flow, inlet protection, channel flow, and live streams
- Cannot be made of bale bindings of jute or cotton
- Require labor-intensive installation and maintenance
- Cannot be used on paved surfaces
- Should not to be used for drain inlet protection
- Should not be used on lined ditches
- May introduce undesirable non-native plants to the area

Implementation

General

A straw bale barrier consists of a row of straw bales placed on a level contour. When appropriately placed, a straw bale barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. Straw bale barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils.

Straw bale barriers have not been as effective as expected due to improper use. These barriers have been placed in streams and drainage ways where runoff volumes and velocities have caused the barriers to wash out. In addition, failure to stake and entrench the straw bale has allowed undercutting and end flow. Use of straw bale barriers in accordance with this BMP should produce acceptable results.

Design and Layout

- Locate straw bale barriers on a level contour.
  - Slopes up to 10:1 (H:V): Straw bales should be placed at a maximum interval of 50 ft (a closer spacing is more effective), with the first row near the toe of slope.
  - Slopes greater than 10:1 (H:V): Not recommended.

Straw Bale Barrier SE-9

- Turn the ends of the straw bale barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, consider moving the barrier away from the slope toe to facilitate cleaning. To prevent flow behind the barrier, sand bags can be placed perpendicular to the barrier to serve as cross barriers.
- Drainage area should not exceed 1 acre, or 0.25 acre per 100 ft of barrier.
- Maximum flow path to the barrier should be limited to 100 ft.
- Straw bale barriers should consist of two parallel rows.
  - Butt ends of bales tightly
  - Stagger butt joints between front and back row
  - Each row of bales must be trenched in and firmly staked
- Straw bale barriers are limited in height to one bale laid on its side.
- Anchor bales with either two wood stakes or four bars driven through the bale and into the soil. Drive the first stake towards the butt joint with the adjacent bale to force the bales together.
- See attached figure for installation details.

Materials

- ***Straw Bale Size:*** Each straw bale should be a minimum of 14 in. wide, 18 in. in height, 36 in. in length and should have a minimum mass of 50 lbs. The straw bale should be composed entirely of vegetative matter, except for the binding material.
- ***Bale Bindings:*** Bales should be bound by steel wire, nylon or polypropylene string placed horizontally. Jute and cotton binding should not be used. Baling wire should be a minimum diameter of 14 gauge. Nylon or polypropylene string should be approximately 12 gauge in diameter with a breaking strength of 80 lbs force.
- ***Stakes:*** Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake, or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable. Steel bar reinforcement should be equal to a #4 designation or greater. End protection should be provided for any exposed bar reinforcement.

Costs

Straw bales cost $5 - $7 each. Adequate labor should be budgeted for installation and maintenance.

Straw Bale Barrier SE-9

Inspection and Maintenance

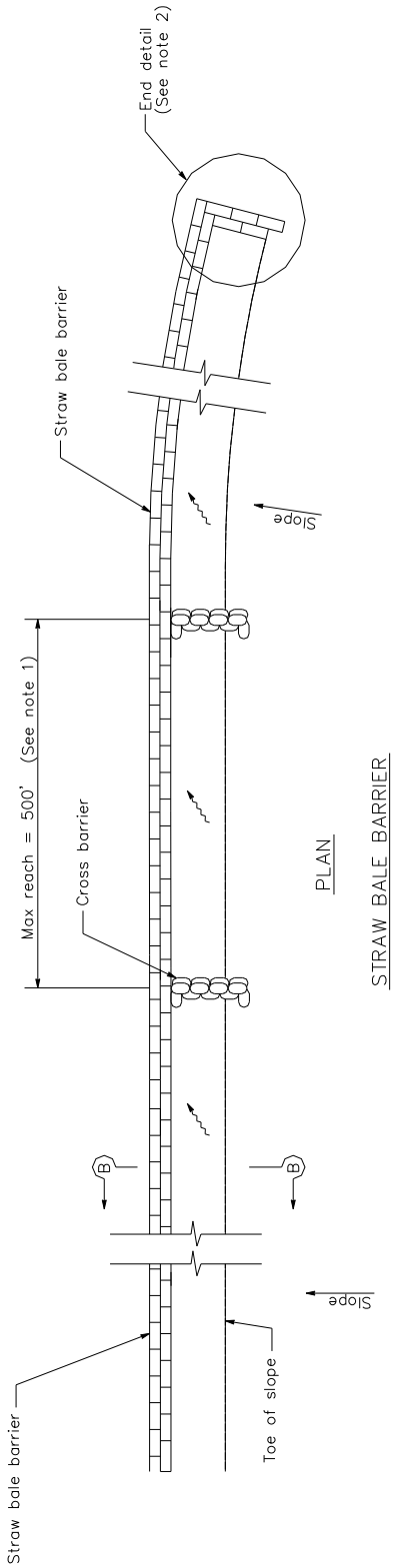
Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Straw bales degrade, especially when exposed to moisture. Rotting bales will need to be replaced on a regular basis.
- Replace or repair damaged bales as needed.
- Repair washouts or other damages as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Remove straw bales when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area. Removed sediment should be incorporated in the project or disposed of.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Straw Bale Barrier SE-9



PLAN

STRAW BALE BARRIER

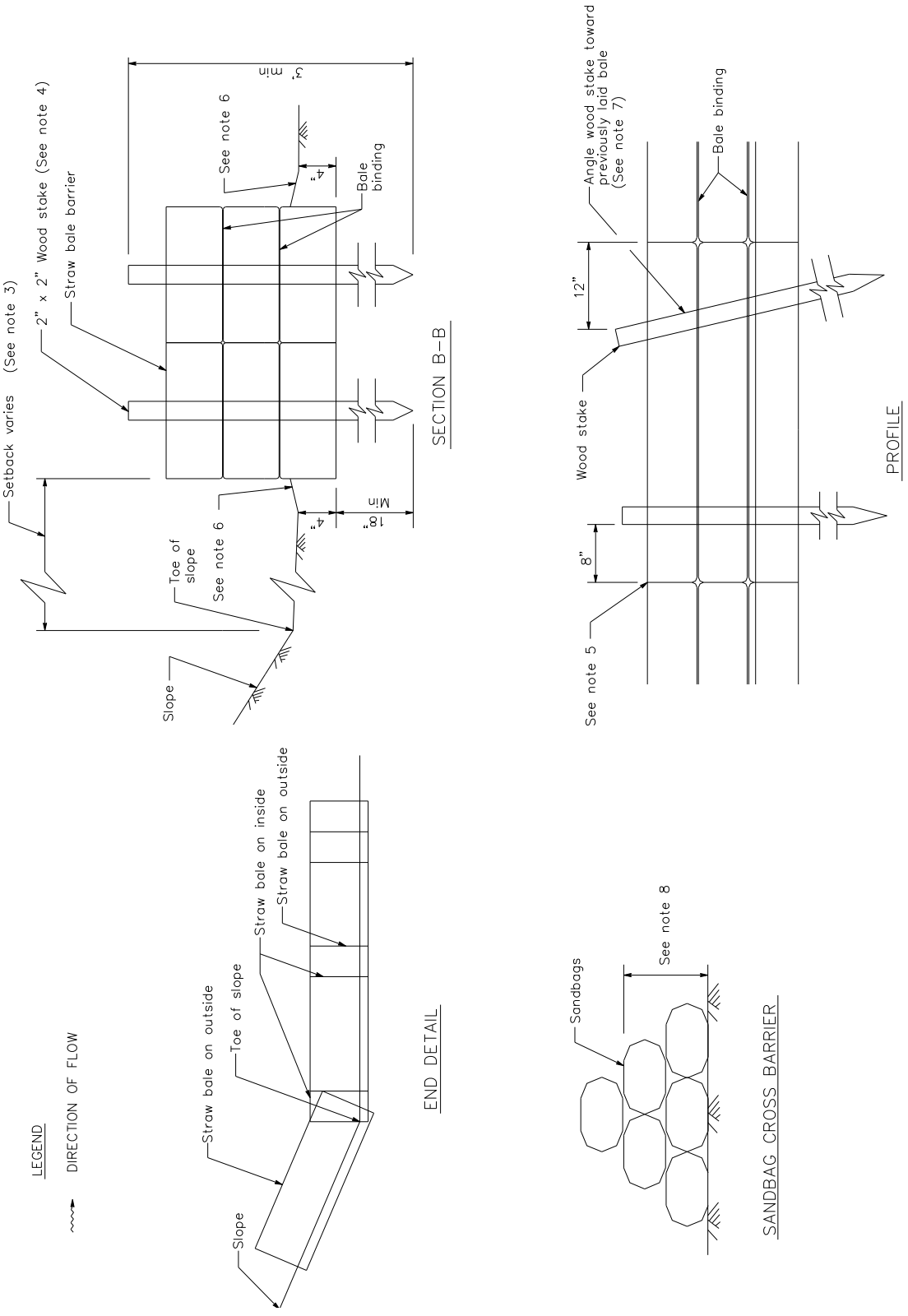
LEGEND

DIRECTION OF FLOW

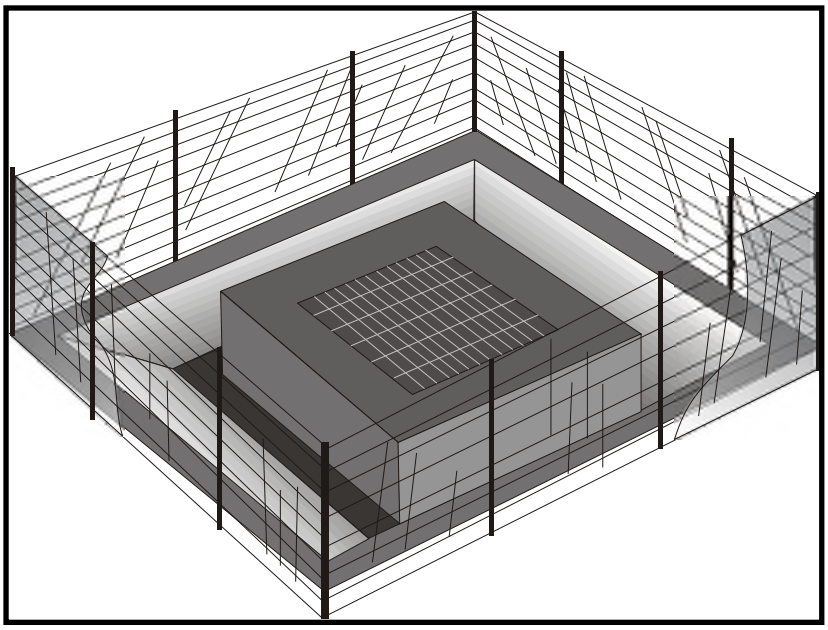
NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. The end of barrier shall be turned up slope.
3. Dimension may vary to fit field condition.
4. Stake dimensions are nominal.
5. Place straw bales tightly together.
6. Tamp embedment spoils against sides of installed bales.
7. Drive angled wood stake before vertical stake to ensure tight abutment to adjacent bale.
8. Sandbag cross barriers should be a min of 1/2 and a max of 2/3 the height of the linear barrier.
9. Sandbag rows and layers should be offset to eliminate gaps.

Straw Bale Barrier SE-9



Storm Drain Inlet Protection SE-10



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence
SE-5 Fiber Rolls
SE-6 Gravel Bag Berm
SE-8 Sandbag Barrier
SE-14 Biofilter Bags
SE-13 Compost Socks and Berms

Description and Purpose

Storm drain inlet protection consists of a sediment filter or an impounding area in, around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction. Temporary geotextile storm drain inserts attach underneath storm drain grates to capture and filter storm water.

Suitable Applications

- Every storm drain inlet receiving runoff from unstabilized or otherwise active work areas should be protected. Inlet protection should be used in conjunction with other erosion and sediment controls to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.

Limitations

- Drainage area should not exceed 1 acre.
- In general straw bales should not be used as inlet protection.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.
- Sediment removal may be inadequate to prevent sediment discharges in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use

other onsite sediment trapping techniques in conjunction with inlet protection.

- Frequent maintenance is required.
- Limit drainage area to 1 acre maximum. For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

Implementation

General

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap and/or used in conjunction with other drainage control, erosion control, and sediment control BMPs to protect the site. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Alternative methods are available in addition to the methods described/shown herein such as prefabricated inlet insert devices, or gutter protection devices.

Design and Layout

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- The key to successful and safe use of storm drain inlet protection devices is to know where runoff that is directed toward the inlet to be protected will pond or be diverted as a result of installing the protection device.
  - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.
  - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.
- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.
- Seven types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.

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- Silt Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
- Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).
- Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
- Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.
- Temporary Geotextile Storm drain Inserts: Different products provide different features. Refer to manufacturer details for targeted pollutants and additional features.
- Biofilter Bag Barrier: Used to create a small retention area upstream of inlets and can be located on pavement or soil. Biofilter bags slowly filter runoff allowing sediment to settle out. Appropriate for flows under 0.5 cfs.
- Compost Socks: Allow filtered run-off to pass through the compost while retaining sediment and potentially other pollutants (SE-13). Appropriate for flows under 1.0 cfs.

- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
- Provide area around the inlet for water to pond without flooding structures and property.
- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
- Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

Installation

- ***DI Protection Type 1 - Silt Fence*** - Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced and water flow through the grate will be blocked resulting in flooding. See typical Type 1 installation details at the end of this fact sheet.

  1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.
  2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes should be at least 48 in.
  3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.
  4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.

5. Backfill the trench with gravel or compacted earth all the way around.

- ***DI Protection Type 2 - Excavated Drop Inlet Sediment Trap -*** Install filter fabric fence in accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd^3/acre of drainage area. See typical Type 2 installation details at the end of this fact sheet.

- ***DI Protection Type 3 - Gravel bag -*** Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability. See typical Type 3 installation details at the end of this fact sheet.

  1. Construct on gently sloping street.

  2. Leave room upstream of barrier for water to pond and sediment to settle.

  3. Place several layers of gravel bags – overlapping the bags and packing them tightly together.

  4. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.

- ***DI Protection Type 4 – Block and Gravel Filter -*** Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction. See typical Type 4 installation details at the end of this fact sheet.

  1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place woven geotextile over the wire mesh.

  2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.

  3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.

  4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

- ***DI Protection Type 5 – Temporary Geotextile Insert (proprietary) –*** Many types of temporary inserts are available. Most inserts fit underneath the grate of a drop inlet or inside of a curb inlet and are fastened to the outside of the grate or curb. These inserts are removable and many can be cleaned and reused. Installation of these inserts differs between manufacturers. Please refer to manufacturer instruction for installation of proprietary devices.

Storm Drain Inlet Protection SE-10

- ***DI Protection Type 6 - Biofilter bags*** – Biofilter bags may be used as a substitute for gravel bags in low-flow situations. Biofilter bags should conform to specifications detailed in SE-14, Biofilter bags.

    1. Construct in a gently sloping area.
    2. Biofilter bags should be placed around inlets to intercept runoff flows.
    3. All bag joints should overlap by 6 in.
    4. Leave room upstream for water to pond and for sediment to settle out.
    5. Stake bags to the ground as described in the following detail. Stakes may be omitted if bags are placed on a paved surface.

- ***DI Protection Type 7 – Compost Socks*** – A compost sock can be assembled on site by filling a mesh sock (e.g., with a pneumatic blower). Compost socks do not require special trenching compared to other sediment control methods (e.g., silt fence). Compost socks should conform to specification detailed in SE-13, Compost Socks and Berms.

Costs

- Average annual cost for installation and maintenance of DI Type 1-4 and 6 (one year useful life) is $200 per inlet.
- Temporary geotextile inserts are proprietary and cost varies by region. These inserts can often be reused and may have greater than 1 year of use if maintained and kept undamaged. Average cost per insert ranges from $50-75 plus installation, but costs can exceed $100. This cost does not include maintenance.
- See SE-13 for Compost Sock cost information.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Silt Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes. At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height.
- Gravel Filters. If the gravel becomes clogged with sediment, it should be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.

Storm Drain Inlet Protection SE-10

- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Inspect and maintain temporary geotextile insert devices according to manufacturer's specifications.
- Remove storm drain inlet protection once the drainage area is stabilized.
    - Clean and regrade area around the inlet and clean the inside of the storm drain inlet, as it should be free of sediment and debris at the time of final inspection.

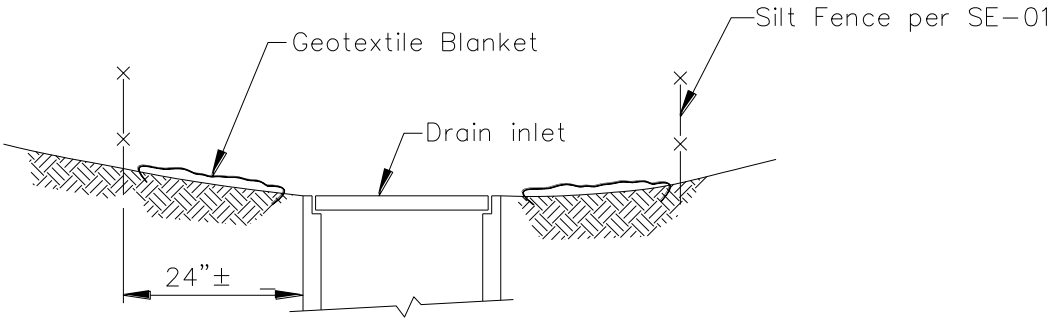
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

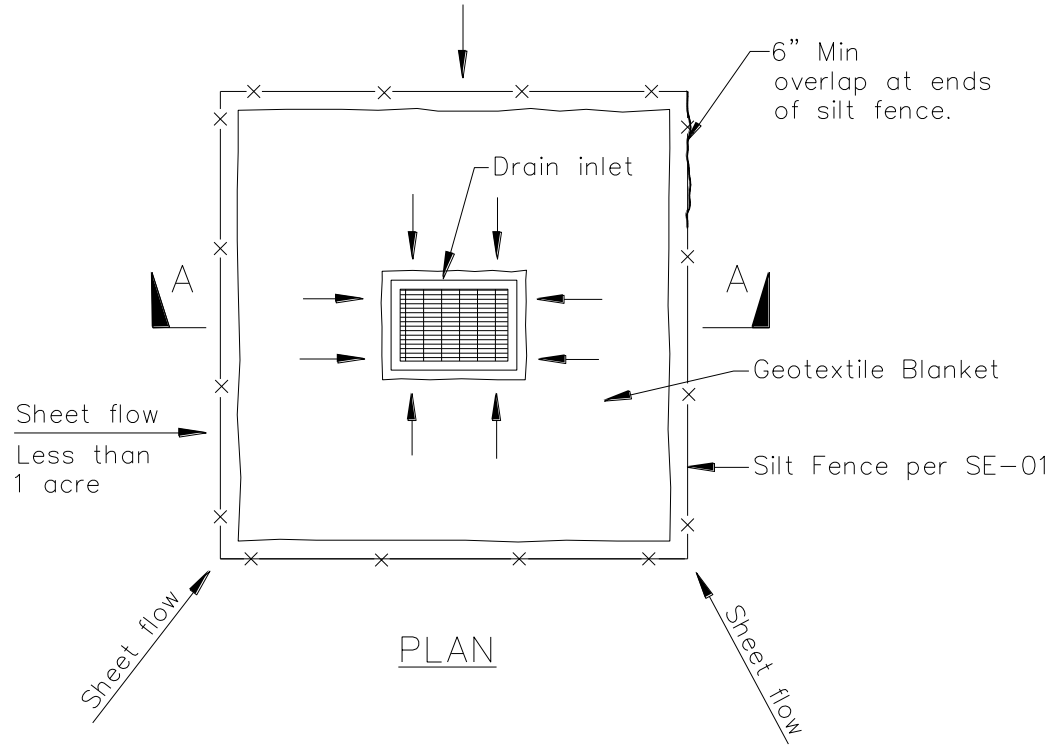
Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Storm Drain Inlet Protection SE-10



SECTION A–A



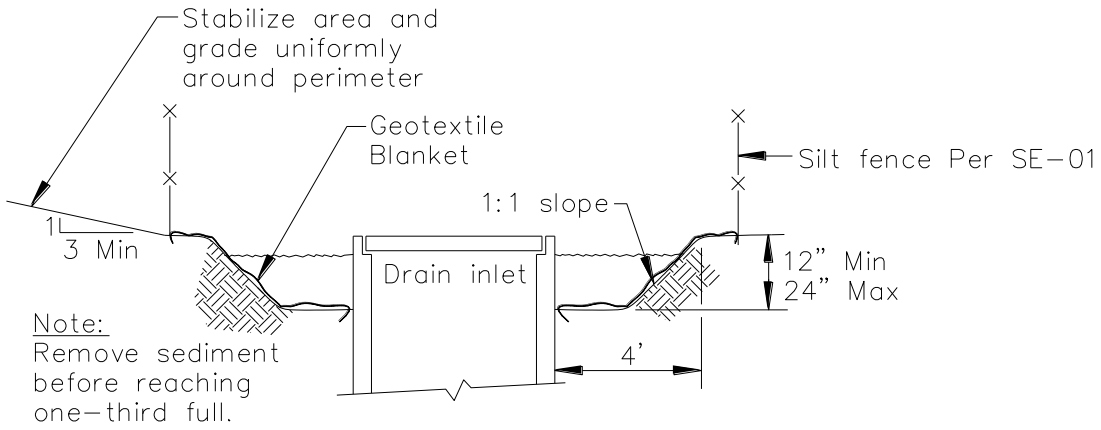
PLAN

DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.

Storm Drain Inlet Protection SE-10



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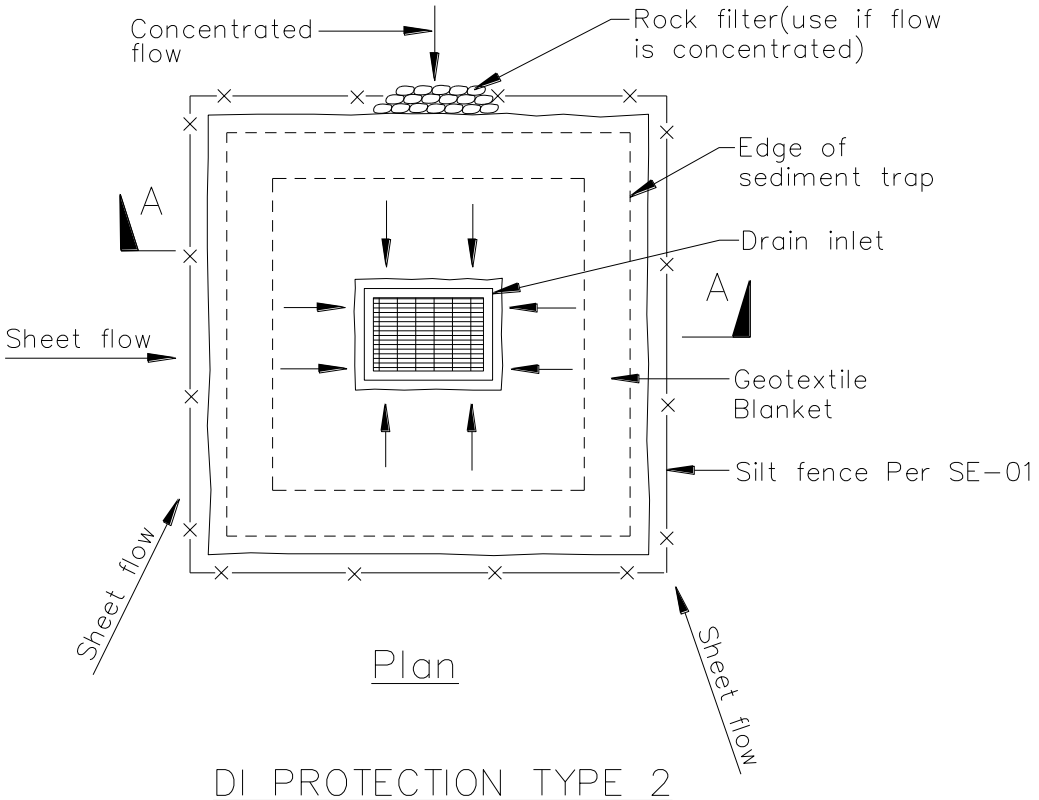
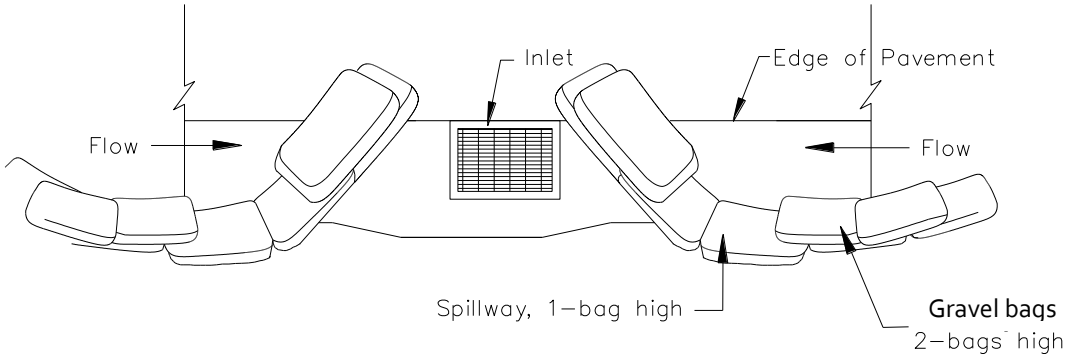


Plan

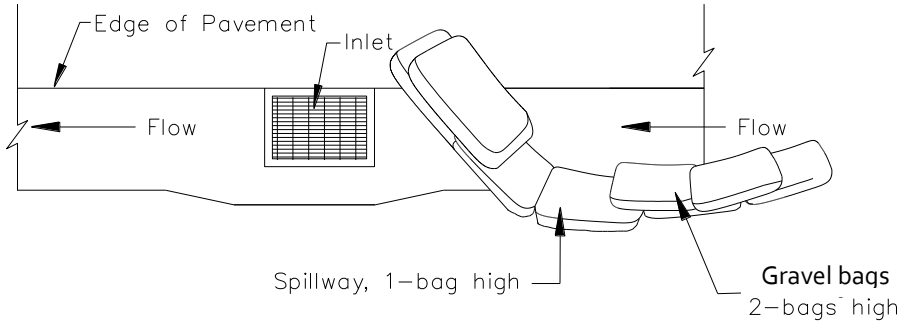
DI PROTECTION TYPE 2
NOT TO SCALE

Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.

Storm Drain Inlet Protection SE-10



TYPICAL PROTECTION FOR INLET ON SUMP



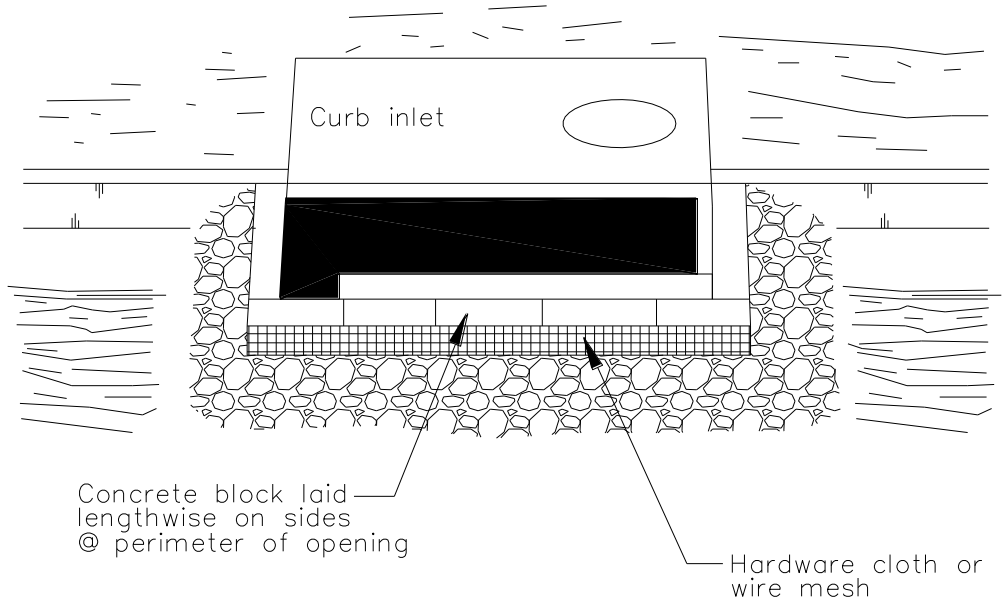
TYPICAL PROTECTION FOR INLET ON GRADE

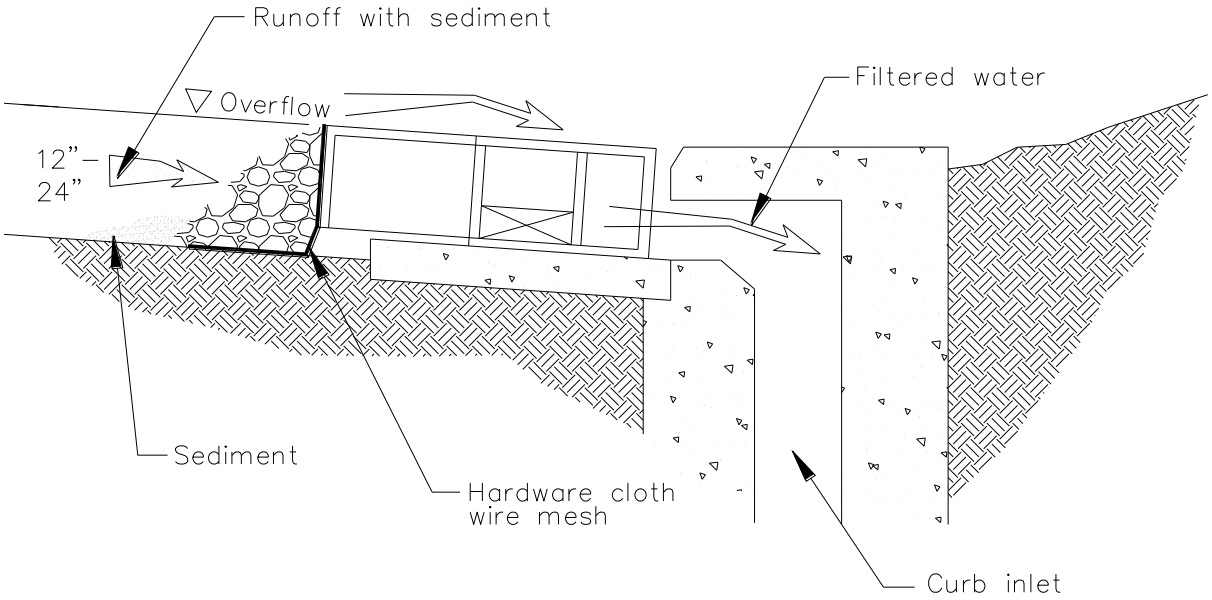
NOTES:

1. Intended for short-term use.
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.
6. Protection can be effective even if it is not immediately adjacent to the inlet provided that the inlet is protected from potential sources of pollution.

DI PROTECTION TYPE 3
NOT TO SCALE

Storm Drain Inlet Protection SE-10

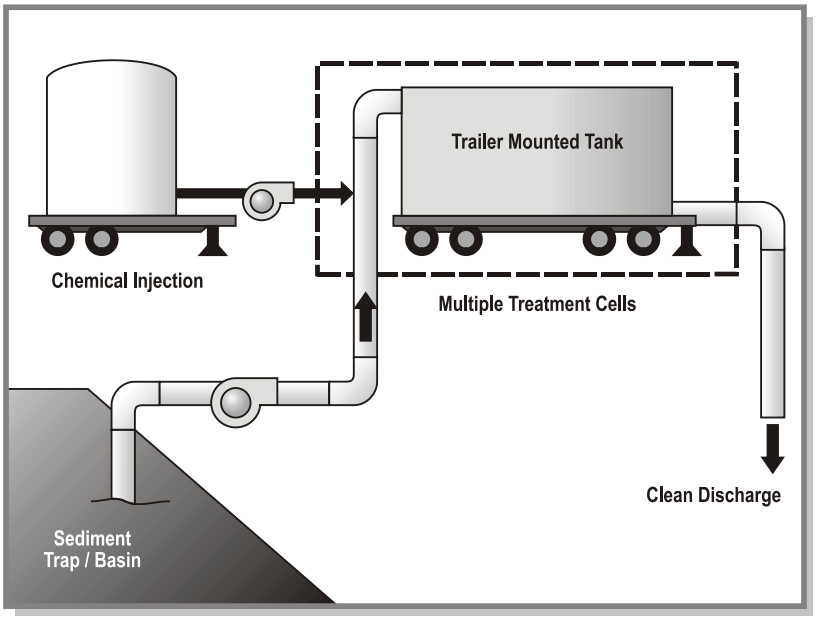




DI PROTECTION – TYPE 4

NOT TO SCALE

Active Treatment Systems SE-11



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Active Treatment Systems (ATS) reduce turbidity of construction site runoff by introducing chemicals to stormwater through direct dosing or an electrical current to enhance flocculation, coagulation, and settling of the suspended sediment. Coagulants and flocculants are used to enhance settling and removal of suspended sediments and generally include inorganic salts and polymers (USACE, 2001). The increased flocculation aids in sedimentation and ability to remove fine suspended sediments, thus reducing stormwater runoff turbidity and improving water quality.

Suitable Applications

ATS can reliably provide exceptional reductions of turbidity and associated pollutants and should be considered where turbid discharges to sediment and turbidity sensitive waters cannot be avoided using traditional BMPs. Additionally, it may be appropriate to use an ATS when site constraints inhibit the ability to construct a correctly sized sediment basin, when clay and/or highly erosive soils are present, or when the site has very steep or long slope lengths.

Limitations

Dischargers choosing to utilize chemical treatment in an ATS must follow all guidelines of the Construction General Permit Attachment F – Active Treatment System Requirements. General limitations are as follows:

Active Treatment Systems SE-11

- Numeric Effluent Limit (NEL) for all discharges (10 NTU daily flow-weighted average)
- Limited availability of chemical residual testing procedures that meet permit requirements for flow-through treatment
- Specific field and classroom ATS training required to operate equipment
- Batch treatment requires extensive toxicity testing of effluent
- Batch treatment requires large footprint to accommodate treatment cells
- Requires additional filtration to remove residual floc and treatment chemicals prior to discharge
- Petroleum based polymers should not be used
- Requires site-specific design and equipment
- Limited discharge rates depending on receiving water body
- Labor intensive operation and maintenance
- ATS costs are higher on a unit basis for smaller sites that would be expected to have a lower volume of treated runoff
- ATS costs are seasonably variable due to increases or decreases in rainfall volumes

Implementation

Turbidity is difficult to control once fine particles are suspended in stormwater runoff from a construction site. Sedimentation ponds are effective at removing larger particulate matter by gravity settling, but are ineffective at removing smaller particulates such as clay and fine silt. Sediment ponds are typically designed to remove sediment no smaller than medium silt (0.02 mm). ATS may be used to reduce the turbidity of stormwater runoff. With an ATS, very high turbidities can be reduced to levels comparable to what is found in streams during dry weather.

Criteria for ATS Product Use

Chemically treated stormwater discharged from construction sites must be non-toxic to aquatic organisms. The following protocol should be used to evaluate chemicals proposed for stormwater treatment at construction sites. Authorization to use a chemical in the field based on this protocol does not relieve the applicant from responsibility for meeting all discharge and receiving water criteria applicable to a site.

- An ATS Plan, which includes an Operation and Maintenance component, a Monitoring, Sampling and Reporting component, a Health and Safety component, and a Spill Prevention component must be prepared and submitted to the Regional Water Quality Control Board (RWQCB).

- Treatment chemicals should be approved by EPA for potable water use or otherwise be demonstrated to be protective of human health and the environment. Chemical residual or whole effluent toxicity testing is required.

- Prior to field use of chemical treatment, jar tests are to be conducted to demonstrate that turbidity reduction necessary to meet the NELs and receiving water criteria can be achieved. Test conditions, including but not limited to raw water quality and jar test procedures, should be indicative of field conditions. Although these small-scale tests cannot be expected to reproduce performance under field conditions, they are indicative of treatment capability. A minimum of six site-specific jar tests must be conducted per chemical.

- The proposed maximum dosage should be at least a factor of five lower than the no observed effects concentration (NOEC).

- Effluent discharge from an ATS to a receiving water is conditional upon the favorable results of full-scale whole effluent bioassay/toxicity testing for batch treatment systems and upon chemical residuals testing for flow-through systems.

- Contact the RWQCB for a list of treatment chemicals that may be pre-approved for use.

Active Treatment System Design Considerations

The design and operation of an ATS should take into consideration the factors that determine optimum, cost-effective performance. While site characteristics will influence system design, it is important to recognize the following overriding considerations:

- The right chemical must be used at the right dosage. A dosage that is either too low or too high will not produce the lowest turbidity. There is an optimum dosage rate. This is a situation where the adage "adding more is always better" is not the case.

- The coagulant must be mixed rapidly into the water to insure proper dispersion.

- The mixing system for batch treatment must be sized to provide adequate mixing for the design storage volume. Lack of adequate mixing during the flocculation phase results in flocs that are too small and/or insufficiently dense. Too much mixing can rapidly destroy floc as it is formed.

- Care must be taken in the design of the withdrawal system to minimize outflow velocities and to prevent floc discharge. The discharge should be directed through a filtration system such as sand, bag, or cartridge filter that would catch any unintended floc discharge.

- ATS is also regulated for pH of the discharge. A pH-adjusting chemical should be added into the treated water to control pH if the selected coagulant requires alteration of the pH of the discharge outside of the acceptable range.

Active Treatment System Design

ATS can be designed as batch treatment systems using either ponds or portable trailer-mounted tanks, or as flow-through systems using any number of proprietary designed systems.

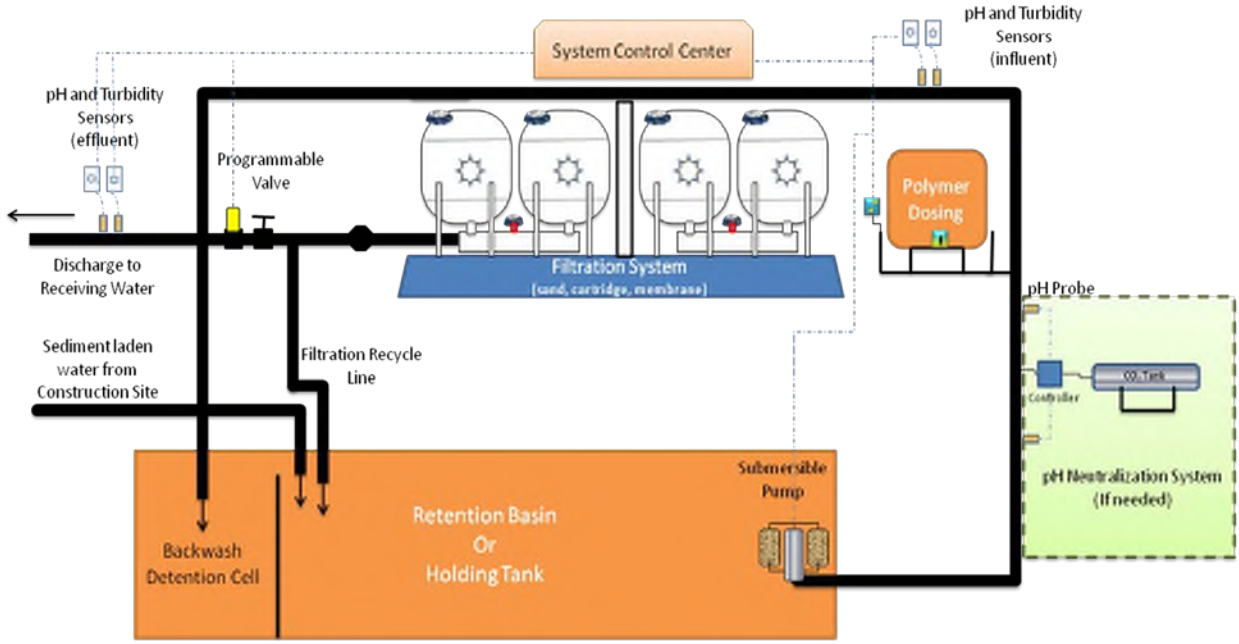


Figure has been adapted from Port of Seattle response to Washington Dept. of Ecology Action Order 2948

Batch Treatment

Batch Treatment systems consist of the stormwater collection system (either temporary diversion or the permanent site drainage system); a sediment basin, trap or holding tanks; pumps; a chemical feed system; treatment cells; and, interconnecting piping.

Batch treatment systems should use a minimum of two lined treatment cells. Multiple treatment cells allow for clarification of treated water while other cells are being filled or emptied. Treatment cells may be basins, traps, or tanks. Portable tanks may also be suitable for some sites.

The following equipment should be located in a secured, covered location:

- The chemical injector
- Secondary contaminant for acid, caustic, buffering compound, and treatment chemical
- Emergency shower and eyewash
- Monitoring equipment which consists of a pH meter and a turbidimeter (if not already within the instrumentation panel of the chemical injector)

Flow-through Treatment

At a minimum, a flow-through ATS system consists of the stormwater collection system (either temporary diversion or the permanent site drainage system), an untreated stormwater storage pond or holding tank, and a chemically enhanced filtration system.

Stormwater is collected at interception point(s) on the site and is diverted by gravity or by pumping to an untreated stormwater storage pond or other untreated stormwater holding area.

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The stormwater is stored until treatment occurs. It is important that the holding pond be large enough to provide adequate storage.

Stormwater is then pumped from the untreated stormwater storage pond to the chemically enhanced filtration system where polymer is added. Adjustments to pH may be necessary before chemical addition. The filtration system continually monitors the stormwater for turbidity and pH. If the discharge water is out of the acceptable turbidity or pH range, the water is recycled to the untreated stormwater pond (or holding tank) where it can be retreated. Flow through systems must ensure that:

- Cumulative flow volume shall be recorded daily. The data recording system shall have the capacity to record a minimum of seven days of continuous data.
- Instrumentation systems are interfaced with system control to provide auto shutoff or recirculation in the event that effluent measurements exceed turbidity or pH.
- Upon system upset, power failure, or other catastrophic event, the ATS will default to a recirculation mode or safe shut down.
- The instrumentation system provides a method for controlling coagulant dose, to prevent potential overdosing.

Sizing Criteria

An ATS shall be designed and approved by a Certified Professional in Erosion and Sediment Control (CPESC), a Certified Professional in Storm Water Quality (CPSWQ); a California registered civil engineer; or any other California registered engineer.

ATS must be designed to capture and treat (within 72 hours) runoff from the 10-year 24-hour storm event. The runoff volume of the watershed area to be treated from this size storm event is required to be calculated using the Rational Method with a runoff coefficient of 1.

If sediment basins are used to capture flow-through or batch treatment, see SE-2, Sediment Basin, for design criteria. Bypass should be provided around the ATS to accommodate extreme storm events. Primary settling should be encouraged in the sediment basin/storage pond. A forebay with access for maintenance may be beneficial.

The permissible discharge rate governed by potential downstream effect should be used to calculate the recommended size of the treatment cells. Local requirements related to Phase I or Phase II NPDES permit thresholds should be considered in developing maximum discharge rates the ATS Plan.

Costs

Costs for ATS may be significant due to equipment rental requirements and cost of chemicals. ATS cost is lower on a treated unit-basis for large construction sites with large volumes of runoff.

Inspection and Maintenance

ATS must be operated and maintained by individuals with experience in their use and trained in accordance with training requirements below. ATS should be monitored continuously while in

use. A designated responsible person shall be on site daily at all times during treatment operations. Daily on-site visual monitoring of the system for proper performance shall be conducted and recorded in the project data log. The name, phone number, and training documentation of the person responsible for system operation and monitoring shall be included in the project data log.

The following monitoring requirements and results should be recorded in the data log:

Operational and Compliance Monitoring

- Effluent flow rate and volume shall be continuously monitored and recorded at 15- minute or less intervals.
- Influent and effluent pH must be continuously monitored and recorded at 15-minute or less intervals.
- Influent and effluent turbidity (expressed in NTU) must be continuously monitored and recorded at 15-minute or less intervals.
- The type and amount of chemical used for pH adjustment, if any, shall be monitored and recorded.
- Dose rate of chemical used in the ATS system (expressed in mg/L) shall be monitored and reported 15-minutes after startup and every 8 hours of operation.
- Laboratory duplicates – monthly laboratory duplicates for residual coagulant analysis must be performed and records shall be maintained onsite.
- Effluent shall be monitored and recorded for residual chemical/additive levels.
- If a residual chemical/additive test does not exist and the ATS is operating in a batch treatment mode of operation refer to the toxicity monitoring requirements below.

Toxicity Monitoring

Batch Treatment

Toxicity testing for systems operated in batch treatment mode should be made in accordance with the following:

- Acute toxicity testing on effluent samples representing effluent from each batch prior to discharge shall be undertaken. All bioassays shall be sent to a laboratory certified by the Department of Health Services (DHS) Environmental Laboratory Accreditation Program (ELAP). The required field of testing number for Whole Effluent Toxicity (WET) testing is E113.
- Acute toxicity tests shall be conducted with the following species and protocols. The methods to be used in the acute toxicity testing shall be those outlined for a 96-hour acute test in "Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, USEPA-841-R-02-012" for Fathead minnow, *Pimephales promelas*. Rainbow trout, *Oncorhynchus mykiss*, may be used as a substitute for fathead minnow.

All toxicity tests shall meet quality assurance criteria and test acceptability criteria in the most recent versions of the EPA test method for WET testing.

Flow-through Treatment

Toxicity testing for systems operated in flow-through treatment mode should be made in accordance with the following:

- A residual chemical test method shall be used that has a method detection limit (MDL) of 10% or less than the maximum allowable threshold concentration (MATC) for the specific coagulant in use and for the most sensitive species of the chemical used. The MATC is equal to the geometric mean of the No Observed Effect Concentration (NOEC) and Lowest Observed Effect Concentration (LOEC) Acute and Chronic toxicity results for most sensitive species determined for the specific coagulant.
- The residual chemical test method shall produce a result within one hour of sampling.
- A California State certified laboratory shall validate the selected residual chemical test. Specifically the lab will review the test protocol, test parameters, and the detection limit of the coagulant. The discharger shall electronically submit this documentation as part of the ATS Plan.

Numeric Effluent Limit (NEL) Compliance:

All chemically treated stormwater must be sampled and tested for compliance with pH and turbidity limits. These limits have been established by the Construction General Permit. Sampling and testing for other pollutants may also be necessary at some sites. Turbidity limits have been set as 10 NTU as a daily flow-weighted average or 20 NTU from a single sample. pH must be within the range of 6.0 to 9.0 standard units. It is often possible to discharge treated stormwater that has a lower turbidity than the receiving water and that matches the pH.

Treated stormwater samples and measurements should be taken from the discharge pipe or another location representative of the nature of the treated stormwater discharge. Samples used for determining compliance with the water quality standards in the receiving water should not be taken from the treatment pond prior to decanting. Compliance with the water quality standards is determined in the receiving water.

Operator Training:

Operators shall have training specific to using an ATS and liquid coagulants for stormwater discharges in California. The training shall be in the form of a formal class with a certificate and requirements for testing and certificate renewal. Training shall include a minimum of eight hours classroom and 32 hours field training.

Standard BMPs:

Erosion and sediment control BMPs should be implemented throughout the site to prevent erosion and discharge of sediment to the ATS. Some types of chemical coagulation and flocculation are only achievable in water below a certain turbidity; therefore minimizing the amount of sediment reaching the system will increase the likelihood of meeting effluent limits and will potentially lower costs of chemical dosing.

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Sediment Removal and Disposal

- Sediment shall be removed from the storage or treatment cells as necessary to ensure that the cells maintain their required water storage (i.e., volume) capability.
- Handling and disposal of all solids generated during ATS operations shall be done in accordance with all local, state, and federal laws and regulations.
- If sediment is determined to be non-toxic, it may be incorporated into the site away from drainages.

References

Engineering and Design – Precipitation/Coagulation/Flocculation. United States Army Corps of Engineers, EM 1110-1-4012, 2001.

Evaluation of Active Treatment Systems (ATS) for Construction Site Runoff. California Building and Industry Association (prepared by Geosyntec Consultants), 2008.

Stormwater Management Manual for Western Washington, Volume II – Construction Stormwater Pollution Prevention, Washington State Department of Ecology, August 2001.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Manufactured Linear Sediment Controls (MLSC) SE-12

Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

Description and Purpose

Manufactured linear sediment controls (MLSC) are pre-manufactured devices that are typically specified and installed for drainage and sediment control on the perimeter of disturbed sites or stockpiles and as check dams within channels. Typically, MLSCs can be reused.

This fact sheet is intended to provide guidance on BMP selection and implementation of proprietary or vendor-supplied products, for sediment control. Products should be evaluated for project-specific implementation and used if determined to be appropriate by the SWPPP Preparer.

Suitable Applications

MLSCs are generally used in areas as a substitute for fiber rolls and silt fences in sediment control applications to slow down runoff water, divert drainage or contain fines and sediment. MLSCs are a linear control and application suitability varies based on the specific product type. They may be suitable:

- On paved surfaces for perimeter protection.
- As check structures in channels.
- Along the perimeter of disturbed sites in lieu of silt fence.

Manufactured Linear Sediment Controls (MLSC) SE-12

- At operational storm drains as a form of inlet protection.
- Around temporary stockpiles or material/equipment storage areas.
- At the interface between graveled driveways and pavement.
- Along the toe of exposed and erodible slopes.

Limitations

- Limitations vary by product. Product manufacturer's printed product use instructions should be reviewed by the SWPPP Preparer to determine the project-specific applicability of MLSCs.

Implementation

General

When appropriately placed, MLSCs intercept and slow sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. The device is porous, which allows the ponded runoff to flow slowly through the device, releasing the runoff as sheet flows. Generally, MLSCs should be used in conjunction with temporary soil stabilization controls up-slope to provide an effective combination of erosion and sediment control.

Design and Layout

- MLSCs used on soil should be trenched or attached to the ground per manufacturer specifications in a manner that precludes runoff or ponded water from flowing around or under the device.
- MLSCs designed for use on asphalt or concrete may be attached using a variety of methods, including nailing the device to the pavement, or using a high strength adhesive.
- Follow manufacturer written specifications when installing MLSCs.
- Allow sufficient space up-slope from the silt dike to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, MLSCs should be set back 3 feet from the slope toe to facilitate cleaning. Where site conditions do not allow set back, the sediment control may be constructed on the toe of the slope. To prevent flows behind the barrier, sand or gravel bags can be placed perpendicular and between the sediment control and slope to serve as a barrier to parallel flow.
- Drainage area should not exceed 5 acres.

Materials

- Several manufactured products are available. The following search terms or combination of terms can be used with an internet search engine to find manufactured linear sediment controls:

Manufactured Linear Sediment Controls (MLSC) SE-12

- "silt barrier"
- "reusable silt fence"
- "silt fence alternative" or
- "perimeter sediment control"

Costs

Manufacturers should be contacted directly for current pricing.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Reshape or replace sections of damaged MLSCs as needed.
- Repair washouts or other damage as needed.
- Sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove MLSCs when no longer needed. Remove sediment accumulation and clean, re-grade, and stabilize the area. Removed sediment should be incorporated in the project or disposed of properly.

References

City of Elko Construction Site Best Management Practices Handbook, December 2005.

Construction Site Best Management Practices Handbook, June 2008 Update, Truckee Meadows Regional Stormwater Quality Management Program, June 2008.

Complying with the Edwards Aquifer Rules Technical Guidance on Best Management Practices, Texas Commission on Environmental Quality, Revised July 2005, Addendum Sheet, January26, 2011.

Stormwater Management Manual for Western Washington Volume II, Construction Stormwater Pollution Prevention, Washington State Department of Ecology, February 2005.

Compost Socks and Berms SE-13

Description and Purpose

Compost socks and berms act as three-dimensional biodegradable filtering structures to intercept runoff where sheet flow occurs and are generally placed at the site perimeter or at intervals on sloped areas. Compost socks are generally a mesh sock containing compost and a compost berm is a dike of compost, trapezoidal in cross section. When employed to intercept sheet flow, both BMPs are placed perpendicular to the flow of runoff, allowing filtered runoff to pass through the compost and retaining sediment (and potentially other pollutants). A compost sock can be assembled on site by filling a mesh sock (e.g. with a pneumatic blower). The compost berm should be constructed using a backhoe or equivalent and/or a pneumatic delivery (blower) system and should be properly compacted. Compost socks and berms act as filters, reduce runoff velocities, and in some cases, aid in establishing vegetation.

Compost is organic, biodegradable, and renewable. Compost provides soil structure that allows water to infiltrate the compost medium which helps prevent rill erosion and the retained moisture promotes seed germination and vegetation growth, in addition to providing organic matter and nutrients important for fostering vegetation. Compost improves soil quality and productivity, as well as erosion and sediment control.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☒
Bacteria	☒
Oil and Grease	☒
Organics	

Potential Alternatives

SE-1 Silt Fence
SE-5 Fiber Roll
SE-6 Gravel Bag Berm
SE-8 Sandbag Barrier
SE-14 Biofilter Bags

Compost Socks and Berms SE-13

The compost of the compost sock or berm can be selected that targets site specific objectives in capturing sediment and other pollutants, supporting vegetation, or additional erosion control.

Compost is typically derived from combinations of feedstocks, biosolids, leaf and yard trimmings, manure, wood, or mixed solid waste. Many types of compost are products of municipal recycle or "Greenwaste" programs. Compost is organic and biodegradable and can be left onsite. There are many types of compost with a variety of properties with specific functions, and accordingly compost selection is an important design consideration in the application of this type of erosion and sediment control.

Suitable Applications

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow (compost berms should only be used at the top of slopes or on slopes 4:1 (H:V) or flatter, all other slope applications should use compost socks)
- Along the perimeter of a project
- As check dams in unlined ditches (compost socks only)
- Down-slope of exposed soil areas
- At operational storm drains as a form of inlet protection (compost socks only)
- Around temporary stockpiles

Compost socks and berms do not require special trenching or BMP removal compared to other sediment control methods (e.g. silt fence or fiber rolls). Compost socks and berms can remain in place after earth disturbing activities are completed or the compost components can be spread over the site providing nutrients for plant growth and augmenting soil structure. BMPs that remain in place are particularly advantageous below embankments, especially adjacent streams, by limiting re-entry and the disturbance to sensitive areas.

Compost can be pre-seeded prior to application (recommended by the EPA for construction site stormwater runoff control and required for compost socks) or seeded after installation (for compost berms only). The compost medium can also remove pollutants in stormwater including heavy metals; oil and grease; and hydrocarbons.

Limitations

- Compost can potentially leach nutrients (dissolved phosphorus and nitrogen) into runoff and potentially impact water quality. Compost should not be used directly upstream from nutrient impaired waterbodies (Adams et. al, 2008).
- Compost may also contain other undesirable constituents that are detrimental to water quality. Compost should be obtained from a supplier certified by the California Integrated Waste Management Board or compost should otherwise meet the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7. Carefully consider the qualifications and experience of any compost producer/supplier.

Compost Socks and Berms SE-13

- Application by hand is more time intensive and potentially costly. Using a pneumatic blower truck is the recommended cost effective method of assembly.
- Compost socks and berms should not be employed at the base of slopes greater than 2:1 (H:V). They can be employed with other erosion control methods for steeper slopes.
- Difficult to move once saturated.
- Compost berms should not be applied in areas of concentrated flows.
- Compost socks and berms are easy to fix; however, they are susceptible to damage by frequent traffic. Compost socks can be used around heavy machinery, but regular disturbance decreases sock performance.

Implementation

Compost Materials

- California Compost Regulations (Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3) define and require a quality of compost for application. Compost should comply with all physical and chemical requirements. Specific requirements are provided in **Table 1**, taken from Caltrans Standard Special Provision 10-1 (SSP 10-1), Erosion Control (Compost Blanket).
- The compost producer should be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility should certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.
- The compost producer should be a participant in United States Composting Council's Seal of Testing Assurance program.
- Compost medium parameter specifications for compost socks and berms have been developed to assist in compost selection, such as those provided by the American Association of State Highway Transportation Officials (AASHTO).
- Particle size is important parameter for selecting compost. Well consolidated coarser grades of compost (e.g. small and large pieces) perform better for filtration objectives, while finer grades better support vegetation. Particle size of the compost should be selected based on site conditions, such as expected precipitation, and filtration goals and / or long term plant nutrients.
- Compost moisture should be considered for composition quality and application purposes. A range of 30-50% is typical. Compost that is too dry is hard to apply and compost that is too wet is more difficult (and more expensive) to transport. For arid or semi-arid areas, or for application during the dry season, use compost with greater moisture content than areas with wetter climates. For wetter or more humid climates or for application during the wet season, drier composts can be used as the compost will absorb moisture from the ambient air.

Compost Socks and Berms SE-13

- If vegetation establishment is a desired function of the compost, a compost sample should be inspected by a qualified individual. Vegetation has different nutrient and moisture needs.
- Organic content of the compost is also important and should range from 30 to 65% depending on site conditions.
- Compost should not be derived from mixed municipal solid waste and should be reasonably free of visible contaminates.
- Compost should not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Metal concentrations in compost should not exceed the maximum metal concentrations listed under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.
- Compost should not possess objectionable odors.
- Compost should be weed free.

Compost Socks and Berms SE-13

Table 1. Physical/Chemical Requirements of Compost
Reference - Caltrans SSP-10 Erosion Control Blanket (Compost)

Property	Test Method	Requirement
pH	*TMECC 04.11-A Elastometric pH 1:5 Slurry Method pH Units	6.0–8.0
Soluble Salts	TMECC 04.10-A Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0-10.0
Moisture Content	TMECC 03.09-A Total Solids & Moisture at 70+/- 5 deg C % Wet Weight Basis	30-60
Organic Matter Content	TMECC 05.07-A Loss-On-Ignition Organic Matter Method (LOI) % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	80 or Above 80 or Above
Stability	TMECC 05.08-B Carbon Dioxide Evolution Rate mg CO_2-C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	100% Passing, 3 inch 90-100% Passing, 1 inch 65-100% Passing, 3/4 inch 0 - 75% Passing, 1/4 inch Maximum length 6 inches
Pathogen	TMECC 07.01-B Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Plastic, Glass and Metal % > 4mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles) % > 4mm fraction	None Detected

*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Installation

- Prior to application, prepare locations for socks and berms by removing brush and thick vegetation. The compost of the sock and/or berm should be allowed to come in full contact with the ground surface.

- Select method to apply the compost sock or berm. A pneumatic blower is most cost effective and most adaptive in applying compost to steep, rough terrain, and hard to reach locations.

- The compost of the berm should be distributed evenly to the surface, compacted, and shaped trapezoidal in cross section. Berm design is generally consists of a base two times the height. AASHTO specification MP 9-03 provides compost berm dimensions based on anticipated

site precipitation (AASHTO, 2003 and USEPA, 2009). State agencies, such as Oregon Department of Environmental Quality (ODEQ) have developed berm dimension based on slope steepness and length (ODEQ, 2004).

- Compost socks can be assembled on site by filling mesh socks with the selected compost. Mesh socks can be tied at one end, filled, and then tied at the other end. The ends of socks can be interlocked until the desired length is achieved. The sock diameter is a function of slope steepness and length. Again, ASSHTO provides specifications for various parameters. Compost socks range from 8" to 18", but are typically 12" to 18" in diameter.

- Compost socks are typically placed in contours perpendicular to sheet flow. They can also be placed in V formation on a slope. Compost socks need to be anchored, typically stakes, through the center of the sock. To prevent water flowing around them, the ends of compost socks should be placed upslope.

- Locate compost socks and berms on level contours spaced as follows:

  - Slope inclination of 4:1 (H:V) or flatter: Socks and/or berms should be placed at a maximum interval of 20 ft.

  - Slope inclination between 4:1 and 2:1 (H:V): Socks should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).

  - Slope inclination 2:1 (H:V) or greater: Socks should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).

- Place perimeter socks and berms using a j-hook installation. Use of vegetation will also provide additional anchoring.

- Compost socks and berms can be placed around the perimeter of an affected area, like a silt fence, if the area is flat or on a contour. Do not place these socks and berms where ponded water could become an issue.

- If used at the toe of slopes, the compost sock or berm should at a minimum of 5 to 10 feet away.

- Use additional anchoring and erosion control BMPs in conjunction of the compost socks and berms as needed.

- Consider using compost berms or socks as necessary at the top and/or bottom of the slope for additional erosion control performance.

- Compost socks and berms can also be effective over rocky and frozen ground if installed properly.

- It is recommended that the drainage areas of these compost BMPs do not exceed 0.25 acre per 100 feet placement interval and runoff does not exceed 1 cubic foot per second.

Compost Socks and Berms SE-13

Costs

Recently obtained vendor costs indicated $3.50 per linear foot for compost berm application and $2.00 per linear foot for 8" socks and $2.50 per linear foot for 12"socks. Costs do not include final compost sock or berm functions at the end of construction activities, including spreading or removal, if required. ODEQ estimates that compost berms cost 30 percent less than silt fences to install.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Once damage is identified, mend or reapply the sock or berm as needed. Washed out areas should be replaced. If the sock or berm height is breached during a storm, an additional sock can be stacked to increase the sock height and similarly the berm dimensions can be increased, as applicable. An additional sock or berm may be installed upslope, as needed. It may be necessary to apply an additional type of stormwater BMP, such as a compost blanket.

- Sediment contained by the sock or berm should be removed prior reaching 1/3 of the exposed height of the BMP. The sediment can be stabilized with the compost sock or berm with vegetation at the end of construction activities.

- Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.

- Limit traffic to minimize damage to BMPs or impede vegetation establishment.

References

An analysis of Composting as an Environmental Remediation Technology, U.S. Environmental Protection Agency (USEPA), Solid Waste and Emergency Response (5305W), EPA530-R-8-008, 1998.

Characteristics of Compost: Moisture Holding and Water Quality Improvement, Center for Research in Water Resources, Kirchoff, C., Malina, J., and Barrett, M., 2003.

Compost Utilization for Erosion Control, The University of Georgia College of Agricultural and Environmental Sciences, pubs.caes.uga.edu/caespubs/pubcd/B1200.htm, Faucette, B. and Risse, M., 2001.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Standard Special Provision 10-1, Erosion Control (Compost Blanket), State of California Department of Transportation (Caltrans). 2007 Update.

Evaluation of Environmental Benefits and Impacts of Compost and Industry Standard Erosion and Sediment Controls Measures Used in Construction Activities, Dissertation, Institute of Ecology, University of Georgia, Faucette, B., 2004.

National Pollutant Discharge Elimination System (NPDES), Compost Blankets, U.S. Environmental Protection Agency (USEPA). http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=118, 2009.

Standard Specifications for Transportation Materials and Methods of Sampling and Testing, Designation MP-9, Compost for Erosion/Sediment Control (Filter Berms), Provisional, American Association of State Highway Transportation Officials (AASHTO), 2003.

Stormwater Best Management Practices (BMPs) Field Trials of Erosion Control Compost in Reclamation of Rock Quarry Operations, Nonpoint Source Protection Program CWA §319(h), Texas Commission on Environmental Quality, Adams, T., McFarland, A., Hauck, L., Barrett, M., and Eck, B., 2008.

Biofilter Bags SE-14

Categories

EC	Erosion Control	
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence
SE-4 Check Dams
SE-5 Fiber Roll
SE-6 Gravel Bag Berm
SE-8 Sandbag Barrier
SE-10 Storm Drain Inlet Protection

Description and Purpose

Biofilter bags, or bio-bags, are a multi-purpose sediment control BMP consisting of a plastic mesh bag filled with 100% recycled wood product waste. Biofilter bags come in a variety of sizes (30" x 18" and 30" x 9" being common) and generally have between 1-2 cubic yards of recycled wood waste (or wood chips). Biofilter bags work by detaining flow and allowing a slow rate of discharge through the wood media. This action removes suspended sediment through gravity settling of the detained water and filtration within the bag.

Suitable Applications

Biofilter bags are a short-term BMP that can be rapidly deployed, maintained, and replaced. Biofilter bags can be an effective short-term solution to place in developed rills to prevent further erosion until permanent measures can be established. Suitable short-term applications include:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - Below other small cleared areas
  - Along the perimeter of a site (with low-expected flow)
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas

Biofilter Bags SE-14

- Along streams and channels

- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow
  - At the top of slopes to divert runoff away from disturbed slopes
  - As check dams across mildly sloped construction roads
- Inlet Protection (See SE-10)
- Supplement to silt fences or other sediment control devices

Limitations

- Short life-span (maximum usefulness of 2-3 months and should be replaced more frequently if needed); regular maintenance and replacement required to ensure effectiveness. Bags will rapidly fill with sediment and reduce permeability.
- Easily damaged by construction vehicles.
- If not properly staked, will fail on slope applications.
- If improperly installed can allow undercutting or side-cutting flow.
- Not effective where water velocities or volumes are high.
- Potentially buoyant and easily displaced if not properly installed.

Implementation

General

Biofilter bags are a relatively low cost temporary BMP that are easily deployed and have a simple installation that can be performed by hand. Without proper installation, however, biofilter bags can fail due to their light weight, potential displacement, and multiple joint locations. One of the benefits of utilizing biofilter bags is that the media (wood-product) can be recycled or used onsite when no longer needed (where acceptable).

Design and Layout – Linear control

- Locate biofilter bags on level contours.
  - Slopes between 20:1 and 4:1 (H:V): Biofilter bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slopes between 4:1 and 2:1 (H:V): Biofilter bags should be placed at a maximum interval of 15 ft, with the first row near the slope toe.
  - Slopes 2:1 (H:V) or steeper: Biofilter bags should be placed at a maximum interval of 10 ft., with the first row placed the slope toe.

Biofilter Bags SE-14

- Turn the ends of the biofilter bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the biofilter bag berm to allow ponding, and to provide room for sediment storage.
- Stake biofilter bags into a 1 to 2 in. deep trench with a width equal to the bag.
  - Drive one stake at each end of the bag.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- Biofilter bags should be overlapped (6 in.), not abutted.

Costs

Pre-filled biofilter bags cost approximately $2.50-$3.50 per bag, dependent upon size.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Biofilter bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.
- Reshape or replace biofilter bags as needed.
- Repair washouts or other damage as needed.
- Sediment that is retained by the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove biofilter bag berms when no longer needed. Remove sediment accumulation and clean, re-grade, and stabilize the area. Biofilter media may be used on-site, if allowed.

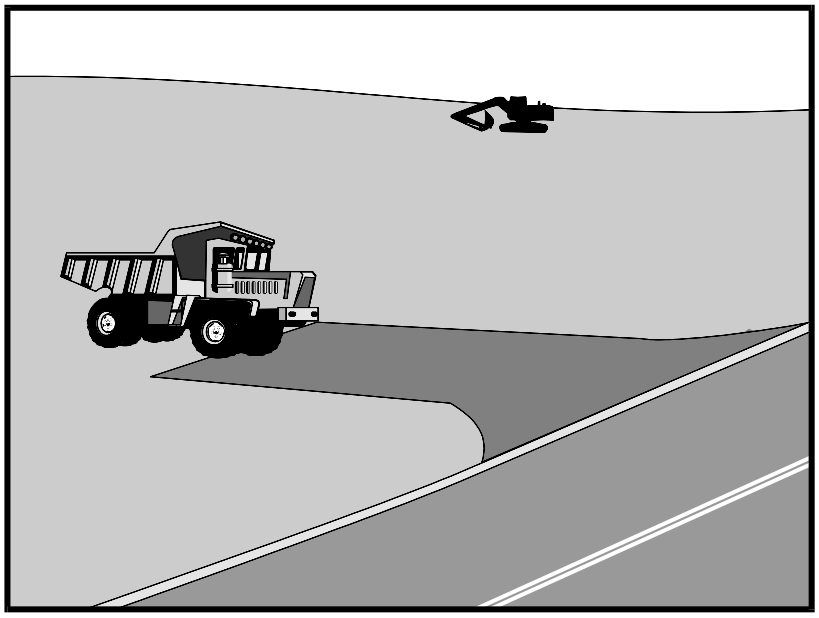
References

Catalog of Stormwater Best Management Practices for Idaho Cities and Counties. Volume 2, Section 7, BMP 34 – Biofilter Bags, Idaho Department of Environmental Quality, 2005.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stabilized Construction Entrance / Exit TC-1



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.

Stabilized Construction Entrance/Exit TC-1

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft or maximum site will allow, and 10 ft minimum width or to accommodate traffic.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.

Stabilized Construction Entrance/Exit TC-1

- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from $1,200 to $4,800 each, averaging $2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from $1,200 - $6,000 each, averaging $3,600 per entrance.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

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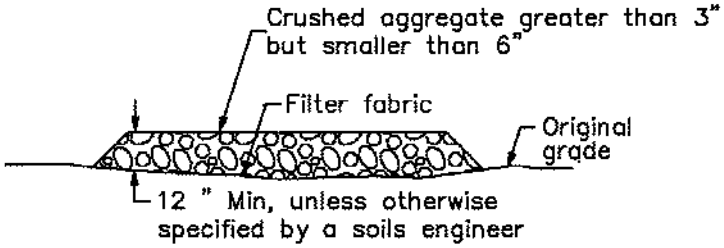
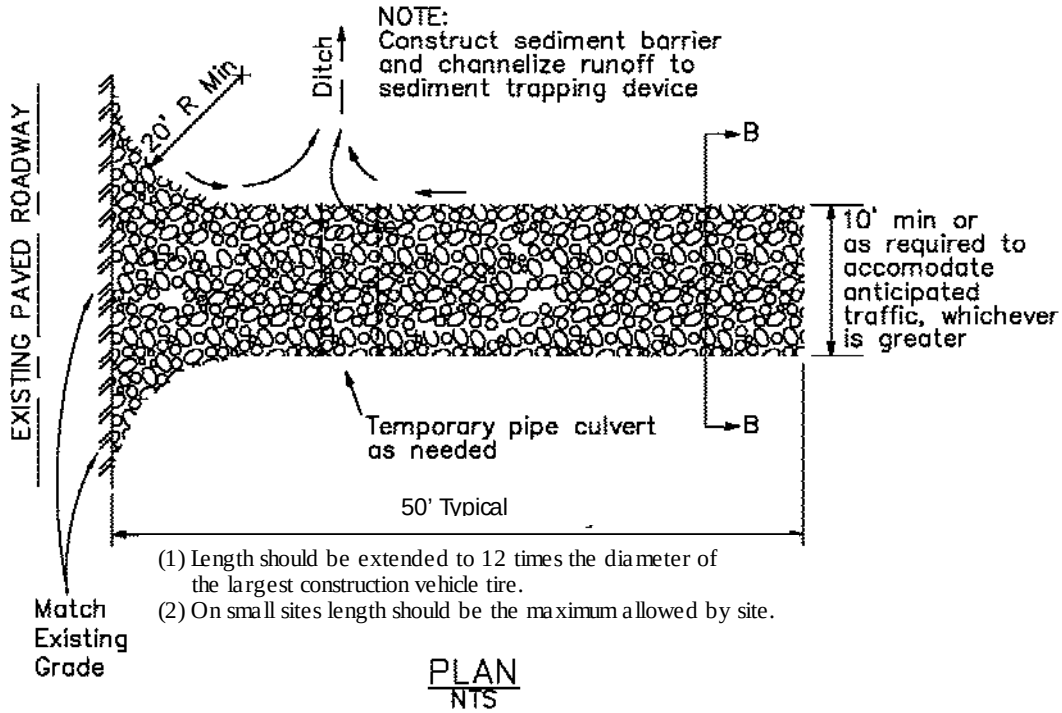
Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Stabilized Construction Entrance / Exit TC-1



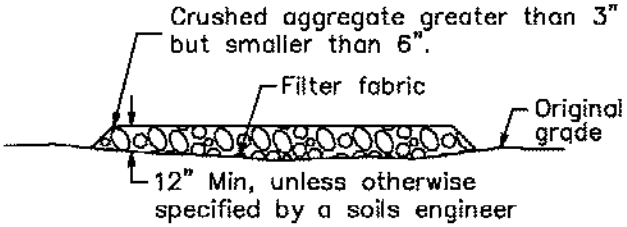
SECTION B–B
NTS



(1) Length should be extended to 12 times the diameter of the largest construction vehicle tire.
(2) On small sites length should be the maximum allowed by site.

PLAN
NTS

Stabilized Construction Entrance / Exit TC-1



SECTION B–B
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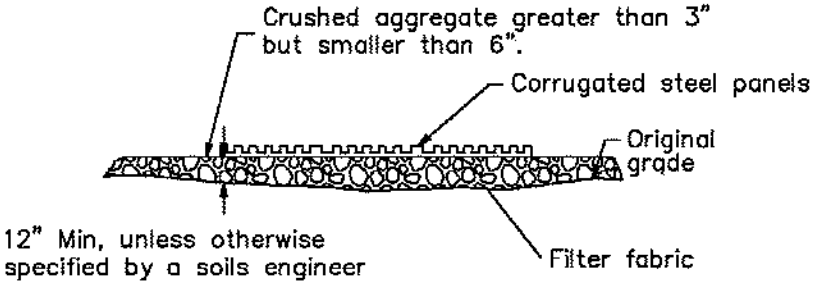
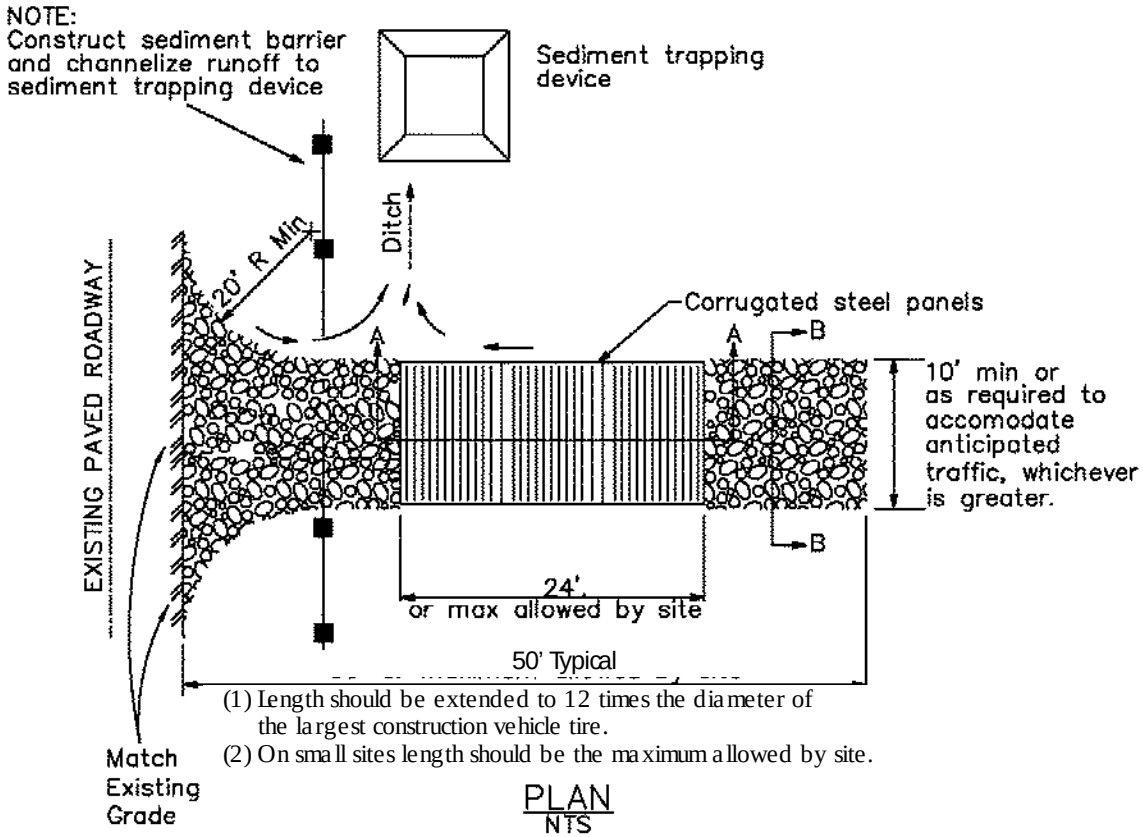


SECTION A–A
NOT TO SCALE



(1) Length should be extended to 12 times the diameter of the largest construction vehicle tire.
(2) On small sites length should be the maximum allowed by site.

PLAN
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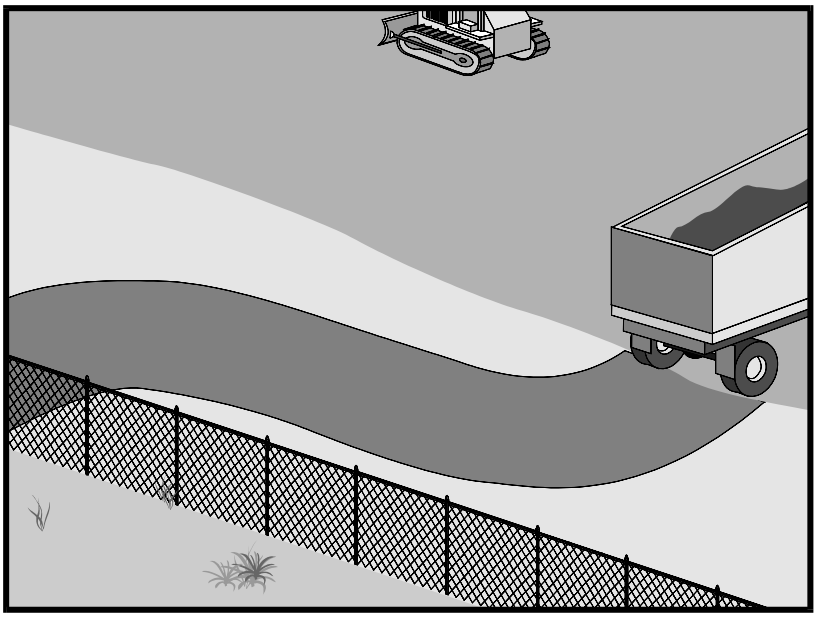
Stabilized Construction Roadway TC-2



Description and Purpose

Access roads, subdivision roads, parking areas, and other onsite vehicle transportation routes should be stabilized immediately after grading, and frequently maintained to prevent erosion and control dust.

Suitable Applications

This BMP should be applied for the following conditions:

- Temporary Construction Traffic:
  - Phased construction projects and offsite road access
  - Construction during wet weather
- Construction roadways and detour roads:
  - Where mud tracking is a problem during wet weather
  - Where dust is a problem during dry weather
  - Adjacent to water bodies
  - Where poor soils are encountered

Limitations

- The roadway must be removed or paved when construction is complete.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Stabilized Construction Roadway TC-2

- Certain chemical stabilization methods may cause stormwater or soil pollution and should not be used. See WE-1, Wind Erosion Control.
- Management of construction traffic is subject to air quality control measures. Contact the local air quality management agency.
- Materials will likely need to be removed prior to final project grading and stabilization.
- Use of this BMP may not be applicable to very short duration projects.

Implementation

General

Areas that are graded for construction vehicle transport and parking purposes are especially susceptible to erosion and dust. The exposed soil surface is continually disturbed, leaving no opportunity for vegetative stabilization. Such areas also tend to collect and transport runoff waters along their surfaces. During wet weather, they often become muddy quagmires that generate significant quantities of sediment that may pollute nearby streams or be transported offsite on the wheels of construction vehicles. Dirt roads can become so unstable during wet weather that they are virtually unusable.

Efficient construction road stabilization not only reduces onsite erosion but also can significantly speed onsite work, avoid instances of immobilized machinery and delivery vehicles, and generally improve site efficiency and working conditions during adverse weather

Installation/Application Criteria

Permanent roads and parking areas should be paved as soon as possible after grading. As an alternative where construction will be phased, the early application of gravel or chemical stabilization may solve potential erosion and stability problems. Temporary gravel roadway should be considered during the rainy season and on slopes greater than 5%.

Temporary roads should follow the contour of the natural terrain to the maximum extent possible. Slope should not exceed 15%. Roadways should be carefully graded to drain transversely. Provide drainage swales on each side of the roadway in the case of a crowned section or one side in the case of a super elevated section. Simple gravel berms without a trench can also be used.

Installed inlets should be protected to prevent sediment laden water from entering the storm sewer system (SE-10, Storm Drain Inlet Protection). In addition, the following criteria should be considered.

- Road should follow topographic contours to reduce erosion of the roadway.
- The roadway slope should not exceed 15%.
- Chemical stabilizers or water are usually required on gravel or dirt roads to prevent dust (WE-1, Wind Erosion Control).
- Properly grade roadway to prevent runoff from leaving the construction site.
- Design stabilized access to support heaviest vehicles and equipment that will use it.

Stabilized Construction Roadway TC-2

- Stabilize roadway using aggregate, asphalt concrete, or concrete based on longevity, required performance, and site conditions. The use of cold mix asphalt or asphalt concrete (AC) grindings for stabilized construction roadway is not allowed.
- Coordinate materials with those used for stabilized construction entrance/exit points.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Keep all temporary roadway ditches clear.
- When no longer required, remove stabilized construction roadway and re-grade and repair slopes.
- Periodically apply additional aggregate on gravel roads.
- Active dirt construction roads are commonly watered three or more times per day during the dry season.

Costs

Gravel construction roads are moderately expensive, but cost is often balanced by reductions in construction delay. No additional costs for dust control on construction roads should be required above that needed to meet local air quality requirements.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

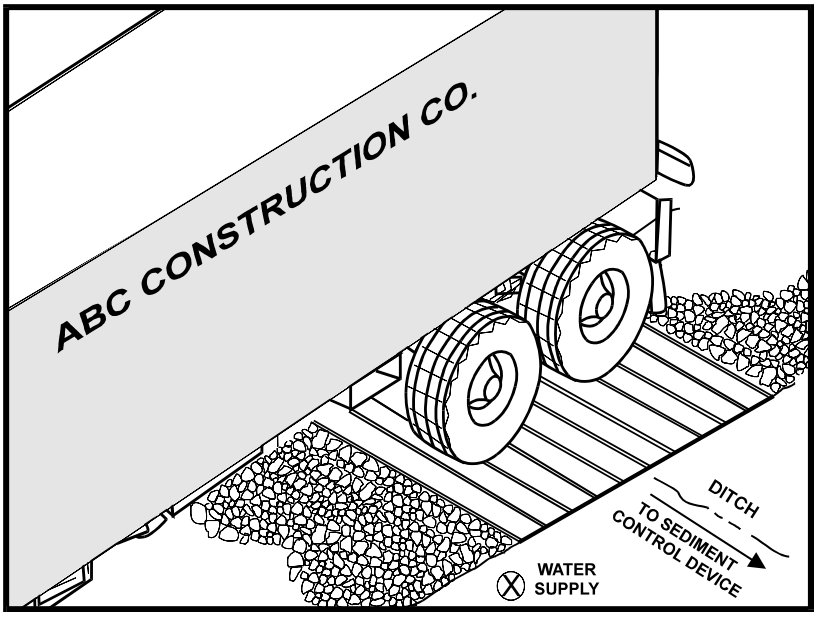
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Stabilized Construction Roadway TC-2

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Entrance/Outlet Tire Wash TC-3



Description and Purpose

A tire wash is an area located at stabilized construction access points to remove sediment from tires and under carriages and to prevent sediment from being transported onto public roadways.

Suitable Applications

Tire washes may be used on construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.

Limitations

- The tire wash requires a supply of wash water.
- A turnout or doublewide exit is required to avoid having entering vehicles drive through the wash area.
- Do not use where wet tire trucks leaving the site leave the road dangerously slick.

Implementation

- Incorporate with a stabilized construction entrance/exit. See TC-1, Stabilized Construction Entrance/Exit.
- Construct on level ground when possible, on a pad of coarse aggregate greater than 3 in. but smaller than 6 in. A geotextile fabric should be placed below the aggregate.
- Wash rack should be designed and constructed/manufactured for anticipated traffic loads.

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

TC-1 Stabilized Construction Entrance/Exit

Entrance/Outlet Tire Wash TC-3

- Provide a drainage ditch that will convey the runoff from the wash area to a sediment trapping device. The drainage ditch should be of sufficient grade, width, and depth to carry the wash runoff.
- Use hoses with automatic shutoff nozzles to prevent hoses from being left on.
- Require that all employees, subcontractors, and others that leave the site with mud caked tires and undercarriages to use the wash facility.
- Implement SC-7, Street Sweeping and Vacuuming, as needed.

Costs

Costs are low for installation of wash rack.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Remove accumulated sediment in wash rack and/or sediment trap to maintain system performance.
- Inspect routinely for damage and repair as needed.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

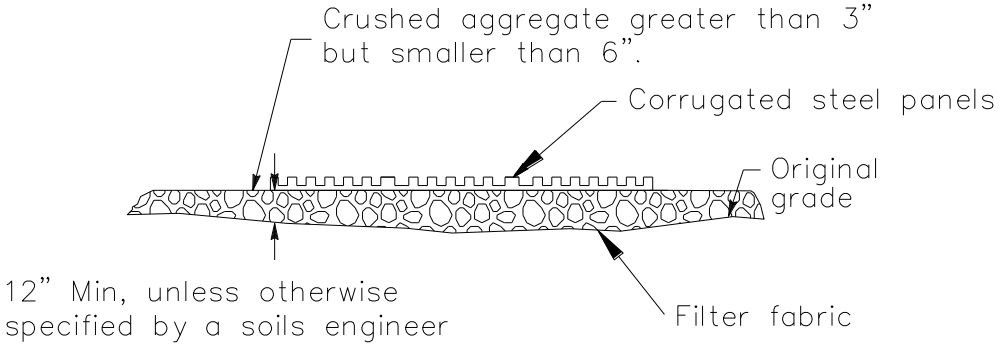
Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

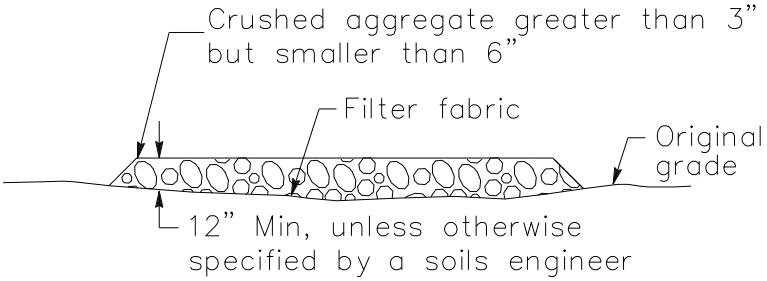
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Entrance/Outlet Tire Wash TC-3



SECTION A–A
NOT TO SCALE



SECTION B–B
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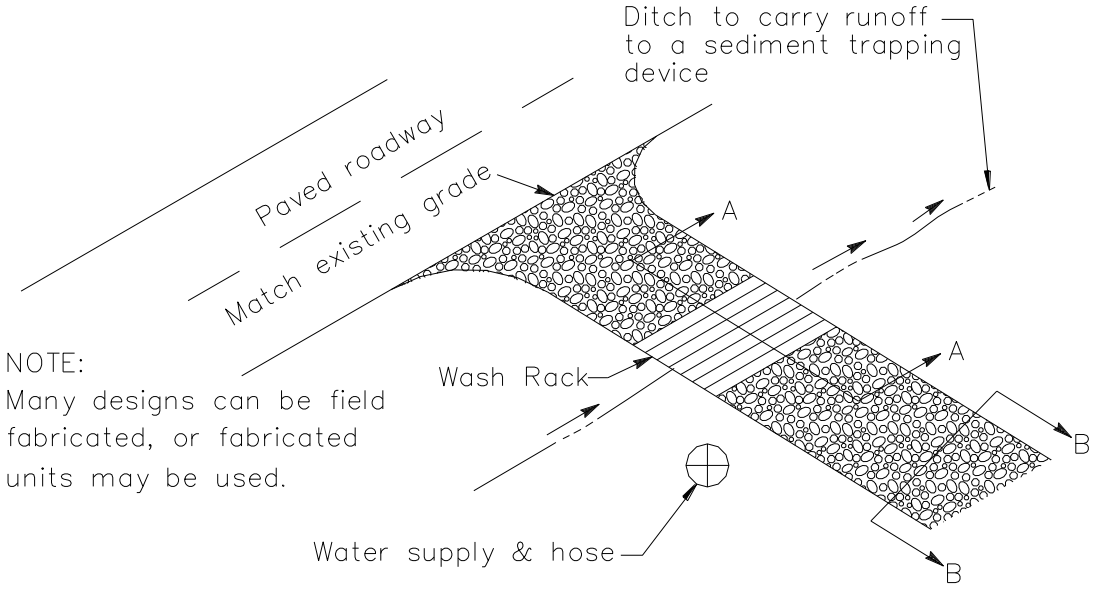
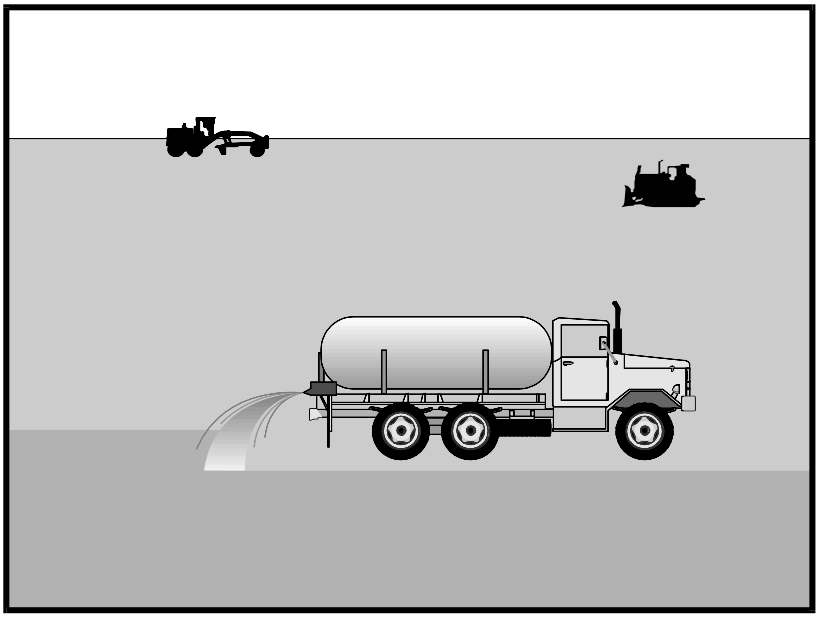


TYPICAL TIRE WASH
NOT TO SCALE

Wind Erosion Control WE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	☑
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-5 Soil Binders

Description and Purpose

Wind erosion or dust control consists of applying water or other chemical dust suppressants as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

California's Mediterranean climate, with a short "wet" season and a typically long, hot "dry" season, allows the soils to thoroughly dry out. During the dry season, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment. Site conditions and climate can make dust control more of an erosion problem than water based erosion. Additionally, many local agencies, including Air Quality Management Districts, require dust control and/or dust control permits in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. Wind erosion control is required to be implemented at all construction sites greater than 1 acre by the General Permit.

Suitable Applications

Most BMPs that provide protection against water-based erosion will also protect against wind-based erosion and dust control requirements required by other agencies will generally meet wind erosion control requirements for water quality protection. Wind erosion control BMPs are suitable during the following construction activities:

- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period (generally less than a few hours) and should be applied daily (or more often) to be effective.
- Over watering may cause erosion and track-out.
- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Chemical dust suppression agents may have potential environmental impacts. Selected chemical dust control agents should be environmentally benign.
- Effectiveness of controls depends on soil, temperature, humidity, wind velocity and traffic.
- Chemical dust suppression agents should not be used within 100 feet of wetlands or water bodies.
- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.
- If the soil surface has minimal natural moisture, the affected area may need to be pre-wetted so that chemical dust control agents can uniformly penetrate the soil surface.

Implementation

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table presents dust control practices that can be applied to varying site conditions that could potentially cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph or less, and controlling the number and activity of vehicles on a site at any given time.

Wind Erosion Control WE-1

Chemical dust suppressants include: mulch and fiber based dust palliatives (e.g. paper mulch with gypsum binder), salts and brines (e.g. calcium chloride, magnesium chloride), non-petroleum based organics (e.g. vegetable oil, lignosulfonate), petroleum based organics (e.g. asphalt emulsion, dust oils, petroleum resins), synthetic polymers (e.g. polyvinyl acetate, vinyls, acrylic), clay additives (e.g. bentonite, montimorillonite) and electrochemical products (e.g. enzymes, ionic products).

Site Condition	Dust Control Practices							
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Temporary Gravel Construction Entrances/Equipment Wash Down	Synthetic Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	x	x	x	x	x			x
Disturbed Areas Subject to Traffic			x	x	x	x		x
Material Stockpiles		x	x	x			x	x
Demolition			x			x	x	
Clearing/ Excavation			x	x				x
Truck Traffic on Unpaved Roads			x	x	x	x	x	
Tracking					x	x		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (see EC-1, Scheduling).
- Quickly treat exposed soils using water, mulching, chemical dust suppressants, or stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Restrict construction traffic to stabilized roadways within the project site, as practicable.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.
- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality

Control Board (RWQCB) requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."

- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and wheel wash areas.
- Stabilize inactive areas of construction sites using temporary vegetation or chemical stabilization methods.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater and should meet all applicable regulatory requirements.

Costs

Installation costs for water and chemical dust suppression vary based on the method used and the length of effectiveness. Annual costs may be high since some of these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check areas protected to ensure coverage.
- Most water-based dust control measures require frequent application, often daily or even multiple times per day. Obtain vendor or independent information on longevity of chemical dust suppressants.

References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

California Air Pollution Control Laws, California Air Resources Board, updated annually.

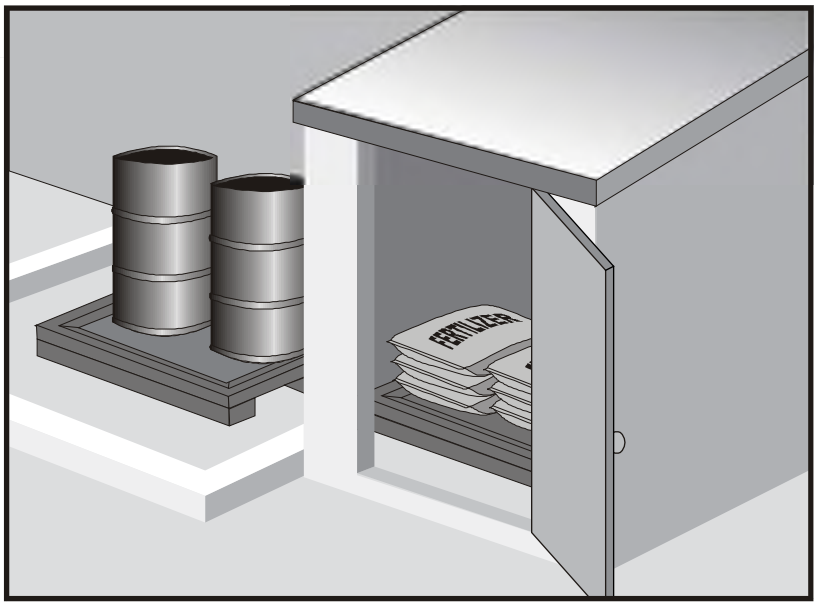
Construction Manual, Chapter 4, Section 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative", California Department of Transportation (Caltrans), July 2001.

Wind Erosion Control WE-1

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Material Delivery and Storage WM-1



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in watertight containers and/or a completely enclosed designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease

Material Delivery and Storage WM-1

- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

Implementation

The following steps should be taken to minimize risk:

- Chemicals must be stored in water tight containers with appropriate secondary containment or in a storage shed.
- When a material storage area is located on bare soil, the area should be lined and bermed.
- Use containment pallets or other practical and available solutions, such as storing materials within newly constructed buildings or garages, to meet material storage requirements.
- Stack erodible landscape material on pallets and cover when not in use.
- Contain all fertilizers and other landscape materials when not in use.
- Temporary storage areas should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be available on-site for all materials stored that have the potential to effect water quality.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located away from waterways, if possible.
  - Avoid transport near drainage paths or waterways.
  - Surround with earth berms or other appropriate containment BMP. See EC-9, Earth Dikes and Drainage Swales.
  - Place in an area that will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.

Material Delivery and Storage WM-1

- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- Keep ample spill cleanup supplies appropriate for the materials being stored. Ensure that cleanup supplies are in a conspicuous, labeled area.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose of materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Materials should be covered prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

Material Delivery and Storage WM-1

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.
- Stockpiles should be protected in accordance with WM-3, Stockpile Management.
- Materials should be stored indoors within existing structures or completely enclosed storage sheds when available.
- Proper storage instructions should be posted at all times in an open and conspicuous location.
- An ample supply of appropriate spill clean up material should be kept near storage areas.
- Also see WM-6, Hazardous Waste Management, for storing of hazardous wastes.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.
- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.
- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.
- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.
- If spills or leaks of materials occur that are not contained and could discharge to surface waters, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Keep storage areas clean and well organized, including a current list of all materials onsite.
- Inspect labels on containers for legibility and accuracy.

Material Delivery and Storage WM-1

- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

References

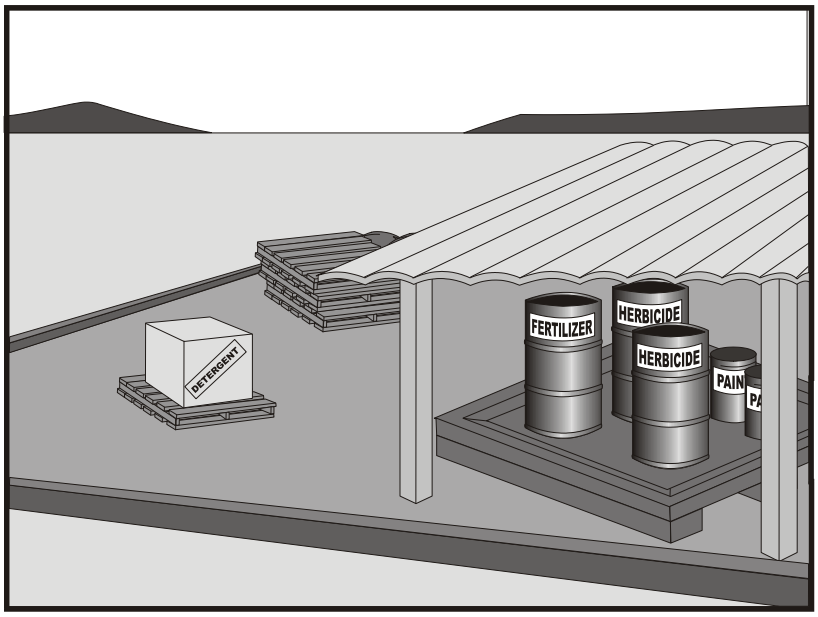
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Material Use WM-2



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

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Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Other materials that may be detrimental if released to the environment

Material Use WM-2

Limitations

Safer alternative building and construction products may not be available or suitable in every instance.

Implementation

The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.
- The preferred method of termiticide application is soil injection near the existing or proposed structure foundation/slab; however, if not feasible, soil drench application of termiticides should follow EPA label guidelines and the following recommendations (most of which are applicable to most pesticide applications):
  - Do not treat soil that is water-saturated or frozen.
  - Application shall not commence within 24-hours of a predicted precipitation event with a 40% or greater probability. Weather tracking must be performed on a daily basis prior to termiticide application and during the period of termiticide application.
  - Do not allow treatment chemicals to runoff from the target area. Apply proper quantity to prevent excess runoff. Provide containment for and divert stormwater from application areas using berms or diversion ditches during application.
  - Dry season: Do not apply within 10 feet of storm drains. Do not apply within 25 feet of aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds).
  - Wet season: Do not apply within 50 feet of storm drains or aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds) unless a vegetative buffer is present (if so, refer to dry season requirements).
  - Do not make on-grade applications when sustained wind speeds are above 10 mph (at application site) at nozzle end height.
  - Cover treatment site prior to a rain event in order to prevent run-off of the pesticide into non-target areas. The treated area should be limited to a size that can be backfilled and/or covered by the end of the work shift. Backfilling or covering of the treated area shall be done by the end of the same work shift in which the application is made.
  - The applicator must either cover the soil him/herself or provide written notification of the above requirement to the contractor on site and to the person commissioning the

application (if different than the contractor). If notice is provided to the contractor or the person commissioning the application, then they are responsible under the Federal Insecticide Fungicide, and Rodenticide Act (FIFRA) to ensure that: 1) if the concrete slab cannot be poured over the treated soil within 24 hours of application, the treated soil is covered with a waterproof covering (such as polyethylene sheeting), and 2) the treated soil is covered if precipitation is predicted to occur before the concrete slab is scheduled to be poured.

- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydraulic application. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals before predicted rainfall.
- Train employees and subcontractors in proper material use.
- Supply Material Safety Data Sheets (MSDS) for all materials.
- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or contain for proper disposal off site. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.
- Document the location, time, chemicals applied, and applicator's name and qualifications.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.
- Discontinue use of erodible landscape material within 2 days prior to a forecasted rain event and materials should be covered and/or bermed.

- Provide containment for material use areas such as masons' areas or paint mixing/preparation areas to prevent materials/pollutants from entering stormwater.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Ensure employees and subcontractors throughout the job are using appropriate practices.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

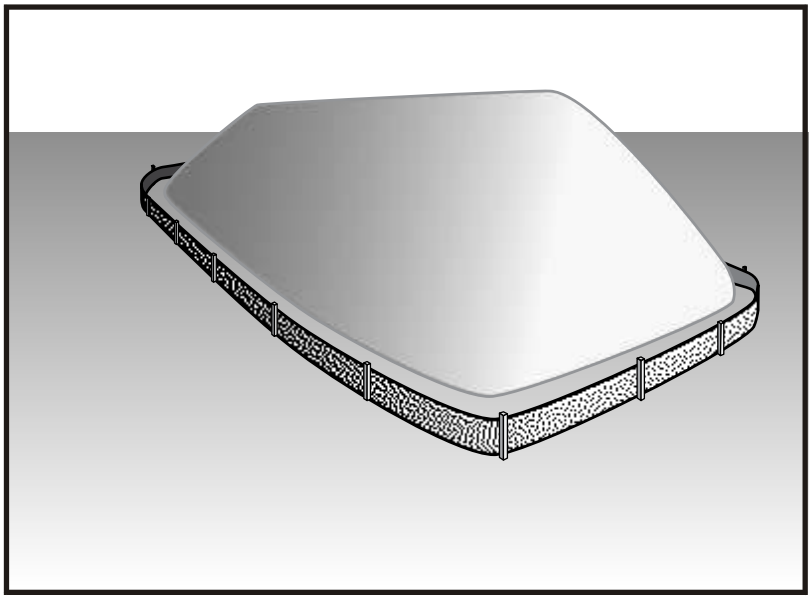
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Comments on Risk Assessments Risk Reduction Options for Cypermethrin: Docket No. OPP–2005–0293; California Stormwater Quality Association (CASQA) letter to USEPA, 2006.Environmental Hazard and General Labeling for Pyrethroid Non-Agricultural Outdoor Products, EPA-HQ-OPP-2008-0331-0021; USEPA, 2008.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Stockpile Management WM-3



Categories		
EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Description and Purpose

Stockpile management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, soil amendments, sand, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other loose materials.

Limitations

- Plastic sheeting as a stockpile protection is temporary and hard to manage in windy conditions. Where plastic is used, consider use of plastic tarps with nylon reinforcement which may be more durable than standard sheeting.
- Plastic sheeting can increase runoff volume due to lack of infiltration and potentially cause perimeter control failure.
- Plastic sheeting breaks down faster in sunlight.
- The use of Plastic materials and photodegradable plastics should be avoided.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Stockpile Management WM-3

- On larger sites, a minimum of 50 ft separation from concentrated flows of stormwater, drainage courses, and inlets is recommended.
- After 14 days of inactivity, a stockpile is non-active and requires further protection described below. All stockpiles are required to be protected as non-active stockpiles immediately if they are not scheduled to be used within 14 days.
- Protect all stockpiles from stormwater runon using temporary perimeter sediment barriers such as compost berms (SE-13), temporary silt dikes (SE-12), fiber rolls (SE-5), silt fences (SE-1), sandbags (SE-8), gravel bags (SE-6), or biofilter bags (SE-14). Refer to the individual fact sheet for each of these controls for installation information.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.
- Place bagged materials on pallets and under cover.
- Ensure that stockpile coverings are installed securely to protect from wind and rain.
- Some plastic covers withstand weather and sunlight better than others. Select cover materials or methods based on anticipated duration of use.

Protection of Non-Active Stockpiles

A stockpile is considered non-active if it either is not used for 14 days or if it is scheduled not to be used for 14 days or more. Stockpiles need to be protected immediately if they are not scheduled to be used within 14 days. Non-active stockpiles of the identified materials should be protected as follows:

Soil stockpiles

- Soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- Temporary vegetation should be considered for topsoil piles that will be stockpiled for extended periods.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- Stockpiles should be covered and protected with a temporary perimeter sediment barrier at all times.

Stockpiles of "cold mix"

- Cold mix stockpiles should be placed on and covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Stockpiles of fly ash, stucco, hydrated lime

Stockpile Management WM-3

- Stockpiles of materials that may raise the pH of runoff (i.e., basic materials) should be covered with plastic and surrounded by a berm.

Stockpiles/Storage of wood (Pressure treated with chromated copper arsenate or ammoniacal copper zinc arsenate

- Treated wood should be covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Protection of Active Stockpiles

A stockpile is active when it is being used or is scheduled to be used within 14 days of the previous use. Active stockpiles of the identified materials should be protected as follows:

- All stockpiles should be covered and protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" and treated wood, and basic materials should be placed on and covered with plastic sheeting or comparable material and surrounded by a berm prior to the onset of precipitation.
- The downstream perimeter of an active stockpile should be protected with a linear sediment barrier or berm and runoff should be diverted around or away from the stockpile on the upstream perimeter.

Costs

For cost information associated with stockpile protection refer to the individual erosion or sediment control BMP fact sheet considered for implementation (For example, refer to SE-1 Silt Fence for installation of silt fence around the perimeter of a stockpile.)

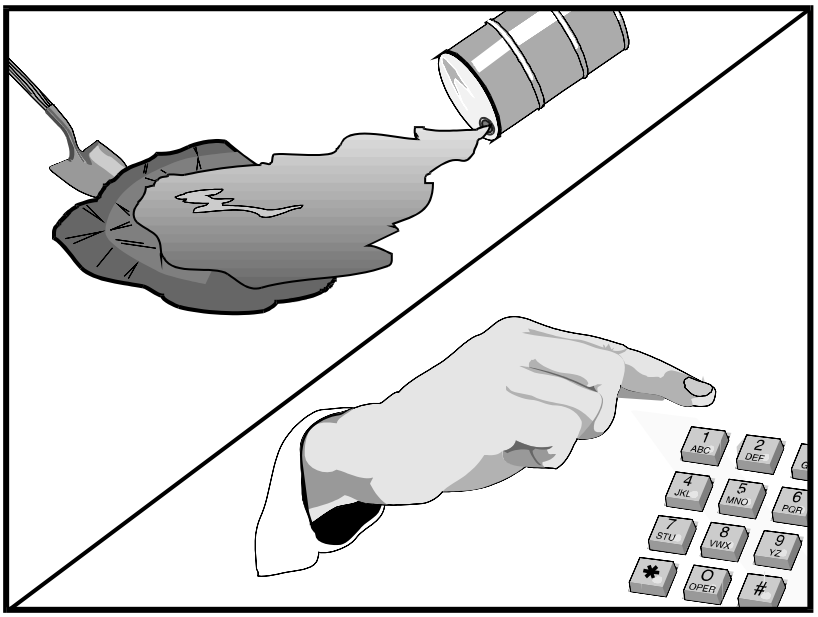
Inspection and Maintenance

- Stockpiles must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- It may be necessary to inspect stockpiles covered with plastic sheeting more frequently during certain conditions (for example, high winds or extreme heat).
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.
- Sediment shall be removed when it reaches one-third of the barrier height.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Spill Prevention and Control WM-4



Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Spill Prevention and Control WM-4

- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runon during rainfall to the extent that it doesn't compromise clean up activities.
- Do not bury or wash spills with water.

Spill Prevention and Control WM-4

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
  - Contain the spread of the spill.
  - Recover spilled materials.
  - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

Spill Prevention and Control WM-4

- Spills should be cleaned up immediately:
  - Contain spread of the spill.
  - Notify the project foreman immediately.
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
  - Notification should first be made by telephone and followed up with a written report.
  - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
  - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Spill Prevention and Control WM-4

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

Spill Prevention and Control WM-4

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

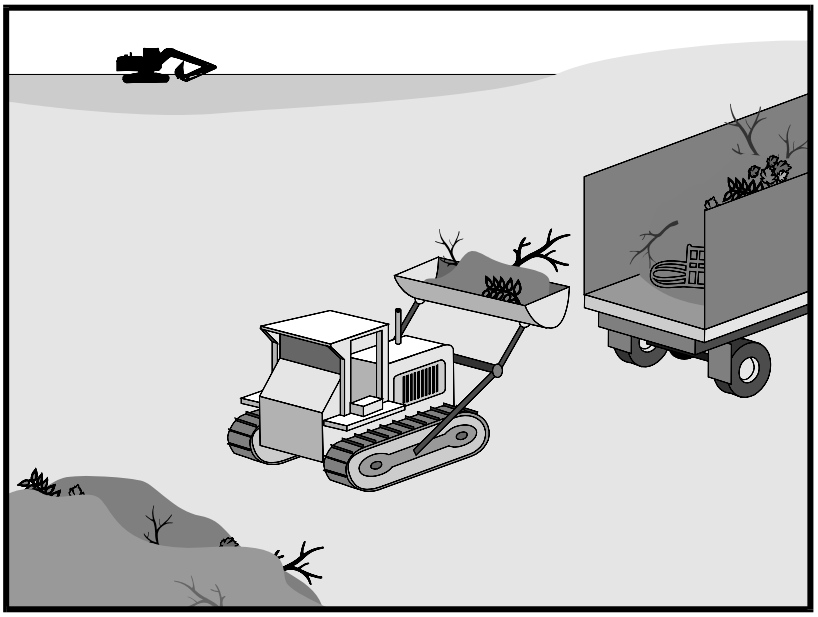
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Solid Waste Management WM-5



Categories

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SE	Sediment Control	
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WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

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Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces, and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials

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Solid Waste Management WM-5

- Highway planting wastes, including vegetative material, plant containers, and packaging materials

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Cover waste containers at the end of each work day and when it is raining.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runon should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.

- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur

- Inspect construction waste area regularly.

- Arrange for regular waste collection.

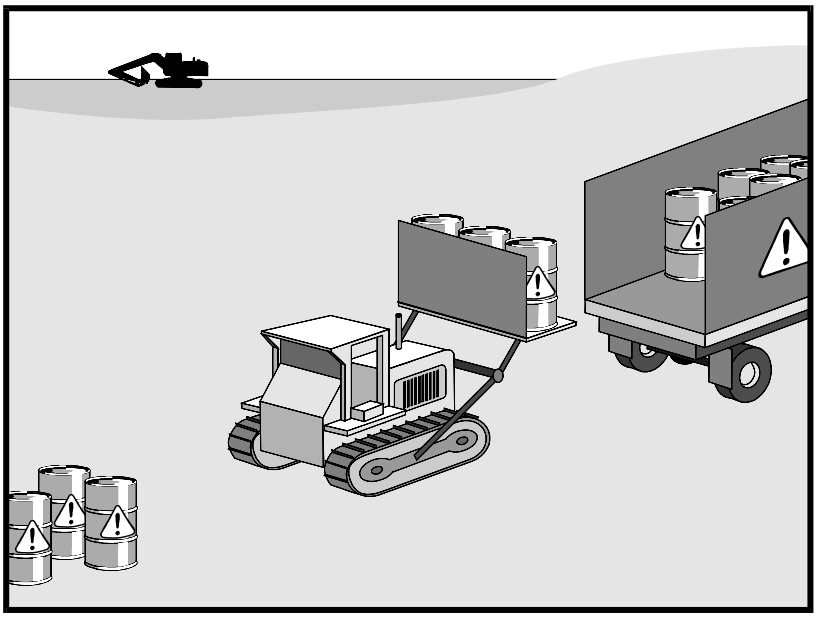
References

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Hazardous Waste Management WM-6



Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum Products
- Asphalt Products
- Concrete Curing Compounds
- Pesticides
- Palliatives
- Acids
- Septic Wastes
- Paints
- Stains
- Solvents
- Wood Preservatives
- Roofing Tar
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Hazardous Waste Management WM-6

In addition, sites with existing structures may contain wastes, which must be disposed of in accordance with federal, state, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints
- Asbestos
- PCBs (particularly in older transformers)

Limitations

- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Nothing in this BMP relieves the contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to WM-7, Contaminated Soil Management.

Implementation

The following steps will help reduce stormwater pollution from hazardous wastes:

Material Use

- Wastes should be stored in sealed containers constructed of a suitable material and should be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172, 173, 178, and 179.
- All hazardous waste should be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers should be stored in temporary containment facilities that should comply with the following requirements:
  - Temporary containment facility should provide for a spill containment volume equal to 1.5 times the volume of all containers able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.
  - Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours.
  - Temporary containment facilities should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids should be sent to an approved disposal site.
  - Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.

- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.

- Throughout the rainy season, temporary containment facilities should be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs.

- Drums should not be overfilled and wastes should not be mixed.

- Unless watertight, containers of dry waste should be stored on pallets.

- Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application. Allow time for infiltration and avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with federal and state regulations.

- Paint brushes and equipment for water and oil based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste.

- Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. "Paint out" brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and reuse thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.

- The following actions should be taken with respect to temporary contaminant:

  - Ensure that adequate hazardous waste storage volume is available.

  - Ensure that hazardous waste collection containers are conveniently located.

  - Designate hazardous waste storage areas onsite away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.

  - Minimize production or generation of hazardous materials and hazardous waste on the job site.

  - Use containment berms in fueling and maintenance areas and where the potential for spills is high.

  - Segregate potentially hazardous waste from non-hazardous construction site debris.

  - Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.

- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Do not mix wastes.
- Use all of the product before disposing of the container.
- Do not remove the original product label; it contains important safety and disposal information.

Waste Recycling Disposal

- Select designated hazardous waste collection areas onsite.
- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes, this can cause chemical reactions, making recycling impossible and complicating disposal.
- Recycle any useful materials such as used oil or water-based paint.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at authorized disposal areas.

Disposal Procedures

- Waste should be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A Department of Health Services certified laboratory should sample waste to determine the appropriate disposal facility.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

Hazardous Waste Management WM-6

Education

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The contractor's superintendent or representative should oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events..
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Hazardous waste should be regularly collected.
- A foreman or construction supervisor should monitor onsite hazardous waste storage and disposal procedures.
- Waste storage areas should be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

- Hazardous spills should be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.
- The National Response Center, at (800) 424-8802, should be notified of spills of federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302. Also notify the Governors Office of Emergency Services Warning Center at (916) 845-8911.
- A copy of the hazardous waste manifests should be provided.

References

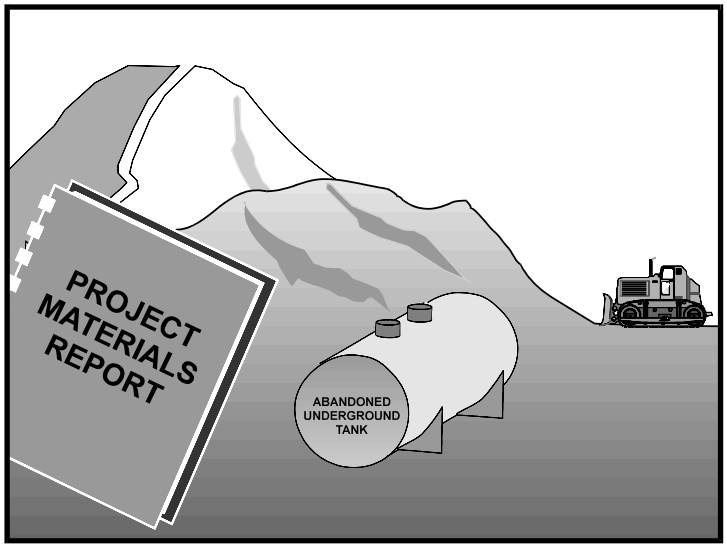
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Contaminated Soil Management WM-7



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from contaminated soil and highly acidic or alkaline soils by conducting pre-construction surveys, inspecting excavations regularly, and remediating contaminated soil promptly.

Suitable Applications

Contaminated soil management is implemented on construction projects in highly urbanized or industrial areas where soil contamination may have occurred due to spills, illicit discharges, aerial deposition, past use and leaks from underground storage tanks.

Limitations

Contaminated soils that cannot be treated onsite must be disposed of offsite by a licensed hazardous waste hauler. The presence of contaminated soil may indicate contaminated water as well. See NS-2, Dewatering Operations, for more information.

The procedures and practices presented in this BMP are general. The contractor should identify appropriate practices and procedures for the specific contaminants known to exist or discovered onsite.

Implementation

Most owners and developers conduct pre-construction environmental assessments as a matter of routine. Contaminated soils are often identified during project planning and development with known locations identified in the plans, specifications and in the SWPPP. The contractor should review applicable reports and investigate appropriate call-outs in the

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Contaminated Soil Management WM-7

plans, specifications, and SWPPP. Recent court rulings holding contractors liable for cleanup costs when they unknowingly move contaminated soil highlight the need for contractors to confirm a site assessment is completed before earth moving begins.

The following steps will help reduce stormwater pollution from contaminated soil:

- Conduct thorough, pre-construction inspections of the site and review documents related to the site. If inspection or reviews indicated presence of contaminated soils, develop a plan before starting work.
- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
- Prevent leaks and spills. Contaminated soil can be expensive to treat and dispose of properly. However, addressing the problem before construction is much less expensive than after the structures are in place.
- The contractor may further identify contaminated soils by investigating:
  - Past site uses and activities
  - Detected or undetected spills and leaks
  - Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements
  - Contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
  - Suspected soils should be tested at a certified laboratory.

Education

- Have employees and subcontractors complete a safety training program which meets 29 CFR 1910.120 and 8 CCR 5192 covering the potential hazards as identified, prior to performing any excavation work at the locations containing material classified as hazardous.
- Educate employees and subcontractors in identification of contaminated soil and on contaminated soil handling and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

Handling Procedures for Material with Aerially Deposited Lead (ADL)

- Materials from areas designated as containing (ADL) may, if allowed by the contract special provisions, be excavated, transported, and used in the construction of embankments and/or backfill.
- Excavation, transportation, and placement operations should result in no visible dust.
- Caution should be exercised to prevent spillage of lead containing material during transport.

- Quality should be monitored during excavation of soils contaminated with lead.

Handling Procedures for Contaminated Soils

- Minimize onsite storage. Contaminated soil should be disposed of properly in accordance with all applicable regulations. All hazardous waste storage will comply with the requirements in Title 22, CCR, Sections 66265.250 to 66265.260.
- Test suspected soils at an approved certified laboratory.
- Work with the local regulatory agencies to develop options for treatment or disposal if the soil is contaminated.
- Avoid temporary stockpiling of contaminated soils or hazardous material.
- Take the following precautions if temporary stockpiling is necessary:
  - Cover the stockpile with plastic sheeting or tarps.
  - Install a berm around the stockpile to prevent runoff from leaving the area.
  - Do not stockpile in or near storm drains or watercourses.
- Remove contaminated material and hazardous material on exteriors of transport vehicles and place either into the current transport vehicle or into the excavation prior to the vehicle leaving the exclusion zone.
- Monitor the air quality continuously during excavation operations at all locations containing hazardous material.
- Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the contaminated material and the hazardous material.
- Collect water from decontamination procedures and treat or dispose of it at an appropriate disposal site.
- Collect non-reusable protective equipment, once used by any personnel, and dispose of at an appropriate disposal site.
- Install temporary security fence to surround and secure the exclusion zone. Remove fencing when no longer needed.
- Excavate, transport, and dispose of contaminated material and hazardous material in accordance with the rules and regulations of the following agencies (the specifications of these agencies supersede the procedures outlined in this BMP):
  - United States Department of Transportation (USDOT)
  - United States Environmental Protection Agency (USEPA)
  - California Environmental Protection Agency (CAL-EPA)

- California Division of Occupation Safety and Health Administration (CAL-OSHA)
- Local regulatory agencies

Procedures for Underground Storage Tank Removals

- Prior to commencing tank removal operations, obtain the required underground storage tank removal permits and approval from the federal, state, and local agencies that have jurisdiction over such work.
- To determine if it contains hazardous substances, arrange to have tested, any liquid or sludge found in the underground tank prior to its removal.
- Following the tank removal, take soil samples beneath the excavated tank and perform analysis as required by the local agency representative(s).
- The underground storage tank, any liquid or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal and transported to disposal facilities permitted to accept such waste.

Water Control

- All necessary precautions and preventive measures should be taken to prevent the flow of water, including ground water, from mixing with hazardous substances or underground storage tank excavations. Such preventative measures may consist of, but are not limited to, berms, cofferdams, grout curtains, freeze walls, and seal course concrete or any combination thereof.
- If water does enter an excavation and becomes contaminated, such water, when necessary to proceed with the work, should be discharged to clean, closed top, watertight transportable holding tanks, treated, and disposed of in accordance with federal, state, and local laws.

Costs

Prevention of leaks and spills is inexpensive. Treatment or disposal of contaminated soil can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for contractor's Water Pollution Control Manager, foreman, and/or construction supervisor to monitor onsite contaminated soil storage and disposal procedures.
- Monitor air quality continuously during excavation operations at all locations containing hazardous material.
- Coordinate contaminated soils and hazardous substances/waste management with the appropriate federal, state, and local agencies.

- Implement WM-4, Spill Prevention and Control, to prevent leaks and spills as much as possible.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

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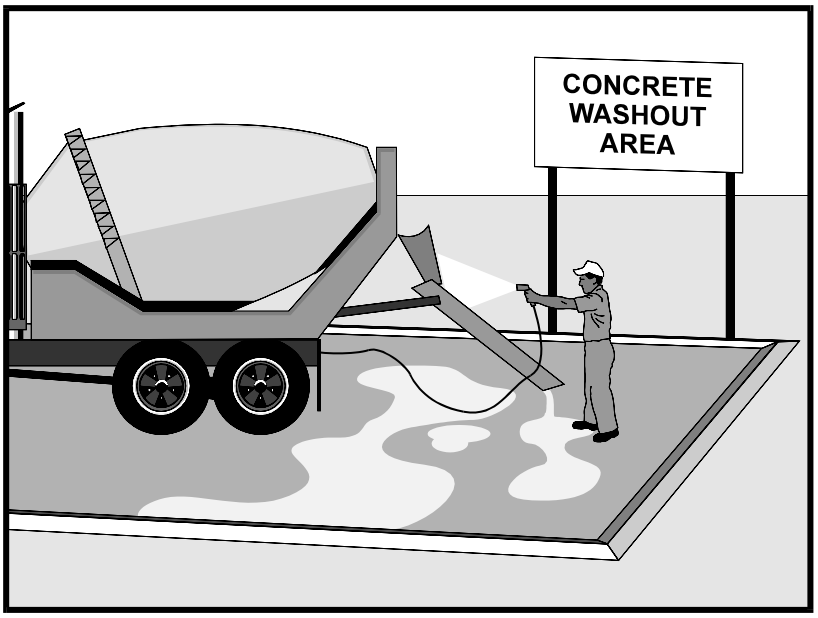
Concrete Waste Management WM-8



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Prevent the discharge of pollutants to stormwater from concrete waste by conducting washout onsite or offsite in a designated area, and by employee and subcontractor training.

The General Permit incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials, including mortar, concrete, stucco, cement and block and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows and raising pH to levels outside the accepted range.

Suitable Applications

Concrete waste management procedures and practices are implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Slurries containing portland cement concrete (PCC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition.
- Concrete trucks and other concrete-coated equipment are washed onsite.

Concrete Waste Management WM-8

- Mortar-mixing stations exist.
- Stucco mixing and spraying.
- See also NS-8, Vehicle and Equipment Cleaning.

Limitations

- Offsite washout of concrete wastes may not always be possible.
- Multiple washouts may be needed to assure adequate capacity and to allow for evaporation.

Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
- Store dry and wet materials under cover, away from drainage areas. Refer to WM-1, Material Delivery and Storage for more information.
- Avoid mixing excess amounts of concrete.
- Perform washout of concrete trucks in designated areas only, where washout will not reach stormwater.
- Do not wash out concrete trucks into storm drains, open ditches, streets, streams or onto the ground. Trucks should always be washed out into designated facilities.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- For onsite washout:
  - On larger sites, it is recommended to locate washout areas at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
  - Washout wastes into the temporary washout where the concrete can set, be broken up, and then disposed properly.
  - Washouts shall be implemented in a manner that prevents leaching to underlying soils. Washout containers must be water tight and washouts on or in the ground must be lined with a suitable impervious liner, typically a plastic type material.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.
- See typical concrete washout installation details at the end of this fact sheet.

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.

- Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.

- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.

Concrete Demolition Wastes

- Stockpile concrete demolition waste in accordance with BMP WM-3, Stockpile Management.

- Dispose of or recycle hardened concrete waste in accordance with applicable federal, state or local regulations.

Concrete Slurry Wastes

- PCC and AC waste should not be allowed to enter storm drains or watercourses.

- PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below).

- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.

- Saw-cut concrete slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine or by sweeping. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3, Paving and Grinding Operations; and WM-10, Liquid Waste Management.

- Concrete slurry residue should be disposed in a temporary washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5, Solid Waste Management.

Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.

- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.

- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

Concrete Waste Management WM-8

- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Temporary washout facilities should be lined to prevent discharge to the underlying ground or surrounding area.
- Washout of concrete trucks should be performed in designated areas only.
- Only concrete from mixer truck chutes should be washed into concrete wash out.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of or recycled offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of or recycle hardened concrete on a regular basis.
- Temporary Concrete Washout Facility (Type Above Grade)
  - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft; however, smaller sites or jobs may only need a smaller washout facility. With any washout, always maintain a sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
  - Materials used to construct the washout area should conform to the provisions detailed in their respective BMPs (e.g., SE-8 Sandbag Barrier).
  - Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
  - Alternatively, portable removable containers can be used as above grade concrete washouts. Also called a “roll-off”; this concrete washout facility should be properly sealed to prevent leakage, and should be removed from the site and replaced when the container reaches 75% capacity.
- Temporary Concrete Washout Facility (Type Below Grade)
  - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.
  - Lath and flagging should be commercial type.
  - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

Concrete Waste Management WM-8

- The base of a washout facility should be free of rock or debris that may damage a plastic liner.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and properly disposed or recycled in accordance with federal, state or local regulations. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and properly disposed or recycled in accordance with federal, state or local regulations..

- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

Costs

All of the above are low cost measures. Roll-0ff concrete washout facilities can be more costly than other measures due to removal and replacement; however, provide a cleaner alternative to traditional washouts. The type of washout facility, size, and availability of materials will determine the cost of the washout.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and properly disposed or recycled in accordance with federal, state or local regulations.

- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

- Inspect washout facilities for damage (e.g. torn liner, evidence of leaks, signage, etc.). Repair all identified damage.

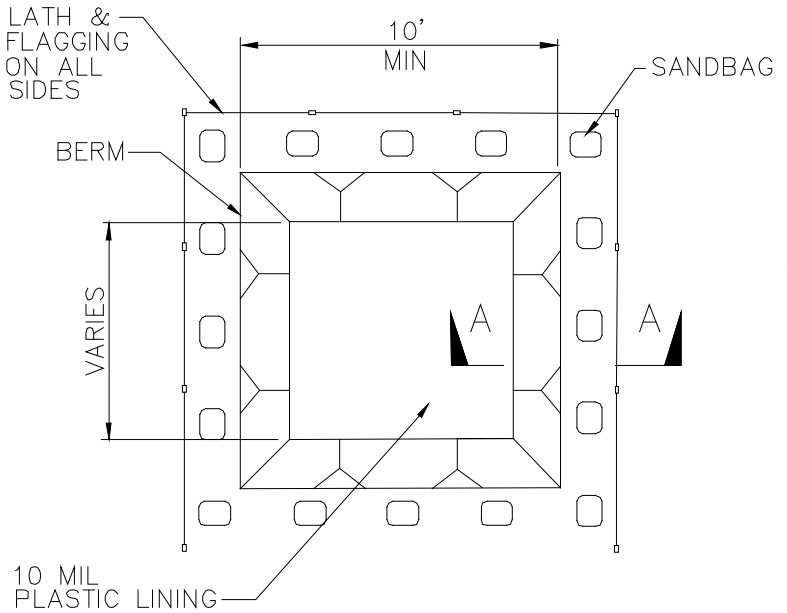
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

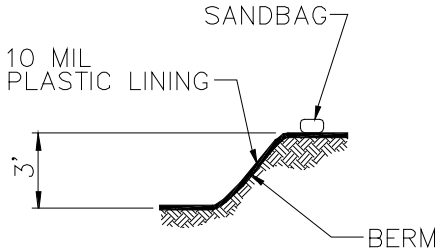
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000, Updated March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

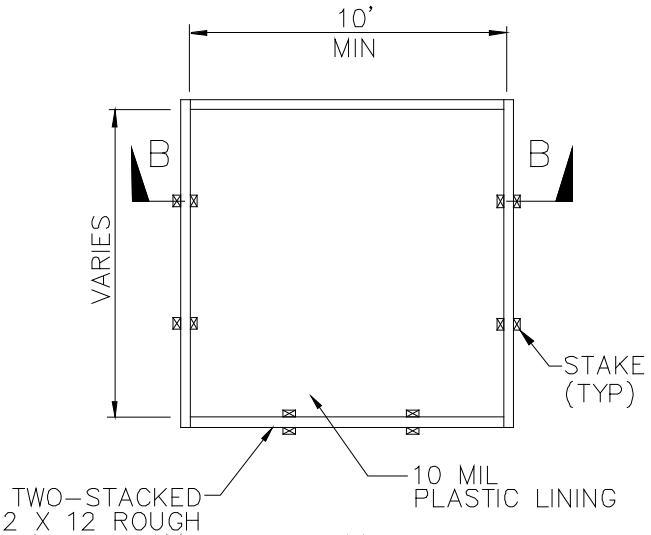
Concrete Waste Management WM-8



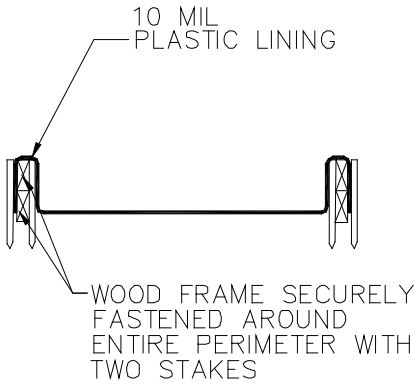
PLAN
NOT TO SCALE
TYPE "BELOW GRADE"



SECTION A–A
NOT TO SCALE



PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"

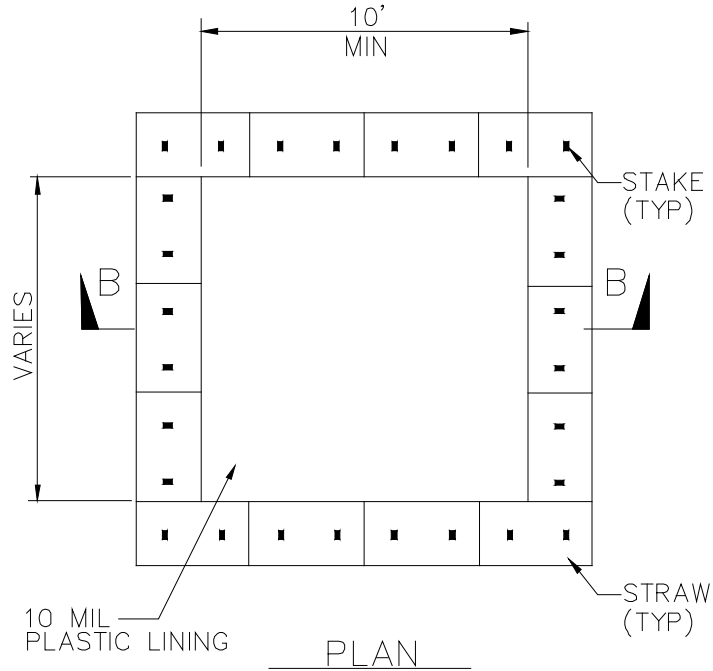


SECTION B–B
NOT TO SCALE

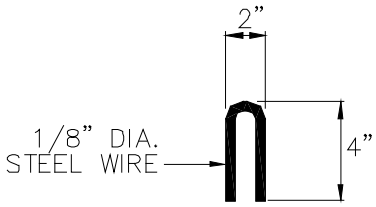
NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.

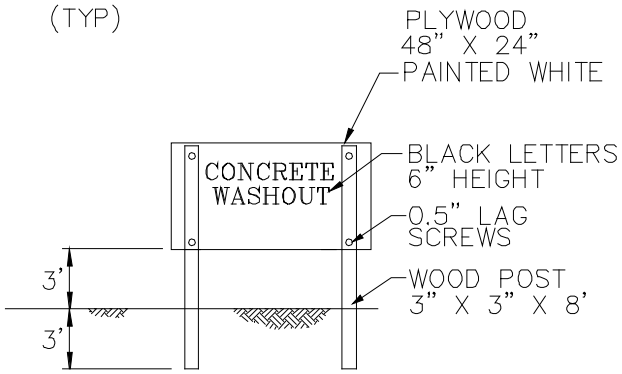
Concrete Waste Management WM-8



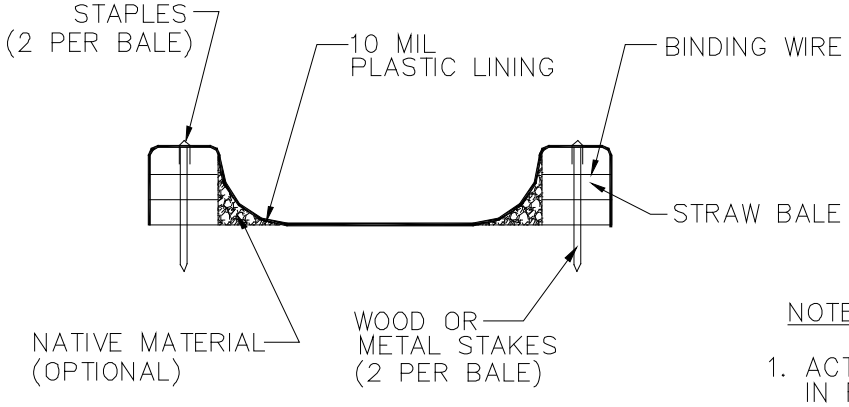
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"
WITH STRAW BALES



STAPLE DETAIL



CONCRETE WASHOUT
SIGN DETAIL
(OR EQUIVALENT)

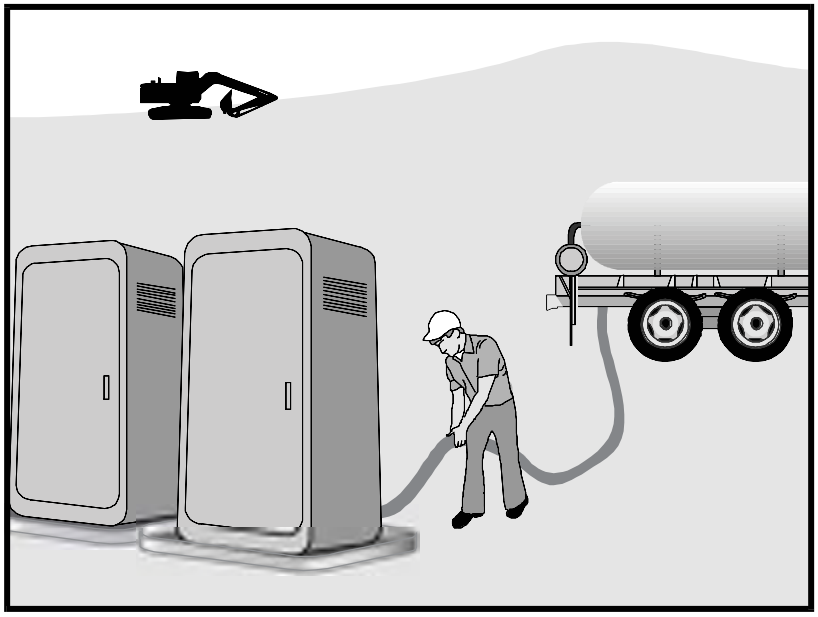


SECTION B–B
NOT TO SCALE

NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.

Sanitary/Septic Waste Management WM-9



Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. If site conditions allow, place portable facilities a minimum of 50 feet from drainage conveyances and traffic areas. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	☑
Oil and Grease	
Organics	☑

Potential Alternatives

None

Sanitary/Septic Waste Management WM-9

- Temporary sanitary facilities must be equipped with containment to prevent discharge of pollutants to the stormwater drainage system of the receiving water.
- Consider safety as well as environmental implications before placing temporary sanitary facilities.
- Wastewater should not be discharged or buried within the project site.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities overflow.
- If a spill does occur from a temporary sanitary facility, follow federal, state and local regulations for containment and clean-up.

Education

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce the use of sanitary facilities (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Costs

All of the above are low cost measures.

Sanitary/Septic Waste Management WM-9

Inspection and Maintenance

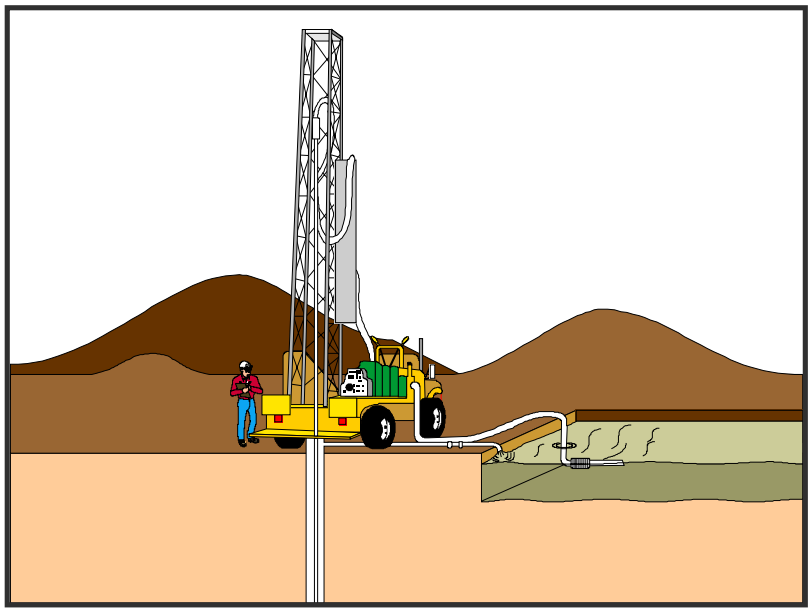
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.
- If spills or leaks from sanitary or septic facilities occur that are not contained and discharge from the site, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Liquid Waste Management WM-10



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Liquid waste management includes procedures and practices to prevent discharge of pollutants to the storm drain system or to watercourses as a result of the creation, collection, and disposal of non-hazardous liquid wastes.

Suitable Applications

Liquid waste management is applicable to construction projects that generate any of the following non-hazardous by-products, residuals, or wastes:

- Drilling slurries and drilling fluids
- Grease-free and oil-free wastewater and rinse water
- Dredgings
- Other non-stormwater liquid discharges not permitted by separate permits

Limitations

- Disposal of some liquid wastes may be subject to specific laws and regulations or to requirements of other permits secured for the construction project (e.g., NPDES permits, Army Corps permits, Coastal Commission permits, etc.).
- Liquid waste management does not apply to dewatering operations (NS-2 Dewatering Operations), solid waste management (WM-5, Solid Waste Management), hazardous wastes (WM-6, Hazardous Waste Management), or

concrete slurry residue (WM-8, Concrete Waste Management).

- Typical permitted non-stormwater discharges can include: water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; flows from riparian habitats and wetlands; and discharges or flows from emergency fire fighting activities.

Implementation

General Practices

- Instruct employees and subcontractors how to safely differentiate between non-hazardous liquid waste and potential or known hazardous liquid waste.
- Instruct employees, subcontractors, and suppliers that it is unacceptable for any liquid waste to enter any storm drainage device, waterway, or receiving water.
- Educate employees and subcontractors on liquid waste generating activities and liquid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Verify which non-stormwater discharges are permitted by the statewide NPDES permit; different regions might have different requirements not outlined in this permit.
- Apply NS-8, Vehicle and Equipment Cleaning for managing wash water and rinse water from vehicle and equipment cleaning operations.

Containing Liquid Wastes

- Drilling residue and drilling fluids should not be allowed to enter storm drains and watercourses and should be disposed of.
- If an appropriate location is available, drilling residue and drilling fluids that are exempt under Title 23, CCR § 2511(g) may be dried by infiltration and evaporation in a containment facility constructed in conformance with the provisions concerning the Temporary Concrete Washout Facilities detailed in WM-8, Concrete Waste Management.
- Liquid wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud, should be contained and not allowed to flow into drainage channels or receiving waters prior to treatment.
- Liquid wastes should be contained in a controlled area such as a holding pit, sediment basin, roll-off bin, or portable tank.
- Containment devices must be structurally sound and leak free.
- Containment devices must be of sufficient quantity or volume to completely contain the liquid wastes generated.

Liquid Waste Management WM-10

- Precautions should be taken to avoid spills or accidental releases of contained liquid wastes. Apply the education measures and spill response procedures outlined in WM-4, Spill Prevention and Control.

- Containment areas or devices should not be located where accidental release of the contained liquid can threaten health or safety or discharge to water bodies, channels, or storm drains.

Capturing Liquid Wastes

- Capture all liquid wastes that have the potential to affect the storm drainage system (such as wash water and rinse water from cleaning walls or pavement), before they run off a surface.

- Do not allow liquid wastes to flow or discharge uncontrolled. Use temporary dikes or berms to intercept flows and direct them to a containment area or device for capture.

- Use a sediment trap (SE-3, Sediment Trap) for capturing and treating sediment laden liquid waste or capture in a containment device and allow sediment to settle.

Disposing of Liquid Wastes

- A typical method to handle liquid waste is to dewater the contained liquid waste, using procedures such as described in NS-2, Dewatering Operations, and SE-2, Sediment Basin, and dispose of resulting solids per WM-5, Solid Waste Management.

- Methods of disposal for some liquid wastes may be prescribed in Water Quality Reports, NPDES permits, Environmental Impact Reports, 401 or 404 permits, and local agency discharge permits, etc. Review the SWPPP to see if disposal methods are identified.

- Liquid wastes, such as from dredged material, may require testing and certification whether it is hazardous or not before a disposal method can be determined.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management.

- If necessary, further treat liquid wastes prior to disposal. Treatment may include, though is not limited to, sedimentation, filtration, and chemical neutralization.

Costs

Prevention costs for liquid waste management are minimal. Costs increase if cleanup or fines are involved.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Remove deposited solids in containment areas and capturing devices as needed and at the completion of the task. Dispose of any solids as described in WM-5, Solid Waste Management.
- Inspect containment areas and capturing devices and repair as needed.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

APPENDIX F: BMP INSPECTION FORM

BMP INSPECTION REPORT

Date and Time of Inspection:			Date Report Written:	
Inspection Type: (Circle one)	Weekly *Complete Parts I,II,III and VII*	Pre-Storm *Complete Parts I,II,III,IV and VII*	During Rain Event *Complete Parts I, II, III, V, and VII*	Post-Storm *Complete Parts I,II,III,VI and VII*

Part I. General Information

Site Information

Construction Site Name: McKinley/Fowler Elementary School			
Construction stage and completed activities:			Approximate area of site that is exposed:
Photos Taken: (Circle one)	Yes	No	Photo Reference IDs:

Weather

Estimate storm beginning: (date and time)	Estimate storm duration: (hours)
Estimate time since last storm: (days or hours)	Rain gauge reading and location: (in)
Is a "Qualifying Event" predicted or did one occur (i.e., 0.5" rain with 48-hrs or greater between events)? (Y/N) If yes, summarize forecast:	

Exemption Documentation (explanation required if inspection could not be conducted). Visual inspections are not required outside of business hours or during dangerous weather conditions such as flooding or electrical storms.

Inspector Information

Inspector Name:	Inspector Title:	
Signature:		Date:

Part II. BMP Observations. **Describe deficiencies in Part III.**			
Minimum BMPs for Risk Level 1 Sites	Failures or other short comings (yes, no, N/A)	Action Required (yes/no)	Action Implemented (Date)
Good Housekeeping for Construction Materials			
Inventory of products (excluding materials designed to be outdoors)			
Stockpiled construction materials not actively in use are covered and bermed			
All chemicals are stored in watertight containers with appropriate secondary containment, or in a completely enclosed storage shed			
Construction materials are minimally exposed to precipitation			
BMPs preventing the off-site tracking of materials are implemented and properly effective			
Good Housekeeping for Waste Management			
Wash/rinse water and materials are prevented from being disposed into the storm drain system			
Portable toilets are contained to prevent discharges of waste			
Sanitation facilities are clean and with no apparent for leaks and spills			
Equipment is in place to cover waste disposal containers at the end of business day and during rain events			
Discharges from waste disposal containers are prevented from discharging to the storm drain system / receiving water			
Stockpiled waste material is securely protected from wind and rain if not actively in use			
Procedures are in place for addressing hazardous and non-hazardous spills			
Appropriate spill response personnel are assigned and trained			
Equipment and materials for cleanup of spills is available onsite			
Washout areas (e.g., concrete) are contained appropriately to prevent discharge or infiltration into the underlying soil			
Good Housekeeping for Vehicle Storage and Maintenance			
Measures are in place to prevent oil, grease, or fuel from leaking into the ground, storm drains, or surface waters			
All equipment or vehicles are fueled, maintained, and stored in a designated area with appropriate BMPs			
Vehicle and equipment leaks are cleaned immediately and disposed of properly			

Part II. BMP Observations Continued. Describe deficiencies in Part III.			
Minimum BMPs for Risk Level 1 Sites	Adequately designed, implemented and effective (yes, no, N/A)	Action Required (yes/no)	Action Implemented (Date)
Good Housekeeping for Landscape Materials			
Stockpiled landscape materials such as mulches and topsoil are contained and covered when not actively in use			
Erodible landscape material has not been applied 2 days before a forecasted rain event or during an event			
Erodible landscape materials are applied at quantities and rates in accordance with manufacturer recommendations			
Bagged erodible landscape materials are stored on pallets and covered			
Good Housekeeping for Air Deposition of Site Materials			
Good housekeeping measures are implemented onsite to control the air deposition of site materials and from site operations			
Non-Stormwater Management			
Non-Stormwater discharges are properly controlled			
Vehicles are washed in a manner to prevent non-stormwater discharges to surface waters or drainage systems			
Streets are cleaned in a manner to prevent unauthorized non-stormwater discharges to surface waters or drainage systems.			
Erosion Controls			
Wind erosion controls are effectively implemented			
Effective soil cover is provided for disturbed areas inactive (i.e., not scheduled to be disturbed for 14 days) as well as finished slopes, open space, utility backfill, and completed lots			
The use of plastic materials is limited in cases when a more sustainable, environmentally friendly alternative exists.			
Sediment Controls			
Perimeter controls are established and effective at controlling erosion and sediment discharges from the site			
Entrances and exits are stabilized to control erosion and sediment discharges from the site			
Sediment basins are properly maintained			
Run-On and Run-Off Controls			
Run-on to the site is effectively managed and directed away from all disturbed areas.			
Other			
Are the project SWPPP and BMP plan up to date, available on-site and being properly implemented?			

Part III. Descriptions of BMP Deficiencies		
Deficiency	**Repairs Implemented: Note - Repairs must begin within 72 hours of identification and, complete repairs as soon as possible.**	
	Start Date	**Action**
1.		
2.		
3.		
4.		

Part IV. Additional Pre-Storm Observations. Note the presence or absence of floating and suspended materials, sheen, discoloration, turbidity, odors, and source(s) of pollutants(s).	
	Yes, No, N/A
Do stormwater storage and containment areas have adequate freeboard? If no, complete Part III.	
Are drainage areas free of spills, leaks, or uncontrolled pollutant sources? If no, complete Part VII and describe below.	
Notes:	
Are stormwater storage and containment areas free of leaks? If no, complete Parts III and/or VII and describe below.	
Notes:	

Part V. Additional During Storm Observations. If BMPs cannot be inspected during inclement weather, list the results of visual inspections at all relevant outfalls, discharge points, and downstream locations. Note odors or visible sheen on the surface of discharges. Complete Part VII (Corrective Actions) as needed.	
Outfall, Discharge Point, or Other Downstream Location	
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description

Part VI. Additional Post-Storm Observations. Visually observe (inspect) stormwater discharges at all discharge locations within two business days (48 hours) after each qualifying rain event, and observe (inspect) the discharge of stored or contained stormwater that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Complete Part VII (Corrective Actions) as needed.	
Discharge Location, Storage or Containment Area	**Visual Observation**

Part VII. Additional Corrective Actions Required. Identify additional corrective actions not included with BMP Deficiencies (Part III) above. Note if SWPPP change is required.	
Required Actions	**Implementation Date**

APPENDIX G: TRAINING REPORTING FORM

Identification of QSP

Project Name: McKinley/Fowler Elementary School

WDID #:_____

The following are QSPs associated with this project

Name of Personnel(1)	Company	Date

(1) If additional QSPs are required on the job site add additional lines and include information here

Trained Contractor Personnel Log

Stormwater Management Training Log and Documentation

Project Name: McKinley/Fowler Elementary School
WDID #:_____

Stormwater Management Topic: (check as appropriate)

☐ Erosion Control
☐ Sediment Control
☐ Wind Erosion Control
☐ Tracking Control
☐ Non-Stormwater Management
☐ Waste Management and Materials Pollution Control
☐ Stormwater Sampling

Specific Training Objective: _____

Location: _____ Date: _____

Instructor:_____ Telephone: _____

Course Length (hours): _____

Attendee Roster (Attach additional forms if necessary)

Name	Company	Phone

As needed, add proof of external training (e.g., course completion certificates, credentials for QSP, QSD).

APPENDIX H: CONSTRUCTION GENERAL PERMIT

The State Water Resources Control Board National Pollutant Discharge Elimination System (NPDES) Construction General Permit, 2009-0009-DWQ as amended by 2010-0014-DWQ can be found at the following web site:

http://www.swrcb.ca.gov/water_issues/programs/stormwater/constpermits.shtml

Attachment C Risk Level 1 Requirements from the Construction General Permit can be reached through the hyperlink above.

APPENDIX I: AMENDMENT CERTIFICATION

SWPPP Amendment No. _____

Project Name: _____

Project Number: _____

Qualified SWPPP Developer's Certification of the

Stormwater Pollution Prevention Plan Amendment

"This Stormwater Pollution Prevention Plan and its appendices were prepared under my direction to meet the requirements of the California Construction General Permit (SWRCB Order No. 2009-009-DWQ as amended by 2010-0014-DWQ and 2012-0006-DWQ). I certify that I am a Qualified SWPPP Developer in good standing as of the date signed below."

QSD's Signature	Date
Paige Noga	00839
QSD Name	QSD Certificate Number
Vice Principle, PE, QSD	(559) 326-1400
Title and Affiliation	Telephone
451 Clovis Ave #200, Clovis, CA 93612	pnoga@bcf-engr.com
Address	Email

XX/XX/2023

Project: McKinley/Fowler Elementary School ***Darden Project #2116***
Client: Clovis Unified School District
Location: Fresno, CA

Colors listed have not yet been approved by district. Colors to be confirmed with owner prior to the commencement of work.

APPENDIX "B": INTERIOR COLOR SCHEDULE

AD1

MATERIAL	MANUFACTURER	REF #	DESCRIPTION
CAST-IN-PLACE CONCRETE			
Polished Concrete			
Color 1	-	-	Natural
Unless Otherwise Noted			
Color 2	Stain to match Bomanite	-	Black Orchid
Add Alternate #3			
MODULAR CASEWORK			
Plastic Laminate			
PL-1	Formica	756-58	Natural Maple
PL-2	Formica	S6027-T	Maritime Gray
PL-3	Formica	5883-58	Pecan Woodline
PL-4	Chemetal	227	Venetian Horizontal Corrugated
All cabinets to be PL-1, Unless otherwise noted. All plastic laminate countertops to be PL-2, Unless Otherwise Noted.			
RAKKS Bracket to be painted to match adjacent wall, UNO.			
Solid Surfacing			
SS-1	Corian	ST907	Ghost White
SS-2	HI-MACS	S103	Concrete Gray
Solid surface sills to be SS-1, UNO. Solid Surface sills to be SS-2 @ PAINT, Color 2.			
Bench Cap to be SS-2, UNO.			
Upholstery	Stinson	65087	Color Block, Energy
LAMINATE FACED WOOD DOORS			
Laminate	Formica	756-58	Natural Maple
STOREFRONT			
Door	Kawneer	14	Clear Anodized
Frame	Kawneer	14	Clear Anodized
Unless Otherwise Noted			
TILE			
Ceramic, Interior Floor Tile			
CT-1, Color 1	Daltile	D208	Suede Grey Speckle
Unless Otherwise Noted. Grout to be Custom Building Products #370 Dove Gray			
Ceramic, Interior Wall Tile			
CT-2	Daltile	0100	White
Unless Otherwise Noted. Grout to be Custom Building Products #11 Snow White.			
CT-3, Color 1	Daltile	0182	Suede Grey
CT-3, Color 2	Daltile	1097	Orange Burst
Refer to A/A803, D/A803, and E/A803. Grout to be Custom Building Products #11 Snow White.			

Project: McKinley/Fowler Elementary School ***Darden Project #2116***
Client: Clovis Unified School District
Location: Fresno, CA

Colors listed have not yet been approved by district. Colors to be confirmed with owner prior to the commencement of work.

APPENDIX "B": INTERIOR COLOR SCHEDULE

AD1

MATERIAL	MANUFACTURER	REF #	DESCRIPTION
HARDWOOD FLOOR			
Platform	-	-	Maple
RESILIENT BASE AND ACCESSORIES			
Rubber Base	Mannington	217	Charcoal
Color 1			
Unless Otherwise Noted			
Color 2	Mannington	323	Bluebonnet
To occur at BL-1 only. Where classrooms have both polished concrete and broadloom, rubber base to be Color 2			
RESILIENT SHEET			
Rubber Sheet	Mondo	HG 120	Pearl Grey
RESINOUS FLOORING			
Resinous Floor	Sherwin Williams	-	BC23, Stormy Evening
CARPET (OFCI)			
Carpet (Broadloom)			
BL-1	Tarkett	-	"Clovis Blue"
Unless Otherwise Noted			
Carpet (Modular)			
MT-1	Mohawk	GT341, 955	Digital Terrain, Coastal
MT-2	Mohawk	GT342, 955	Seismic Wave, Coastal
MT-3	Mohawk	GT343, 955	Gravitational, Coastal
MT-4	Mohawk	GT405, 252	Color Balance, Solar
Refer to interior design drawings. To be installed Brick Ashlar, UNO.			
Walk Off	Tarkett	02578, 19100	Abrasive Action II, Charcoal
WALL COVERINGS			
Fiberglass Reinforced Panels	Sequentia	85	White
Vinyl Covered Tackboard	Koroseal School Collection	-	Harborweave, Atrium
PAINT			
Gypsum Board/Cement Plaster			
Color 1	PPG to match Sherwin Williams		Swiss Coffee
Unless otherwise noted.			
Color 2	PPG to match Dunn Edwards	DE6376	Looking Glass
Color 3	PPG	PPG-1198-7	Sesame Crunch
Color 4	PPG to match Dunn Edwards	DE6377	Boat Anchor
Color 5	PPG	PPG1198-6	Carrot Cake

Colors listed have not yet been approved by district. Colors to be confirmed with owner prior to the commencement of work.

AD1

APPENDIX "B": INTERIOR COLOR SCHEDULE

MATERIAL	MANUFACTURER	REF #	DESCRIPTION
Color 6	PPG	PPG1001-7	Black Magic
Refer to drawings A/A801, A/A802, B/A801, B/A802, C/A801, C/A802, D/A801, D/A802, E/A801, E/A802, K/A801, K/A802			
Metal Doors/Frames			
Metal Doors	PPG	-	Match to adjacent wall color
Metal Frames	PPG	-	Match to adjacent wall color
Unless Otherwise Noted			
Metal Frames @ Laminate Faced Wood Doors	PPG	-	Match to adjacent wall color
Steel and Fabrications	PPG	-	Match to adjacent
Metal Deck			
Color 1	PPG to match Sherwin Williams		Swiss Coffee
Unless otherwise noted.			
Color 2	PPG to match Dunn Edwards	DE6376	Looking Glass
To occur at metal deck in Building E MPR Open Area 100 only.			
Mechanical	PPG	-	Match to adjacent
Plumbing	PPG	-	Match to adjacent
MISCELLANEOUS SPECIALTIES			
Cubicle Curtain	Architex	RX 6017	Magnolia
Operable Partition		-	
Whiteboard	Modernfold	-	White
To occur on Stage 103 side of partition			
Vinyl	Modernfold	541	Emboss LT Suede, B White
To occur on Multipurpose 100 side of partition			
Trim	Modernfold	-	Smoke Gray
Dimensional Letters			
Fabricated	Gemini		TBD
Cut Acrylic Type I	Gemini		TBD
Cut Acrylic Type II	Gemini		TBD
VISUAL DISPLAY BOARDS			
Liquid Markerboard	Claridge	-	White
Liquid Markerboard Panels	Claridge	-	White

Project: McKinley/Fowler Elementary School ***Darden Project #2116***
Client: Clovis Unified School District
Location: Fresno, CA

Colors listed have not yet been approved by district. Colors to be confirmed with owner prior to the commencement of work.

APPENDIX "B": INTERIOR COLOR SCHEDULE

AD1

MATERIAL	MANUFACTURER	REF #	DESCRIPTION
Recessed Display Case			
Tack	Claridge	1136	Graphite
Frame	Claridge	-	Clear Satin Anodized
TOILET PARTITIONS			
Solid Plastic Partition	Scranton	-	Grey, Orange Peel
WALL AND CORNER GUARDS			
Corner Guards			
Color 1	Inpro	0238	Feather
To occur at PAINT, Color 1			
Color 2	Inpro	0107	Pewter Gray
To occur at PAINT, Color 2			
Color 3	Inpro	152	Black
To occur at PAINT, Color 6			
Color 3			
To occur at bench wall in Building B 108, Building C 108 and Building D 110			
High Impact Wall Covering/Wall Guard			
Color 1	Inpro	0238	Feather
Unless otherwise Noted.			
Color 2	Inpro	0107	Pewter Gray
To occur at PAINT, Color 2			
METAL LOCKERS			
Metal Lockers	Republic Storage	20	Dove Gray
PLATFORM CURTAINS			
Curtains	Rose Brand		Slate

Project: McKinley/Fowler Elementary School ***Darden Project #2116***
Client: Clovis Unified School District
Location: Fresno, CA

Colors listed have not yet been approved by district. Colors to be confirmed with owner prior to the commencement of work.

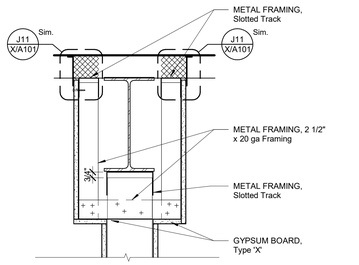
APPENDIX "B": INTERIOR COLOR SCHEDULE

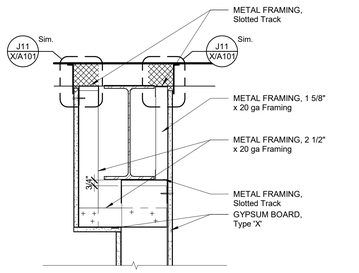
AD1

MATERIAL	MANUFACTURER	REF #	DESCRIPTION

NOTES:

1. The intent of this schedule is to clarify and detail the color and patterns of finishes. All information regarding construction conditions, casework, framing and ceiling details, etc. shall be per Architectural plans, unless otherwise noted.
2. Interior Color Schedule to be used in conjunction with Architectural plans and Specifications.
3. Paint colors listed on Interior Color Schedule are for color reference only. Refer to Architectural Specifications and Finish Schedules for information regarding paint systems.
4. Change of paint color to occur on an inside corner, unless otherwise noted.
5. All Gypsum Board surfaces to be painted Color 1, unless otherwise noted.
6. All vision light frames in laminate faced wood doors to match adjacent frame. All vision light frames in hollow metal doors to match door color.
7. All interior Wall Louver Assemblies receiving a field finish to be painted to match color of adjacent surface.
8. All access doors and frames to be painted to match color of adjacent surface.
9. All miscellaneous exposed to view metal and mechanical equipment receiving a field finish to be painted to match color of adjacent surface. If adjacent material is vinyl covered tackboard, paint to be Color 1.
10. All interior ladders and ladder assemblies receiving a field finish to be painted to match color of adjacent surface.
11. All accent paint, changes in paint color and extent of paint and accent paint to be verified by Darden Architects at job site prior to commencement of work.
12. All finishes to extend inside accessible base cabinets.
13. All modular casework edgebanding to match adjacent plastic laminate.
14. Modular Casework Apron, when directly adjacent to Base Cabinet, Plastic Laminate color shall match Base Cabinet.
15. All paints and stains are to be submitted in the form of brushouts to Darden Architects for approval prior to commencement of work.
16. All painted school logos, quotes and words to be coordinated with owner prior to commencement of work.
17. All MISCELLANEOUS SPECIALITIES, Dimensional Letters to be coordinated/confirmed with owner prior to the commencement of work.
18. Louvers located in doors shall match door color.

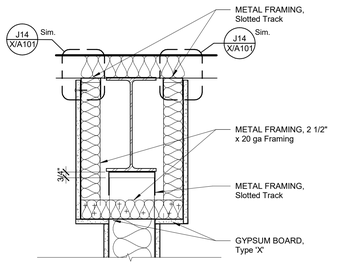


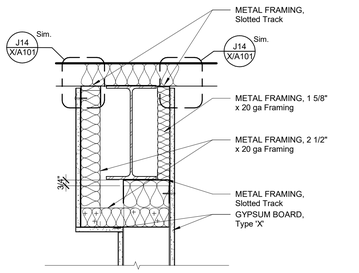


NOTE:
Refer to STRUCTURAL for typical Metal Stud Details, Framing, Attachments and Additional Information

J1 GYPSUM BOARD, Head of Rated wall at Steel Framing

1 1/2" = 1'-0"

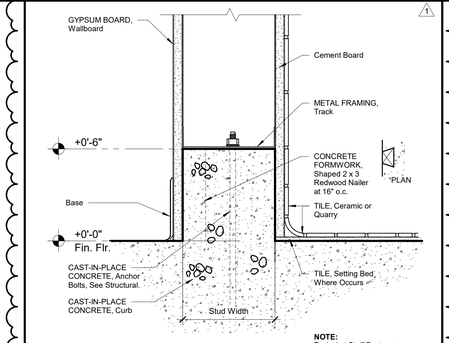




NOTE:
Refer to STRUCTURAL for typical Metal Stud Details, Framing, Attachments and Additional Information

J4 GYPSUM BOARD, Typical Non-Rated Wall at Steel Framing

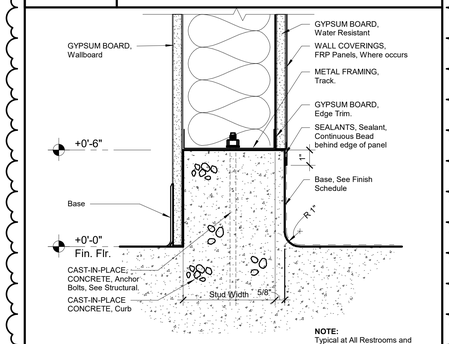
1 1/2" = 1'-0"



NOTE:
Typical at Staff Restrooms where Tile Flooring occurs

N7 CAST-IN-PLACE CONCRETE, Interior Wall Sill at Concrete Curb

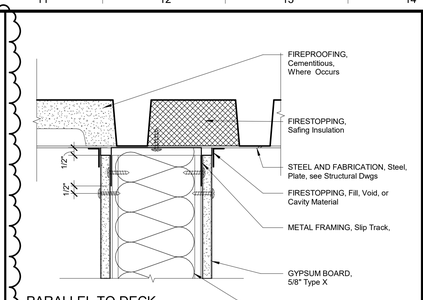
3" = 1'-0"



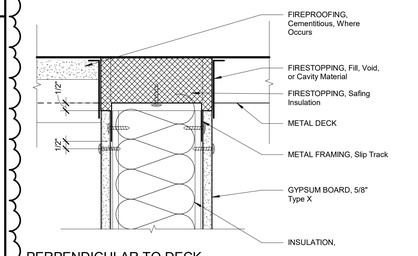
NOTE:
Typical at All Restrooms and Kitchen Areas where Epoxy Flooring occurs

J7 CAST-IN-PLACE CONCRETE, Interior Wall Sill at Concrete Curb

3" = 1'-0"



PARALLEL TO DECK

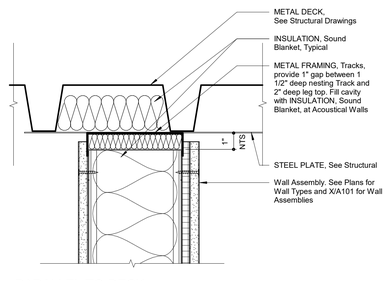


PERPENDICULAR TO DECK

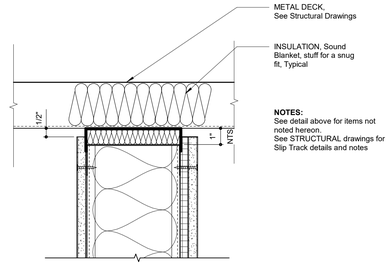
TOP OF WALL ASSEMBLY
3M-UL #HW-D-0020
HILTI-UL #HW-D-0042

J11 METAL FRAMING, 1 Hour Rated Wall at Metal Deck Without Concrete

3" = 1'-0"



PARALLEL TO DECK



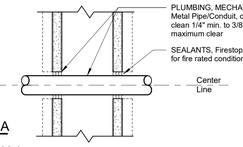
NOTES:
See detail above for items not noted hereon.
See STRUCTURAL drawings for Slip Track details and notes

PERPENDICULAR TO DECK

J14 INSULATION, Typical, Full Height, Non-Rated Walls

3" = 1'-0"

System No. W-L-1001
June 15, 2005
F Ratings — 1, 2, 3 and 4 Hr (See Items 2 and 3)
T Ratings — 0, 1, 2, 3, and 4 Hr (See Item 3)
L Rating At Ambient — less than 1 CFM/sq ft
L Rating At 400 F — less than 1 CFM/sq ft



SECTION A-A

NOTE: For 1" or larger Pipe/Conduit sizes, see Mechanical, Plumbing and Electrical drawings.

1. **Wall Assembly —** The 1, 2, 3 or 4 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner described in the individual U300 or U400 Series Wall or Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
A. **Studs —** Wall framing may consist of either wood studs (max 2 h fire rated assemblies) or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC with nom 2 by 4 in. (51 by 102 mm) lumber end plates and cross braces. Steel studs to be min 3-5/8 in. (92 mm) wide by 1-3/8 in. (35 mm) deep channels spaced max 24 in. (610 mm) OC.
B. **Gypsum Board* —** Nom 1/2 or 5/8 in. (13 or 16 mm) thick, 4 ft. (122 cm) wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 26 in. (660 mm).

2. **Through-Penetrant —** One metallic pipe, conduit or tubing installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and periphery of opening shall be min of 0 in / (0 mm). (point contact) to max 2 in. (51 mm) Pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
A. **Steel Pipe —** Nom 24 in. (610 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
B. **Iron Pipe —** Nom 24 in. (610 mm) diam (or smaller) service weight (or heavier) cast iron soil pipe, nom 12 in (305 mm) diam (or smaller) or Class 50 (or heavier) ductile iron pressure pipe.
C. **Conduit —** Nom 6 in. (152 mm) diam (or smaller) steel conduit or nom 4 in (102 mm) diam (or smaller) steel electrical metallic tubing
D. **Copper Tubing —** Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing
E. **Copper Pipe —** Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.
F. **Through Penetrating Product* —** Flexible Metal Piping The following types of steel flexible metal gas piping may be used:
1. Nom 2 in. (51 mm) diam (or smaller) steel flexible metal gas piping. Plastic covering on piping may or may not be removed on both sides of floor or wall assembly.
OMEGA FLEX INC
2. Nom 1 in. (25 mm) diam (or smaller) steel flexible metal gas piping. Plastic covering on piping may or may not be removed on both sides of floor or wall assembly.
GASTITE, DIV OF TITEFLEX
3. Nom 1 in. (25 mm) diam (or smaller) steel flexible metal gas piping. Plastic covering on piping may or may not be removed on both sides of floor or wall assembly.
WARD MFG L L C
3. **Fill, Void or Cavity Material* — Caulk or Sealant —** Min 5/8 , 1-1/4 1-7/8 and 2-1/2 in. (16, 32, 48 and 64 mm) thickness of caulk for 1, 2, 3 and 4 hr rated assemblies, respectively, applied within annulus, flush with both surfaces of wall. Min 1/4 in. (6 mm) diam bead of caulk applied to gypsum board/penetrant interface at point contact location on both sides of wall. The hourly F Rating of the firestop system is dependent upon the hourly fire rating of the wall assembly in which it is installed, as shown in the following table. The hourly T Rating of the firestop system is dependent upon the type or size of the pipe or conduit and the hourly fire rating of the wall assembly in which it is installed, as tabulated below:

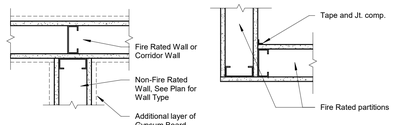
Max Pipe or Conduit Diam In (mm)	F Rating Hr	T Rating Hr
1 (25)	1 or 2	0+, 1 or 2
1 (25)	3 or 4	3 or 4
4 (102)	1 or 2	0
6 (152)	3 or 4	0
12 (305)	1 or 2	0

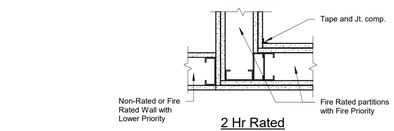
+When copper pipe is used, T Rating is 0 h.
3M COMPANY — CP 25WB+ or FB-3000 WT.

UL Design No. WL1001

A1 FIRESTOPPING, Interior Condition

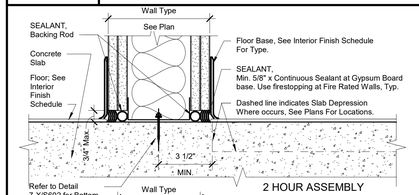
3" = 1'-0"

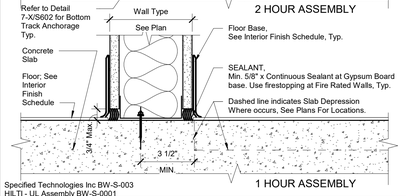




A4 GYPSUM BOARD, Partition Intersection At Rated Walls

1 1/2" = 1'-0"

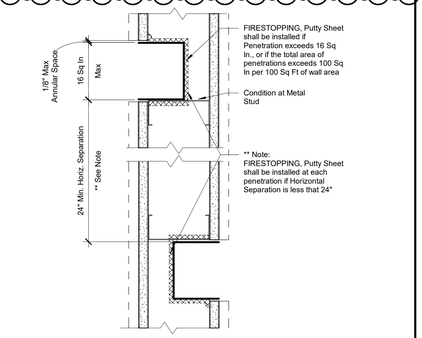




Specified Technologies Inc BW-S-003
HILTI - UL Assembly BW-S-0001

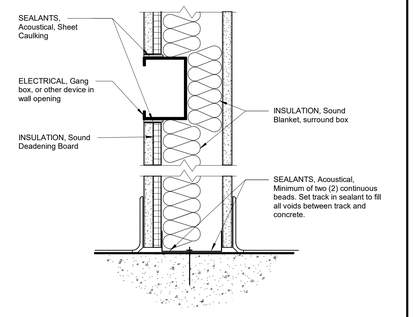
E4 GYPSUM BOARD, Partition Intersection At Rated Walls

1 1/2" = 1'-0"



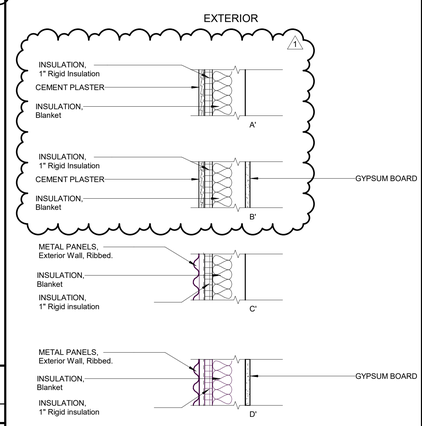
E7 FIRESTOPPING, Outlet Separation, Membrane Penetrations

3" = 1'-0"



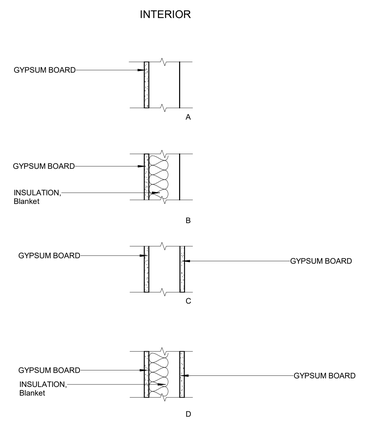
A7 INSULATION, Typical Wall Base & Openings at Non-Rated Walls

3" = 1'-0"



A11 Exterior Wall Assembly

1 1/2" = 1'-0"



A14 Interior Wall Assembly

1 1/2" = 1'-0"

DSA File No.:
10-48

DSA Application No.:
02-120543

Agency Approval

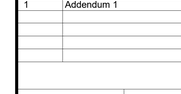
NOTES

1. These Schedules are provided for the convenience of the Contractor. All conditions and dimensions shall be field verified prior to any fabrication.
2. The intent of these schedules is to indicate the various layers of materials which comprise the different Wall Assemblies.
3. Refer to the Exterior Elevations and Exterior Finish Schedule for additional Wall Covering and for Material Finishes.
4. Refer to the Interior Elevations and Interior Finish Schedule for additional Wall Coverings and for Material Finishes.
5. Where Ceramic Tile Systems are designated, refer to the Finish Schedule and Specification Section for the appropriate Ceramic Tile System.
6. Provide a continuous Thermal Blanket Insulation at all walls designated as Exterior Walls. Refer to the Specification Section for the Insulation Type and location for Installation.
7. Provide a continuous Sound Blanket at walls designated as Interior walls where insulation is indicated as part of Assembly.
8. Refer to Floor Plans for Typical and Special Wall Assemblies References.
9. Refer to the Floor Plans for Walls that are Designated to be Rated Assemblies.
10. FIRE RATED WALLS.
   A. Refer to Floor Plans for Fire Resistive Rating of Typical Wall Assemblies and special Wall Assemblies.
   B. Fire Resistive Construction shall take Precedence over Sound Wall Construction.
   C. For Sealing Penetrations through Fire-Rated Walls Refer to Detail E11-X/A101.
   D. FIRE RESISTIVE CONSTRUCTION:
      1. Refer to the Floor Plans for Walls that are Designated to be Rated Assemblies.
      2. Stud size may exceed the minimum, and stud spacing may be less than the maximum stated in the referenced Fire Rated Assemblies. Refer to the Floor Plan Wall Assembly Symbols, Legends and Structural drawings for Stud Size and Spacing.

CBC Design XX-X.X (Table 720)	= Refer to California Building Code, Chapter 7 For Fire Resistive Standards and Notes.
FRDM Design WP-XXXX	= Refer to Gypsum Association Fire Resistive Design Manual for Fire Resistive Standards and Notes.
UL Fire Resistive Design U-4xx	= Refer to Underwriters Laboratories Fire Resistance Directory for Fire Resistive Standards and Notes.

   E. Construct Walls per Typical and Special Wall Assemblies. Note the details referenced, show typical single stud construction. Construct special Wall Assemblies similarly.
Non-Bearing Walls:
1) Connection to Floor or Roof Decks, Refer to Details ***J11-X/A101***
2) Connection to Framing, Refer to Details ***J4-X/A101***
12. Refer to Structural Sheets for Metal Stud Gauges and Lengths.

WALL ASSEMBLY SYMBOLS



DEFINITIONS

LOCATION
E = Exterior
I = Interior
A = Acoustical

STUD MATERIAL
W = Wood
M = Metal

NOMINAL STUD DEPTH

	METAL	WOOD
3 =	3 5/8"	2 1/2"
4 =	4"	3 1/2"
6 =	6"	5 1/2"
8 =	8"	7 1/2"
10 =	10"	9 1/4"
9 =	Special Wall Assemblies. Reserved for Special Construction, i.e., Multi-Stud Assemblies, refer to Special Wall Assembly Schedules	

WALL ASSEMBLIES
See Typical and Special Wall Assemblies Schedules

F18 Typical Wall Assemblies Legend

No scale

McKinley/Fowler Elementary School- Increment 2
Clovis Unified School District
Fresno, CA 93727
Project

TYPICAL INFORMATION
WALL ASSEMBLIES
Drawing

darden architects
ARCHITECTURE
PLANNING
INTERIORS
www.dardenarchitects.com
6790 N. West Ave. • Fresno, CA 93711 • T. 559.448.8051
LICENSED ARCHITECT ANDREW A. CORREA No. C37102 Exp. 11-30-25 STATE OF CALIFORNIA
Architect

No.	Revision/Submission	Date
1	Addendum 1	02/17/23

Revision

Designed Designer | Copyright 2022 Darden Architects
Scale: As indicated | Drawn By: Author
Project Number: 2116 | Checked IChecker
Date: 02/15/23 | ReviewedApprover

X/A101

2/19/2023 10:28:52 AM
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Interior Finish Schedule- Building A

Building	Room Number	Room Name	Floor Finishes: CAST-IN-PLACE CONCRETE, Concrete Slab,	CARPET, Broadloom	CARPET, Modular (MT-1, MT-2, MT-3 & MT-4)	CARPET, Walk-off	TILE, Ceramic Tile, SYS-IFA (Conc Sub Floor - Thin Set)	RESINOUS FLOORING, Resinous Floor	Base Finishes: RESILIENT BASE AND ACCESSORIES, Rubber Wall Base, 4"	TILE, Ceramic Tile, SYS-IWD (Cement Board - Thin Set)	RESINOUS FLOORING, Base	Wall Finishes: GYPSUM BOARD, Wallboard, (Texture GB-2)	GYPSUM BOARD, Water Resistant, (Texture GB-2)	TILE, Ceramic Tile, SYS-IWD (Cement Board - Thin Set),	WALL COVERINGS, Vinyl Covered Tackboard over Gypsum Board (GB-3)	FRP Panels over Gypsum Board, Water Resistant (GB-3)	ROUGH CARPENTRY, 3/4" Fire Resistant Plywood Sheathing over Gypsum Board	Ceiling Finishes: ACOUSTICAL CEILINGS, Suspension System,	GYPSUM BOARD, Wallboard (Texture GB-2),	METAL DECK, Metal Deck and Steel Beams,	METAL DECK, Acoustical Metal Deck,	Miscellanous Finishes: METAL DOORS AND FRAMES, Doors, Panels and Frames	LAMINATE-FACED WOOD DOORS	Remarks
A	100	Main Office	PC	-	FF	FF	-	-	FF	-	-	DW-5	-	-	FF	-	-	FF	DW-1	-	M-1	M-2	FF	1, 3
A	101	Office	-	FF	-	-	-	-	FF	-	-	-	-	-	FF	-	-	FF	-	-	-	M-2	FF	1
A	102	Office	-	FF	-	-	-	-	FF	-	-	-	-	-	FF	-	-	FF	-	-	-	M-2	FF	1
A	103	Conference	-	-	FF	-	-	-	FF	-	-	DW-5	-	-	FF	-	-	FF	-	-	-	-	FF	1
A	104	Telecom Room	CFS	-	-	-	-	-	FF	-	-	DW-5	-	-	-	-	W-2	-	-	-	M-1	M-2	FF	-
A	105	Principal's Office	-	FF	-	-	-	-	FF	-	-	DW-5	-	-	FF	-	-	FF	DW-1	-	-	M-2	FF	1
A	106	Staff Restroom	-	-	-	-	CT-1	-	-	CT-1	-	-	DW-5	CT-2, CT-3	-	-	-	-	DW-5	-	-	M-2	FF	
A	107	Custodial	CFS	-	-	-	-	-	FF	-	-	-	-	-	-	FF	-	-	DW-5	-	-	M-2	FF	
A	108	Staff Restroom	-	-	-	-	CT-1	-	-	CT-1	-	-	DW-5	CT-2, CT-3	-	-	-	-	DW-5	-	-	M-2	FF	
A	109	Storage	CFS	-	-	-	-	-	FF	-	-	DW-5	-	-	-	-	-	FF	-	-	-	M-2	FF	
A	110	Workroom	PC	-	-	-	-	-	FF	-	-	-	-	-	FF	-	-	FF	DW-1	-	-	M-2	FF	3
A	111	GIS Office	-	FF	-	-	-	-	FF	-	-	-	-	-	FF	-	-	FF	DW-1	-	-	M-2	FF	1
A	112	Nurse	PC	-	-	-	-	-	FF	-	-	DW-5	-	-	-	-	-	FF	DW-1	-	-	M-2	FF	3
A	112a	Toilet	-	-	-	-	-	RF-1	-	-	RF-1	-	-	-	FF	-	-	-	DW-5	-	-	M-2	FF	
A	113	Library Open Area	-	-	FF	FF	-	-	FF	-	-	DW-5	-	-	FF	-	-	FF	DW-1	-	M-1	M-2	FF	1
A	113a	Reading	-	-	FF	-	-	-	FF	-	-	DW-5	-	-	-	-	-	-	-	-	M-1	-	-	1
A	114	Library Classroom	-	FF	-	FF	-	-	FF	-	-	-	-	-	FF	-	-	FF	-	-	-	M-2	FF	1
A	114a	Roof Access	CFS	-	-	-	-	-	FF	-	-	DW-5	-	-	-	-	-	-	-	-	M-1	M-2	FF	
A	115	Library Storage	-	FF	-	-	-	-	FF	-	-	DW-5	-	-	-	-	-	FF	-	-	-	M-2	FF	1
A	116	Hallway	PC	-	-	FF	-	-	FF	CT-2	-	DW-5	-	CT-2, CT-3	-	-	-	-	DW-1	-	M-1	M-2	FF	1, 2, 3
A	117	Hallway	PC	-	-	FF	-	-	FF	-	-	DW-5	-	-	-	-	-	FF	-	-	-	M-2	FF	1, 3
A	118	Hallway	PC	-	-	FF	-	-	FF	-	-	DW-5	-	-	-	-	-	FF	-	-	-	M-2	FF	1, 3
A	119	Fire Riser	CFS	-	-	-	-	-	FF	-	-	DW-5	-	-	-	-	-	-	-	-	M-1	M-2	-	
A	120	Electrical Room	CFS	-	-	-	-	-	FF	-	-	DW-5	-	-	-	-	-	FF	-	-	-	M-2	FF	

J1 — Interior Finish Schedule- Building A
No Scale — Refer to H18 for Abbreviations, Notes and Remarks

Interior Finish Schedule- Building B

Building	Room Number	Room Name	Floor Finishes: CAST-IN-PLACE CONCRETE, Concrete Slab,	CARPET, Broadloom	CARPET, Modular (MT-1, MT-2, MT-3 & MT-4)	CARPET, Walk-off	RESINOUS FLOORING, Resinous Floor	Base Finishes: RESILIENT BASE AND ACCESSORIES, Rubber Wall Base, 4"	RESINOUS FLOORING, Base	Wainscot Finishes: WALL AND CORNER GUARDS, Impact Resistant Wall Coverings	Wall Finishes: GYPSUM BOARD, Wallboard, (Texture GB-2)	WALL COVERINGS, Vinyl Covered Tackboard over Gypsum Board (GB-3)	FRP Panels over Gypsum Board, Water Resistant (GB-3)	ROUGH CARPENTRY, 3/4" Fire Resistant Plywood over Gypsum Board	WALL COVERINGS, Custom Printed Tackable Panels	Ceiling Finishes: ACOUSTICAL CEILINGS, Suspension System,	GYPSUM BOARD, Wallboard (Texture GB-2),	Miscellanous Finishes: METAL DOORS AND FRAMES, Doors, Panels and Frames	LAMINATE-FACED WOOD DOORS	Remarks
B	100	Classroom- Lower Grade	PC	FF	-	-	-	FF	-	-	-	FF	-	-	-	FF	DW-1	M-2	FF	-	1, 3
B	101	Classroom- Lower Grade	PC	FF	-	-	-	FF	-	-	-	FF	-	-	-	FF	DW-1	M-2	FF	-	1, 3
B	102	Classroom- Lower Grade	PC	FF	-	-	-	FF	-	-	-	FF	-	-	-	FF	DW-1	M-2	FF	-	1, 3
B	103	Classroom- Lower Grade	PC	FF	-	-	-	FF	-	-	-	FF	-	-	-	FF	DW-1	M-2	FF	-	1, 3
B	104	Classroom- Lower Grade	PC	FF	-	-	-	FF	-	-	-	FF	-	-	-	FF	DW-1	M-2	FF	-	1, 3
B	105	Classroom- Lower Grade	PC	FF	-	-	-	FF	-	-	-	FF	-	-	-	FF	DW-1	M-2	FF	-	1, 3
B	106	Classroom- Lower Grade	PC	FF	-	FF	-	FF	-	-	-	FF	-	-	-	FF	DW-1	M-2	FF	-	1, 3
B	106a	Restroom	-	-	-	-	RF-1	-	RF-1	-	-	-	-	FF	-	-	-	M-2	FF	-	
B	107	Classroom- Lower Grade	PC	FF	-	FF	-	FF	-	-	FF	-	-	FF	-	FF	DW-1	M-2	FF	-	1, 3
B	108	Corridor	PC	-	-	FF	-	FF	-	-	FF	DW-5	FF	-	-	FF	DW-1	M-2	FF	FF	1, 3
B	109	Student Restroom	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DW-5	M-2	FF	-	
B	110	Student Restroom	-	-	-	-	RF-1	-	RF-1	-	-	-	-	FF	-	-	DW-5	M-2	FF	-	
B	111	Telecom Room	CFS	-	-	-	-	FF	-	-	DW-5	-	-	-	-	-	DW-1	M-2	-	-	
B	112	Electrical Room	CFS	-	-	-	-	FF	-	-	DW-5	-	-	-	-	-	DW-1	M-2	-	-	
B	113	Fire Riser/ Custodial Closet	CFS	-	-	-	-	FF	-	-	-	-	FF	-	-	-	DW-5	M-2	FF	-	

J9 — Interior Finish Schedule- Building B
No Scale — Refer to H18 for Abbreviations, Notes and Remarks

Interior Finish Schedule- Building C

Building	Room Number	Room Name	Floor Finishes: CAST-IN-PLACE CONCRETE, Concrete Slab,	CARPET, Broadloom	CARPET, Walk-off	TILE, Ceramic Tile, SYS-IFA (Conc Sub Floor - Thin Set)	RESINOUS FLOORING, Resinous Floor	Base Finishes: RESILIENT BASE AND ACCESSORIES, Rubber Wall Base, 4"	TILE, Ceramic Tile, SYS-IWD (WR Gyp Bd - Thin Set)	RESINOUS FLOORING, Base	Wainscot Finishes: WALL AND CORNER GUARDS, Impact Resistant Wall Coverings	Wall Finishes: GYPSUM BOARD, Wallboard, (Texture GB-2)	TILE, Ceramic Tile, SYS-IWD (WR Gyp Bd - Thin Set),	WALL COVERINGS, Vinyl Covered Tackboard over Gypsum Board (GB-3)	FRP Panels over Gypsum Board, Water Resistant (GB-3)	ROUGH CARPENTRY, 3/4" Fire Resistant Plywood over Gypsum Board	WALL COVERINGS, Custom Printed Tackable Panels	Ceiling Finishes: ACOUSTICAL CEILINGS, Suspension System,	GYPSUM BOARD, Wallboard (Texture GB-2),	METAL DECK, Metal Deck and Steel Beams,	Miscellanous Finishes: METAL DOORS AND FRAMES, Doors, Panels and Frames	LAMINATE-FACED WOOD DOORS	Remarks
C	100	Classroom- Upper Grade	PC	FF	-	-	-	FF	-	-	-	-	-	-	FF	-	-	FF	DW-1	-	M-2	FF	1, 3
C	101	Classroom- Upper Grade	PC	FF	-	-	-	FF	-	-	-	-	-	-	FF	-	-	FF	DW-1	-	M-2	FF	1, 3
C	102	Classroom- Upper Grade	PC	FF	-	-	-	FF	-	-	-	-	-	-	FF	-	-	FF	DW-1	-	M-2	FF	1, 3
C	103	Classroom- Upper Grade	PC	FF	-	-	-	FF	-	-	-	-	-	-	FF	-	-	FF	DW-1	-	M-2	FF	1, 3
C	104	Classroom- Upper Grade	PC	FF	-	-	-	FF	-	-	-	-	-	-	FF	-	-	FF	DW-1	-	M-2	FF	1, 3
C	105	Classroom- Upper Grade	PC	FF	-	-	-	FF	-	-	-	-	-	-	FF	-	-	FF	DW-1	-	M-2	FF	1, 3
C	106	Classroom- Upper Grade	PC	FF	-	-	-	FF	-	-	-	-	-	-	FF	-	-	FF	DW-1	-	M-2	FF	1, 3
C	107	Classroom- Upper Grade	PC	FF	-	-	-	FF	-	-	-	-	-	-	FF	-	-	FF	DW-1	-	M-2	FF	1, 3
C	108	Corridor	PC	-	FF	-	-	FF	-	-	FF	-	DW-5	-	FF	-	-	FF	DW-1	-	M-2	FF	1, 3
C	109	Student Restroom	-	-	-	-	RF-1	-	-	RF-1	-	-	-	-	FF	-	-	-	DW-5	-	M-2	FF	
C	110	Student Restroom	-	-	-	-	RF-1	-	-	RF-1	-	-	-	-	FF	-	-	-	DW-5	-	M-2	FF	
C	111	Staff Restroom	-	-	-	CT-1	-	FF	CT-1	-	-	-	DW-5	CT-2, CT-3	-	-	-	-	DW-5	-	M-2	-	
C	112	Telecom Room	CFS	-	-	-	-	FF	-	-	-	-	DW-5	-	-	-	W-2	-	-	-	M-1	M-2	FF	
C	113	Fire Riser/Custodial	CFS	-	-	-	-	FF	-	-	-	-	-	-	-	FF	-	-	DW-5	-	M-1	M-2	FF	
C	114	Electrical Room	CFS	-	-	-	-	FF	-	-	-	-	DW-5	-	-	-	-	-	-	-	-	M-2	FF	

A1 — Interior Finish Schedule- Building C
No Scale — Refer to H18 for Abbreviations, Notes and Remarks

Interior Finish Schedule- Building D

Building	Room Number	Room Name	Floor Finishes: CAST-IN-PLACE CONCRETE, Concrete Slab,	CARPET, Broadloom	CARPET, Modular (MT-1, MT-2, MT-3 & MT-4)	CARPET, Walk-off	TILE, Ceramic Tile, SYS-IFA (Conc Sub Floor - Thin Set)	RESINOUS FLOORING, Resinous Floor	Base Finishes: RESILIENT BASE AND ACCESSORIES, Rubber Wall Base, 4"	TILE, Ceramic Tile, SYS-IWD (Cement Board - Thin Set)	RESINOUS FLOORING, Base	Wainscot Finishes: WALL AND CORNER GUARDS, Impact Resistant Wall Coverings	Wall Finishes: GYPSUM BOARD, Wallboard, (Texture GB-2)	GYPSUM BOARD, Water Resistant, (Texture GB-2)	TILE, Ceramic Tile, SYS-IWD (Cement Board - Thin Set),	WALL COVERINGS, Vinyl Covered Tackboard over Gypsum Board (GB-3)	FRP Panels over Gypsum Board, Water Resistant (GB-3)	ROUGH CARPENTRY, 3/4" Fire Resistant Plywood over Gypsum Board	WALL COVERINGS, Custom Printed Tackable Panels	Ceiling Finishes: ACOUSTICAL CEILINGS, Suspension System,	CEMENT PLASTER, System	GYPSUM BOARD, Wallboard (Texture GB-2),	METAL DECK, Metal Deck and Steel Beams,	Miscellanous Finishes: METAL DOORS AND FRAMES, Doors, Panels and Frames	LAMINATE-FACED WOOD DOORS	Remarks
D	100	Classroom- Lower Grade	PC	FF	-	-	-	-	FF	-	-	-	-	-	-	-	-	-	-	-	FF	-	DW-1	-	M-2	FF	1, 3
D	101	Classroom- Lower Grade	PC	FF	-	-	-	-	FF	-	-	-	-	-	-	-	-	-	-	-	FF	-	DW-1	-	M-2	FF	1, 3
D	102	Classroom- Lower Grade	PC	FF	-	FF	-	-	FF	-	-	-	-	-	-	-	-	-	-	-	FF	-	DW-1	-	M-2	FF	1, 3
D	103	Classroom- Lower Grade	PC	FF	-	FF	-	-	FF	-	-	-	-	-	-	-	-	-	-	-	FF	-	DW-1	-	M-2	FF	1, 3
D	104	Classroom- Lower Grade	PC	FF	-	-	-	-	FF	-	-	-	-	-	-	-	-	-	-	-	FF	-	DW-1	-	M-2	FF	1, 3
D	105	Classroom- Lower Grade	PC	FF	-	-	-	-	FF	-	-	-	-	-	-	-	-	-	-	-	FF	-	DW-1	-	M-2	FF	1, 3
D	106	Classroom- Lower Grade	PC	FF	-	-	-	-	FF	-	-	-	-	-	-	-	-	-	-	-	FF	-	DW-1	-	M-2	FF	1, 3
D	107	Classroom- Upper Grade	PC	FF	-	-	-	-	FF	-	-	-	-	-	-	-	-	-	-	-	FF	-	DW-1	-	M-2	FF	1, 3
D	108	Classroom- Upper Grade	PC	FF	-	-	-	-	FF	-	-	-	-	-	-	-	-	-	-	-	FF	-	DW-1	-	M-2	FF	1, 3
D	109	Classroom- Upper Grade	PC	FF	-	-	-	-	FF	-	-	-	-	-	-	-	-	-	-	-	FF	-	DW-1	-	M-2	FF	1, 3
D	110	Corridor	PC	-	-	FF	-	-	FF	-	-	FF	DW-5	-	-	-	-	FF	-	-	FF	-	DW-1	-	M-2	FF	1, 3
D	112	Hallway	PC	-	-	FF	-	-	FF	-	-	FF	DW-5	-	-	-	-	-	-	-	FF	-	DW-1	-	M-2	-	1, 3
D	113	Telecom Room	CFS	-	-	-	-	-	FF	-	-	-	DW-5	-	-	-	-	-	W-2	-	-	-	-	-	M-1	M-2	FF	
D	114	Electrical Room	CFS	-	-	-	-	-	FF	-	-	-	DW-5	-	-	-	-	-	-	-	-	-	-	-	M-1	M-2	FF	
D	114a	Fire Riser	CFS	-	-	-	-	-	FF	-	-	-	DW-5	-	-	-	-	-	-	-	-	-	-	-	M-1	M-2	-	
D	115	Concession	CFS	-	-	-	-	-	FF	-	-	-	-	-	-	-	-	FF	-	-	-	P-1	-	-	M-2	FF	
D	115a	Storage	CFS	-	-	-	-	-	FF	-	-	-	-	-	-	-	-	FF	-	-	-	P-1	-	-	M-2	FF	
D	116	Field Storage	CFS	-	-	-	-	-	FF	-	-	-	DW-5	-	-	-	-	-	W-2	-	-	-	-	M-1	M-2	-	
D	117	Student Restroom	-	-	-	-	-	RF-1	-	-	RF-1	-	-	-	-	-	FF	-	-	-	P-2	-	-	M-2	-	
D	118	Student Restroom	-	-	-	-	-	RF-1	-	-	RF-1	-	-	-	-	-	FF	-	-	-	P-2	-	-	M-2	-	
D	119	Custodial	CFS	-	-	-	-	-	FF	-	-	-	-	-	-	-	-	FF	-	-	-	P-2	-	-	M-2	-	
D	120	Staff/Adult Restrooms	-	-	-	-	CT-1	-	-	CT-1	-	-	-	DW-5	CT-2, CT-3	-	-	-	-	-	-	P-2	-	-	M-2	-	
D	121	Staff/Adult Restrooms	-	-	-	-	CT-1	-	-	CT-1	-	-	-	DW-5	CT-2, CT-3	-	-	-	-	-	-	P-2	-	-	M-2	-	

A9 — Interior Finish Schedule- Building D
No Scale — Refer to H18 for Abbreviations, Notes and Remarks

DSA File No.:
10-48

DSA Application No.:
02-120543

Agency Approval

ABBREVIATIONS

AESS	=	Architectural Exposed Structural Steel
AFP	=	Acrylic Floor Finish
CCC	=	Clear Curing Compound
CFS	=	Clear Floor Sealer
CFH	=	Clear Floor Hardener
CWR	=	Colored Water Resistant Finish
CT#	=	Ceramic Tile Type
FF	=	Factory Finish
GS	=	Grout Sealer
HF	=	Refer to HARDWOOD FLOOR specification section
PC	=	Polished Concrete
ACT#	=	Acoustic Ceiling Tile Type
RWF	=	Resilient Wood Floor
RF#	=	Resinous Floor Type
*	=	Refer To Remarks

Interior Paint Finishes:

Refer To Specification Section - PAINTING

C#	=	Concrete or Concrete Masonry Units
DW#	=	Gypsum Board Finish
P#	=	Cement Plaster, Veneer Plaster or Gypsum Plaster Finish
M#	=	Metal Finish
W#	=	Woodwork Finish
X#	=	Special Finishes

NOTES

1. Refer to appropriate Specification Sections for Materials, Systems and Types.
2. All Details, Materials and Finishes shall be considered "Typical" for all similar conditions, Unless Otherwise Noted.
3. Do not paint Fire Rated Door and Frame Rating Plates.
4. Where changes in Floor Materials occur, refer to detail K11-X/A603
5. Refer to Interior Elevations for additional information.
6. This Schedule is provided for the convenience of the Contractor. Field verify all conditions and dimensions prior to fabrication, installation or application.
7. See Interior Color Schedule for Finish / Material Colors.
8. Gypsum Board Textures indicated are for areas exposed to view. Areas above ceilings shall be GB5, Unless Otherwise Noted. Refer to Specifications for appropriate locations of other textures.
9. VAPOR-ALKALINITY CONTROL: Apply Vapor-Alkalinity Control Membrane System at all concrete slab areas scheduled to receive applied floor covering that are sensitive to and have requirements for limits of vapor transmission and pH levels."
10. MECHANICAL, ELECTRICAL and PLUMBING: All items exposed to view to be M-2, UNO.
11. Refer to Reflected Ceiling Plan for Acoustical Ceiling Tile Type.
12. STEEL AND FABRICATION and SHEET METAL: All items exposed to view to be M-2, UNO.

REMARKS

1. CARPET, Broadloom, Modular and Walk-Off to be OFCI. See specification section CARPET and OWNER- FURNISHED ITEMS.
2. TILE, Wall Tile and Base at drinking fountain, see interior elevations.
3. CAST-IN- PLACE CONCRETE, Polished Concrete to be determined upon mockup, see specifications section POLISHED CONCRETE FLOOR FINISHING.
4. Refer to specification section HARDWOOD FLOOR for complete installation and finishing.

H18 — Interior Finish Schedule Legend
No Scale

McKinley/Fowler Elementary School- Increment 2
Clovis Unified School District
Fresno, CA 93727
Project

TYPICAL INFORMATION
INTERIOR FINISH SCHEDULE- BUILDING A, B, C & D
Drawing

darden architects
ARCHITECTURE
PLANNING
INTERIORS
www.dardenarchitects.com
6790 N. West Ave. • Fresno, CA 93711 • T. 559.448.8051
LICENSED ARCHITECT ANDREW A. GOEHRING No. C37102 REN. 11-30-23 STATE OF CALIFORNIA

Architect

No.	Revision/Submission	Date
1	Addendum 1	02/17/23

Revision

Designed Designer
Drawn By: Author
Checked Checker
Reviewed Approver

Scale: 1/8" = 1'-0"
Project Number: 2116
Date: 02/15/23

X/A201

2/19/2023 10:29:06 AM
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Interior Finish Schedule- Building E

Room Number	Room Name	Floor Finishes: CAST-IN-PLACE CONCRETE, Concrete Slab,	CARPET, Broadloom	CARPET, Walk-off	RESILIENT BASE AND ACCESSORIES, Rubber Tread and Risers	TILE, Ceramic Tile, SYS-IFA (Conc Sub Floor - Thin Set)	HARDWOOD FLOOR, Stage System	RESINOUS FLOORING, Resinous Floor	RESILIENT SHEET, Vinyl Sheet over Plywood	MILLWORK, Wood Stair, Treads, Risers	Base Finishes: RESILIENT BASE AND ACCESSORIES, Rubber Wall Base, 4"	TILE, Ceramic Tile, SYS-IWD (Cement Board - Thin Set)	MILLWORK, Wood Base, 4"	RESINOUS FLOORING, Base	RESILIENT SHEET, Integral Base	Wainscot Finishes: WALL AND CORNER GUARDS, Impact-Resistant Wall Coverings	Wall Finishes: GYPSUM BOARD, Wallboard, (Texture GB-2)	GYPSUM BOARD, Water Resistant, (Texture GB-2)	TILE, Ceramic Tile, SYS-IWD (Cement Board - Thin Set),	WALL COVERINGS, Vinyl Covered Tackboard over Gypsum Board (GB-3)	FRP Panels over Gypsum Board, Water Resistant (GB-3)	ROUGH CARPENTRY, 3/4" Fire Resistant Plywood over Gypsum Board	Ceiling Finishes: ACOUSTICAL CEILINGS, Suspension System,	GYPSUM BOARD, Wallboard (Texture GB-2),	METAL DECK, Metal Deck and Steel Beams,	METAL DECK, Acoustical Metal Deck,	Miscellanous Finishes: METAL DOORS AND FRAMES, Doors, Panels and Frames	ACCESS DOORS AND FRAMES, Doors, Panels and Frames	LAMINATE-FACED WOOD DOORS	WALL AND CORNER GUARDS, Corner Guard	Remarks
100	MPR Open Area	PC	-	FF	-	-	-	-	-	-	FF	-	-	-	FF	DW-5	-	-	FF	-	-	-	-	M-1	M-2	-	FF	-	1, 3
101	Stage Stairs	PC	-	-	-	-	-	-	W-7	-	FF	-	W-7	-	-	DW-5	-	-	-	-	-	-	-	M-1	M-2	-	-	FF	3, 4
102	Electrical Room	CFS	-	-	-	-	-	-	-	-	FF	-	-	-	-	DW-5	-	-	-	-	-	-	-	M-1	M-2	-	-	-	-
103	Stage	-	-	-	-	-	HF	-	W-7	-	-	-	W-7	-	-	DW-5	-	-	FF	-	-	-	DW-1	-	M-1	M-2	-	-	FF	4
104	Music Office	-	FF	-	-	-	-	-	-	-	FF	-	-	-	-	DW-5	-	-	FF	-	-	-	FF	-	-	M-2	-	-	-	1
105	Music Storage	CFS	-	-	-	-	-	-	-	-	FF	-	-	-	-	DW-5	-	-	FF	-	-	-	FF	-	-	M-2	FF	-	-	
106	Control Room	-	FF	-	-	-	-	-	-	-	FF	-	-	-	-	DW-5	-	-	FF	-	-	-	FF	-	-	M-2	-	-	-	1
107	Hallway	PC	-	FF	FF	-	-	-	-	-	FF	-	-	-	-	DW-5	-	-	FF	-	-	-	DW-1	-	-	M-2	-	FF	FF	1, 3
108	FS Riser	CFS	-	-	-	-	-	-	-	-	FF	-	-	-	-	DW-5	-	-	-	-	-	-	-	M-1	M-2	-	-	-	
109	Student Restrooms	-	-	-	-	-	-	RF-1	-	-	-	-	-	RF-1	-	-	-	-	FF	-	-	-	DW-5	-	M-2	-	FF	-	
110	Vestibule	PC	-	FF	-	-	-	-	-	-	FF	CT-2	-	-	FF	DW-5	-	-	-	CT-2, CT-3	-	-	FF	DW-1	-	M-2	-	FF	-	1, 3
111	Student Restrooms	-	-	-	-	-	-	RF-1	-	-	-	-	-	RF-1	-	-	-	-	FF	-	-	-	DW-5	-	-	M-2	-	FF	-	
112	Open Work Area	CFS	-	-	FF	-	-	-	-	-	FF	-	-	-	-	DW-5	-	-	-	-	-	-	-	DW-1	-	M-2	-	-	-	
112a	Storage	CFS	-	-	-	-	-	-	-	-	FF	-	-	-	-	DW-5	-	-	-	-	-	-	FF	-	-	M-2	-	-	-	
113	Office	CFS	-	-	-	-	-	-	-	-	FF	-	-	-	-	-	-	-	FF	-	-	-	FF	-	-	M-2	-	-	-	
114	Receiving Area	-	-	-	-	-	-	RF-1	-	-	-	-	-	RF-1	-	-	-	-	-	-	-	FF	FF	-	-	M-2	-	-	-	
115a	Refrigerator	-	-	-	-	-	-	RF-2	-	-	-	-	-	RF-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
115b	Freezer	-	-	-	-	-	-	RF-2	-	-	-	-	-	RF-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
116	Office and Dry Storage	-	-	-	-	-	-	RF-1	-	-	-	-	-	RF-1	-	-	-	-	-	-	FF	-	FF	-	-	M-2	-	-	-	
118	Preparation Area	-	-	-	-	-	-	RF-1	-	-	-	-	-	RF-1	-	-	-	-	-	-	FF	-	FF	-	-	M-2	FF	-	-	
118a	Dish Washing	-	-	-	-	-	-	RF-1	-	-	-	-	-	RF-1	-	-	-	-	-	-	FF	-	FF	-	-	-	-	-	-	
119	Serving Area	PC	-	-	-	-	-	-	-	-	FF	-	-	-	FF	DW-5	-	-	-	-	-	-	FF	-	-	M-2	-	FF	-	3
120	Custodian	CFS	-	-	-	-	-	-	-	-	FF	-	-	-	-	-	-	-	FF	-	-	-	DW-5	-	-	M-2	-	-	-	
121	Staff Restroom	-	-	-	-	CT-1	-	-	-	-	-	CT-1	-	-	-	-	DW-5	CT-2, CT-3	-	-	-	-	DW-5	-	-	M-2	-	FF	-	
122	Hallway	PC	-	FF	-	-	-	-	-	-	FF	-	-	-	-	DW-5	-	-	-	-	-	-	FF	-	-	M-2	-	FF	-	1, 3
123	Staff Restroom	-	-	-	-	CT-1	-	-	-	-	-	CT-1	-	-	-	-	DW-5	CT-2, CT-3	-	-	-	-	DW-5	-	-	M-2	-	FF	-	
124	Staff Dining	PC	-	FF	-	-	-	-	-	-	FF	-	-	-	FF	DW-5	-	-	FF	-	-	-	FF	-	-	M-2	-	FF	FF	1, 3
125	Lockers	-	-	-	-	-	-	RF-1	-	-	-	-	-	RF-1	-	-	-	-	FF	-	-	-	DW-5	-	-	M-2	-	FF	-	
125a	Restroom	-	-	-	-	-	-	RF-1	-	-	-	-	-	RF-1	-	-	-	-	FF	-	-	-	DW-5	-	-	M-2	-	FF	-	
126	Telecom Room	CFS	-	-	-	-	-	-	-	-	FF	-	-	-	-	DW-5	-	-	-	-	W-2	FF	-	-	-	M-2	-	-	-	
127	Custodial	CFS	-	-	-	-	-	-	-	-	FF	-	-	-	-	-	-	-	FF	-	-	-	DW-5	-	-	M-2	-	-	-	
201	Storage Above Office	CFS	-	-	-	-	-	-	-	-	FF	-	-	-	-	DW-5	-	-	-	-	-	-	-	M-1	-	-	M-2	-	-	

Interior Finish Schedule- Building K1

Room Number	Room Name	Floor Finishes: CAST-IN-PLACE CONCRETE, Concrete Slab,	CARPET, Broadloom	CARPET, Walk-off	RESINOUS FLOORING, Resinous Floor	Base Finishes: RESILIENT BASE AND ACCESSORIES, Rubber Wall Base, 4"	RESINOUS FLOORING, Base	Wall Finishes: GYPSUM BOARD, Wallboard, (Texture GB-2)	WALL COVERINGS, Vinyl Covered Tackboard over Gypsum Board (GB-3)	FRP Panels over Gypsum Board, Water Resistant (GB-3)	ROUGH CARPENTRY, 3/4" Fire Resistant Plywood over Gypsum Board	Ceiling Finishes: ACOUSTICAL CEILINGS, Suspension System,	GYPSUM BOARD, Wallboard (Texture GB-2),	METAL DECK, Metal Deck and Steel Beams,	Miscellanous Finishes: METAL DOORS AND FRAMES, Doors, Panels and Frames	LAMINATE-FACED WOOD DOORS	STOREFRONT, Clear Anodized	Remarks
101	Classroom	PC	FF	FF	-	FF	-	DW-5	FF	-	-	-	FF	DW-1	-	M-2	FF	FF	1, 3
102	Classroom	PC	FF	FF	-	FF	-	DW-5	FF	-	-	-	FF	DW-1	-	M-2	FF	FF	1, 3
112	Staff Workroom	PC	-	-	-	FF	-	-	-	-	-	-	FF	-	-	M-2	FF	-	3
113	Storage	PC	-	-	-	FF	-	DW-1	-	M-1	M-2	-	-	FF	-	-	-	-	3
114	Restroom	-	-	-	RF-1	-	RF-1	-	-	-	FF	-	-	DW-5	-	M-2	FF	-	
115	Restroom	-	-	-	RF-1	-	RF-1	-	-	-	FF	-	-	DW-5	-	M-2	FF	-	
116	Storage	CFS	-	-	-	FF	-	DW-5	-	-	FF	-	-	-	M-1	M-2	-	-	
117	Electrical	CFS	-	-	-	FF	-	DW-5	-	-	-	-	-	-	M-1	M-2	-	-	
119	Data	CFS	-	-	-	FF	-	-	-	-	W-2	FF	-	-	-	M-2	-	-	

Interior Finish Schedule- Building K2 (Add Alternate #1)

Room Number	Room Name	Floor Finishes: CAST-IN-PLACE CONCRETE, Concrete Slab,	CARPET, Broadloom	CARPET, Walk-off	RESINOUS FLOORING, Resinous Floor	Base Finishes: RESILIENT BASE AND ACCESSORIES, Rubber Wall Base, 4"	RESINOUS FLOORING, Base	Wall Finishes: GYPSUM BOARD, Wallboard, (Texture GB-2)	WALL COVERINGS, Vinyl Covered Tackboard over Gypsum Board (GB-3)	FRP Panels over Gypsum Board, Water Resistant (GB-3)	ROUGH CARPENTRY, 3/4" Fire Resistant Plywood over Gypsum Board	Ceiling Finishes: ACOUSTICAL CEILINGS, Suspension System,	GYPSUM BOARD, Wallboard (Texture GB-2),	METAL DECK, Metal Deck and Steel Beams,	Miscellanous Finishes: METAL DOORS AND FRAMES, Doors, Panels and Frames	LAMINATE-FACED WOOD DOORS	Remarks
103	Classroom	PC	FF	FF	-	FF	-	DW-2	FF	-	-	FF	DW-1	-	M-2	FF	1, 3
104	Classroom	PC	FF	FF	-	FF	-	DW-2	FF	-	-	FF	DW-1	-	M-2	FF	1, 3
105	Telecom	CFS	-	-	-	FF	-	DW-2	-	-	W-2	FF	-	-	M-2	-	
106	Electrical	CFS	-	-	-	FF	-	DW-2	-	-	-	-	-	M-1	M-2	-	
107	Staff Workroom	PC	-	-	-	FF	-	-	FF	-	-	FF	-	-	M-2	FF	3
108	Storage	PC	-	-	-	FF	-	-	FF	-	-	FF	-	-	-	-	3
109	Restroom	-	-	-	RF-1	-	RF-1	-	-	FF	-	-	DW-5	-	M-2	FF	
110	Restroom	-	-	-	RF-1	-	RF-1	-	-	FF	-	-	DW-5	-	M-2	FF	
118	Custodial/ Fire Riser	CFS	-	-	-	FF	-	-	-	FF	-	-	DW-5	-	M-2	-	

Interior Finish Schedule- Building P

Room Number	Room Name	Floor Finishes: CARPET, Broadloom	CARPET, Walk-off	RESILIENT SHEET, Rubber Sheet	Base Finishes: RESILIENT BASE AND ACCESSORIES, Rubber Wall Base, 4"	RESILIENT SHEET, Integral Base	Wall Finishes: GYPSUM BOARD, Wallboard, (Texture GB-2)	WALL COVERINGS, Vinyl Covered Tackboard over Gypsum Board (GB-3)	FRP Panels over Gypsum Board, Water Resistant (GB-3)	Ceiling Finishes: ACOUSTICAL CEILINGS, Suspension System,	GYPSUM BOARD, Wallboard (Texture GB-2),	METAL DECK, Metal Deck and Steel Beams,	METAL DECK, Acoustical Metal Deck,	Miscellanous Finishes: METAL DOORS AND FRAMES, Doors, Panels and Frames	LAMINATE-FACED WOOD DOORS	STOREFRONT, Clear Anodized	Remarks
100	Classroom	FF	FF	FF	FF	-	-	-	-	-	-	-	-	-	-	-	1
101	Restroom	-	-	FF	FF	-	-	-	-	-	-	-	-	-	-	-	
102	Restroom	-	-	FF	FF	-	-	-	-	-	-	-	-	-	-	-	
103	Classroom	FF	FF	FF	FF	-	-	-	-	-	-	-	-	-	-	-	1
104	Restroom	-	-	FF	FF	-	-	-	-	-	-	-	-	-	-	-	
105	Restroom	-	-	FF	FF	-	-	-	-	-	-	-	-	-	-	-	

DSA File No.:

10-48

DSA Application No.:

02-120543

Agency Approval

ABBREVIATIONS

AESS	=	Architectural Exposed Structural Steel
AFP	=	Acrylic Floor Finish
CCC	=	Clear Curing Compound
CFS	=	Clear Floor Sealer
CFH	=	Clear Floor Hardener
CWR	=	Colored Water Resistant Finish
CT#	=	Ceramic Tile Type
FF	=	Factory Finish
GS	=	Grout Sealer
HF	=	Refer to HARDWOOD FLOOR specification section
PC	=	Polished Concrete
ACT#	=	Acoustic Ceiling Tile Type
RWF	=	Resilient Wood Floor
RF#	=	Resinous Floor Type
*	=	Refer To Remarks

Interior Paint Finishes:

Refer To Specification Section - PAINTING

CB#	=	Concrete or Concrete Masonry Units
DW#	=	Gypsum Board Finish
P#	=	Cement Plaster, Veneer Plaster or Gypsum Plaster Finish
M#	=	Metal Finish
W#	=	Woodwork Finish
X#	=	Special Finishes

NOTES

1. Refer to appropriate Specification Sections for Materials, Systems and Types.
2. All Details, Materials and Finishes shall be considered "Typical" for all similar conditions, Unless Otherwise Noted.
3. Do not paint Fire Rated Door and Frame Rating Plates.
4. Where changes in Floor Materials occur, refer to detail K11-X/A603
5. Refer to Interior Elevations for additional information.
6. This Schedule is provided for the convenience of the Contractor. Field verify all conditions and dimensions prior to fabrication, installation or application.
7. See Interior Color Schedule for Finish / Material Colors.
8. Gypsum Board Textures indicated are for areas exposed to view. Areas above ceilings shall be GB5, Unless Otherwise Noted. Refer to Specifications for appropriate locations of other textures.
9. VAPOR-ALKALINITY CONTROL: Apply Vapor-Alkalinity Control Membrane System at all concrete slab areas scheduled to receive applied floor covering that are sensitive to and have requirements for limits of vapor transmission and pH levels."
10. MECHANICAL, ELECTRICAL and PLUMBING: All items exposed to view to be M-2, UNO.
11. Refer to Reflected Ceiling Plan for Acoustical Ceiling Tile Type.
12. STEEL AND FABRICATION and SHEET METAL: All items exposed to view to be M-2, UNO.

REMARKS

1. CARPET, Broadloom, Modular and Walk-Off to be OFCI. See specification section CARPET and OWNER- FURNISHED ITEMS.
2. TILE, Wall Tile and Base at drinking fountain, see interior elevations.
3. CAST-IN- PLACE CONCRETE, Polished Concrete to be determined upon mockup, see specifications section POLISHED CONCRETE FLOOR FINISHING.
4. Refer to specification section HARDWOOD FLOOR for complete installation and finishing.

J1 — Interior Finish Schedule- Building E
No Scale — Refer to H18 for Abbreviations, Notes and Remarks

J9 — Interior Finish Schedule- Building K1
No Scale — Refer to H18 for Abbreviations, Notes and Remarks

A1 — Interior Finish Schedule- Building K2 (Add Alternate #1)
No Scale — Refer to H18 for Abbreviations, Notes and Remarks

A9 — Interior Finish Schedule- Building P
No Scale — Refer to H18 for Abbreviations, Notes and Remarks

H18 — Interior Finish Schedule Legend
No Scale

McKinley/Fowler Elementary School- Increment 2
Clovis Unified School District
Fresno, CA 93727
Project

TYPICAL INFORMATION
INTERIOR FINISH SCHEDULE- BUILDING E, K1, K2 & P
Drawing

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LICENSED ARCHITECT ANDREW A. CORNEJO No. C37102 REG. 11-30-23 STATE OF CALIFORNIA
Architect

No.	Revision/Submission	Date
1	Addendum 1	02/17/23

Revision

Designed Designer
Drawn By: Author
Checked Checker
Reviewed Approver
Date: 02/15/23
Scale: 1/8" = 1'-0"
Project Number: 2116

X/A202

AD1-AX03

2/19/2023 10:29:13 AM
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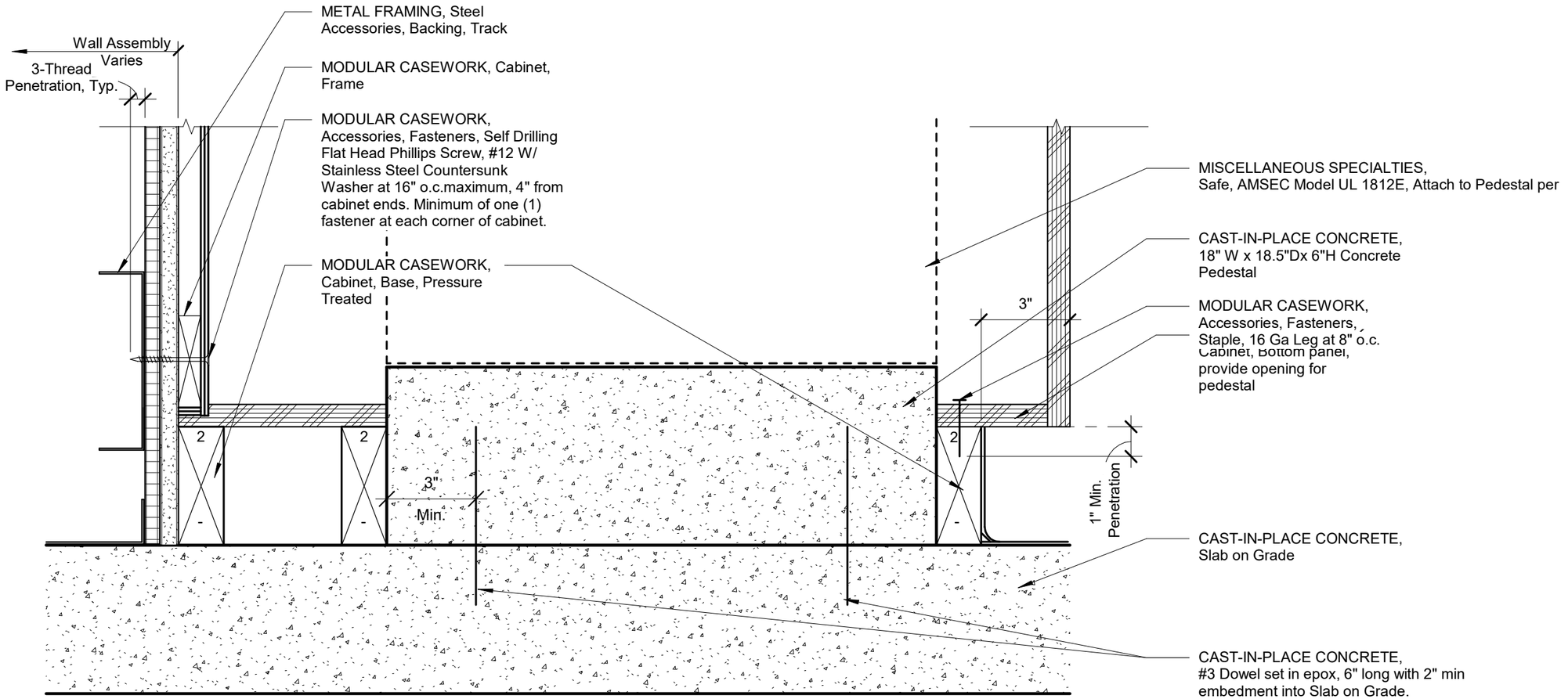


N11

3" = 1'-0"

MODULAR CASEWORK, Safe Pedestal

MODULAR CASEWORK, Safe Pedestal

McKinley/Fowler Elementary School- Increment 2
Clovis Unified School District
Fresno, CA 93727

darden architects

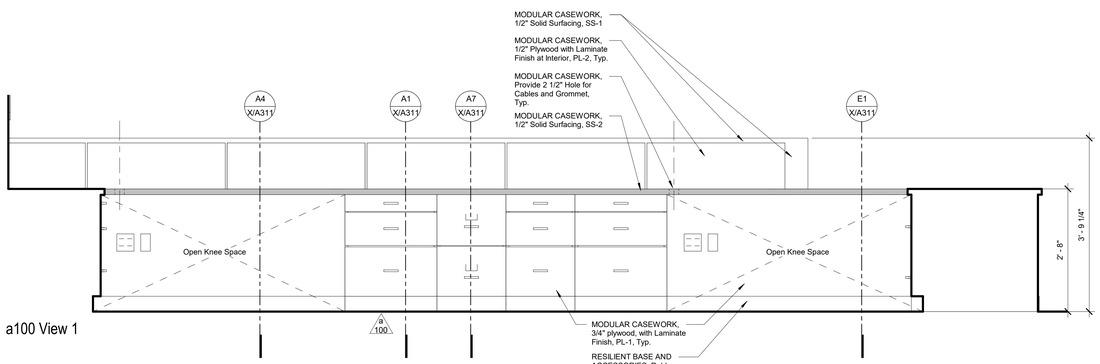
ARCHITECTURE · PLANNING · INTERIORS

Robert L. Petithomme AIA · Antonio J. Avila AIA · DeDe Darnell ASID
Grant E. Dodson AIA · Michael K. Fennacy AIA · Andrew A. Corral AIA
Leslie A. Rau IIDA · Mathew R. Heiss AIA · Gerardo Padron · Martin A. Ilic
Michael J. Nelson · Sean P. Mendoza AIA · William Brandle AIA

6790 N. West Avenue · Fresno, California 93711 · 559 448-8051 · Fax 559 446-1765

Designed By:	AC	Project Number:	2116
Drawn By:	AC	Scale:	3" = 1'-0"
Checked By:	-		
Reviewed By:	-		
Date:	02/15/23		

AD1 AX04



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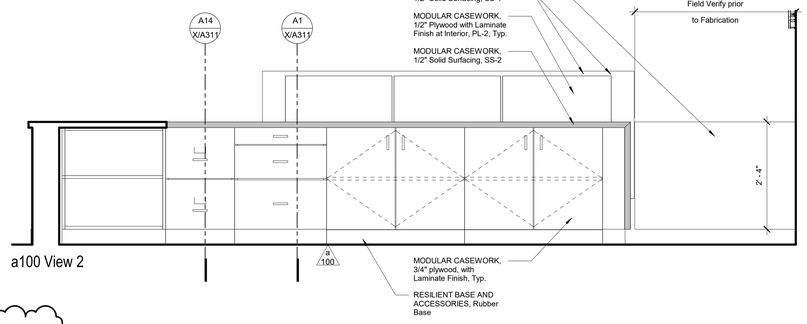

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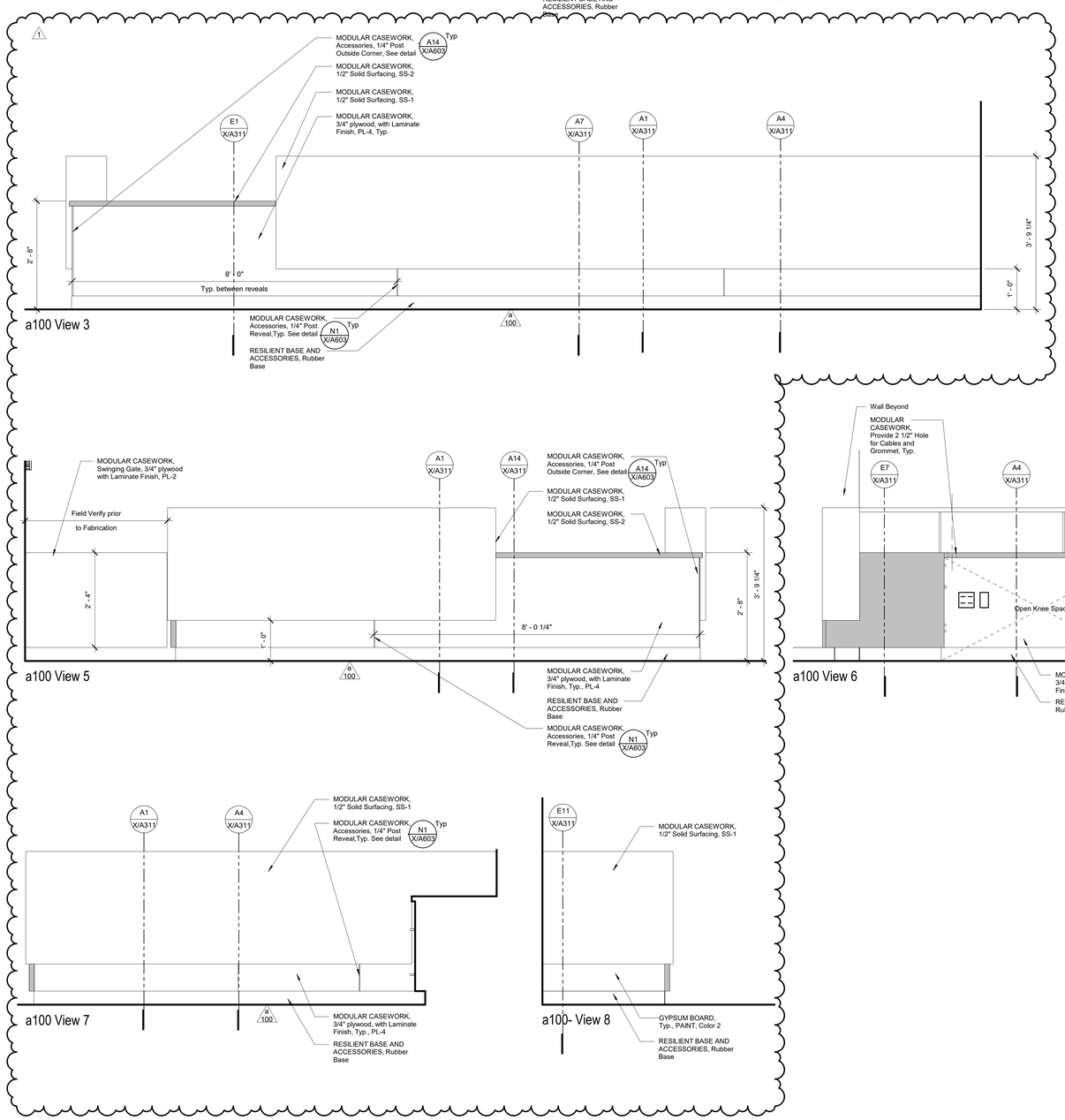

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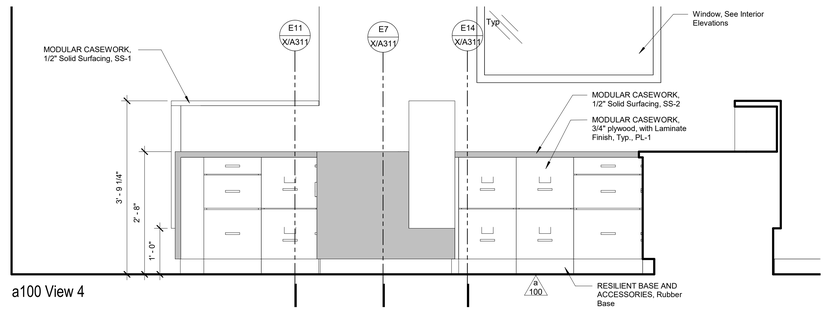
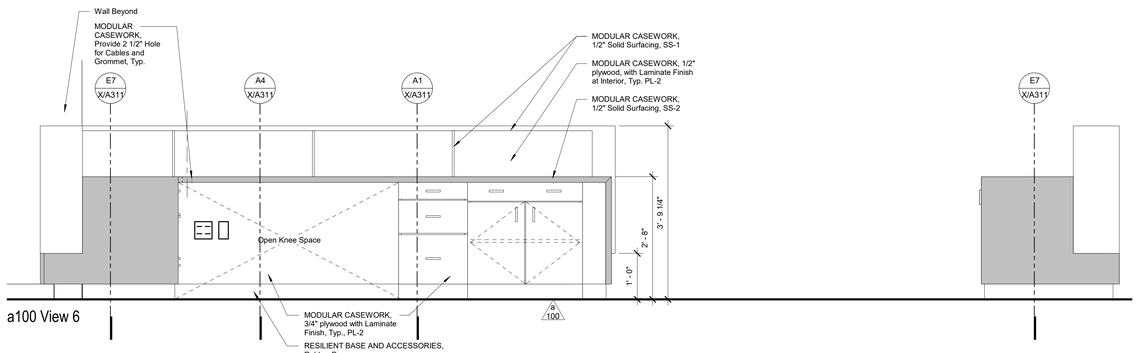


a100 View 4

a100 View 5



a100 View 6

a100 View 7

a100- View 8

DSA File No.:
10-48

DSA Application No.:
02-120543

Agency Approval

NOTES

1. WALL ASSEMBLY: Refer to Floor Plans, Typical Wall Assembly Schedule and Special Wall Assembly Schedule for wall depth and wall materials.
2. WALL FINISHES: Refer to Interior Elevations and Interior Finish Schedules for the Wall Material Finishes and Additional Wall Coverings.
3. FLOOR MATERIAL: Refer to Floor Plans and Interior Finish Schedules for the actual floor material to be installed.
4. METAL FRAMING, Where Backing is indicted, Provide Backing per N14 X/A601
5. Refer to MODULAR CASEWORK Schedule.

N18	MODULAR CASEWORK, Detail Notes
No Scale	

McKinley/Fowler Elementary School- Increment 2
Clovis Unified School District
Fresno, CA 93727
Project

TYPICAL INFORMATION
CUSTOM CASEWORK- BUILDING A- a 100
Drawing

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LICENSED ARCHITECT ANDREW A. CORREA No. C37102 Exp. 11-30-23 STATE OF CALIFORNIA
Architect

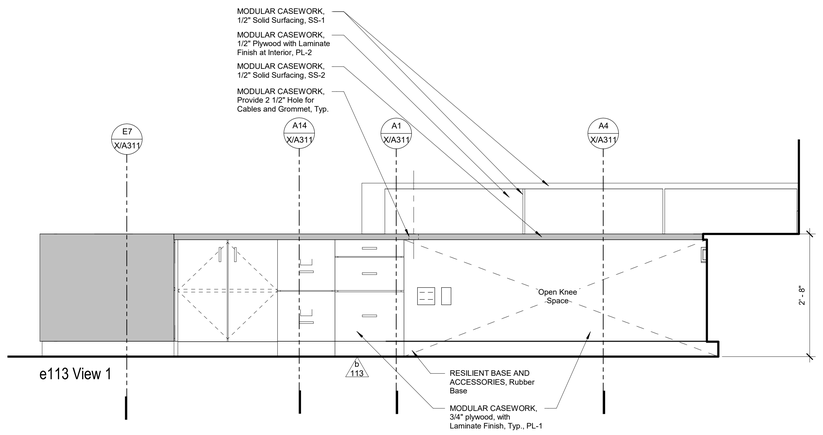
No.	Revision/Submission	Date
1	Addendum 1	02/17/23

Revision

	Designed Designer	Copyright 2022 Darden Architects
Scale: As indicated	Drawn By: Author	*X/A313*
Project Number: 2116	Checked Checker	
Date: 02/15/23	Reviewed Approver	

A1	Building A- Elevations- a 100
3/4" = 1' - 0"	

AD1-AX05



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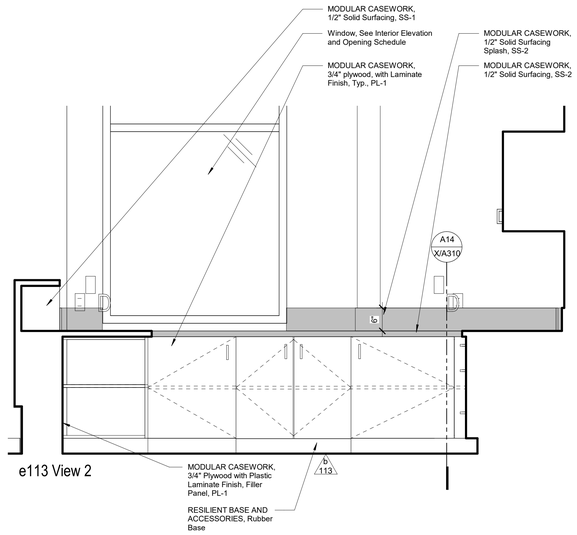

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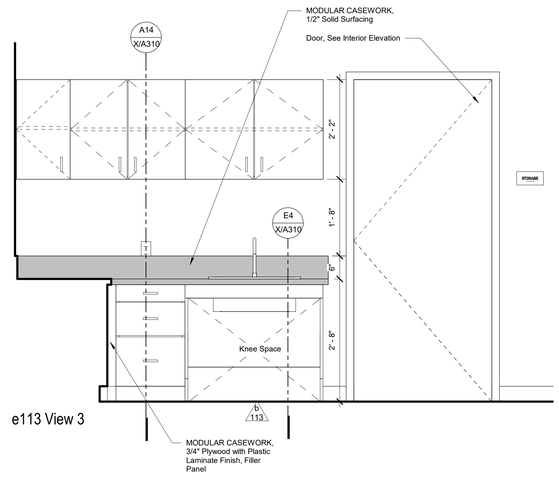

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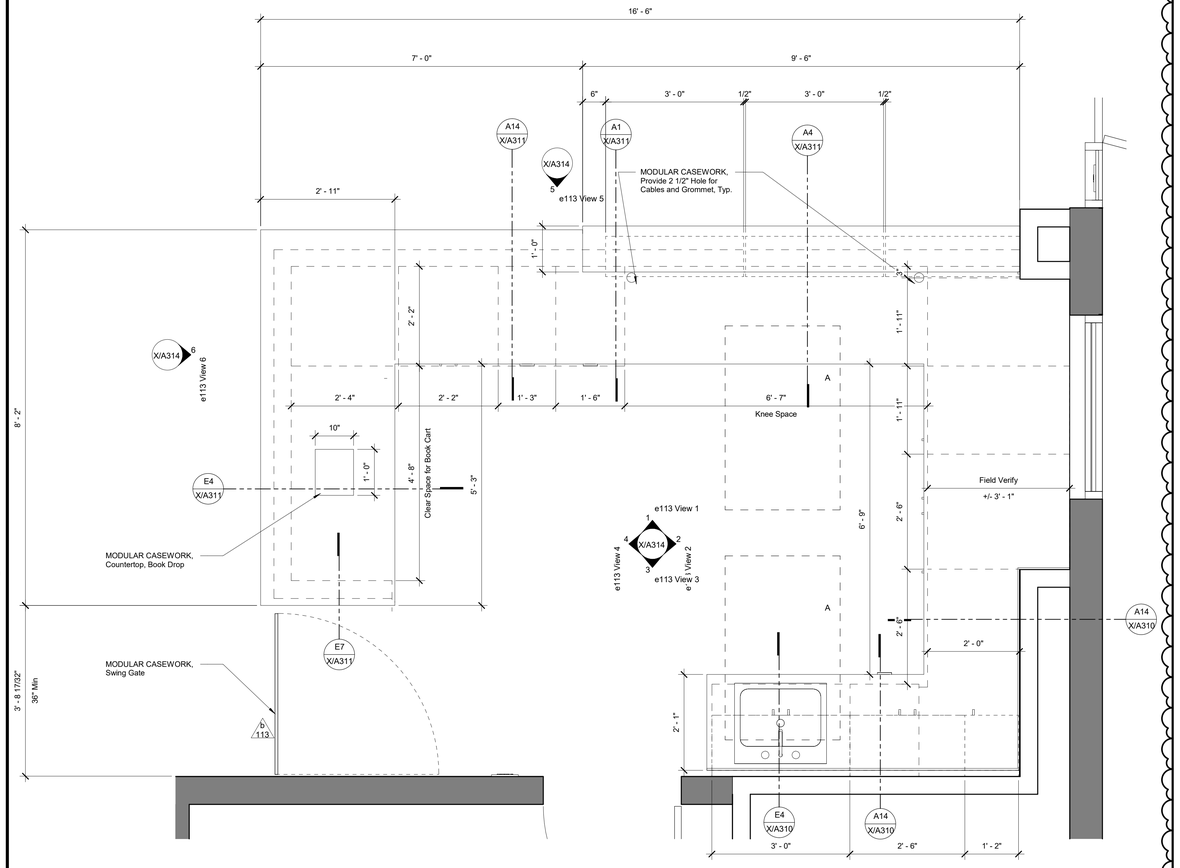

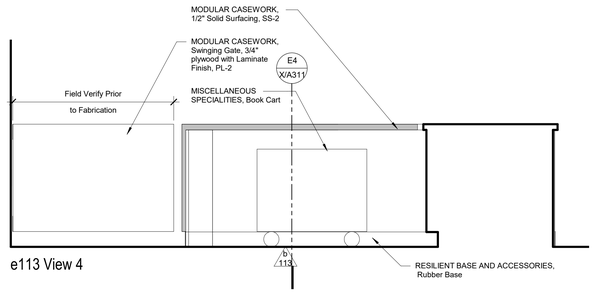

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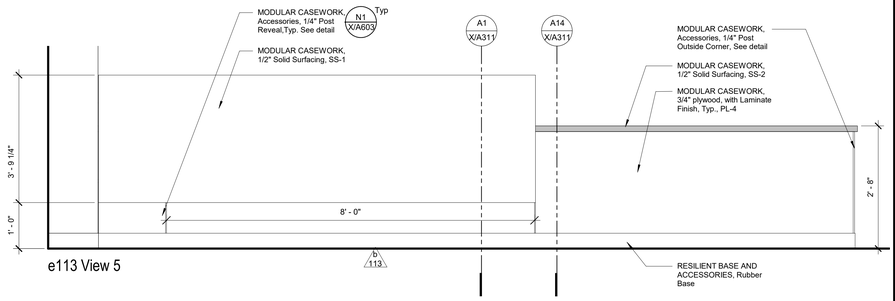

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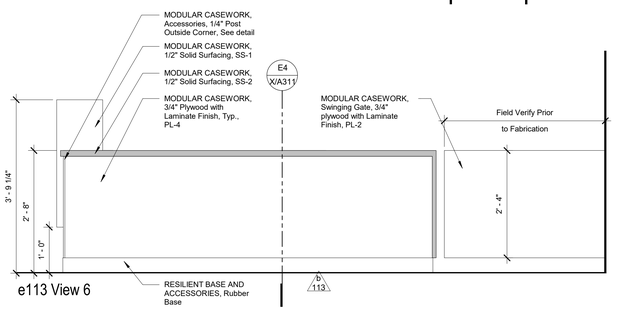

e113 View 6

DSA File No.:
10-48

DSA Application No.:
02-120543

Agency Approval

NOTES

1. WALL ASSEMBLY: Refer to Floor Plans, Typical Wall Assembly Schedule and Special Wall Assembly Schedule for wall depth and wall materials.
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3. FLOOR MATERIAL: Refer to Floor Plans and Interior Finish Schedules for the actual floor material to be installed.
4. METAL FRAMING, Where Backing is indicted, Provide Backing per N14 X/A601
5. Refer to MODULAR CASEWORK Schedule.

N18 | MODULAR CASEWORK, Detail Notes

No Scale

McKinley/Fowler Elementary School- Increment 2
Clovis Unified School District
Fresno, CA 93727
Project

TYPICAL INFORMATION
CUSTOM CASEWORK- BUILDING A- b 113
Drawing

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LICENSED ARCHITECT ANDREW A. CORNEJO No. C37102 REG. 11-30-23 STATE OF CALIFORNIA
Architect

No.	Revision/Submission	Date
	Addendum 1	02/17/23

Revision

	Designed Designer	Copyright 2022 Darden Architects
Scale: As indicated	Drawn By: Author	*X/A314*
Project Number: 2116	Checked IChecker	
Date: 02/15/23	Reviewed Approver	

A1 | Building A- Enlarged Plan- e 113
3/4" = 1'-0"
See A11-X/A313 for Elevations

A10 | Building A- Elevations- e 113
3/4" = 1' - 0"

2/19/2023 10:29:33 AM
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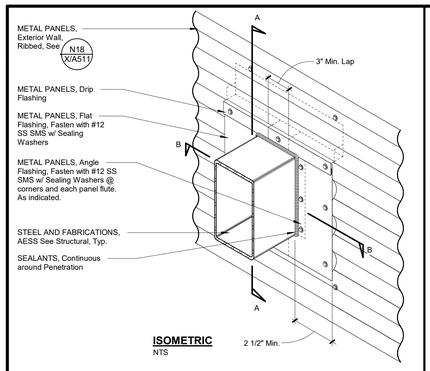

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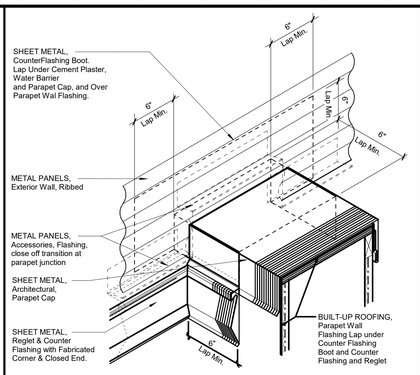
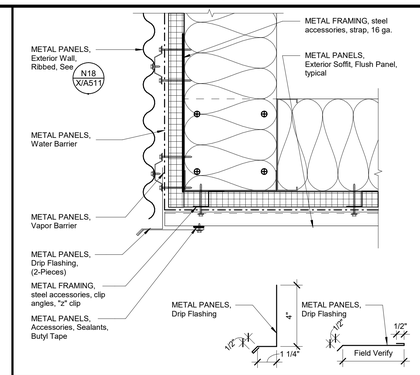
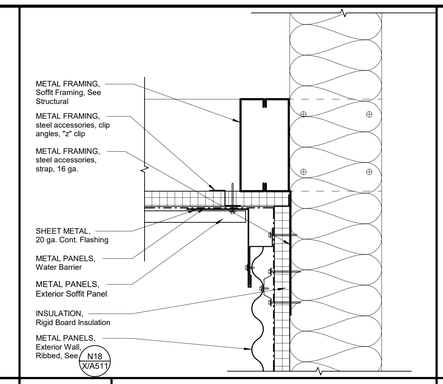
NTS



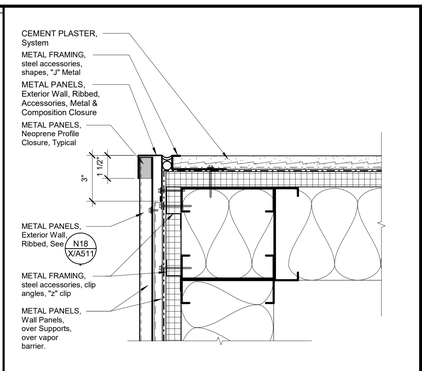
N4	SHEET METAL,Counter Flashing Boot Low Parapet to High Wall
3" = 1'-0"	



N7	METAL PANEL, Soffit Trim, Section
3" = 1'-0"	



N11	METAL PANEL, Soffit to Wall
3" = 1'-0"	

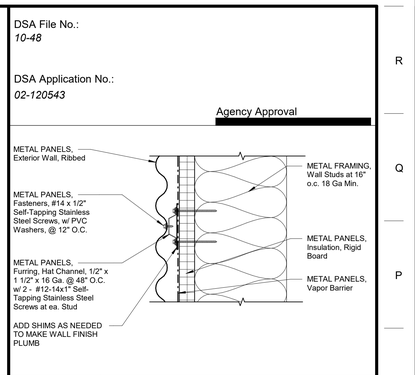


N14	METAL PANEL, Plan, Vertical Joint at Cement Plaster
3" = 1'-0"	

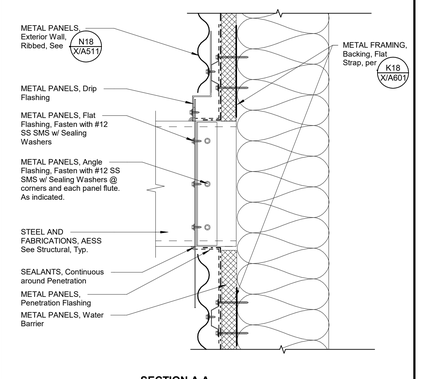
DSA File No.:
10-48

DSA Application No.:
02-120543

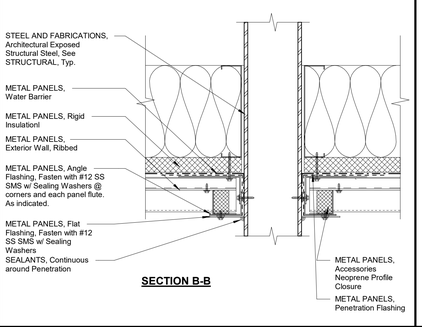
Agency Approval



N18	METAL PANELS, Typical Wall Attachment, Section
3" = 1'-0"	

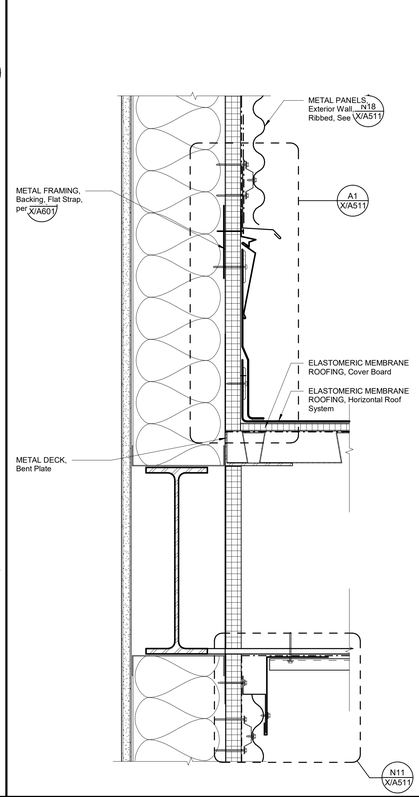


SECTION A-A

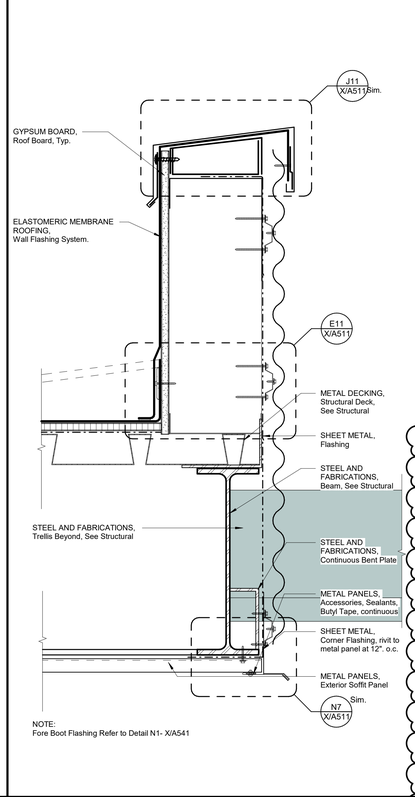


SECTION B-B

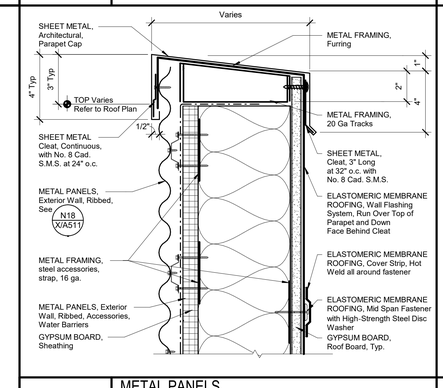
E1	METAL PANELS, Steel Penetration
3" = 1'-0"	



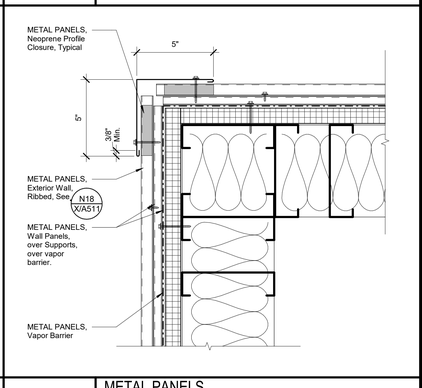
E4	METAL PANEL, Reglet & Counter Flashing at Exterior Overhang
3" = 1'-0"	



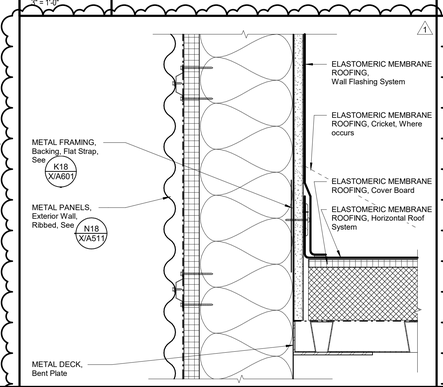
E7	METAL PANELS, Parapet at Exterior Overhang
3" = 1'-0"	



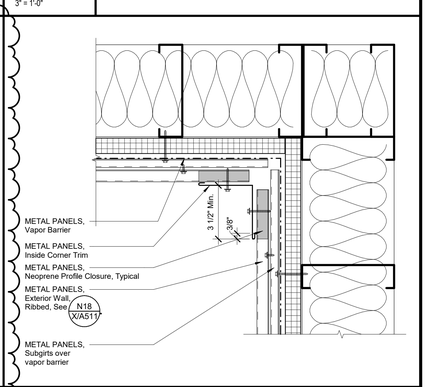
J11	METAL PANELS, Parapet Cap
3" = 1'-0"	



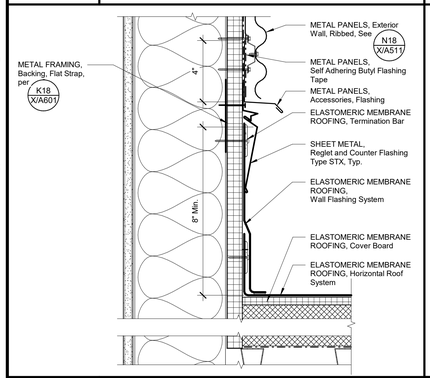
J14	METAL PANELS, Outside Corner Trim, Plan
3" = 1'-0"	



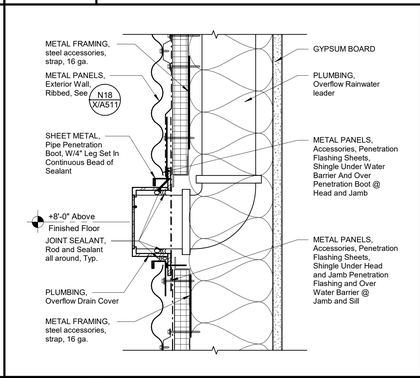
E11	METAL PANEL, Metal Panel System at Roof
3" = 1'-0"	



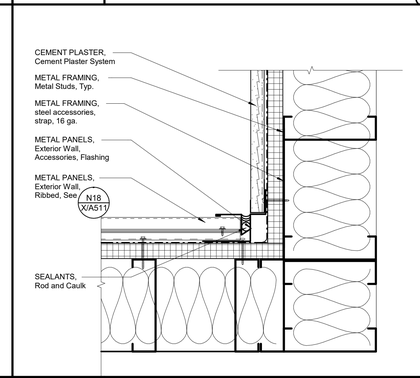
E14	METAL PANELS, Inside Corner Trim, Plan
3" = 1'-0"	



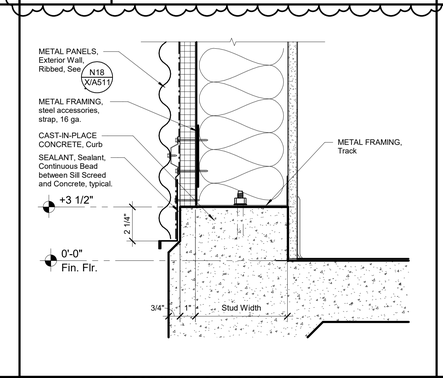
A1	METAL PANEL, Reglet & Counter Flashing at Elastomeric Membrane Roofing
3" = 1'-0"	



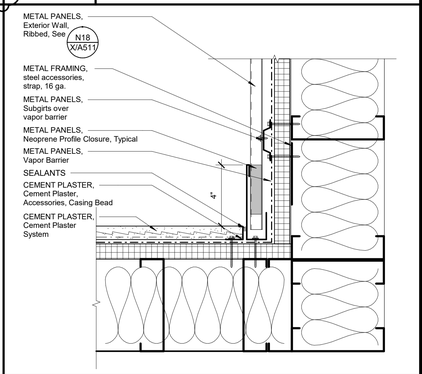
A4	PLUMBING, Rainwater Overflow Leader at Metal Panel
3" = 1'-0"	



A7	METAL PANEL, Section, Metal Ribbed Panel at Plaster Wall
3" = 1'-0"	



A11	CAST-IN-PLACE CONCRETE, Exterior Wall at Concrete Curb
3" = 1'-0"	



A14	METAL PANELS, Inside Corner Trim at Plaster, Plan
3" = 1'-0"	

McKinley/Fowler Elementary School- Increment 2
Clovis Unified School District
Fresno, CA 93727

Project

TYPICAL INFORMATION
EXTERIOR DETAILS- METAL WALL PANELS

Drawing

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LICENSED ARCHITECT ANDREW A. CORREA No. C37102 Exp. 11-30-23 STATE OF CALIFORNIA

Architect

No.	Revision/Submission	Date
1	Addendum 1	02/17/23

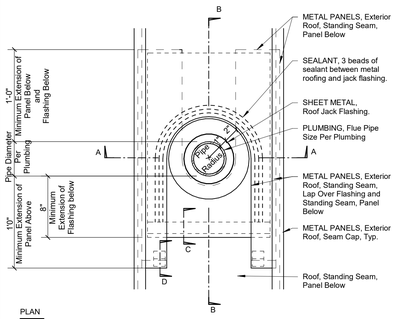
Revision

Designed By: JGM
Drawn By: JGM
Checked By: AC
Reviewed By: MF

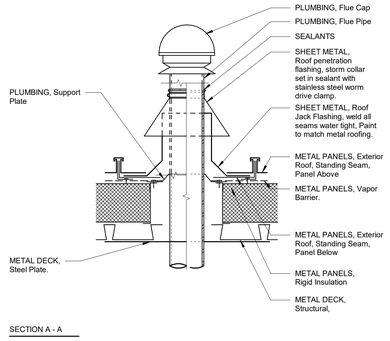
Scale: 3" = 1'-0"
Project Number: 2116
Date: 02/15/23

X/A511

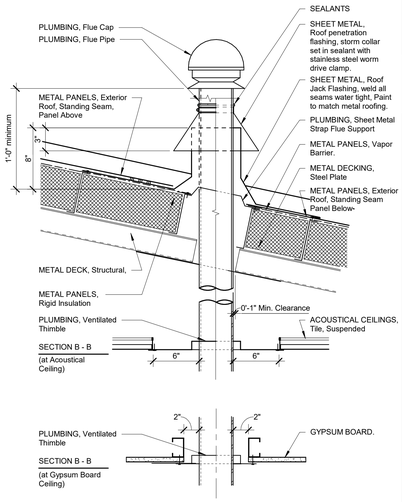
AD1-AX07



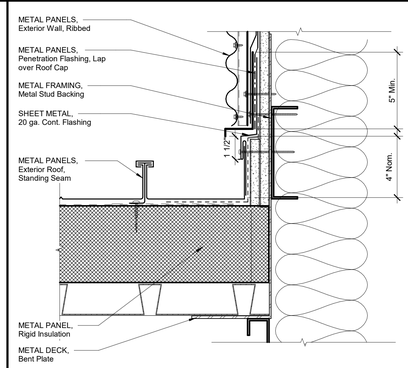
PLAN



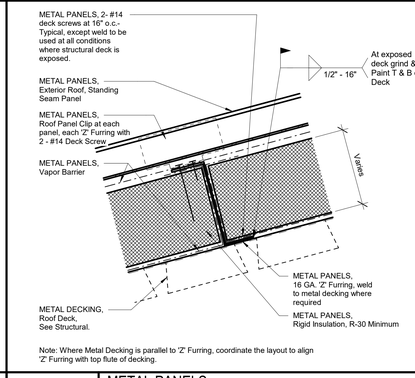
SECTION A - A



G1	METAL PANELS, Roof Penetration Flashing, Flue
1 1/2" = 1'-0"	

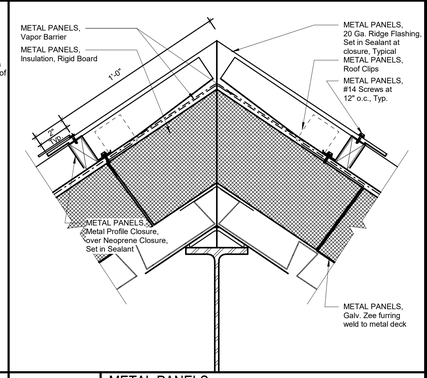


N7	SHEET METAL, Metal Panel System to Sheet Metal at Standing Seam Roof
3" = 1'-0"	

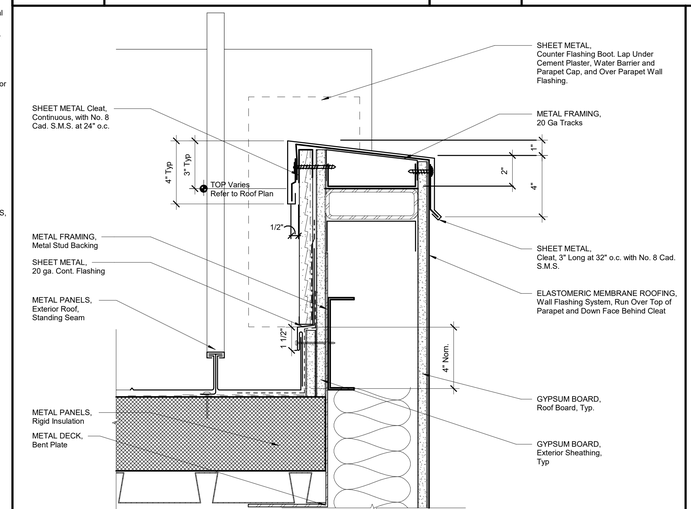


Note: Where Metal Decking is parallel to 'Z' Furring, coordinate the layout to align 'Z' Furring with top flute of decking.

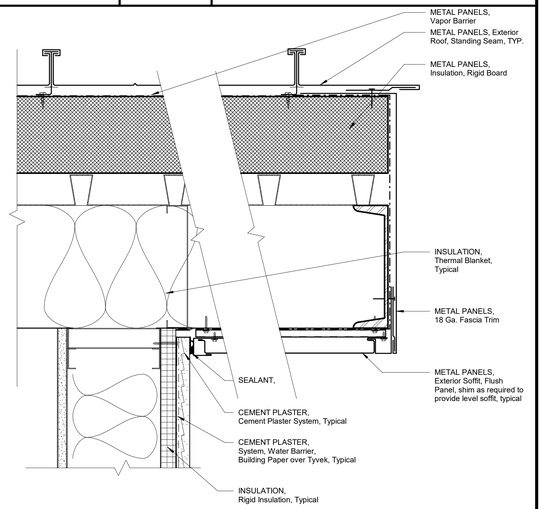
N11	METAL PANELS, Typical Roof Attachment
3" = 1'-0"	



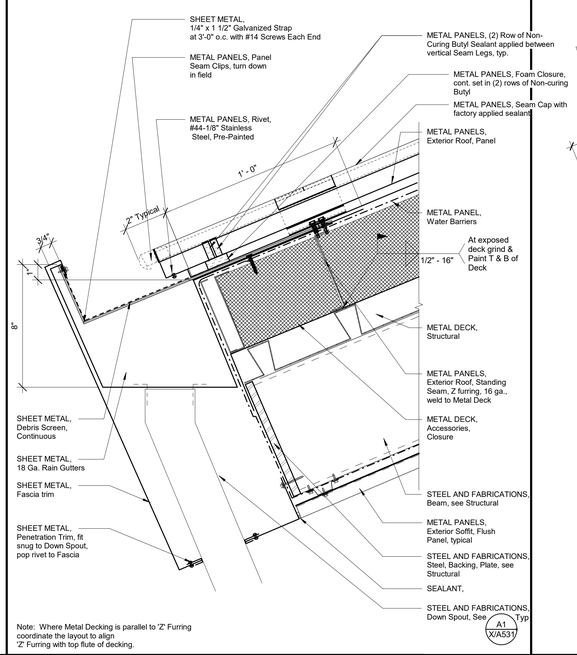
N14	METAL PANELS, Ridge
3" = 1'-0"	



G7	SHEET METAL, Parapet Cap at Cement Plaster & Standing Seam Roofing
3" = 1'-0"	

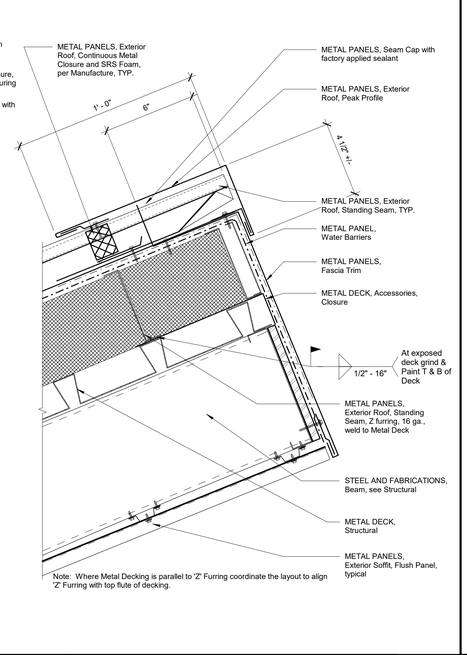


G13	METAL PANELS, Roof @ Rake
3" = 1'-0"	



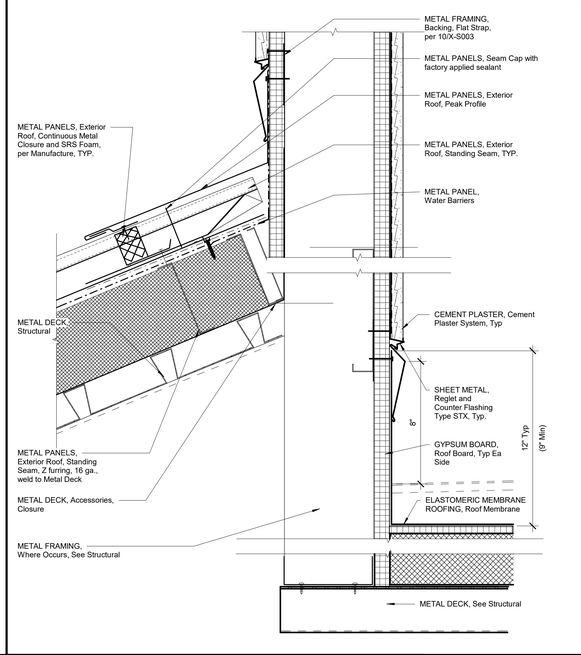
Note: Where Metal Decking is parallel to 'Z' Furring coordinate the layout to align 'Z' Furring with top flute of decking.

A5	METAL PANELS, Exterior Roof, Standing Seam @ Eave
3" = 1'-0"	



Note: Where Metal Decking is parallel to 'Z' Furring coordinate the layout to align 'Z' Furring with top flute of decking.

A9	METAL PANEL, Exterior Roof, Standing Seam Fascia @ Peak
3" = 1'-0"	



A13	METAL PANELS, Roof @ Ridge To Wall Condition
3" = 1'-0"	

DSA File No.:
10-48

DSA Application No.:
02-120543

Agency Approval

General Notes

McKinley/Fowler Elementary School- Increment 2
Clovis Unified School District
Fresno, CA 93727
Project

TYPICAL INFORMATION
EXTERIOR DETAILS- STANDING SEAM ROOF
Drawing

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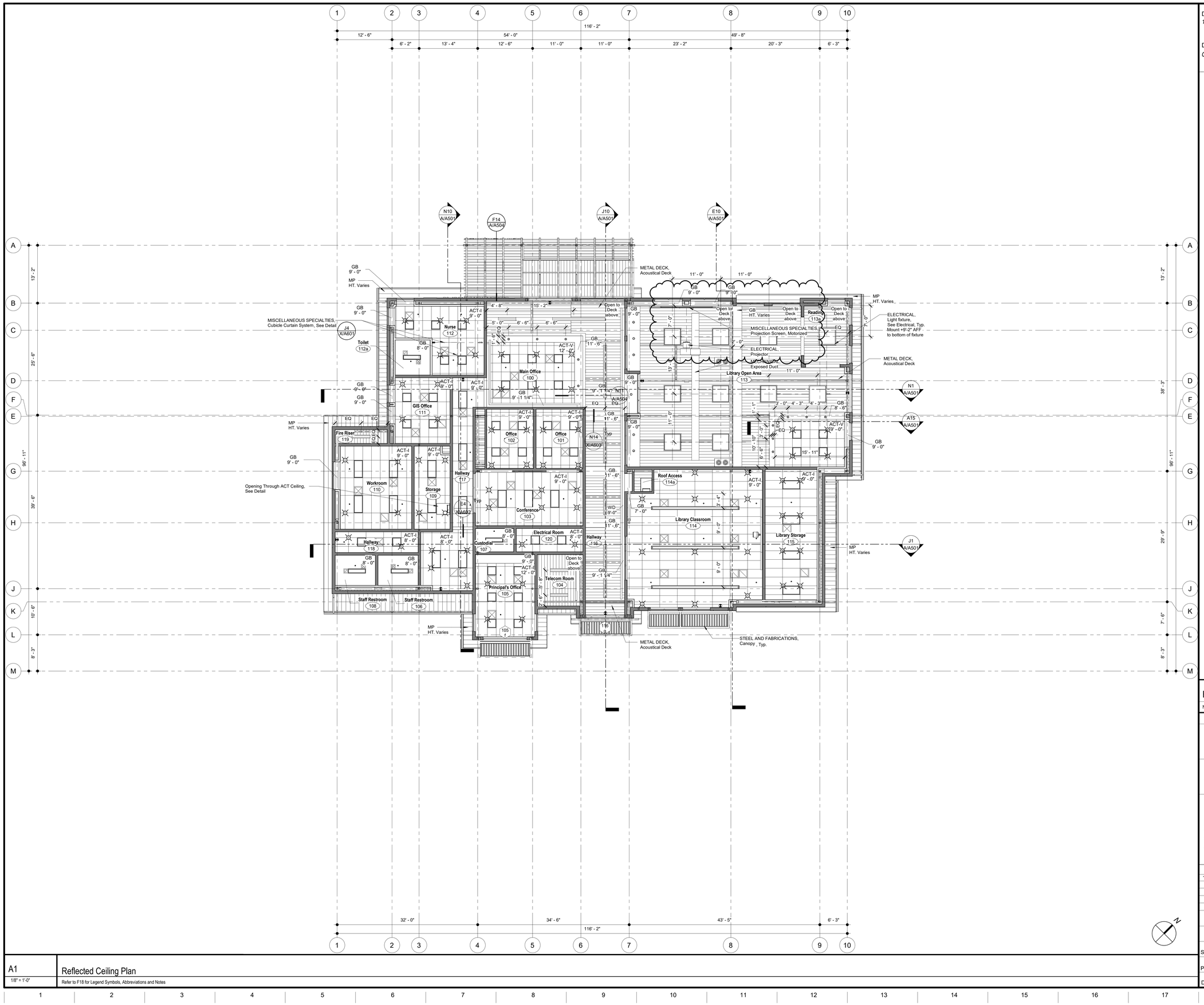
Architect

No.	Revision/Submission	Date
1	Addendum 1	02/17/23

Revision

	Designed Designer	Copyright 2022 Darden Architects
Scale: As indicated	Drawn By: JGM	X/A513
Project Number: 2116	Checked By: AC	
Date: 02/15/23	Reviewed By: RP	



DSA File No.:
10-48

DSA Application No.:
02-120543

Agency Approval

SYMBOLS

- MECHANICAL, Air Supply Grill
- MECHANICAL, Air Return Grill
- MECHANICAL, Strip Grill
- MECHANICAL, Exhaust Fan
- FIRE PROTECTION, Fire Sprinkler Head
- OD — PLUMBING, Overflow Drain
- ACOUSTICAL CEILINGS, Suspended Ceiling Compression Strut/ Splay Wire location
- (RA) — ROOF ACCESSORIES, Roof Hatch
- ELECTRICAL, Light Fixture, Recessed. Unless Noted Otherwise. (p) = Pendant Mounted (s) = Surface Mounted
- ELECTRICAL, Light Fixture, Exit Sign
- HD — ELECTRICAL, Fire Alarm Device, Heat Detector
- SD — ELECTRICAL, Fire Alarm Device, Smoke Detector
- S — ELECTRICAL, Speaker
- CEMENT PLASTER, Cement Plaster System
- GYPSUM BOARD, Refer to Interior Finish Schedule
- ACOUSTICAL CEILINGS, Refer to Plan for Type.
- ACOUSTICAL CEILINGS, Refer to Plan for Type.
- Metal Deck
- PLUMBING, Roof Drain, Refer to Plumbing.
- ACCESS DOORS AND FRAMES, Access Doors, Ceiling (20" X 30"), UNO
- 1 Hr. Corridor Wall - (1 Hr. Fire Resistive Construction, 20 Min. Door Assemblies, 45 Min. Window Assemblies)
- 1 Hr. Fire Barrier - (1 Hr. Fire Resistive Construction, 60 Min. Door Assemblies)
- 1 Hr. Occupancy Separation / Fire Partition - (1 Hr. Fire Resistive Construction, 45 Min. Door Assemblies, 45 Min. Window Assemblies)
- 2 Hr. Fire Wall (2 Hr. Fire Resistive Construction, 1-1/2 Hr. Opening Assemblies)
- 2 Hr. Fire Barrier (2 Hr. Fire Resistive Construction, 1-1/2 Hr. Opening Assemblies)
- Reference Point

ABBREVIATIONS

ACT	ACOUSTICAL CEILINGS, Tile, Suspended, Unless Noted Otherwise.
CLG	Ceiling
CP	CEMENT PLASTER, System
(E)	Existing
GB	GYPSUM BOARD, Type "X", Unless Noted Otherwise.
GLB	GLUE-LAMINATED CONSTRUCTION, Beam
HT	Height
MD	METAL DECK
TYP	Typical
SIM	Similar
OH	Opposite hand
DS	Downspout
OD	Overflow Drain
UNO	Unless Noted Otherwise

NOTES

1. ACOUSTICAL CEILINGS. For typical suspended ceiling support and bracing, Refer to A11 X/A602 and A7 X/A602
2. Gypsum Board Ceilings Noted As "CLG HT Varies", Gypsum Board is attached to bottom side of framing/ joists, UNO
3. Ceiling Heights indicated are above Finish Floor at each floor level, UNO.
4. Where Fire Sprinklers occur at Acoustic Tile, Sprinkler Heads shall be centered in the Tile.
5. Not all fire Sprinkler Head locations are shown to provide code required coverage. But locations shown are intended to convey design intent. Coordinate with FIRE PROTECTION.
6. See Structural for framing of soffits and ceilings
7. Single Lights or Single Rows of Lights at Soffits/ Ceilings shall be centered, UNO.

E18 — Reflected Ceiling Plan Legend
No Scale

McKinley/Fowler Elementary School- Increment 2
Clovis Unified School District
Fresno, CA 93727
Project

BUILDING A- ADMINISTRATION
REFLECTED CEILING PLAN
Drawing

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Architect

No.	Revision/Submission	Date
1	Addendum 1	02/17/23

Revision

Designed Designer
Drawn By: Author
Checked Checker
Reviewed Approver

Scale: 1/8" = 1'-0"
Project Number: 2116
Date: 02/15/23

A/A201

A1 — Reflected Ceiling Plan
1/8" = 1'-0"
Refer to F18 for Legend Symbols, Abbreviations and Notes

2/19/2023 10:28:12 AM
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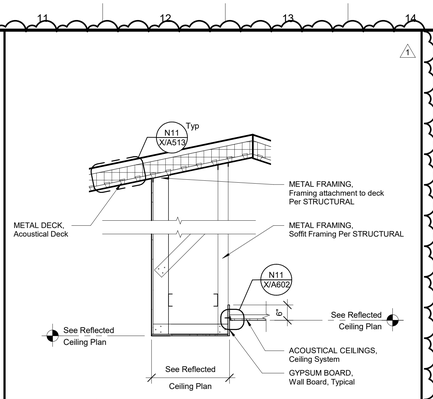
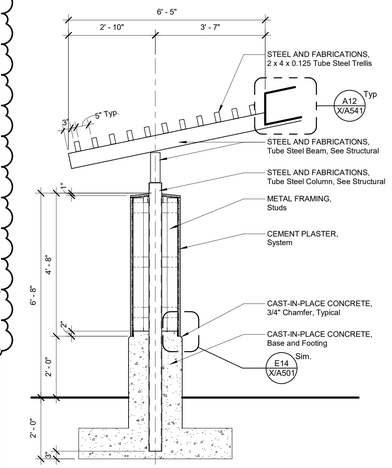
AD1-AX09



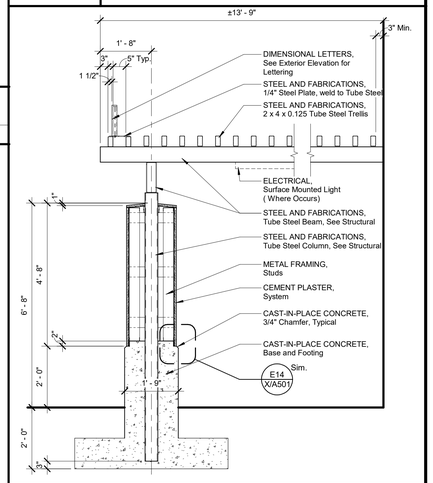
N11 — Wall Section at Hallway Soffit

1/2" = 1'-0"



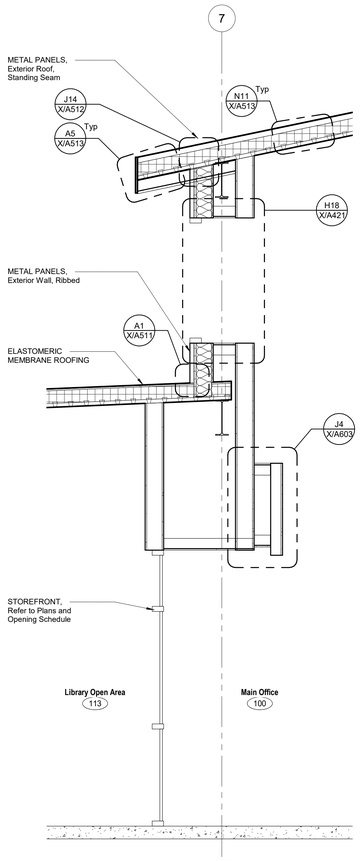
L14 — Section Library Trellis

1/2" = 1'-0"



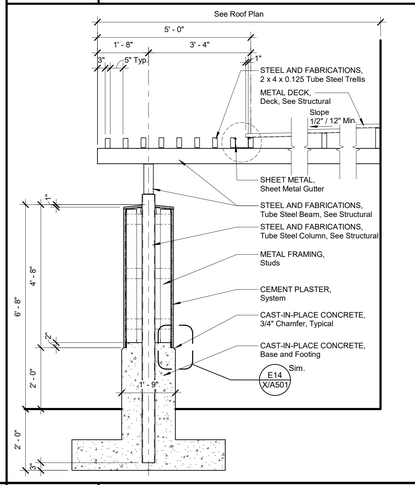
F14 — Section at Admin Entrance- Trellis

1/2" = 1'-0"



A11 — Wall Section

1/2" = 1'-0"



A14 — Section at Admin Entrance

1/2" = 1'-0"

DSA File No.:
10-48

DSA Application No.:
02-120543

Agency Approval

McKinley/Fowler Elementary School- Increment 2
Clovis Unified School District
Fresno, CA 93727

Project

BUILDING A- ADMINISTRATION
WALL SECTIONS

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LICENSED ARCHITECT
ANDREW A. CORNEJO
No. C37102
REG. 11-30-23
STATE OF CALIFORNIA

Architect

No.	Revision/Submission	Date
1	Addendum 1	02/17/23

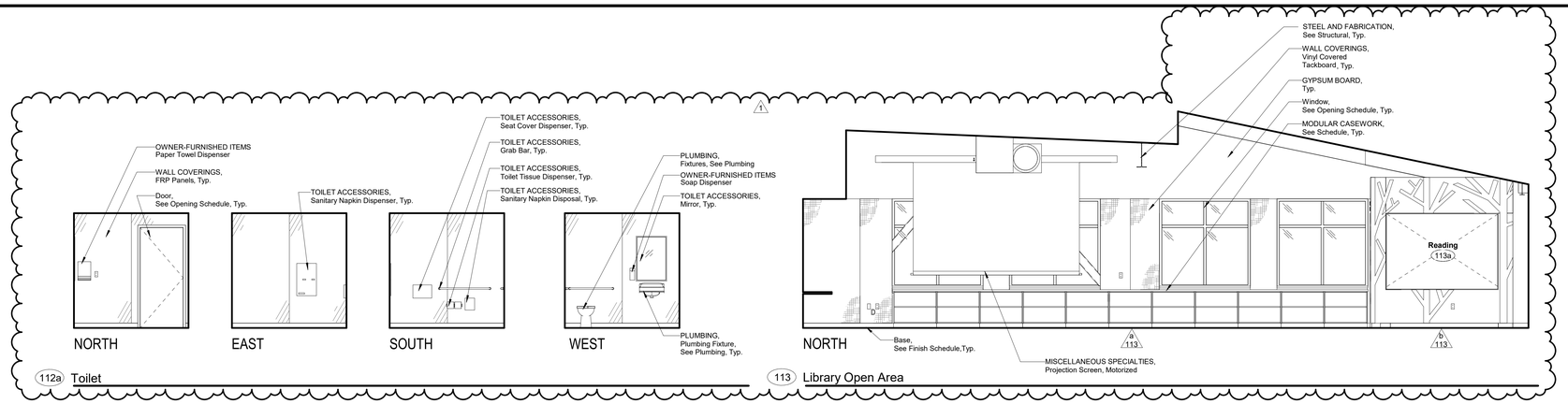
Revision

Designed Designer

Scale: 1/2" = 1'-0"
Drawn By: Author
Project Number: 2116
Checked Checker
Date: 02/15/23
Reviewed Approver

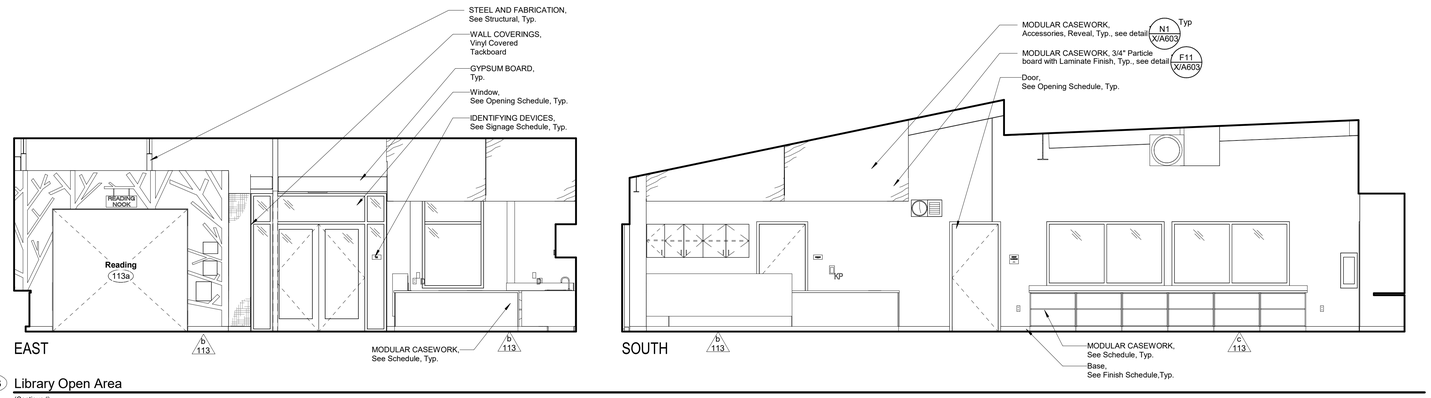
A/A504

AD1-AX10

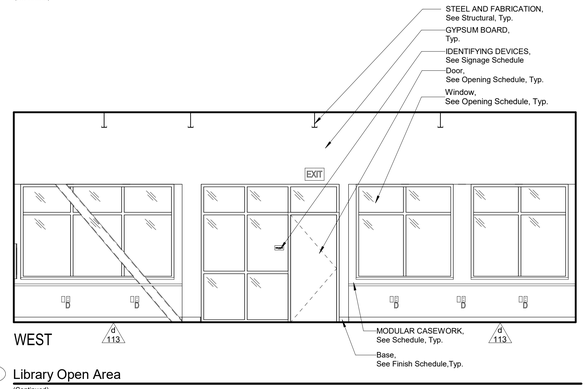


112a Toilet

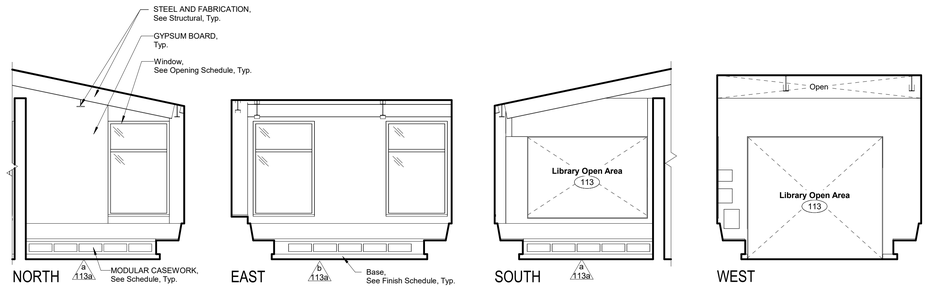
113 Library Open Area



113 Library Open Area
(Continued)



113 Library Open Area
(Continued)



113a Reading
(Continued)

SYMBOLS

- a / ### — Cabinet Group No. Refer to Modular Casework Schedule and Lab Casework Schedule.
- 10 — Equipment Item No. Refer to Equipment Schedule.
- FEC — FIRE PROTECTION SPECIALTIES, Fire Extinguisher Cabinet, Top of Cabinet @ +5'-0", Unless Noted Otherwise. Provide Fire Rated Cabinet at Rated Walls
- FEBC — FIRE PROTECTION SPECIALTIES, Fire Extinguisher/Blanket Cabinet, Top of Cabinet @ +5'-0", Unless Noted Otherwise. Provide Fire Rated Cabinet at Rated Walls. Provide Surface Mounted Cabinet at Rated Walls Where Stud Depth is Less than 6" and at Masonry Walls.
- ELECTRICAL, Speaker @ +8'-0" to center of device, Unless Noted Otherwise.
- ELECTRICAL, Clock @ +8'-0" to center of device, Unless Noted Otherwise.
- ELECTRICAL, Clock/Speaker @ +8'-0" to center of device, Unless Noted Otherwise.
- ELECTRICAL, Outlet
- D — ELECTRICAL, Data Outlet
- ELECTRICAL, Light Switch
- M — ELECTRICAL, Microphone Outlet
- FA — ELECTRICAL, Fire Alarm Device
- IS — ELECTRICAL, Intrusion Sensor
- V — ELECTRICAL, Volume Control
- MS — ELECTRICAL, Motion Sensor
- TV — ELECTRICAL, Television Outlet
- ELECTRICAL, Telephone Outlet
- T — MECHANICAL, Thermostat
- KP — OWNER FURISHED ITEM, Keypad, see ELECTRICAL
- HB — PLUMBING, Hose Bib
- GLASS

ABBREVIATIONS

Gl.	Glass
KS	Knee Space
OH	Opposite Hand
Typ.	Typical
Sim.	Similar
Dia.	Diameter
UNO	Unless Noted Otherwise

NOTES

1. All Details, Materials and Finishes shall be considered typical for all similar conditions Unless Noted Otherwise.
2. Refer to Plumbing, Mechanical, Telecommunications, Food Service, and Electrical for all wall mounted devices and coordinate location and heights with Architectural (ie. casework, equipment, etc.)
3. Locate and mount TOILET ACCESSORIES and PLUMBING per detail A4 X/A601, A11 X/A601 Unless Noted Otherwise.
4. Provide backing at all TOILET ACCESSORIES, TOILET PARTITIONS, and IDENTIFYING DEVICES per detail N14 X/A601 Unless Noted Otherwise.
5. Provide Backing for TOILET ACCESSORIES, Grab Bars per detail A1 X/A601
6. Locate and mount IDENTIFYING DEVICES per detail E11 X/A601 Unless Noted Otherwise.
7. Provide backing at all MODULAR CASEWORK per detail N14 X/A601
8. Attach all MODULAR CASEWORK per details A14 X/A316, G14 X/A316
9. WALL COVERINGS, Vinyl Covered Tackboard, See detail N4 X/A601
10. WALL COVERINGS, FRP Panels, See detail N1 X/A601
11. GYPSUM BOARD, Control Joints, see details E18 X/A602
12. Provide backing at all OWNER FURNISHED ITEMS, Television per detail N14 X/A601
13. WALL AND CORNER GUARDS, Corner Guard, see detail N11 X/A601
14. For Modular Casework Schedules, Refer to X/A301 through X/A304

F18 — Interior Elevation Legend
No Scale

DSA File No.:
10-48

DSA Application No.:
02-120543

Agency Approval

McKinley/Fowler Elementary School- Increment 2
Clovis Unified School District
Fresno, CA 93727
Project

BUILDING A- ADMINISTRATION
INTERIOR ELEVATIONS- ROOMS 112a-113a
Drawing

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LICENSED ARCHITECT — ANDREW A. CORNEJO — No. C37102 — Rev. 11-30-23 — STATE OF CALIFORNIA

Architect

No.	Revision/Submission	Date
1	Addendum 1	02/17/23

Revision

Designed Designer
Drawn By: Author
Checked Checker
Reviewed Approver

Scale: 1/4" = 1'-0"
Project Number: 2116
Date: 02/15/23

A/A603

A1 — Interior Elevations
1/4" = 1'-0"
Refer to F18 for Legend Symbols, Abbreviations and Notes