CITY OF SAUSALITO

420 Litho Street, Sausalito, CA 94965

Addendum No. 1

Issued **September 12, 2025**

For
Dunphy Park Improvement Phase 2 Project

NOTICE TO ALL PLAN HOLDERS SUBMITTING BIDS FOR THIS WORK:

You are hereby notified of the following information, changes, clarifications or modifications to the original Contract Documents, Project Manual, Drawings, Specifications and subsequent Addenda. This Addendum shall supersede the original Contract Documents and previous Addenda wherein it contradicts the same and shall take precedence over anything to the contrary therein. All other conditions remain UNCHANGED.

This Addendum is hereby made a part of the Contract Documents to the same extent as though it were originally included therein.

Revisions:

PLANS:

A- List the sheets that have been revised.

Sheet L1.0
Note # 29 “IF ANY WASTE IS ENCOUNTERED DURING INSTALL AND EXCAVATION, CONTACT CITY REPRESENTATIVE AND LANDSCAPE ARCHITECT. LANDSCAPE ELEMENTS ARE NOT TO BE INSTALLED IN WASTE MATERIAL. ALL INSTALLATIONS TO BE IN CLEAN COVER MATERIAL.”

Sheet L1.1
Note #4 on Sheet L1.1 Demolition Plan has been revised to read, "IF WASTE IS ENCOUNTERED DURING SITE WORK, REFER TO NOTES 28-33 ON SHEET L1.0 GENERAL NOTES."

Sheet L5.0
Notes #2 & #28. Note #2 refers to temporary irrigation installed at the surface and so will not be installed in waste material. Note 28 is added: "IF ANY WASTE IS ENCOUNTERED DURING EXCAVATION FOR AND INSTALLATION OF IRRIGATION EQUIPMENT AND PIPING, DO NOT INSTALL IN WASTE AND CONTACT CITY REPRESENTATIVE AND LANDSCAPE ARCHITECT. IRRIGATION EQUIPMENT AND PIPING IS TO BE INSTALLED WITHIN THE THICKNESS OF CLEAN COVER MATERIAL."

B- Storm Water Pollution Prevention Plan, prepared by CSWST2, dated August 21, 2025 – Contractors shall comply with this document and are not required to prepare a SWPPP.

C- Informational Attachments:

- **Geological Study Report, prepared by RGH Consultants, dated June 9, 2015**
- **Interim Final Completion Report, Shoreline Soil Excavation, Replacement, and Stockpile Removal, prepared by Geo-Logic Associates, dated December 2023. This attachment may be downloaded from https://www.dropbox.com/t/krXrY1EgXo6UJoWi**

RESPONSE TO QUESTIONS

QUESTION 1: "Does the above project currently have an estimated mobilization date?"

Response to Question 1:

The project is set to start in October 2025 and is expected to last more than four months, with a contract performance time of 120 days.

QUESTION 2: "Is this project subject to a PLA (Project Labor Agreement)?"

Response to Question 2:

No.

QUESTION 3: "There is a third report noted on drawing L1.0. Can you please post this report as well?"

Response to Question 3:

The Geotechnical Study is made available as part of Addendum 1 Informational Attachment **Geological Study Report, prepared by RGH Consultants, dated June 9, 2015**. The report contains geotechnical recommendations for site grading and structures such as footings, slabs, utility trenches, and pavements. To the extent these structures are included in project phase 2, the recommendations are generally applicable. To note, requirements for replacement fill at shoreline excavations are not provided in this report.

For additional information on Shoreline Soil refer to specification section 311000.2.1.B Site Preparation & Plant Protection & Sheet L3.0.

In addition, a related "Interim Final Completion Report, Shoreline soil excavation, Replacement and Stockpile Removal" is made available and can downloaded from: https://www.dropbox.com/t/krXrY1EgXo6UJoWi.

QUESTION 4: "Drawing L1.1, note #4 states,

"SOIL AND WASTE REMOVAL & REPLACEMENT REQUIREMENTS AS PER "INTERIM FINAL COMPLETION REPORT SHORELINE SOIL EXCAVATION, REPLACEMENT & STOCKPILE REMOVAL" DATED DECEMBER 2023 AND "TECHNICAL MEMORANDUM: SHORELINE SOIL EXCAVATION AND DISPOSAL RECOMMENDATIONS - DUNPHY PARK IMPROVEMENT PHASE 2" DATED SEPTEMBER 2024 PREPARED BY GEO-LOGIC ASSOCIATES FOR THE CITY OF SAUSALITO."

"Can you please provide these reports?"

Response to Question 4:

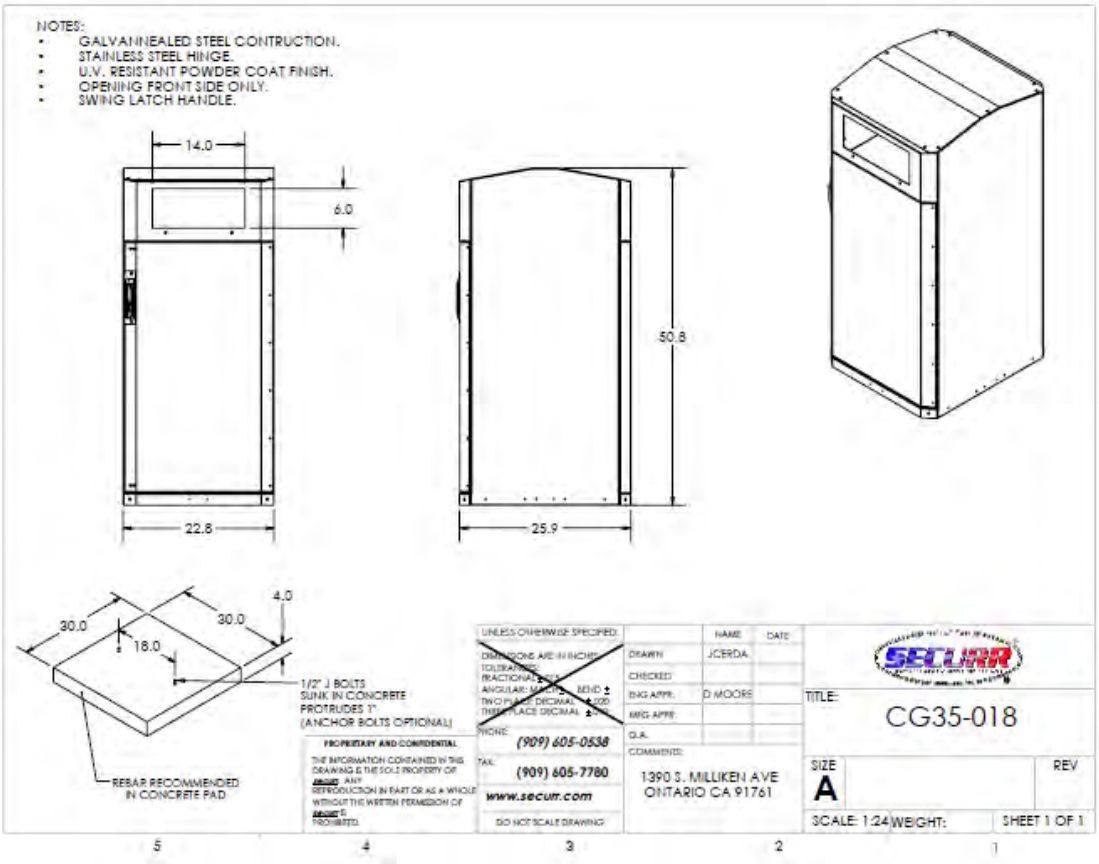
Note #4 on Sheet L1.1 Demolition Plan has been revised to read, "IF WASTE IS ENCOUNTERED DURING SITE WORK, REFER TO NOTES 28-33 ON SHEET L1.0 GENERAL NOTES."

This note, together with the provided Addendum 1 geological study reports, documents the selective soil excavation and replacement work completed to date on the Dunphy Park Improvements Project in Sausalito, CA.

QUESTION 5: "What kind of trash recycling receptacle does the City of Sausalito want for Bid Item # 21?"

Response to Question 5:

The City of Sausalito requires a specific trio of receptacles—trash, compost, and recycling—for all City-owned properties, including Dunphy Park. For this project, the contractor must procure these receptacles from BEARSAVER/SECURR (P: 909-212-5379 | C: 909-210-0100 | F: 909-605-7780; PO Box 1438, Guasti, CA 91743; 1390 S. Milliken Ave., Ontario, CA 91761). The receptacles are distinguished by their openings: rectangular for trash, oval for compost, and circular for recycling.



QUESTION 6: "Is the City of Sausalito open to alternative as equal site furnishings for the benches, picnic tables and recycling receptacles?"

Response to Question 6:

No. Site furnishings—including benches, picnic tables, and recycling receptacles—must comply with the landscape architectural plans and specifications.

QUESTION 7: "After reviewing the project specs, we saw there was a requirement for builder's risk insurance. We were wondering if your team could possibly consider waiving the insurance requirement?"

Response to Question 7:

No. Builder's Risk Insurance is required.

END RESPONSE TO QUESTIONS

REVISION TO PROJECT DOCUMENTS

REVISION TO THE PROJECT SPECIFICATIONS – NONE

REVISION TO EXHIBIT B – TECHNICAL SPECIFICATIONS – NONE

REVISION TO PROJECT PLANS

Changes are reflected in the Addendum 1 Project Plans REVISION 1 attachment.

End Revisions to the Project Plans

END REVISION TO PROJECT DOCUMENTS

END OF ADDENDUM NO. 1

Issued By: **City of Sausalito**
Sara Khorshidifard
DPW Project Manager

ACKNOWLEDGED

_____
Bidder's Signature
A signed copy of this addendum is to be submitted as a part of the bid package for the subject project. Failure to do so may subject the Bidder to Disqualification.

Dunphy Park Improvement Project Phase 2

The scope of these Bid Documents includes.

- Demolition
- Soil preparation and grading
- Planting and irrigation
- Pedestrian paths
- Shoreline protection fencing
- Site furnishings

OWNER:

CITY OF SAUSALITO
420 LITHO ST
SAUSALITO, CA 94965
(T) 415.289.4100

LANDSCAPE:

RHAA
LANDSCAPE ARCHITECTURE
225 MILLER AVENUE
MILL VALLEY, CA 94941
(T) 415.383.7900

SHEET INDEX

Landscape

ABBREVIATIONS

AL	ALIGN
AC	ASPHALTIC CONCRETE
AD	AREA DRAIN
ADA	AMERICANS WITH DISABILITIES ACT
AGG	AGGREGATE
ALUM	ALUMINUM
APPX	APPROXIMATE
ARCH	ARCHITECTURE
BLDG	BUILDING
BOS	BOTTOM OF SLOPE
BR	BOTTOM OF RAMP
BS	BOTTOM OF STAIRS
BX	BOX
CAL	CALIPER
CALDAG	CALIFORNIA DISABLED ACCESSIBILITY GUIDEBOOK
CB	CATCH BASIN
CBC	CALIFORNIA BUILDING CODE
CJ	CONTROL JOINT
CL	CENTERLINE
CLF	CHAIN LINK FENCE
CLR	CLEAR
CO	CLEAN OUT
COL	COLUMN
CONC	CONCRETE
CONST	CONSTRUCTION
CONT	CONTINUOUS
CTR	CENTER
CY	CUBIC YARD
DG	DECOMPOSED GRANITE
DI	DRAIN INLET
DIA	DIAMETER
DWGS	DRAWINGS
EJ	EXPANSION JOINT
ELE TRANS	ELECTRICAL TRANSFORMER
ELEV	ELEVATION
EQ	EQUAL
EQUIP	EQUIPMENT
ETWU	ESTIMATED TOTAL WATER USE
(E)	EXISTING
FFE	FINISH FLOOR ELEVATION
FG	FINISH GRADE
FL	FLOWLINE
FOB	FACE OF BUILDING
FOC	FACE OF CURB
FT	FOOT/FEET
FTG	FOOTING
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GB	GRADE BREAK
GC	GALLON CAN
GFRC	GLASS FIBER REINFORCED CONCRETE
GPM	GALLONS PER MINUTE
GRD	GRADE
HB	HOSE BIB
HDPE	HIGH DENSITY POLYETHYLENE
HDR	HEADER
HORIZ	HORIZONTAL
HT	HEIGHT
ID	INSIDE DIAMETER
INV	INVERT ELEVATION
IRR	IRRIGATION
LF	LINEAR FEET
MAWA	MAXIMUM APPLIED WATER ALLOWANCE
MAX	MAXIMUM
MFG	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
(N)	NEW
NIC	NOT IN CONTRACT
NO	NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
PA	PLANTING AREA
PERF	PERFORATED
PERP	PERPENDICULAR
PIP	POURED-IN-PLACE
PL	PROPERTY LINE
POC	POINT OF CONNECTION
PROP	PROPOSED
PSI	POUNDS PER SQUARE INCH
PVC	POLYVINYL-CHLORIDE
QTY	QUANTITY
R	RADIUS
RB	ROOTBALL
REBAR	REINFORCING BAR
REC	RECOMMENDATION
REQ'D	REQUIRED
RGH	ROUGH
RIM	RIM ELEVATION
RWD	REDWOOD
SAD	SEE ARCHITECTURAL DRAWINGS
SED	SEE ELECTRICAL DRAWINGS
SPD	SEE PLUMBING DRAWINGS
SSD	SEE STRUCTURAL DRAWINGS
SCD	SEE CIVIL DRAWINGS
SD	STORM DRAIN
SDR	STORM / SLOT DRAIN RIM
SHT	SHEET
SJ	SCORE JOINT
SMD	SEE MECHANICAL DRAWINGS
SPCS	SPACES
SPEC'D	SPECIFIED
SPECS	SPECIFICATIONS
SQ	SQUARE
SF	SQUARE FEET
SS	STAINLESS STEEL
STD	STANDARD
STL	STEEL
STPA	STORMWATER TREATMENT PLANTING AREA
SW	SIDEWALK
TBD	TO BE DETERMINED
TC	TOP OF CURB
TOF	TOP OF FOOTING
TOW	TOP OF WALL
TR	TOP OF RAMP
TS	TOP OF STAIRS
TW	TOP OF WALL
TYP	TYPICAL
UBC	UNIFORM BUILDING CODE
UON	UNLESS OTHERWISE NOTED
VERT	VERTICAL
W	WATER LINE
WUCOLS	WATER USE CLASSIFICATION OF LANDSCAPE SPECIES
W/	WITH
@	AT

Vicinity Map (NTS)

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900
rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

Public Works Director:
Date:

1" = 30'-0"
0 10' 20' 30' 60'
N

SHEET TITLE

COVER SHEET

DRAWN BY: TS / QU CHECKED BY: JM

L0.0

Date Plotted: 9/8/2025 4:27 PM

Date Plotted: 9/8/2025 4:28 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

LICENSED LANDSCAPE ARCHITECT
License No. 6174
Signature
05-31-2026
Renewal Date
08-22-2025
Date
STATE OF CALIFORNIA

Public Works Director:
Date:

1" = 30'-0"
0 10' 20' 30' 60'
N

SHEET TITLE

ILLUSTRATIVE SITE PLAN

DRAWN BY: TS / QU CHECKED BY: JM

L0.1

GENERAL NOTES

1. These drawings and specifications describe the quality and character of the materials, shape, configuration and design intent of the completed, installed work. The contractor is responsible for providing complete and operational systems and installations of the described design intent, including all miscellaneous items of work, materials, equipment, etc., necessary to complete the installation whether or not mentioned in the specifications or shown on the drawings. All materials shall be furnished and properly installed by the contractor unless otherwise noted.

2. The installed work shall conform to the requirements of the governing building authority; requirement of the City of Sausalito, Marin Municipal Water District, and any other permitting agency; all special requirements and conditions of the design review permit and building permit; and all applicable codes, laws, standards, etc.

3. The contractor shall examine the drawings and specifications and clearly understand the existing conditions under which the work is to be performed prior to bidding. The contractor shall be familiar with the project site, field investigate, verify and be responsible for all conditions, elevations and dimensions of the project, as shown on or referenced on the drawings. The contractor shall notify the owner's representative about any condition requiring modification or clarification prior to bidding. Entering into an agreement with the owner indicates that the contractor has visited the site, familiar with the existing conditions and fully understands the requirements of the contract documents. No allowances of any kind will be made for any extra cost due to the contractor's failure to inform the owner of discrepancies in time to issue corrective addenda prior to bidding.

4. All general notes, dimensions, and details shall be considered typical and apply to similar conditions unless otherwise noted. Specific notes, details and specifications shall take precedence over general notes and typical details.

5. The contractor is responsible for the coordination of all work between trades, subcontractors, manufacturers, fabricators, and all other contracted for the completion of the work, including those under separate contracts for concurrent projects.

6. The contractor is responsible for all testing, inspections and reporting as outlined in the contract document and as required by the permitting authorities to complete the work.

7. All work shall be in accordance with the recommendations specified in the Geotechinical Study Report prepared by RGH Consultants, dated June 9, 2015, Addendum No. 1, dated August 22, 2017. The recommendations of the report shall supersede the information found within these contract documents (drawings and specifications).

8. The site plan and proposed grading has been developed based on the Boundary and Topographic Survey by Linda A Carruthers & Associates, dated 12/09/13 and revised 6/15/17.

9. All underground utilities shown on these plans reflect the available records. Contractor shall use caution in all excavation operations. Contractor shall be aware that they may encounter burn ash type waste. The contractor is responsible to investigate and verify all existing and proposed conditions as shown or referenced in the documents, including location and depth of all utilities. The contractor shall immediate notify the owner's representative of any conflicts and/or discrepancies between existing and proposed conditions which will affect the work, before proceeding with the work.

10. Contractor shall notify underground service alert (usa 800-642-2444) two working days minimum prior to any excavation.

11. The contractor shall comply with the requirements of the division of industrial safety pertaining to "confined space". Any manhole, culvert, drop inlet or trench, which could contain air that is not readily ventilated, may be considered a "confined space".

12. Provide adequate protection for all proposed and existing utilities during the construction of this project.

13. All existing utility structures (shown or not shown on the drawings) within the area of work shall be adjusted or reconstructed to the finish grades shown and specified.

14. Utility connections and disconnections necessary to complete the work shall be performed in such a manner as to minimize utility service interruptions. Contractor shall coordinate all "down time" with the owner's representative and the appropriate utility and/or agency.

15. Refer to civil drawings for information and location of all existing and proposed utilities.

16. Refer to structural and architectural drawings for information regarding all structural connections, waterproofing, building systems and requirements.

17. The contractor shall protect existing facilities, trees, landscape and other items to remain from damage. Any damage caused by the contractor shall be repaired or replaced at no additional cost to the owner. The contractor shall provide barricades, signs, lights, etc. for the protection of public, personnel, property, and material and to prevent uncontrolled access to the site at all times. The contractor shall assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and property, and not limited to normal working hours.

18. The contractor shall provide accessible egress and ingress to on-site facilities that are to remain operational during construction.

19. Any permanent monuments or points damaged or destroyed by construction activities shall be replaced by a licensed engineer or land surveyor at the contractor's expense.

20. The contractor shall employ all means necessary to control airborne particulate (dust) at and near the construction site of work and along approach routes to the construction site and in compliance with local air quality standards.

21. Contractor shall maintain "good housekeeping" practices at the job site. Excess building materials and debris shall be removed promptly from the job site and disposed of at an approved dumpsite. The job site shall be left "broom clean" at the end of each workday. Before acceptance by the owner's representative, the completed construction shall be cleared, any applicable labels removed, and all other touchup work completed. All finish materials shall be protected at all times against subsequent damage until final acceptance by the owner's representative.

22. The contractor shall contact the owner's representative for designation of the equipment and material storage and staging areas at the job site.

23. Wastewater generated during construction shall not be discharged to the storm drain system. If necessary, the contractor shall provide an area for on-site washing activities during construction. Materials that could contaminate stormwater runoff shall be stored in areas which are designed to prevent exposure to rainfall and prevent runoff. Grading and drainage features shall be constructed so that water flow does not drain to other properties. Flushing of streets and parking lots to remove dirt and construction debris is prohibited unless proper sediment controls are used.

24. Refer to civil drawings for the stormwater pollution prevention plan (swppp). If no plan is provided, it is the responsibility of the contractor to provide a swppp to the appropriate agency for approval.

25. The contractor shall prepare a traffic control plan for review and approval by the appropriate agency prior to any work requiring traffic control. The contractor shall be provide traffic controls in accordance with caltrans "manual of traffic controls for construction and maintenance work zones" (current edition) and any additional city, county, district or other agency requirements. Failure to comply may result in immediate stoppage of work until the proper traffic control is in place.

26. The contractor is responsible for conforming to all improvements to the adjacent existing conditions with smooth transitions to avoid any abrupt or apparent changes in grades, cross slope, hazardous conditions, etc.

27. The contractor shall immediately notify the owner's representative of any revisions or additional work required as a result of field conditions or local governing authorities. All revisions shall be in written change order form and approved and authorized by the owner's representative before proceeding with the work. Work performed without written authorization shall be the full responsibility of the contractor and at no additional cost to the owner.

28. In designated environmentally sensitive areas, 1' maximum excavation depth is permitted.

29. If any waste is encountered during install and excavation, contact city representative and landscape architect. Landscape elements are not to be installed in waste material. All installations to be in clean cover material.

30. When soil is removed, documentation should be provided on the quantity of soil/waste removed, any testing, and receipts/invoices/manifests showing where the soil/waste was disposed of.

31. Record any waste discoveries across the site during construction, including wastes that may extend beyond the MHHW and within the southern shoreline environmentally sensitive areas. Document with photos and GIS coordinates and include all information in the Final Report at the end of the project.

32. Contractor to create a Health and Safety Plan. Air monitoring of VOCs and methane should be included as well as any hazards related to working with burn ash. For more information regarding potential hazards from burn ash, please see the Protocol for Burn Dump Site Investigation and Characterization dated June 30, 2003 (Protocol For Burn Dump Site Investigation and Characterization, June 30, 2003).

33. Upon completion of the work, a Final Report should be submitted to the LEA for review and approval that contains, at a minimum, as-built drawings showing the project was implemented per design, information from Notes 30 and 31 above, daily field reports, and photographs.

34. Contractor to provide staging and access plan in coordination with City of Sausalito.

General References

The contractor shall conform with all applicable 2016 California building, plumbing, electrical, mechanical, energy and green building codes.

The contractor shall comply with all requirements of the City of Sausalito, Marin Municipal Water District requirements, and the state water efficient landscape ordinance.

California Building Code (Caliifornia Code of Regulations Title 24), current addition

Local air quality maintenance district for airborne particulate

Uniform Building Code (UBC)

Caltrans standards

CAL-OSHA, 'Construction Safety Orders' and division of industrial safety pertaining to "Confined Space", current edition

Current standards of the Americans with Disabilites Act (ADA)

California regional water quality control board requirements.

Latest edition of the uniform plumbing code and the national electric code.

California 1881 model water landscape ordinance or adopted local ordinance.

Quality Control Notes

1. Contractor to provide mockups of all paving materials, walls, etc. for approval
2. Contractor to submit shop drawings, product technical data sheets, and material samples for approval.
3. Contractor to submit soil analysis reports for all planting soils for approval.
4. All approved submittals, test results, products, systems, shop drawings, materials, and mockups will be considered part of the project specifications.

Accessibility Notes

1. All site work shall comply with current california building code (caliifornia code of regulations title 24), current standards of the americans with disabilites act (ada), and the current fair housing act design manual.
2. All paving areas shall be accessible per title 24. All paving surfaces are to be stable, firm, and slip resistant with cross slopes not to exceed 2% in any direction, unless otherwise noted. Accessible paths of travel are barrier-free access routes at least 48" clear in width and without any abrupt vertical level changes exceeding 1/2" if beveled at 1:2 max slope, or vertical level changes not exceeding 1/4" max. All accessible pathways shall be sloped less than 5% in the direction of travel, unless otherwise noted.
3. All accessible paths of travel shall be maintained free of overhanging obstructions below 80" above finish grade. Objects with leading edges located between 27"and 80" above finish grade shall not protrude more than 4" horizontally into the path of travel. exceptions include handrails, door closers, and door stops. guardrails or other barriers shall be provided where object protrusion is beyond the limits allowed.

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

LICENSED LANDSCAPE ARCHITECT
Registration License No.
Signature
05-31-2026
Renewal Date
08-22-2025
Date
STATE OF CALIFORNIA

Public Works Director:
Date:

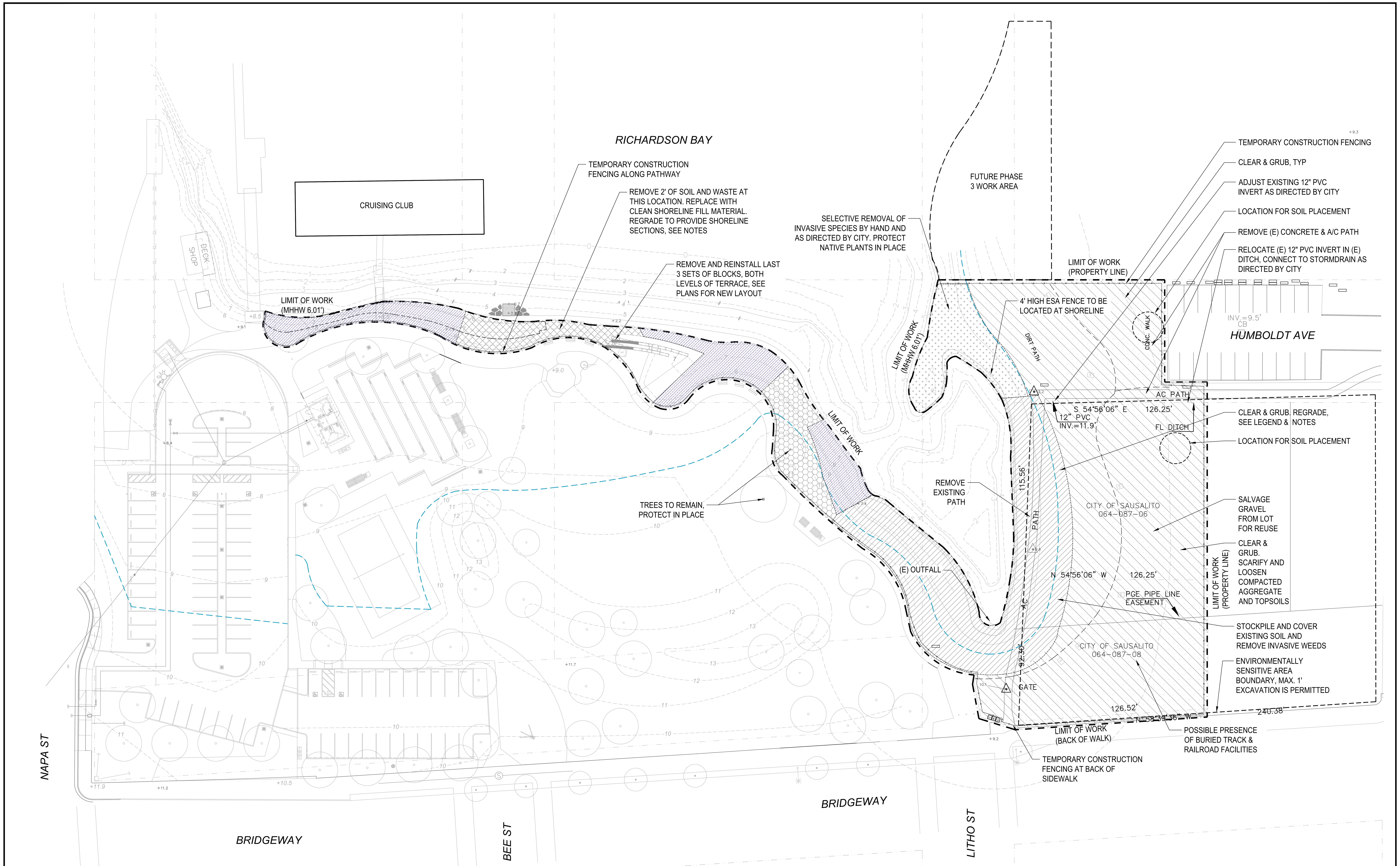
SHEET TITLE

GENERAL NOTES

DRAWN BY: TS / QU **CHECKED BY: JM**

L1.0

Date Plotted: 9/8/2025 4:28 PM



LEGEND

SYMBOL	DESCRIPTION	AREA
	CLEAR & GRUB. REGRADE AS REQUIRED TO PROVIDE SHORELINE SECTIONS. ANY SOIL OR WASTE REMOVAL PER NOTES 30 & 31 ON L1.0 AND 4 ON L1.1.	11,289 SF
	CLEAR & GRUB. SCARIFY AND LOOSEN COMPACTED SOILS. REFER TO SPECIFICATIONS FOR MORE INFORMATION ON SITE & SOIL PREPARATION.	30,422 SF
	SELECTIVE REMOVAL OF INVASIVE SPECIES BY HAND AND AS DIRECTED BY CITY STAFF. ALL NATIVE PLANTS TO BE PROTECTED IN PLACE.	3,083 SF
	SOIL REMEDIATION WAS COMPLETED AT THIS LOCATION AS PART OF PHASE 1 WORK. REMOVE ANY INVASIVE SPECIES PRESENT BY HAND.	5,135 SF

	REMOVE 2' OF SOIL AND WASTE AT THIS LOCATION. REPLACE WITH CLEAN SHORELINE SOIL. REGRADE TO PROVIDE SHORELINE SECTIONS. SEE NOTES 30 & 31 ON L1.0 AND 3 & 4 ON L1.1.	1,750 SF
	SOIL REMEDIATION WAS COMPLETED AT THIS LOCATION AS PART OF PHASE 1 WORK. REMOVE ANY INVASIVE SPECIES PRESENT BY HAND.	2,197 SF
	ENVIRONMENTALLY SENSITIVE AREA BOUNDARY, MAX. 1' EXCAVATION IS PERMITTED	
	PARCEL LINE	
	LIMIT OF WORK LINE	
	100 YEAR XHT 9.53'	

DEMOLITION NOTES

1. CONTRACTOR TO PROTECT IN PLACE ALL EXISTING PARK PATHWAYS AND IMPROVEMENTS.
2. CONTRACTOR TO MITIGATE ANY DAMAGE TO EXISTING IMPROVEMENTS INCLUDING GATES & PATHWAYS.
3. IN AREA WITH 2' REMOVAL OF SOIL, DOCUMENTATION SHOULD BE PROVIDED ON THE QUANTITY OF SOIL / WASTE REMOVED, ANY TESTING, AND RECEIPTS / INVOICES / MANIFESTS SHOWING WHERE THE SOIL / WASTE WAS DISPOSED OF.
4. IF WASTE IS ENCOUNTERED DURING SITE WORK, REFER TO NOTES 28-33 ON SHEET L1.0 GENERAL NOTES. 1
5. FOR SHORELINE SECTIONS SEE SHEETS L4.2 - L4.4
6. REFER TO SOIL PLACEMENT PLAN L3.0 FOR ADDITIONAL INFORMATION ON SOIL TYPES.
7. ARCHAEOLOGIST AND NATIVE AMERICAN MONITOR TO BE ON SITE FOR ANY SOIL DISTURBANCE.

Date Plotted: 9/8/2025 4:28 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

LICENSED LANDSCAPE ARCHITECT — STATE OF CALIFORNIA — Signature 05-31-2026 Renewal Date 08-22-2025 Date

Public Works Director:
Date:

SCALE
1" = 30'-0"
0 15' 30' 60'
N

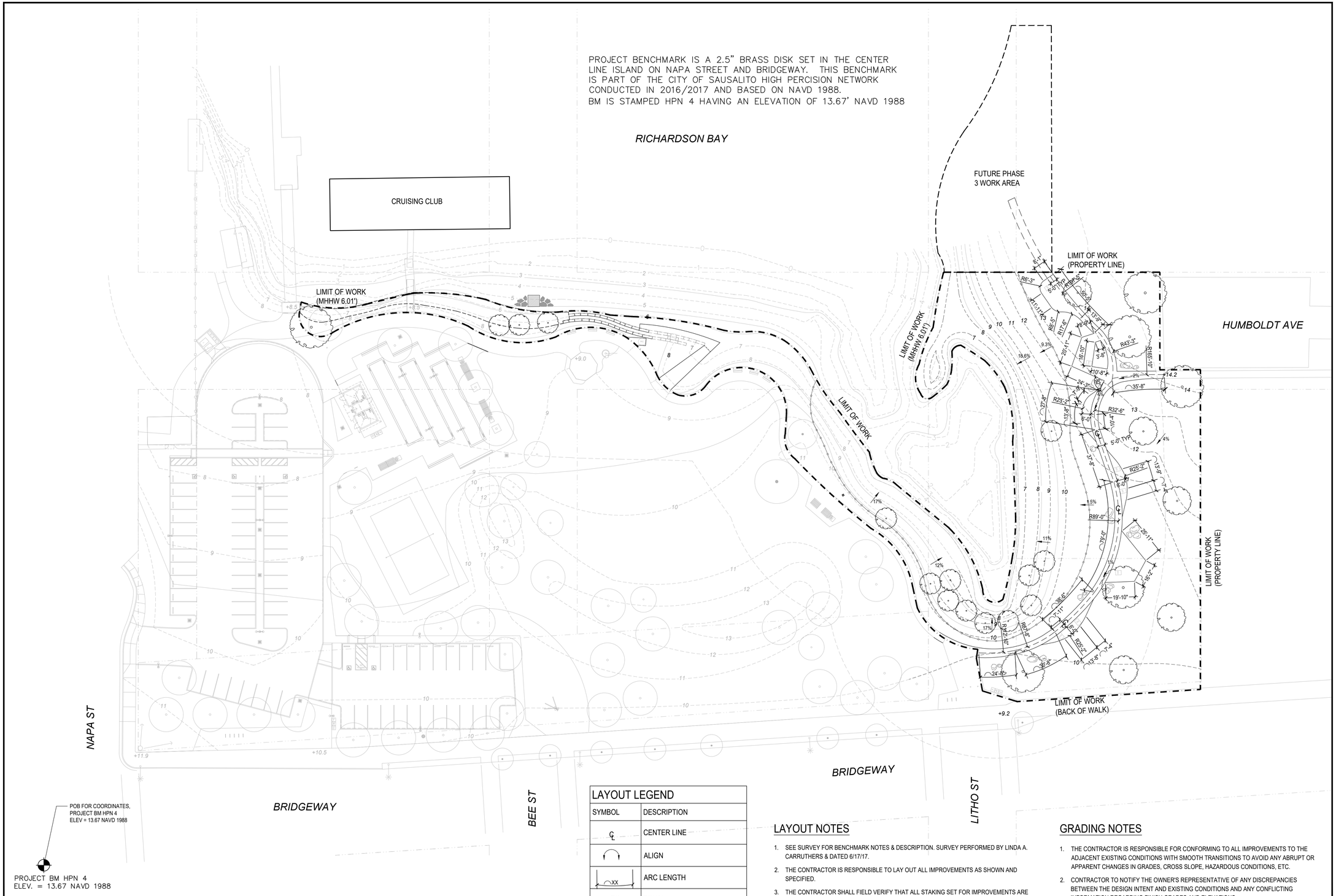
SHEET TITLE

DEMOLITION PLAN

DRAWN BY: TS / QU CHECKED BY: JM

L1.1

PROJECT BENCHMARK IS A 2.5" BRASS DISK SET IN THE CENTER LINE ISLAND ON NAPA STREET AND BRIDGEWAY. THIS BENCHMARK IS PART OF THE CITY OF SAUSALITO HIGH PERCISION NETWORK CONDUCTED IN 2016/2017 AND BASED ON NAVD 1988.
BM IS STAMPED HPN 4 HAVING AN ELEVATION OF 13.67' NAVD 1988



LAYOUT LEGEND	
SYMBOL	DESCRIPTION
℄	CENTER LINE
	ALIGN
XX	ARC LENGTH
EQ	EQUAL
(E)	EXISTING
R XX	RADIUS
OC	ON CENTER
	PARCEL LINE
	LIMIT OF WORK

LAYOUT NOTES

1. SEE SURVEY FOR BENCHMARK NOTES & DESCRIPTION. SURVEY PERFORMED BY LINDA A. CARRUTHERS & DATED 6/17/17.
2. THE CONTRACTOR IS RESPONSIBLE TO LAY OUT ALL IMPROVEMENTS AS SHOWN AND SPECIFIED.
3. THE CONTRACTOR SHALL FIELD VERIFY THAT ALL STAKING SET FOR IMPROVEMENTS ARE CONSISTENT WITH THE DESIGN INTENT OF THESE PLANS AND IMMEDIATELY NOTIFY THE OWNER'S REPRESENTATIVE AND LANDSCAPE ARCHITECT OF ANY DISCREPANCY.
4. ALL CURVES TO BE CONTINUOUS WITH SMOOTH TRANSITIONS AS SHOWN IN THE DRAWINGS, UNLESS OTHERWISE NOTED.
5. HORIZONTAL COORDINATES AND DIMENSIONS ARE SHOWN AT THE PRIMARY GEOMETRIC CONTROL POINTS FOR THE IMPROVEMENTS TO AID THE CONTRACTOR WITH THE ESTABLISHMENT OF THE HORIZONTAL LOCATION OF THE IMPROVEMENTS AND ARE BASED ON THE SURVEY AND COORDINATES PROVIDED BY THE CIVIL ENGINEER.
6. THE CONTRACTOR SHALL REFER TO THE ARCHITECTURAL AND ENGINEERING PLANS FOR THE LAYOUT, DIMENSIONS, ANGLES AND ELEVATIONS OF ALL BUILDINGS, STRUCTURES, UTILITIES, CURBS AND GUTTERS.

GRADING NOTES

1. THE CONTRACTOR IS RESPONSIBLE FOR CONFORMING TO ALL IMPROVEMENTS TO THE ADJACENT EXISTING CONDITIONS WITH SMOOTH TRANSITIONS TO AVOID ANY ABRUPT OR APPARENT CHANGES IN GRADES, CROSS SLOPE, HAZARDOUS CONDITIONS, ETC.
2. CONTRACTOR TO NOTIFY THE OWNER'S REPRESENTATIVE OF ANY DISCREPANCIES BETWEEN THE DESIGN INTENT AND EXISTING CONDITIONS AND ANY CONFLICTING INFORMATION REGARDING FINISH GRADES AND ELEVATIONS.
3. ALL EXISTING UTILITY STRUCTURES (SHOWN OR NOT SHOWN ON THE DRAWINGS) WITHIN THE AREA OF WORK SHALL BE ADJUSTED OR RECONSTRUCTED TO THE FINISH GRADES SHOWN AND SPECIFIED.
4. ALL FINISH GRADES AND CONTOURS IN PLANTING AREAS REFER TO FINISH GRADE OF THE MULCHED LANDSCAPE.

Date Plotted: 9/8/2025 4:28 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

LICENSED LANDSCAPE ARCHITECT
Signature
05-31-2026
Renewal Date
08-22-2025
Date
STATE OF CALIFORNIA

Public Works Director:
Date:

SCALE

1" = 30'-0"
0 15' 30' 60'

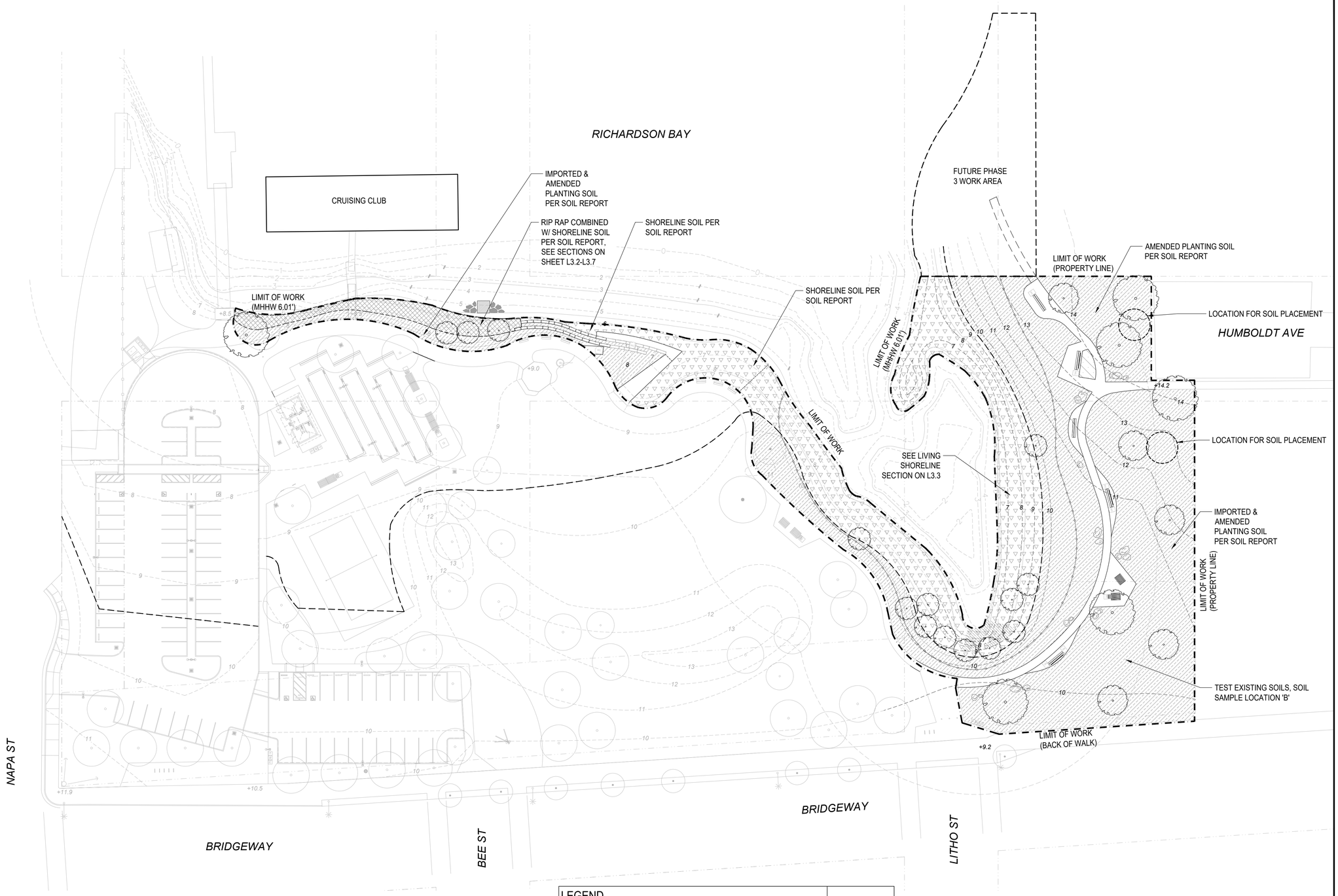
N

SHEET TITLE

LAYOUT PLAN & GRADING PLAN

DRAWN BY: TS / QU **CHECKED BY: JM**

L2.0



LEGEND		
SYMBOL	DESCRIPTION	AREA
	IMPORTED & AMENDED PLANTING SOIL PER SOIL REPORT	34,157 SF
	RIP RAP W/ SHORELINE SOIL, SEE NOTES	1,760 SF
	SHORELINE SOIL, SEE NOTES	14,997 SF
	PARCEL LINE	
	LIMIT OF WORK LINE	
	100 YEAR XHT 9.53'	

SOIL MANAGEMENT NOTES

1. CONTRACTOR TO PROVIDE TESTING AND SOIL REPORT FOR (E) SOIL PRIOR TO STOCKPILING PER SPECIFICATIONS. CONTRACTOR TO AMEND ANY SALVAGED SOIL PER SOIL REPORT RECOMMENDATION.
2. REFER TO SPECIFICATIONS FOR DETAILED SOIL AND STOCKPILING INFORMATION.
3. TREES WITHIN NEW PLANTING AREAS TO RECIEVE AMENDED PLANTING SOIL AT 2X ROOTBALL DIMENSION. TREES WITHIN EXISTING TURF AREAS TO RECIEVE AMENDED PLANTING SOIL AT 3X ROOTBALL DIMENSION
4. SHORELINE SOIL TO BE APPROPRIATE FOR INTERTIDAL PLANT GROWTH, SUCH AS RELOCATED DREGDE MATERIAL OR APPROVED EQUAL, SEE SPECS.
7. ARCHAEOLOGIST AND NATIVE AMERICAN MONITOR TO BE ON SITE FOR ANY SOIL DISTURBANCE.

Date Plotted: 9/8/2025 4:28 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

LICENSED LANDSCAPE ARCHITECT
Registering License No.
Signature
05-31-2026
Renewal Date
08-22-2025
Date
STATE OF CALIFORNIA

Public Works Director:
Date:

SCALE

1" = 30'-0"

0 15' 30' 60'

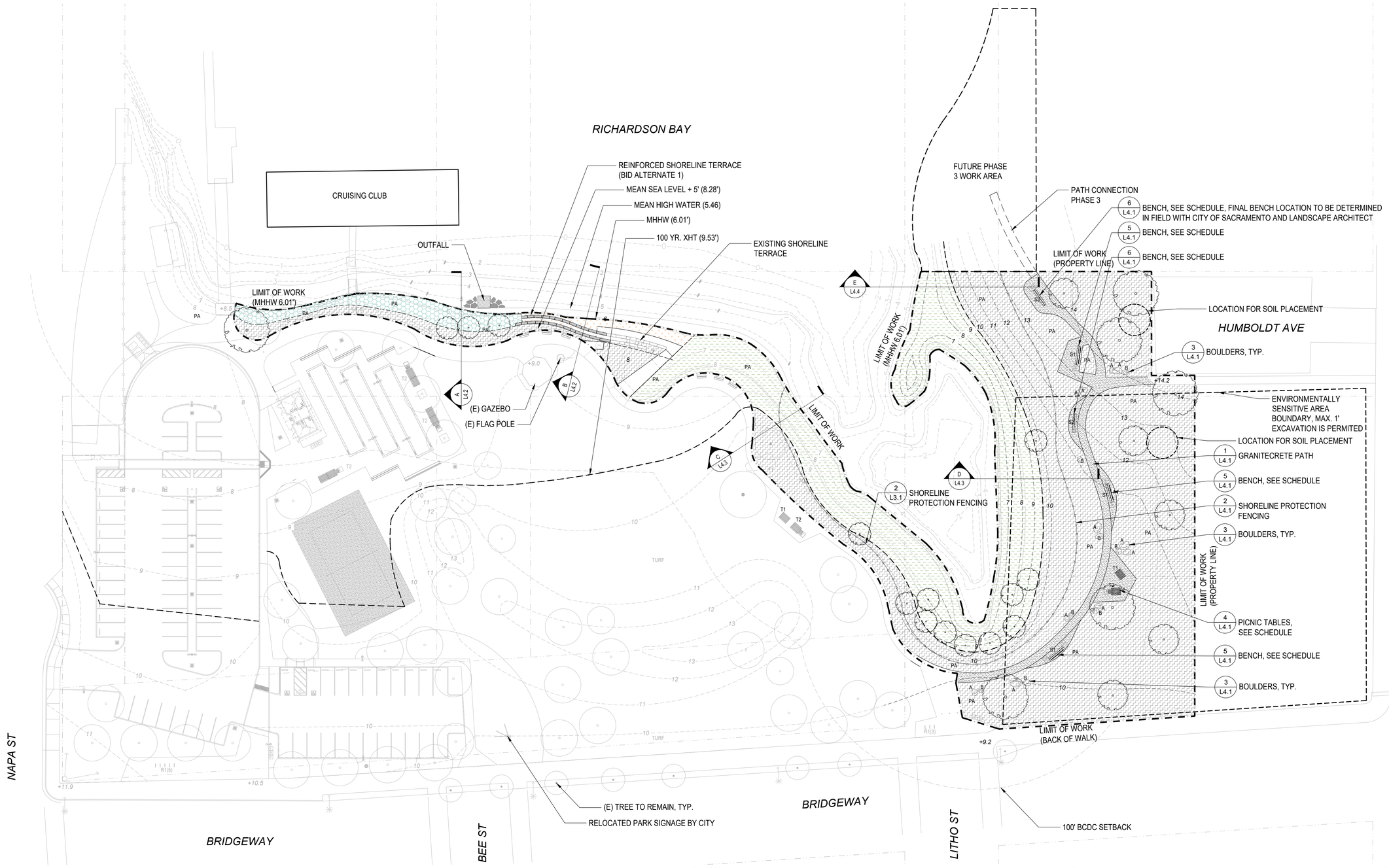
N

SHEET TITLE

SOIL PLACEMENT PLAN

DRAWN BY: TS / QU CHECKED BY: JM

L3.0



BOULDER SCHEDULE			
	DIMENSIONS	WIDTH AT GRADE	QTY
A	24"-30"	36"	11
B	18"-24"	30"	8

FURNISHING SCHEDULE					
SYMBOL	TYPE/SIZE	MATERIAL	MODEL	MANUFACTURER	QTY
S1	12'X24"X16"	STEEL-BLACK	GIANT TIMBER SEAT WITH BACK - MODEL # 2219-12-B-ADA	TIMBERFORM	3
S2	12'X24"X16"	STEEL-BLACK	GIANT TIMBER SEAT W/O BACK - MODEL # 2219-12-ADA	TIMBERFORM	2
T1	5'10"X4'5"X2'6"	STEEL-BLACK	GREENWAY PICNIC TABLE (STANDARD) - MODEL # 2164-6	TIMBERFORM	1
T2	7'10"X4'5"X2'6"	STEEL-BLACK	GREENWAY PICNIC TABLE (ACCESSIBLE) - MODEL # 2164-6	TIMBERFORM	1

MATERIALS SCHEDULE			
HATCH	DESCRIPTION	PRODUCT INFORMATION	PRODUCT IMAGE
	GRANITECRETE PATH	MFG & PRODUCT: GRANITECRETE COLOR: NATURAL GOLD, TO MATCH EXISTING, VIF	

LEGEND		
SYMBOL	DESCRIPTION	AREA
	PARCEL LINE	
	LIMIT OF WORK MHHW 6.01'	
	100 YEAR XHT 9.53'	
	REVETMENT SHORELINE	1,760 SF
	EXTENDED TERRACE WALL SHORELINE	537 SF
	LIVING SHORE SHORELINE	14,460 SF
	UPSLOPE PLANTING AREA	34,157 SF

Date Plotted: 9/8/2025 4:29 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

LICENSED LANDSCAPE ARCHITECT
License No. 6178
Signature
05-31-2026
Renewal Date
08-22-2025
Date
STATE OF CALIFORNIA

Public Works Director:
Date:

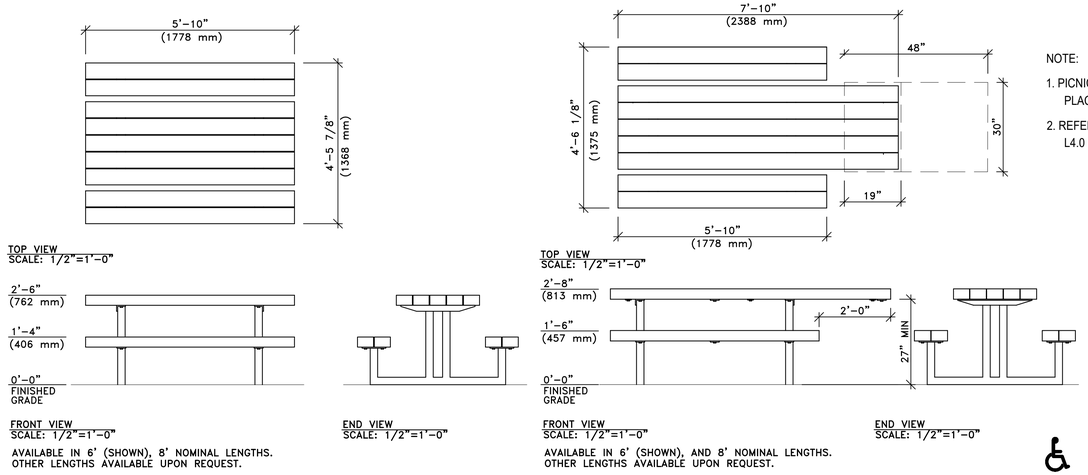
SCALE
1" = 30'-0"
0 15' 30' 60'
N

SHEET TITLE

CONSTRUCTION PLAN

DRAWN BY: TS / QU CHECKED BY: JM

L4.0



STANDARD PICNIC TABLE

ACCESSIBLE PICNIC TABLE

NOTE:

1. PICNIC TABLES ARE TO BE FREESTANDING TYPE, PLACED ON GRANITECRETE SURFACE.
2. REFER TO FURNISHING SCHEDULE ON SHEET L4.0 FOR ADDITIONAL PRODUCT INFORMATION.

4 PICNIC TABLES

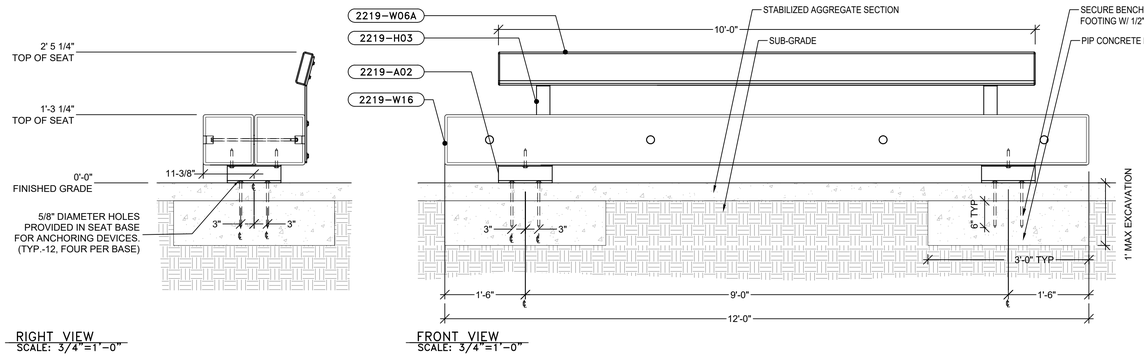
AS NOTED

NOTES:

1. TIMBERFORM GIANT TIMBER SEAT WITH BACK, REFER TO FURNISHING SCHEDULE ON SHEET L4.0 FOR ADDITIONAL PRODUCT INFORMATION.
2. INSTALL PER MANUFACTURER'S INSTRUCTIONS.
3. FOOTING EXCAVATION TO BE LESS THAN 12".

INSTALLATION NOTES:

1. EACH TIMBER MUST BE POSITIONED SO THAT THE BEST FACE IS EXPOSED WHEN ASSEMBLED.
2. FOR MULTIPLE ITEM ORDERS, EXAMINE AND SORT ALL TIMBERS PRIOR TO COMMENCING ASSEMBLY TO ENSURE THE BEST FACES ARE EXPOSED.
3. ASSEMBLE TIMBERS PER DETAIL A/1 IN MANUFACTURER'S INSTRUCTIONS.
4. ATTACH SEAT BASES TO TIMBER ASSEMBLY PER DETAIL A/1 IN MANUFACTURER'S INSTRUCTIONS. USE FULLY ASSEMBLED SEAT TO LOCATE ANCHORING DEVICES, BY OTHERS. THE USE OF SHIMS AND/OR NON-SHRINK GROUT MAY BE REQUIRED FOR LEVEL INSTALLATION, BY OTHERS.
5. SEE IMPORTANT MAINTENANCE INSTRUCTIONS ON DRAWING NO. E-2000-L03.



5 BENCH WITH BACK

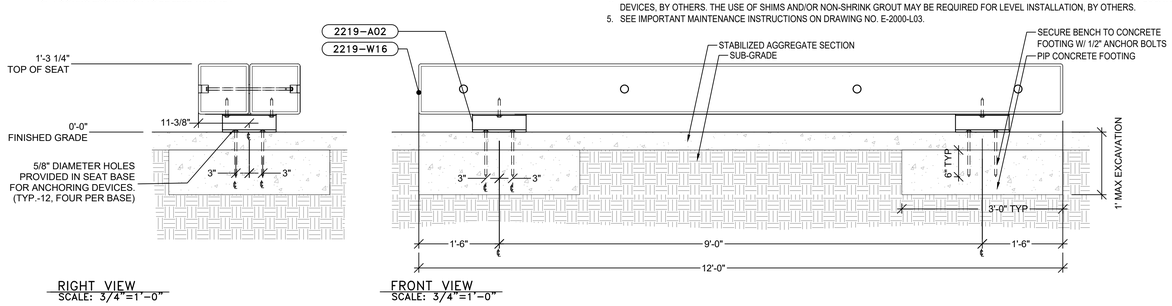
SCALE: 3/4" = 1'-0"

NOTES:

1. TIMBERFORM GIANT TIMBER SEAT WITHOUT BACK, REFER TO FURNISHING SCHEDULE ON SHEET L4.0 FOR ADDITIONAL PRODUCT INFORMATION.
2. INSTALL PER MANUFACTURER'S INSTRUCTIONS.
3. FOOTING EXCAVATION TO BE LESS THAN 12".

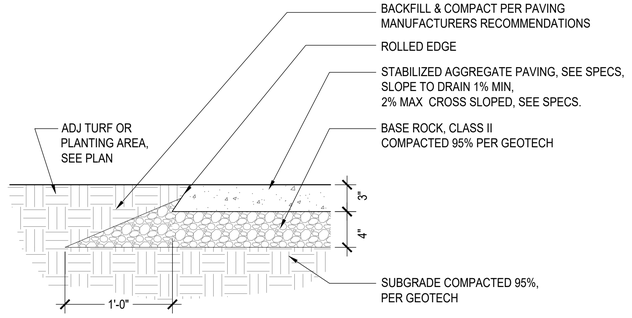
INSTALLATION NOTES:

1. EACH TIMBER MUST BE POSITIONED SO THAT THE BEST FACE IS EXPOSED WHEN ASSEMBLED.
2. FOR MULTIPLE ITEM ORDERS, EXAMINE AND SORT ALL TIMBERS PRIOR TO COMMENCING ASSEMBLY TO ENSURE THE BEST FACES ARE EXPOSED.
3. ASSEMBLE TIMBERS PER DETAIL A/1 IN MANUFACTURER'S INSTRUCTIONS.
4. ATTACH SEAT BASES TO TIMBER ASSEMBLY PER DETAIL A/1 IN MANUFACTURER'S INSTRUCTIONS. USE FULLY ASSEMBLED SEAT TO LOCATE ANCHORING DEVICES, BY OTHERS. THE USE OF SHIMS AND/OR NON-SHRINK GROUT MAY BE REQUIRED FOR LEVEL INSTALLATION, BY OTHERS.
5. SEE IMPORTANT MAINTENANCE INSTRUCTIONS ON DRAWING NO. E-2000-L03.



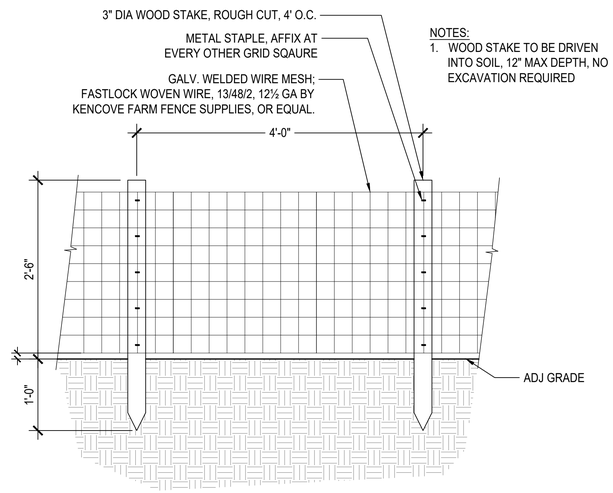
6 BENCH WITHOUT BACK

SCALE: 3/4" = 1'-0"



1 GRANITECRETE PATH

SCALE: 1 1/2" = 1'-0"

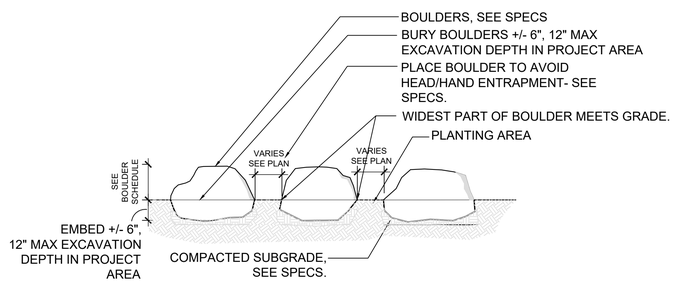


2 SHORELINE PROTECTION FENCING

1" = 1'-0"

NOTE:

1. FINAL BOULDER LOCATION TO BE DETERMINED IN FIELD WITH LANDSCAPE ARCHITECT AND CITY REPRESENTATIVE.
2. BOULDERS ARE CONSIDERED A SEATING ELEMENT, CONTRACTOR TO SELECT FLAT TOPPED BOULDERS WITH RELATIVELY LEVEL AND SMOOTH TOP SURFACE.
3. DETAIL REPRESENTS TYPICAL LAYOUT.



3 BOULDERS

NTS

Date Plotted: 9/8/2025 4:29 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

LICENSED LANDSCAPE ARCHITECT
Angela King License No.
Signature
05-31-2026
Renewal Date
08-22-2025
Date
STATE OF CALIFORNIA

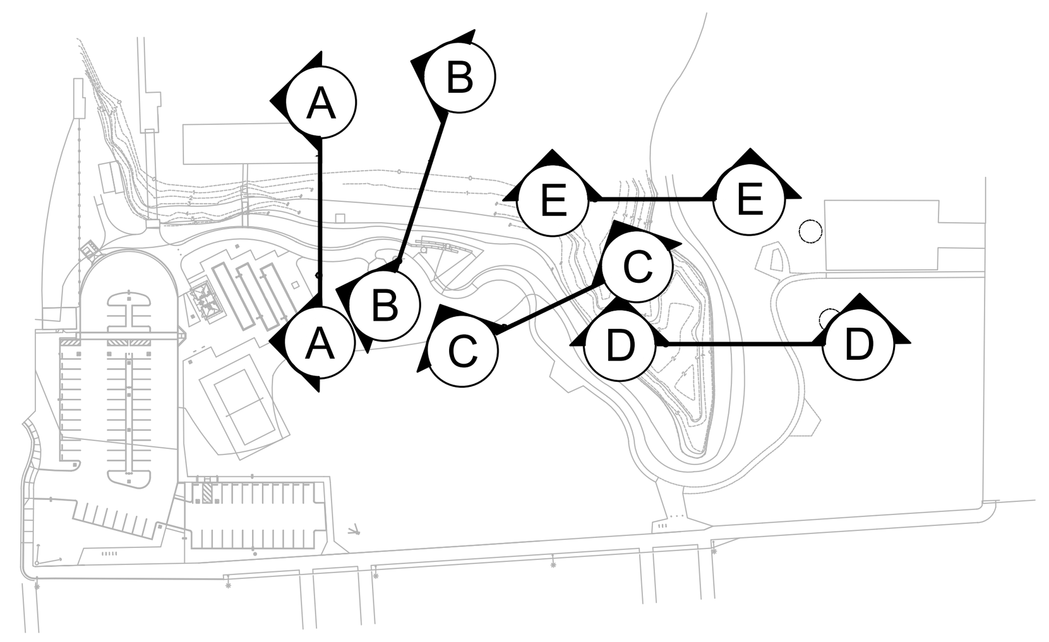
Public Works Director:
Date:

SHEET TITLE

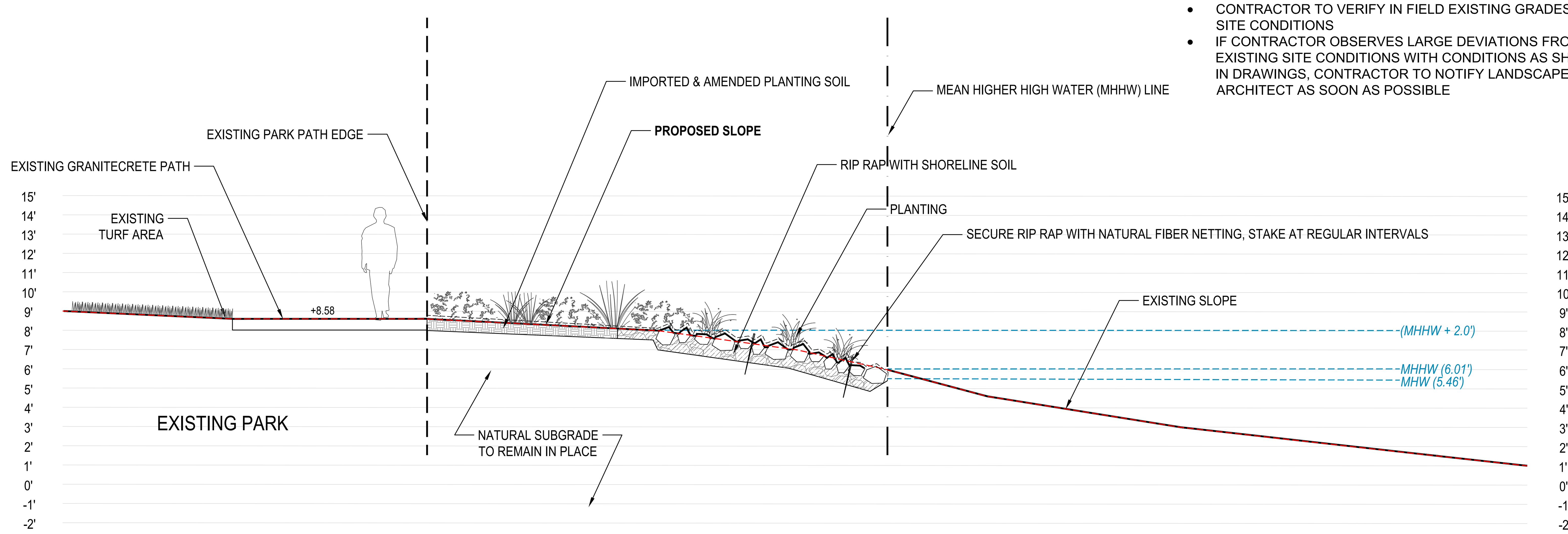
CONSTRUCTION DETAILS

DRAWN BY: TS / QU **CHECKED BY: JM**

L4.1



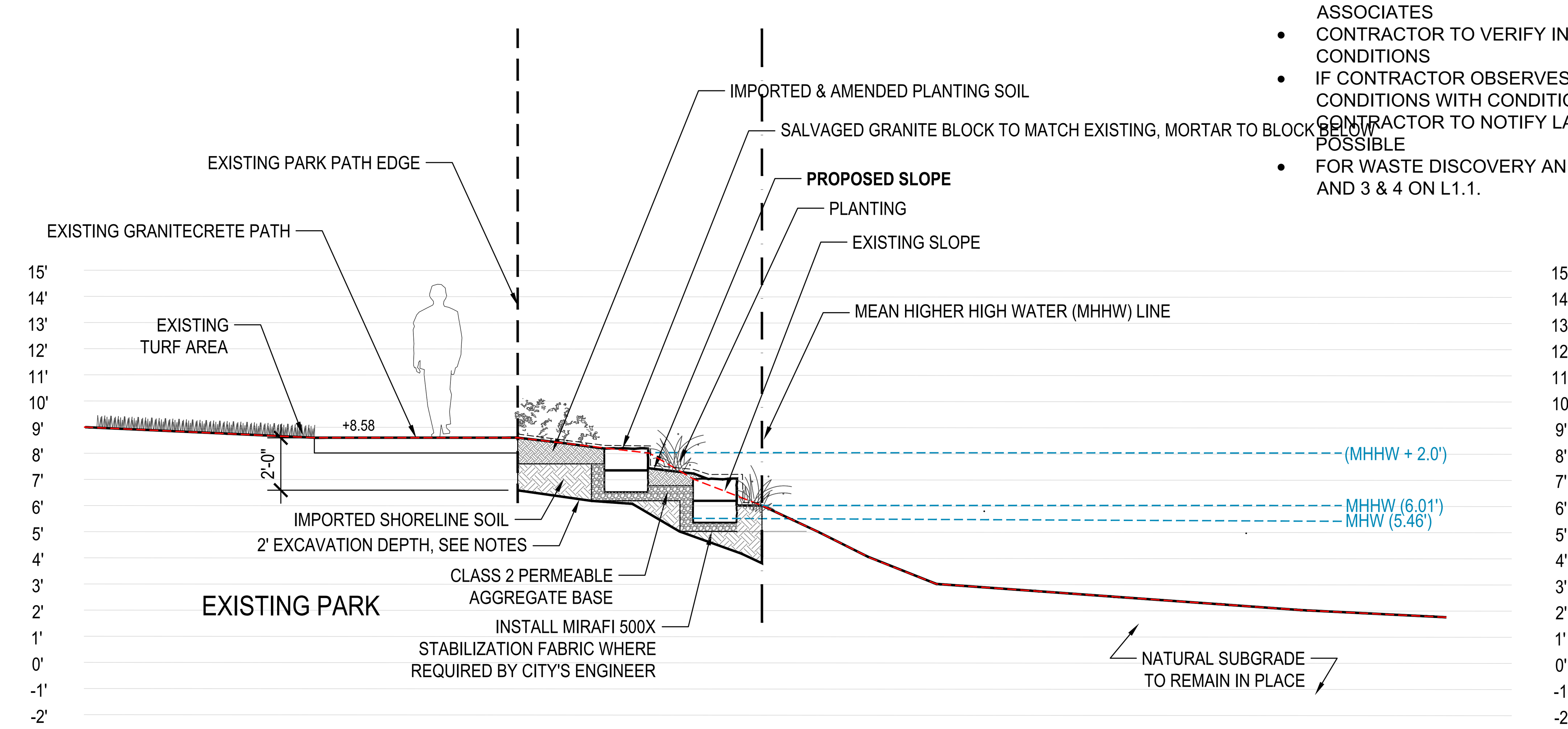
NOTES:
- EXISTING AND PROPOSED GRADING AS SHOWN BASED ON SURVEY AVAILABLE TO LANDSCAPE ARCHITECT BY LINDA A. CARRUTHERS & ASSOCIATES
- CONTRACTOR TO VERIFY IN FIELD EXISTING GRADES AND SITE CONDITIONS
- IF CONTRACTOR OBSERVES LARGE DEVIATIONS FROM EXISTING SITE CONDITIONS WITH CONDITIONS AS SHOWN IN DRAWINGS, CONTRACTOR TO NOTIFY LANDSCAPE ARCHITECT AS SOON AS POSSIBLE



(A) SHORELINE SECTION - PLANTED RIP RAP WITH FIBER NET

1/4" = 1'-0"

NOTES:
- EXISTING AND PROPOSED GRADING AS SHOWN BASED ON SURVEY AVAILABLE TO LANDSCAPE ARCHITECT BY LINDA A. CARRUTHERS & ASSOCIATES
- CONTRACTOR TO VERIFY IN FIELD EXISTING GRADES AND SITE CONDITIONS
- IF CONTRACTOR OBSERVES LARGE DEVIATIONS FROM EXISTING SITE CONDITIONS WITH CONDITIONS AS SHOWN IN DRAWINGS, CONTRACTOR TO NOTIFY LANDSCAPE ARCHITECT AS SOON AS POSSIBLE
- FOR WASTE DISCOVERY AND REMOVAL SEE NOTES 30 & 31 ON L1.0 AND 3 & 4 ON L1.1.



(B) SHORELINE SECTION - PLANTED GRANITE BLOCK STEP (BID ALTERNATE 1)

1/4" = 1'-0"

Date Plotted: 9/8/2025 4:30 PM

rhaa/ Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900
rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

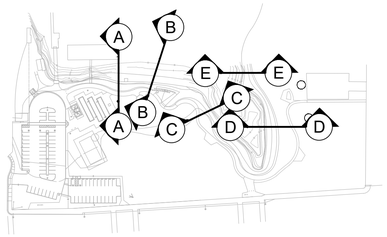
Public Works Director:
Date:

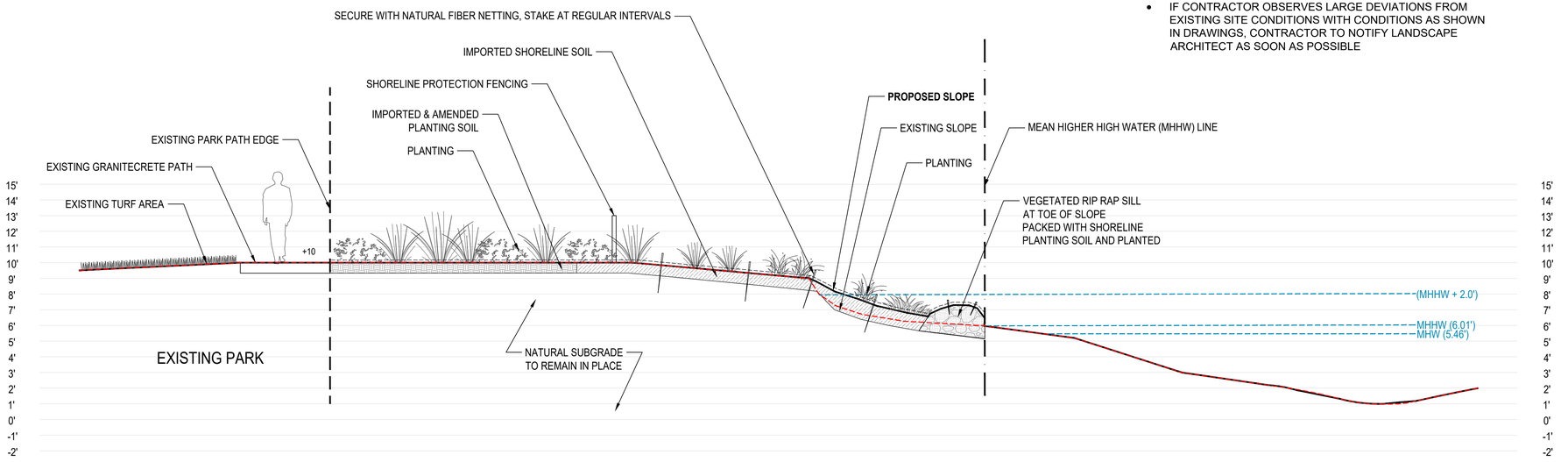
SHEET TITLE

LANDSCAPE SECTIONS

DRAWN BY: TS / QU CHECKED BY: JM

L4.2



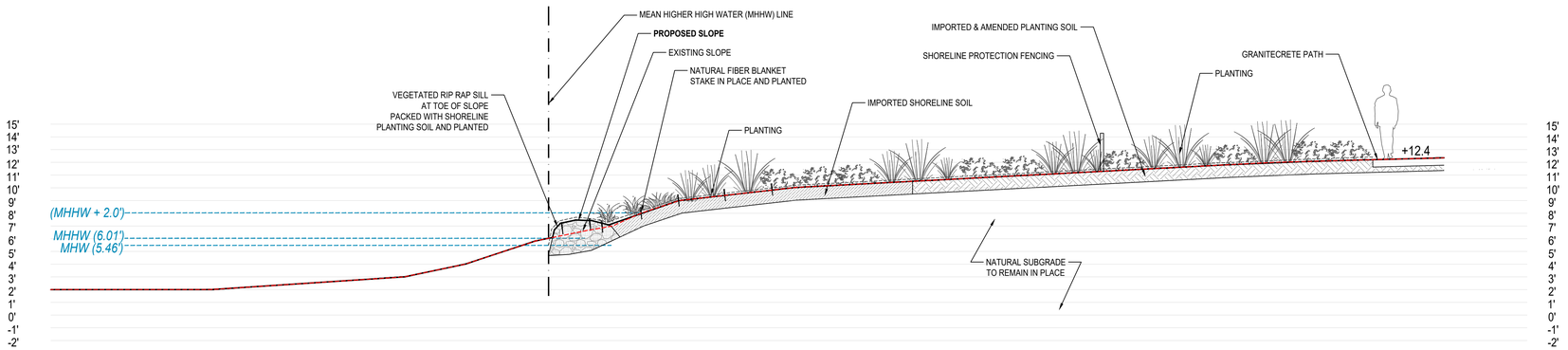


NOTES:
- EXISTING AND PROPOSED GRADING AS SHOWN BASED ON SURVEY AVAILABLE TO LANDSCAPE ARCHITECT BY LINDA A. CARRUTHERS & ASSOCIATES
- CONTRACTOR TO VERIFY IN FIELD EXISTING GRADES AND SITE CONDITIONS
- IF CONTRACTOR OBSERVES LARGE DEVIATIONS FROM EXISTING SITE CONDITIONS WITH CONDITIONS AS SHOWN IN DRAWINGS, CONTRACTOR TO NOTIFY LANDSCAPE ARCHITECT AS SOON AS POSSIBLE

C SHORELINE SECTION - REGRADED PLANTED SLOPE W/ EROSION CONTROL

1/4" = 1'-0"

NOTES:
- EXISTING AND PROPOSED GRADING AS SHOWN BASED ON SURVEY AVAILABLE TO LANDSCAPE ARCHITECT BY LINDA A. CARRUTHERS & ASSOCIATES
- CONTRACTOR TO VERIFY IN FIELD EXISTING GRADES AND SITE CONDITIONS
- IF CONTRACTOR OBSERVES LARGE DEVIATIONS FROM EXISTING SITE CONDITIONS WITH CONDITIONS AS SHOWN IN DRAWINGS, CONTRACTOR TO NOTIFY LANDSCAPE ARCHITECT AS SOON AS POSSIBLE



D SHORELINE SECTION - REGRADED PLANTED SLOPE W/ FIBER BLANKET

3/16" = 1'-0"

Date Plotted: 9/8/2025 4:30 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

LICENSED LANDSCAPE ARCHITECT
Pablo King License No.
Signature
05-31-2026
Renewal Date
08-22-2025
Date
STATE OF CALIFORNIA

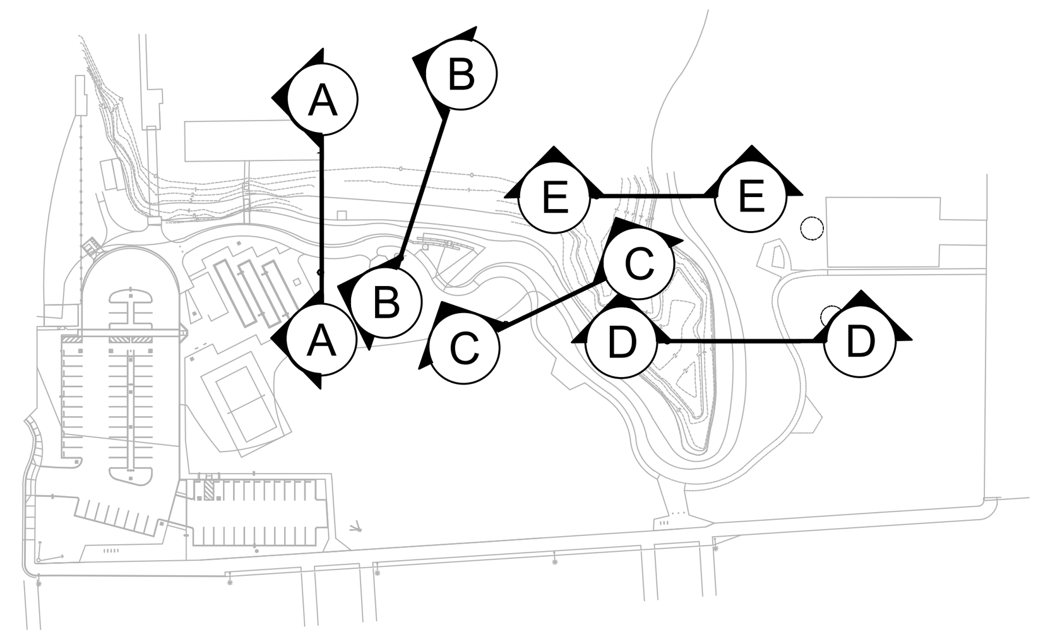
Public Works Director:
Date:

SHEET TITLE

LANDSCAPE SECTIONS

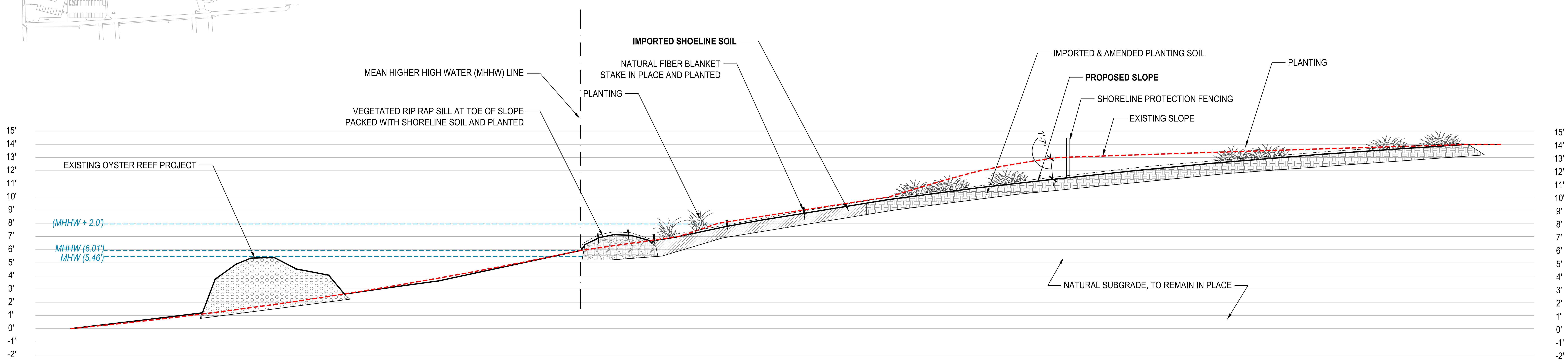
DRAWN BY: TS / QU **CHECKED BY: JM**

L4.3



NOTES:

- EXISTING AND PROPOSED GRADING AS SHOWN BASED ON SURVEY AVAILABLE TO LANDSCAPE ARCHITECT BY LINDA A. CARRUTHERS & ASSOCIATES
- CONTRACTOR TO VERIFY IN FIELD EXISTING GRADES AND SITE CONDITIONS
- IF CONTRACTOR OBSERVES LARGE DEVIATIONS FROM EXISTING SITE CONDITIONS WITH CONDITIONS AS SHOWN IN DRAWINGS, CONTRACTOR TO NOTIFY LANDSCAPE ARCHITECT AS SOON AS POSSIBLE



E

SHORELINE SECTION - REGRADED PLANTED SLOPE W/ EROSION CONTROL & WAVE ATTENUATION

1/4" = 1'-0"

rhaa Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

LICENSED LANDSCAPE ARCHITECT — STATE OF CALIFORNIA — Signature — 05-31-2026 Renewal Date — 08-22-2025 Date

Public Works Director:
Date:

SHEET TITLE

LANDSCAPE SECTIONS

DRAWN BY: TS / QU **CHECKED BY:** JM

L4.4

Date Plotted: 9/8/2025 4:31 PM

Irrigation Notes:

1. The irrigation system to be controlled by an existing, centrally located weather-based irrigation controller with a rain shutoff sensor.

2. Shoreline planting to be temporarily irrigated during plant establishment period only. Temporary irrigation to be removed after plants are established.

3. Refer to plans, details and specifications for irrigation system components, installation, maintenance, scheduling, and reporting requirements.

4. The contractor shall comply with local water district procedures & requirements, all city of Sausalito requirements, and the state water efficient landscape ordinance. ordinance criteria has been applied accordingly for the efficient use of water in the irrigation design plan.

5. These irrigation drawings are diagrammatic and indicative of the work to be installed. all piping, valves, and other irrigation components are to be installed within planting areas to the greatest extent possible. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, sleeves, conduit, and other items which may be required.

6. The contractor is to investigate the existing and proposed finished condition of the work. The contractor shall immediate notify the owner's representative of any conflicts and/or discrepancies between existing and proposed conditions which will affect the work, before proceeding with the work. in the event these notifications are not performed, the contractor assumes full responsibility for required revisions.

7. The contractor shall coordinate all work with other trades, including the installation of all pipe, conduit and sleeves through or under walls, roadways, paving and structures.

8. Prior to trenching and digging, contact usa (800-227-2600) to locate all underground utilities. the contractor shall be responsible for minor changes in the irrigation layout due to obstructions not shown on the irrigation drawings such as underground utilities, vaults, etc. The contractor shall avoid conflicts with underground utilities, new planting, site or architectural elements, and existing trees; any damage to these caused by the installation of the irrigation system shall be repaired and/or replaced at no expense to the owner.

9. Do not trench or install irrigation piping or equipment in lime-treated soil.

10. The irrigation system is designed to operate at 100 gpm, and 120 p.s.i. at the point of connection. The contractor shall verify flow rate and pressure at the point of connection prior to the installation of the irrigation system and notify the owner's representative of test results before construction begins. Notify landscape architect if pressure is greater or less than the static pressure stated on the plans to determine if pressure regulation or a booster pump is required.

11. The contractor shall obtain as-built irrigation drawings of all existing irrigation system(s) from the owner's representative for reference during new and retrofit work.

12. Contractor to field verify condition of all existing irrigation equipment impacted by new construction and repair and replace as necessary.

13. Install all irrigation equipment per manufacturer's recommendations.

14. Install one spare common and control wire from each controller in a continuous loop through each valve box for future use.

15. Where pipe sizes have been omitted or there is a conflict, refer to the lateral pipe sizing chart for sizes. As changes in layout occur during staking and construction, pipe sizes may need to be adjusted accordingly. all lateral end runs shall be 1" size unless otherwise noted.

16. The remote control valves specified on the drawings are pressure reducing types. set the discharge pressure as recommended by manufacturer.

17. Contractor to assume (4) additional control valves to be installed as needed.

18. All irrigation boxes and lids to be black.

19. **Non-potable irrigation note:** This system is being installed for non-potable water use. all pipe, equipment, heads, and fittings shall be color-coded and labeled for non-potable use per all applicable state and local codes.

20. Wherever overhead irrigation is located directly adjacent to hardscape areas, where runoff water flows into the curb and gutter, all spray heads shall be setback a minimum of 24" from hardscape edges.

21. Locate bubblers and emitters on uphill side of plant or tree.

22. Contractor to maintain existing planted areas throughout construction and coordinate operations to keep existing planting areas alive and healthy. Existing and new irrigation systems shall be installed, adjusted and maintained to provide 100% coverage of planting areas and to prevent misting, overspray and runoff onto buildings, walls windows, paved areas, etc.

23. Flush and adjust irrigation emitters, nozzles and outlets for optimum performance and to prevent over spray onto walks, roadways, and/or buildings. Select the best degree of arc and radius to fit the existing site conditions and throttle the flow control at each valve to obtain the optimum operating pressure for each control zone.

24. The intent of this irrigation system is to provide the minimum amount of water required to sustain good plant health. It is the responsibility of the landscape maintenance contractor to program the irrigation controller(s) to provide the minimum amount of water needed to sustain good plant health. This includes making adjustments to the program for seasonal weather changes, plant material, water requirements, mounds and slopes, sun, shade and wind exposure.

25. The contractor shall coordinate valve numbering, controller operations and programming with owner's representative.

26. Station operation times shall not deliver water exceed the soil infiltration rate(s) as determined by the soils report(s).

27. The contractor shall provide the owner's representative with clear as-built plans of the installed of irrigation system.

28. If any waste is encountered during excavation for and installation of irrigation equipment and piping, do not install in waste and contact city representative and landscape architect. Irrigation equipment and piping is to be installed within the thickness of clean cover material. (1)

IRRIGATION LEGEND

C — (E) PEDESTAL MOUNTED CONTROLLER
HUNTER HCC-800-SS W/ EZ-DM DECODER (2-WIRE) IN A STAINLESS STEEL PEDESTAL MOUNTED ENCLOSURE (MODEL ICC-PED-SS) & RAIN SENSOR.

M — (E) IRRIGATION WATER METER (VIF NUMBER & LOCATION)

(E) 2" REDUCED PRESSURE BACKFLOW PROVENTION DEVICE

MV — (E) MASTER VALVE
HUNTER ICV MASTER VALVE W/ ACCU SYNC AS ADJ, NORMALLY CLOSED

FS — (E) FLOW SENSOR
HUNTER HC FLOW METER, LINE SIZE

MAINLINE: SCH 40 PVC, 2" AND SMALLER

LATERAL LINE: 1" AND LARGER, SCH 40 PVC.

SLEEVE: CLASS 200 PVC

GATE VALVE, BRASS
NIBCO T113-IRR (LINE SIZE), OR EQUAL.

QUICK COUPLING VALVE, LOCKING COVER, 1-PIECE BODY, RAINBIRD 5-LRC, BRASS, OR EQUAL.

REMOTE CONTROL VALVE WITH PRESSURE REGULATING
SPRAY ZONES: HUNTER ICV W/ ACCU SYNC AS ADJ
DRIP ZONES: HUNTER ICZ WITH FILTER.

X / X | XX — CONTROLLER / STATION NUMBER; FLOW RATE (GPM); VALVE SIZE (INCHES)

INLINE DRIP IRRIGATION
RAINBIRD XFS-09-12 SUB-SURFACE DRIP LINE (12" EMITTER SPACING) W/ RB XFS DRIP SYSTEM OPERATION INDICATOR AT END OF EACH DRIP ZONE. LINE SPACING TO BE COORDINATED WITH PLANT SPACING (12", 18" & 24" O.C.) *INSTALL LOW FLOW BUBBLERS & IRRIGATION BERMS AT ROOTBALL OF SHRUBS SPACED GREATER THAN 24" O.C.

T — TREE WATERING SYSTEM
DRIP RING AT ROOTBALL W/ 2 EMITTERS AT ROOT CROWN, TYP.
DEEP ROOT IRRIGATION TUBE IN PLAZA AREAS

POP-UP STAINLESS STEEL ROTOR W/ ADJUSTABLE ARC & CHECK VALVE
MODEL I-25-04-SS BY HUNTER, OR EQUAL.
SELECT NOZZLE FOR RADIUS SHOWN @ 50PSI

POP-UP SPRAY HEAD WITH ADJUSTABLE ARC, MATCHED PRECIPITATION RATE, CHECK VALVE & PRESSURE REGULATION.
MODEL PROS-04-PRS40-CV-MP1000/2000/3000 BY HUNTER, OR EQUAL.
SELECT NOZZLE FOR RADIUS SHOWN @40PSI.

TEMPORARY IRRIGATION FOR PLANT ESTABLISHMENT ONLY.
INSTALL (3) SURFACE IN-LINE DRIP LINES AT TOP OF SLOPE. INSTALL REMOTE CONTROL VALVE & QUICK COUPLERS AS SHOWN ON PLANS.

CLASS 200 PVC LATERAL LINE SIZING		TYPICAL VALVE SIZING
0 - 6 GPM: 0.75"	29 - 45 GPM: 2.0"	00 - 25 GPM: 1.0" VALVE
7 - 12 GPM: 1.0"	46 - 65 GPM: 2.5"	26 - 35 GPM: 1.25"
13 - 28 GPM: 1.5"	66 - 100 GPM: 3.0"	36 - 50 GPM: 1.5"
		51 - 100 GPM: 2"

MARIN WATER
WATER BUDGET & WATER USE CALCULATOR

Zip Code:	94965
Date:	6/24/2024
Project Name:	Dunphy Park
Project Address:	200 Napa Street, Sausalito
Project Contact:	Kossen Miller
Project Contact Email:	kossen.miller@rhaa.com

MARIN WATER

Maximum Applied Water Allowance (MAWA)	Project Type	ETo	ETAF	Special Landscape Area (SLA)	Total Landscape Area including SLA	MAWA (CCF/yr)
	Non-residential	26.33	0.45	-	53,195	**522**

Estimated Total Water Use (ETWU)	ETo	(SF * PF) / IE	SLA	ETWU (CCF/yr)
	26.3	19,702	-	**430**

Project meets water budget. **Difference between MAWA and ETWU** 92

ETWU Calculation (Regular landscape areas)	Zone #	Description	Irrigation Type	Hydrozone Area (SF)	Plant Water Use Classification	Irrigation Efficiency (IE)	(SF * PF) / IE
	1	Shrubs	Drip	3,309	Low	0.81	1,226
	2	Trees	Drip	2,648	Low	0.81	981
	3	Shrubs	Drip	2,880	Low	0.81	1,067
	4	Shrubs	Drip	6,335	Low	0.81	2,346
	5	Temporary Shrub	Drip	6,640	Low	0.81	2,459
	6	Shrubs	Drip	3,774	Low	0.81	1,398
	7	Shrubs	Drip	2,984	Low	0.81	1,105
	8	Trees	Drip	2,180	Low	0.81	807
	9	Shrubs	Drip	6,497	Low	0.81	2,406
	10	Shrubs	Drip	2,450	Low	0.81	907
	11	Trees	Drip	1,650	Low	0.81	611
	12	Temporary Shrub	Drip	5,543	Low	0.81	2,053
	13	Shrubs	Drip	2,784	Low	0.81	1,031
	14	Shrubs	Drip	2,165	Low	0.81	802
	15	Shrubs	Drip	1,356	Low	0.81	502
	Landscape area (not including SLA)			**53,195**			**19,702**

ETWU Calculation Special Landscape Areas (SLA)	Description	Hydrozone Area (SF)	Plant Factor / Irrigation Efficiency (PF/IE)	(SF * PF) / IE
	Edible planting area		1.0	-
	Multi-use and sports field turf area		1.0	-
	Area irrigated with recycled water		1.0	-
	Total SLA	**0**		**0**

Total Landscape Area (including SLA) from ETWU Calculation	**53,195**

Water Use Table							
	ETWU	Gallons:	321,662	Units:	430	AF:	0.99
	Billing Period	Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sep/Oct	Nov/Dec
	Baseline (CCF)	2	47	118	138	99	26

1 CCF (hundred cubic feet) = 748.05 gallons; 1 AF (acre foot) = 435.6 CCF

MarinWater.org

rhaa
Landscape Architecture & Planning
225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900
rhaa.com

PROJECT/CLIENT NAME
Dunphy Park Improvement Project Phase 2
200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER
16042A

CONSULTANT

SUBMITTAL
Bid Documents

DATE
22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

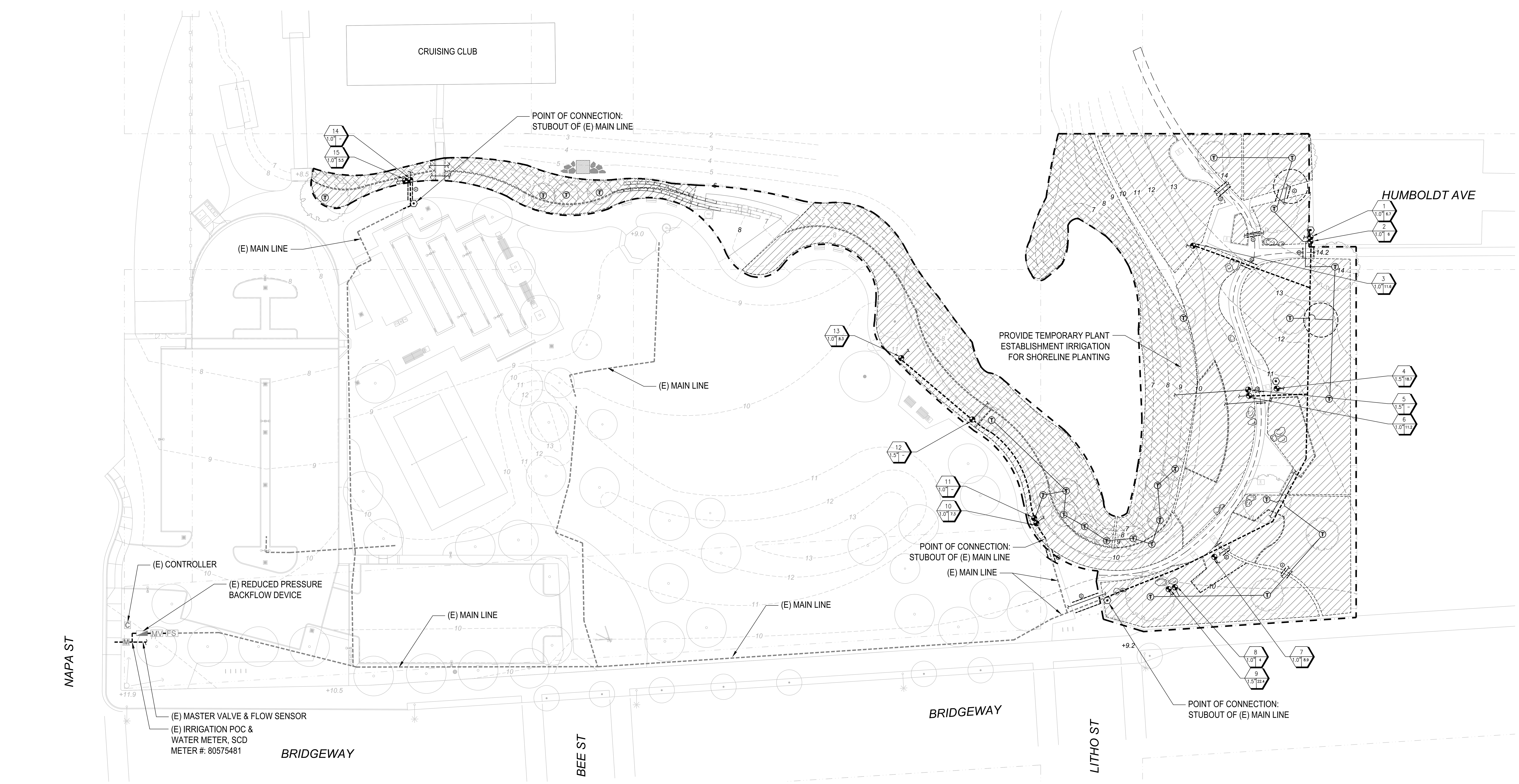
Public Works Director:
Date:

SHEET TITLE
IRRIGATION NOTES

DRAWN BY: TS / QU CHECKED BY: JM

L5.0

Date Plotted: 9/8/2025 4:31 PM



Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900
rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

Public Works Director:
Date:

SCALE

1" = 30'-0"

0 15' 30' 60'

N

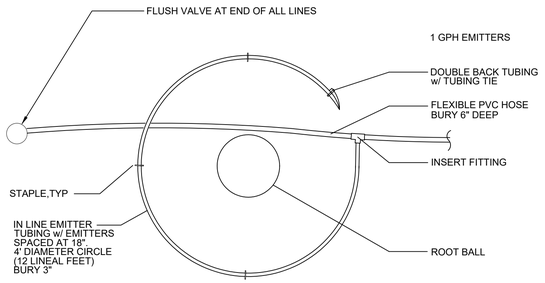
SHEET TITLE

IRRIGATION PLAN

DRAWN BY: TS / QU   CHECKED BY: JM

L5.1

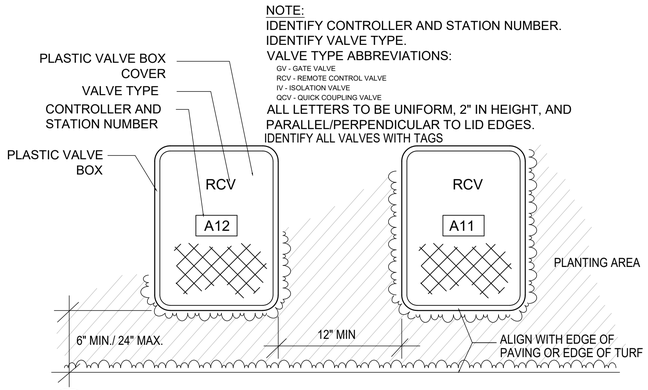
Date Plotted: 9/8/2025 4:31 PM



PLAN

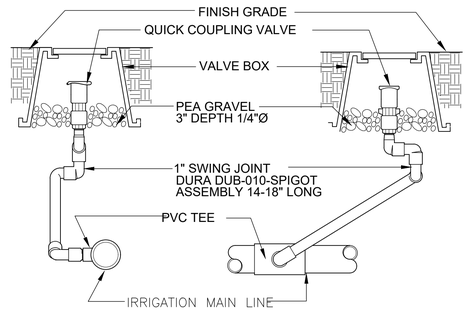
7 TREE DRIP RING IRRIGATION

NTS



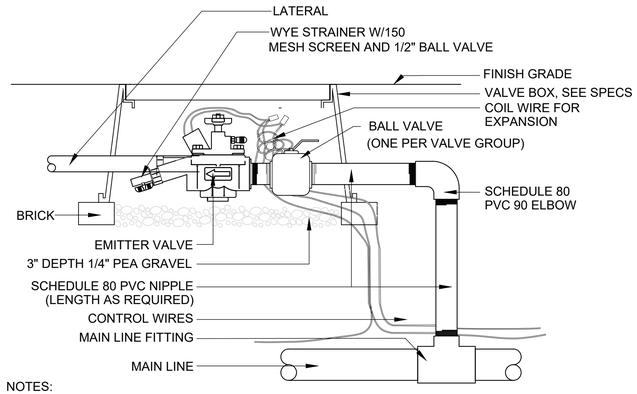
4 REMOTE CONTROL VALVES - LOCATION

NTS



1 QUICK COUPLING VALVE

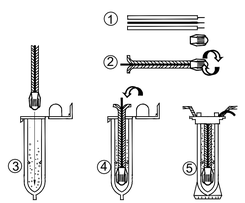
NTS



NOTES:
1. BUNDLE AND TAPE WIRE EVERY 10 FEET
2. PROVIDE 36" EXPANSION LOOP AT EACH WIRE CONNECTION
3. LOCATE VALVES MIN. 4" FROM PAVED WALKWAYS.

5 REMOTE CONTROL VALVE - DRIP

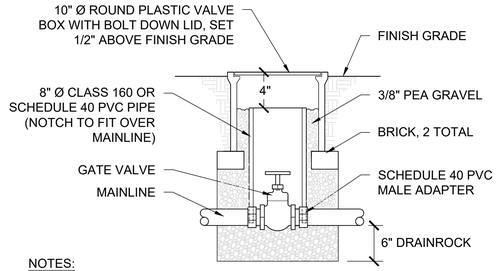
NTS



NOTES:
1. STRIP WIRES APPROXIMATELY 1/2" (12.7 MM) TO EXPOSE WIRE.
2. TWIST CONNECTOR AROUND WIRES CLOCKWISE UNTIL HAND TIGHT, DO NOT OVERTIGHTEN.
3. INSERT WIRE ASSEMBLY INTO PLASTIC TUBE UNTIL WIRE CONNECTOR SNAPS PAST LIP IN BOTTOM OF TUBE.
4. PLACE WIRES WHICH EXIT TUBE IN WIRE EXIT HOLES AND CLOSE CAP UNTIL IT SNAPS.
5. INSPECT FINAL SPLICE ASSEMBLY TO BE SECURE AND FINISHED.

6 WATERPROOF WIRE CONNECTION

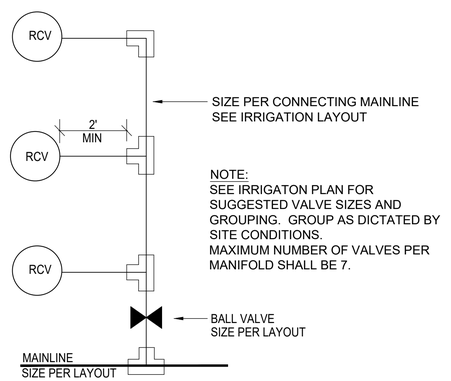
NTS



NOTES:
1. HEAT BRAND LID "GV". SEE SPECS FOR BOX COLOR.
2. GATE VALVE AND FITTINGS SHALL BE LINE SIZE UNLESS NOTED OTHERWISE.
3. USE TEFLON TAPE ON ALL THREADED FITTINGS.

2 GATE VALVE

NTS



3 REMOTE CONTROL VALVES - CONNECTION

NTS

Date Plotted: 9/8/2025 4:31 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

LICENSED LANDSCAPE ARCHITECT
Timothy King License No.
Signature
05-31-2026
Renewal Date
08-22-2025
Date
STATE OF CALIFORNIA

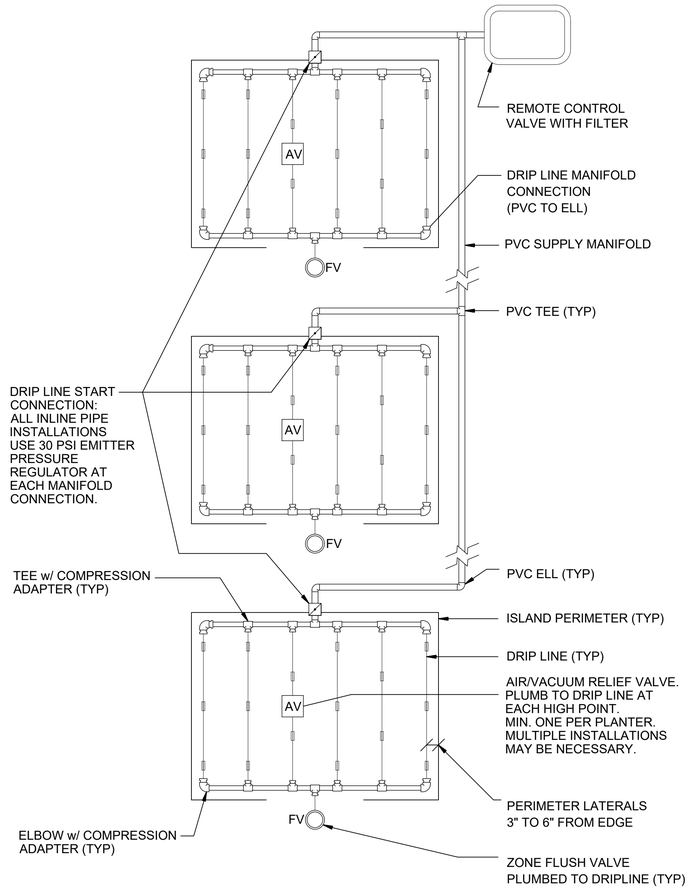
Public Works Director:
Date:

SHEET TITLE

IRRIGATION DETAILS

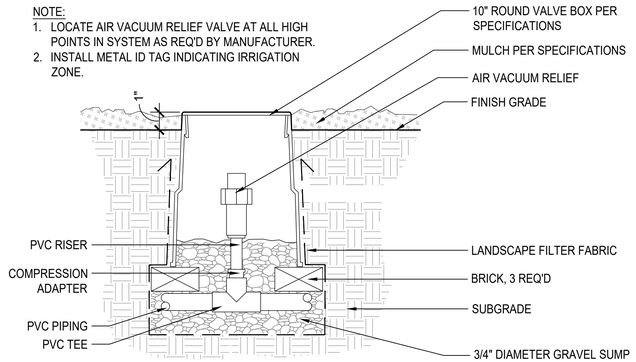
DRAWN BY: TS / QU **CHECKED BY: JM**

L5.2



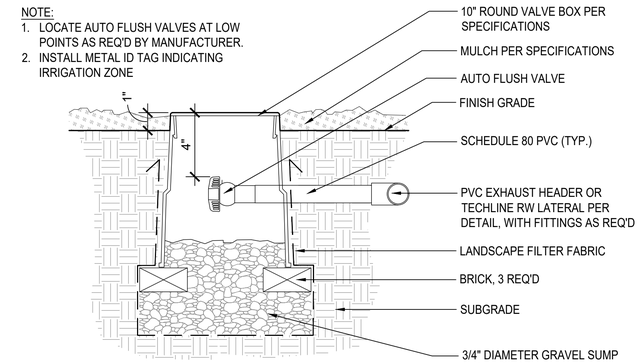
4 INLINE EMITTER ISLAND LAYOUT
NTS

NOTE:
1. LOCATE AIR VACUUM RELIEF VALVE AT ALL HIGH POINTS IN SYSTEM AS REQ'D BY MANUFACTURER.
2. INSTALL METAL ID TAG INDICATING IRRIGATION ZONE.



1 AIR VACUUM RELIEF VALVE
SCALE: NTS

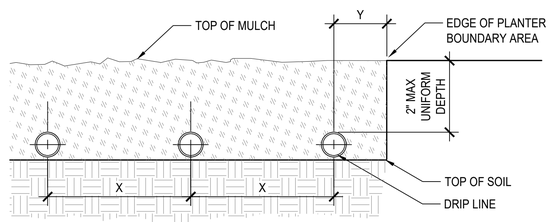
NOTE:
1. LOCATE AUTO FLUSH VALVES AT LOW POINTS AS REQ'D BY MANUFACTURER.
2. INSTALL METAL ID TAG INDICATING IRRIGATION ZONE



2 AUTO FLUSH VALVE
SCALE: 3" = 1'-0"

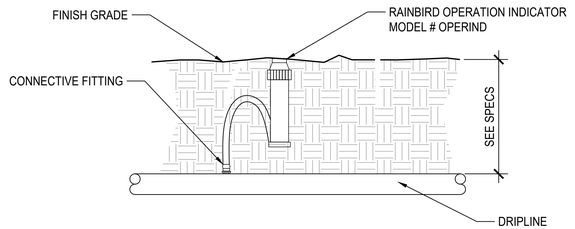
X DIMENSION (INCHES)	Y DIMENSION (INCHES)
12	4 OR 6

NOTES:
1. TYPICAL DIMENSIONS FOR DRIP LINE GRID LAYOUT IN PLANTING AREAS.
2. COORDINATE PLANTING INSTALLATION WITH GRID LAYOUT TO AVOID DAMAGE TO INSTALLED DRIP LINE AND TO PROVIDE UNIFORM IRRIGATION COVERAGE.
3. INSTALL DRIPLINE PARALLEL TO CONTOUR LINES.



5 DRIP TUBING ON GRADE INSTALLATION
SCALE: 6" = 1'-0"

NOTE:
1. LOCATE INDICATOR AT THE FARTHEST AND/OR HIGHEST POINT ON THE ZONE.



3 DRIP OPERATION INDICATOR
NTS

Date Plotted: 9/8/2025 4:31 PM

rhaa Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

LICENSED LANDSCAPE ARCHITECT
Signature
05-31-2026
Renewal Date
08-22-2025
Date
STATE OF CALIFORNIA

Public Works Director:
Date:

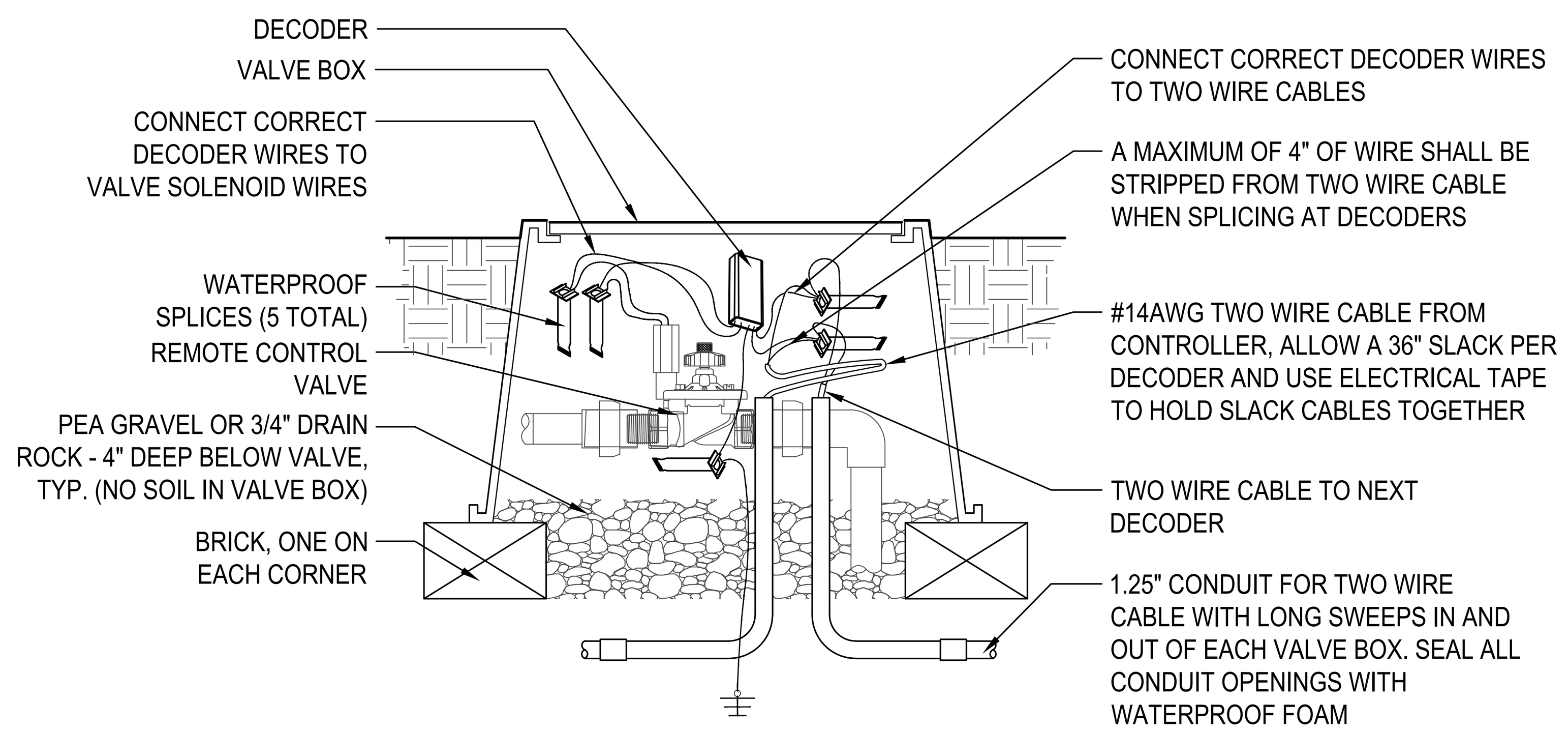
SHEET TITLE

IRRIGATION DETAILS

DRAWN BY: TS / QU **CHECKED BY: JM**

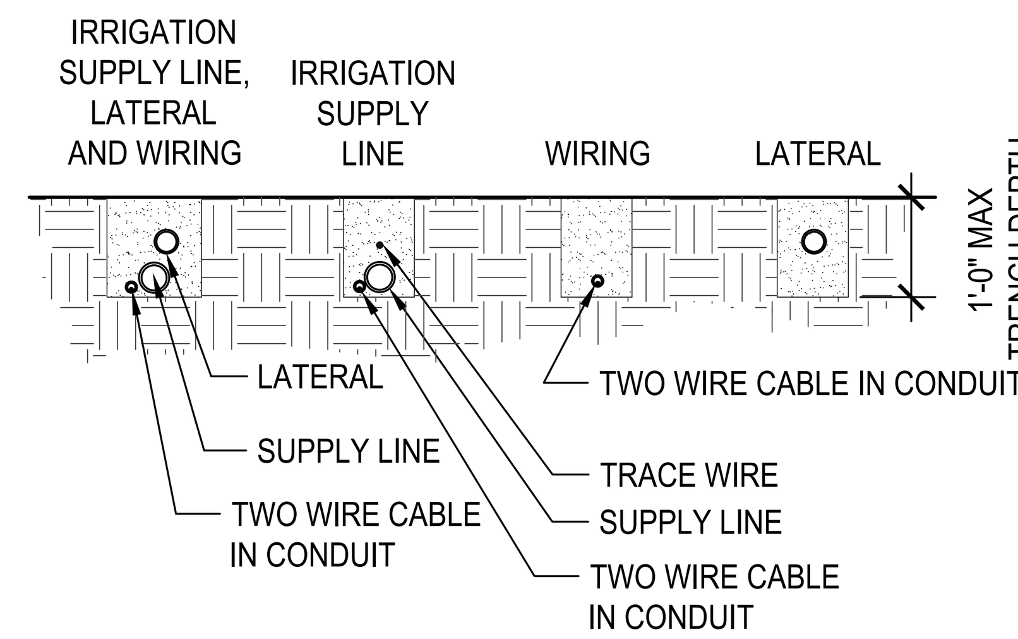
L5.3

NOTE:
ALL DECODERS SHALL HAVE A VALVE NUMBER ADDRESSED AT CONTROLLER PRIOR TO INSTALLATION.



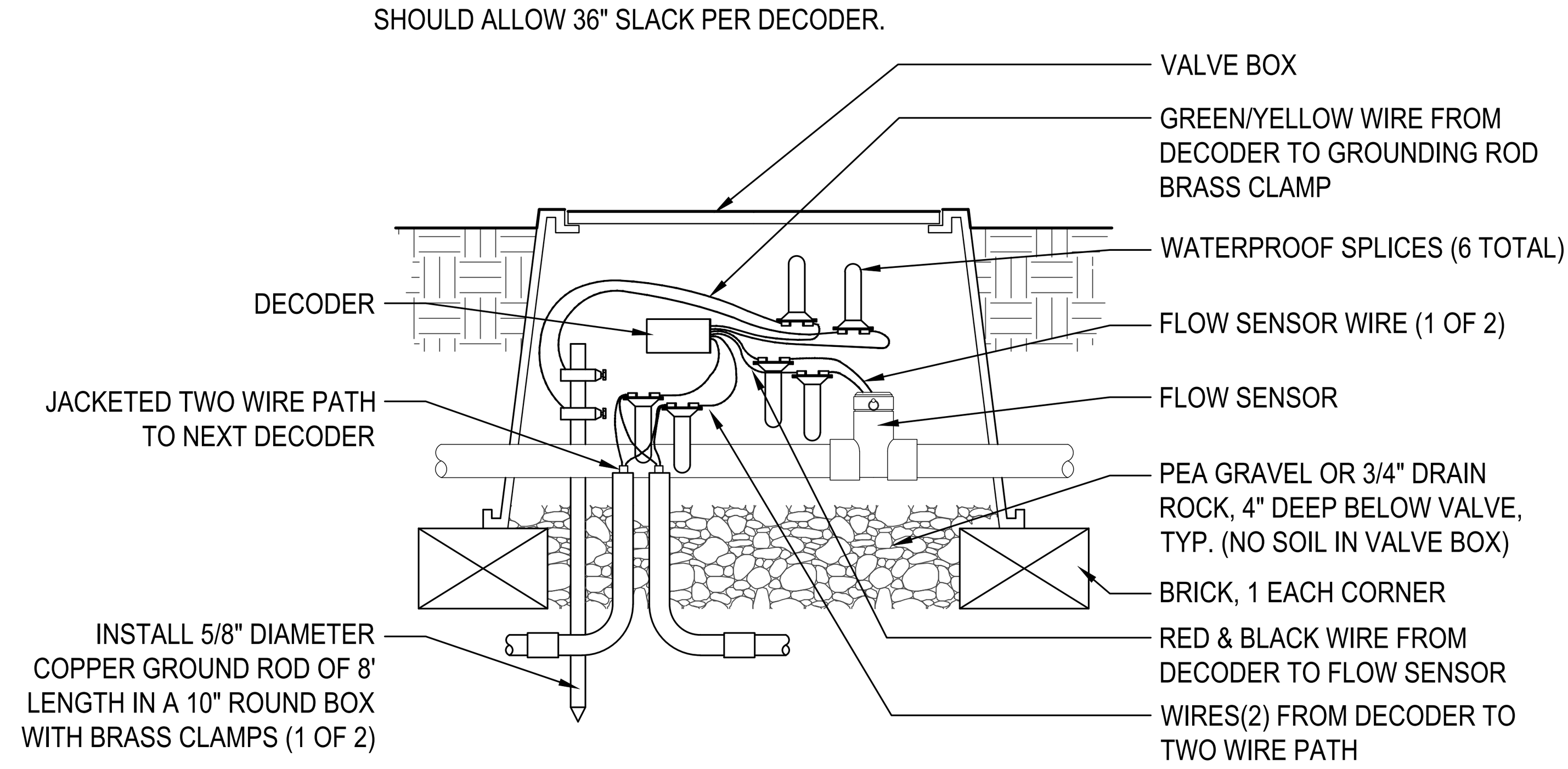
4 DECODER IN VALVE BOX - TWO WIRE
NOT TO SCALE

NOTES:
1. LAY IRRIGATION SUPPLY LINE ON NATIVE SOIL BED UNLESS SAND BED IS SPECIFIED.
2. PROVIDE 36" COVER OVER ALL PIPE AND PIPE SLEEVES UNDER ROADWAYS, PARKING LOTS, ENTRANCES TO PARKING LOTS AND FIRE ACCESS LANES PER NFPA 24, SECTION 10.44.
3. PROVIDE SEPARATE SLEEVES FOR ALL WIRES CROSSING UNDER ROADWAYS, PARKING LOTS AND FIRE ACCESS LANES PER NFPA 24, SECTION 10.44. DO NOT TAPE WIRES WITHIN CONDUIT.
4. MAXIMUM 12" EXCAVATION WITHIN ENVIRONMENTALLY SENSITIVE AREA BOUNDARY.

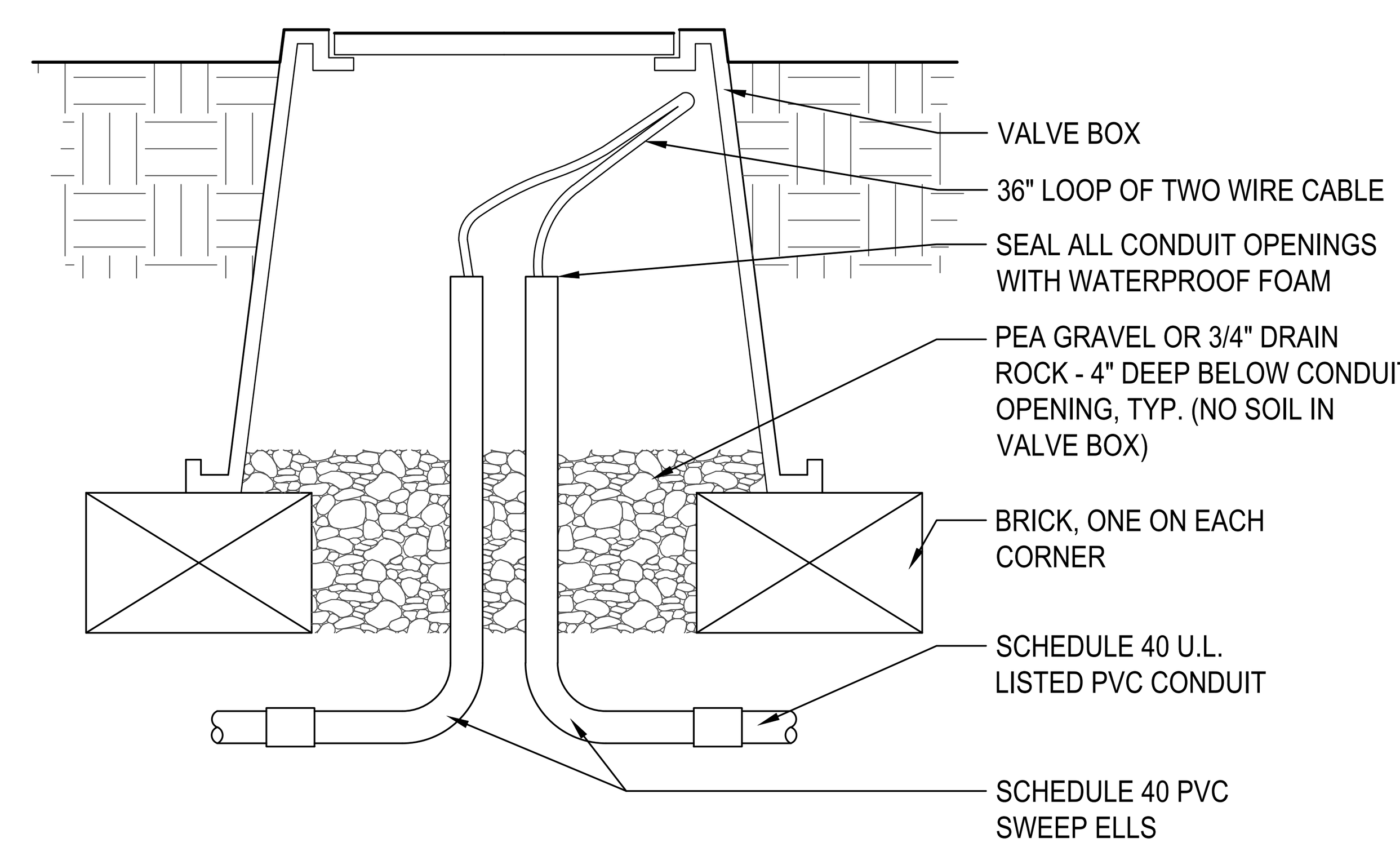


1 IRRIGATION TRENCHING - TWO WIRE
NOT TO SCALE

NOTE:
TWO WIRE PATH JACKETED/ TWISTED FROM CONTROLLER/DECODER SHOULD ALLOW 36" SLACK PER DECODER.

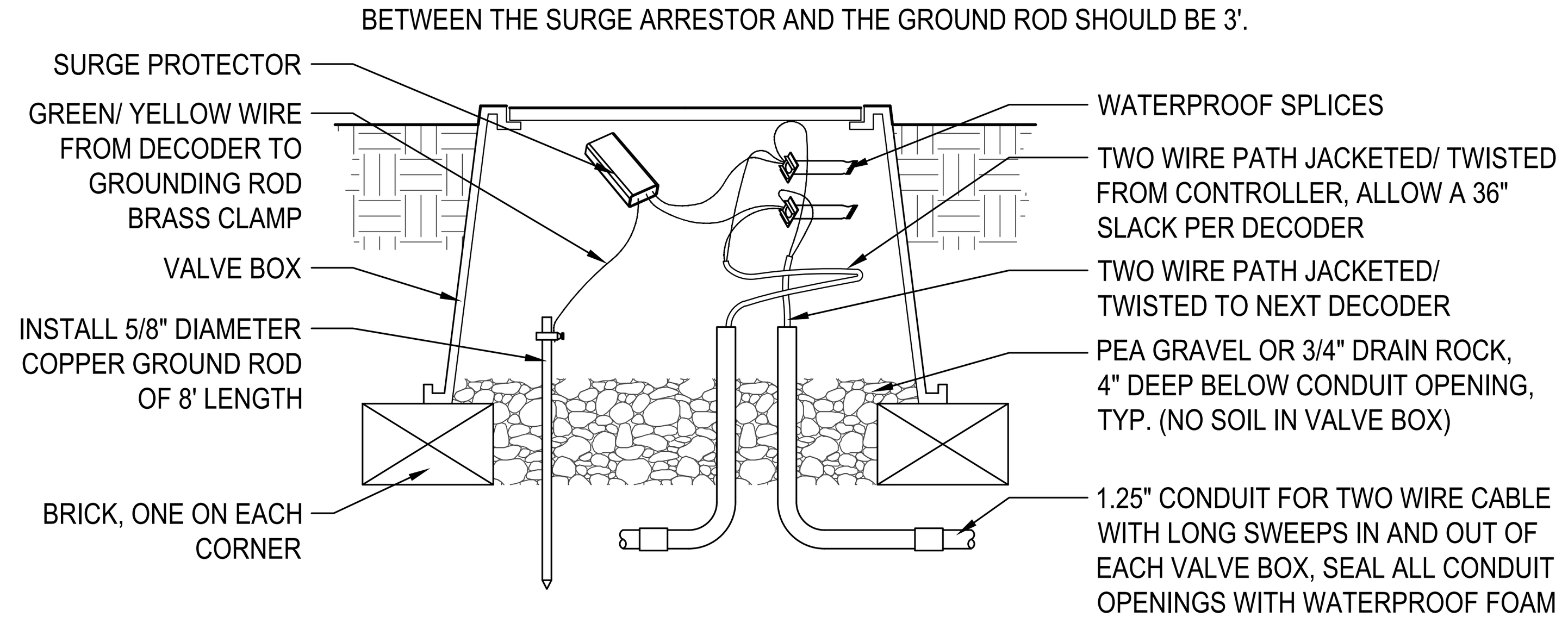


5 FLOW SENSOR DECODER - TWO WIRE
NOT TO SCALE

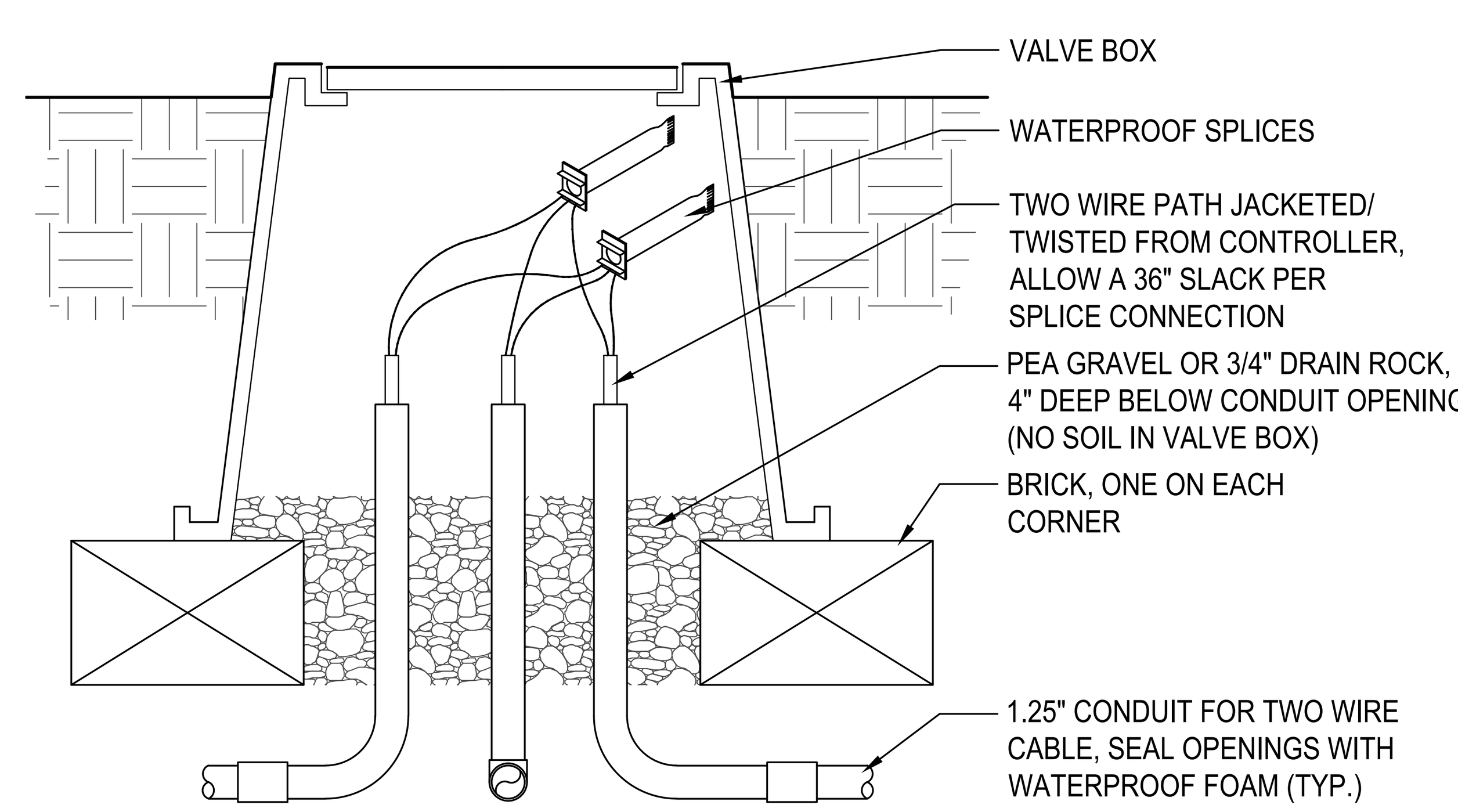


2 IRRIGATION TWO WIRE PULL BOX
NOT TO SCALE

NOTES:
1. TWO WIRE DECODER SYSTEMS MUST BE PROPERLY GROUNDED IN ORDER TO PROTECT AGAINST LIGHTNING SURGES.
2. THE COMMUNICATION CABLE MUST BE GROUNDED NO FURTHER THAN 500' FROM ANY DECODER OR FOR EVERY EIGHT DECODERS AND AT THE END OF THE TWO WIRE PATH.
3. SPLIT BOLT CONNECTION TO BE USED TO CONNECT THE SURGE DEVICE TO THE GROUND WIRE WITH A 3M DBY-6 WATERPROOF CONNECTOR.
4. THE SURGE DEVICE MUST BE A RAIN BIRD MODEL LSP-1TURF. THE MINIMUM DISTANCE BETWEEN THE SURGE ARRESTOR AND THE GROUND ROD SHOULD BE 3'.



6 LIGHTNING ARRESTOR - TWO WIRE
NOT TO SCALE



3 TWO WIRE SPLICE BOX AT MAIN LINE TEE
NOT TO SCALE

Date Plotted: 9/8/2025 4:32 PM

rhaa
Landscape Architecture & Planning
225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900
rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER
16042A

CONSULTANT

SUBMITTAL
Bid Documents

DATE
22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

LICENSED LANDSCAPE ARCHITECT
Signature
06-31-2026
Renewal Date
08-22-2025
Date
STATE OF CALIFORNIA

Public Works Director:
Date:

SHEET TITLE
IRRIGATION DETAILS

DRAWN BY: TS / QU CHECKED BY: JM

L5.4

SHRUBS

QTY	SYMBOL	ABBREVIATION	SCIENTIFIC NAME	COMMON NAME	SIZE	SPACING	MATURE HEIGHT	MATURE WIDTH	WUCOLS
13		ATR BRE	ATRIPLEX LENTIFORMIS 'BREWERI'	BREWER SALTBUSH	1 GAL	5' O.C.	6'	7'	VL
34		ART CAL	ARTEMISIA CALIFORNICA	CALIFORNIA SAGEBRUSH	1 GAL	4' O.C.	6'	4'	L
29		BAC CON	BACCHARIS PILULARIS 'CONSANGUINEA'	COYOTE BRUSH	1 GAL	4' O.C.	7'	5'	L
11		CEA CON	CEANOTHUS 'CONCHA'	CONCHA CALIFORNIA LILAC	1 GAL	6' O.C.	8'	12'	L
19		EPI CAN	EPILOBIUM CANUM	CALIFORNIA FUSCHIA	1 GAL	3' O.C.	3'	5'	L
10		ERI ARB	ERIOGONUM ARBORESCENS	SANTA CRUZ ISLAND BUCKWHEAT	1 GAL	4' O.C.	5'	6'	VL
17		ERI FAS	ERIGONUM FASCICULATUM VAR. FASCICULATUM	COASTAL CALIFORNIA BUCKWHEAT	1 GAL	4' O.C.	18"	8'	L
10		GAR ELL	GARRYA ELLIPTICA 'EVIE'	SILK TASSEL	1 GAL	5' O.C.	10'	10'	L
16		HET ARB	HETEROMELES ARBUTIFOLIA	TOYON	1 GAL	8' O.C.	8'	8'	L
23		LON INV	LONICERA INVOLUCRATA	BLACK TWINBERRY	1 GAL	4' O.C.	15'	4'	L
46		LUP ALB	LUPINUS ALBIFRONS	SILVER BUSH LUPINE	1 GAL	3' O.C.	3'	4'	L
52		MIM AUR	MIMULUS AURANTIACUS	STICKY MONKEY FLOWER	1 GAL	3' O.C.	3'	3'	L
12		RHA CAL	RHAMNUS CALIFORNICA	COFFEEBERRY	1 GAL	6' O.C.	6'	8'	L
2		ROS CAL	ROSA CALIFORNICA	CALIFORNIA WILDROSE	1 GAL	6' O.C.	8'	10'	L
5		SAL CLE	SALVIA CLEVELANDII	CLEVELAND SAGE	1 GAL	4' O.C.	4'	4'	L
15		SAL LEU	SALVIA LEUCOPHYLLA	PURPLE SAGE	1 GAL	4' O.C.	5'	4'	L
36		SAL MEL	SALVIA MELLIFERA	BLACK SAGE	1 GAL	4' O.C.	6'	8'	L

SMALL SHRUBS & PERENNIALS

23		ASC SPE	ASCLEPIAS SPECIOSA	SHOWY MILKWEED	1 GAL	3' O.C.	4'	4'	L
32		ERI CON	ERIOPHYLLUM CONFERTIFLORUM	GOLDEN YARROW	1 GAL	18" O.C.	2'	1'-6"	L
13		ERI GLA	ERIGERON GLAUCUS	SEASIDE DAISY	1 GAL	18' O.C.	<1'	2'	L
58		ERI GRA	ERIOGONUM GRANDE VAR. RUBESCENS	RED-FLOWERED BUCKWHEAT	1 GAL	2' O.C.	1'	3'	L
27		ERI LAT	ERIOGONUM LATIFOLIUM	COAST BUCKWHEAT	1 GAL	2' O.C.	<1'	2'	L
20		ERI STA	ERIOPHYLLUM STAECHADIFOLIUM	SEASIDE WOOLLY SUNFLOWER	1 GAL	2' O.C.	5'	5'	L
10		ESC CAL	ESCHSCHOLZIA CALIFORNICA	CALIFORNIA POPPY	1 GAL	1' O.C.	2'	2'	VL
17		PHA CAL	PHACELIA CALIFORNICA	ROCK PHACELIA	1 GAL	18" O.C.	1'-6"	2'	VL

GROUNDCOVER

62		ART PYC	ARTEMISIA PYCNOCEPHALA	COASTAL SAGEWORT	1 GAL	30" O.C.	2'	3'	L
267		BAC PIG	BACCHARIS PILULARIS 'PIGEON POINT'	PIGEON POINT COYOTE BRUSH	1 GAL	4' O.C.	2'	6'	L
97		CEA ANC	CEANOTHUS GLORIOSUS 'ANCHOR BAY'	POINT REYES CEANOTHUS	1 GAL	4' O.C.	2'	6'	L
10		CIS SUN	CISTUS PULVERLENTUS 'SUNSET'	SUNSET ROCKROSE	1 GAL	5' O.C.	3'	6'	L
4		SAL TER	SALVIA MELLIFERA 'TERRA SECA'	TERRA SECA SAGE	1 GAL	4' O.C.	2'-6"	5'	L

GRASSES

327		FES CAL	FESTUCA CALIFORNICA	CALIFORNIA FESCUE	D-16	2' O.C.	3'	3'	L
103		LEY CAN	LEYMUS CONDENSATUS 'CANYON PRINCE'	CANYON PRINCE WILD RYE	D-16	42" O.C.	4'	3'	L

VINES

6		CAL MAC	CALYSTEGIA MACROPHYLLA	CALIFORNIA MORNING GLORY	1 GAL	5' O.C.	4-6'	10'	L

LIVING SHORELINE

69		BAC DOU	BACCHARIS DOUGLASII (GLUTINOSA)	MARSH BACCHARIS	D-16	36" O.C.	3'	3'	L
35		LIM CAL	LIMONIUM CALIFORNICUM	SEA LAVENDER	D-16	18" O.C.	2'	2'	L
*		DIS SPI	DISTICHLIS SPICATA	SALT GRASS	D-16	15" O.C.	1'	1'	L
39		GRI ANG	GRINDELIA STRICTA VAR. ANGUSTIFOLIA	PACIFIC GUMPLANT	D-16	18" O.C.	3'	4'	L
**		SAR PAC	SARCOCORNIA PACIFICA	PICKLEWEED	D-16	1' O.C.	6"	9"	L

TREES

QTY	SYMBOL	ABBREVIATION	SCIENTIFIC NAME	COMMON NAME	SIZE	SPACING	HEIGHT	SPREAD	NATIVE	WUCOLS	NOTES
3		PIN CON	PINUS CONTORTA VAR. 'CONTORTA'	SHORE PINE	15 GAL	PER PLAN	25'	25'	YES	L	
9		QUE AGR	QUERCUS AGRIFOLIA	COAST LIVE OAK	15 GAL	PER PLAN	40'	40'	YES	L	
6		SAL LAS	SALIX LASIOLEPIS	ARROYO WILLOW	15 GAL	PER PLAN	20'	20'	YES	L	
1		SAM NIG	SAMBUCUS NIGRA	BLACK ELDERBERRY	15 GAL	PER PLAN	30'	20'	YES	L	
3		SAM RAC	SAMBUCUS RACEMOSA	RED ELDERBERRY	15 GAL	PER PLAN	20'	20'	YES	L	

PLANTING NOTES

1. TREES AND PLANTS HAVE BEEN SELECTED FOR THE LOCAL CONDITIONS AND ARE DROUGHT TOLERANT.
2. ALL SOIL AND SUBSOIL TO BE TESTED BY AN APPROVED ACCREDITED SOIL TESTING LABORATORY, REFER TO SPECIFICATIONS
3. A MINIMUM OF 8 INCHES OF NON-MECHANICALLY COMPACTED SOIL SHALL BE AVAILABLE FOR WATER ABSORPTION AND ROOT GROWTH IN PLANTED AREAS.
4. INCORPORATE COMPOST OR NATURAL FERTILIZER INTO THE SOIL TO A MINIMUM DEPTH OF 8 INCHES AT A MINIMUM RATE OF 6 CUBIC YARDS PER 1000 SQUARE FEET OR PER SPECIFIC AMENDMENT RECOMMENDATIONS FROM A SOILS LABORATORY REPORT.
5. A MINIMUM 3 INCH LAYER OF MULCH SHALL BE APPLIED ON ALL EXPOSED SOIL SURFACES OF PLANTING AREAS EXCEPT IN TURF AREAS, CREEPING OR ROOTING GROUNDCOVERS, AND DIRECT SEEDING APPLICATIONS.
6. APPLY MEADOW GRASSES HYDROSEED MIX AT 40 LBS/ACRE

Date Plotted: 9/8/2025 4:32 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

LICENSED LANDSCAPE ARCHITECT
License No. 6470
Signature
05-31-2026
Renewal Date
08-22-2025
Date
STATE OF CALIFORNIA

Public Works Director:
Date:

SHEET TITLE

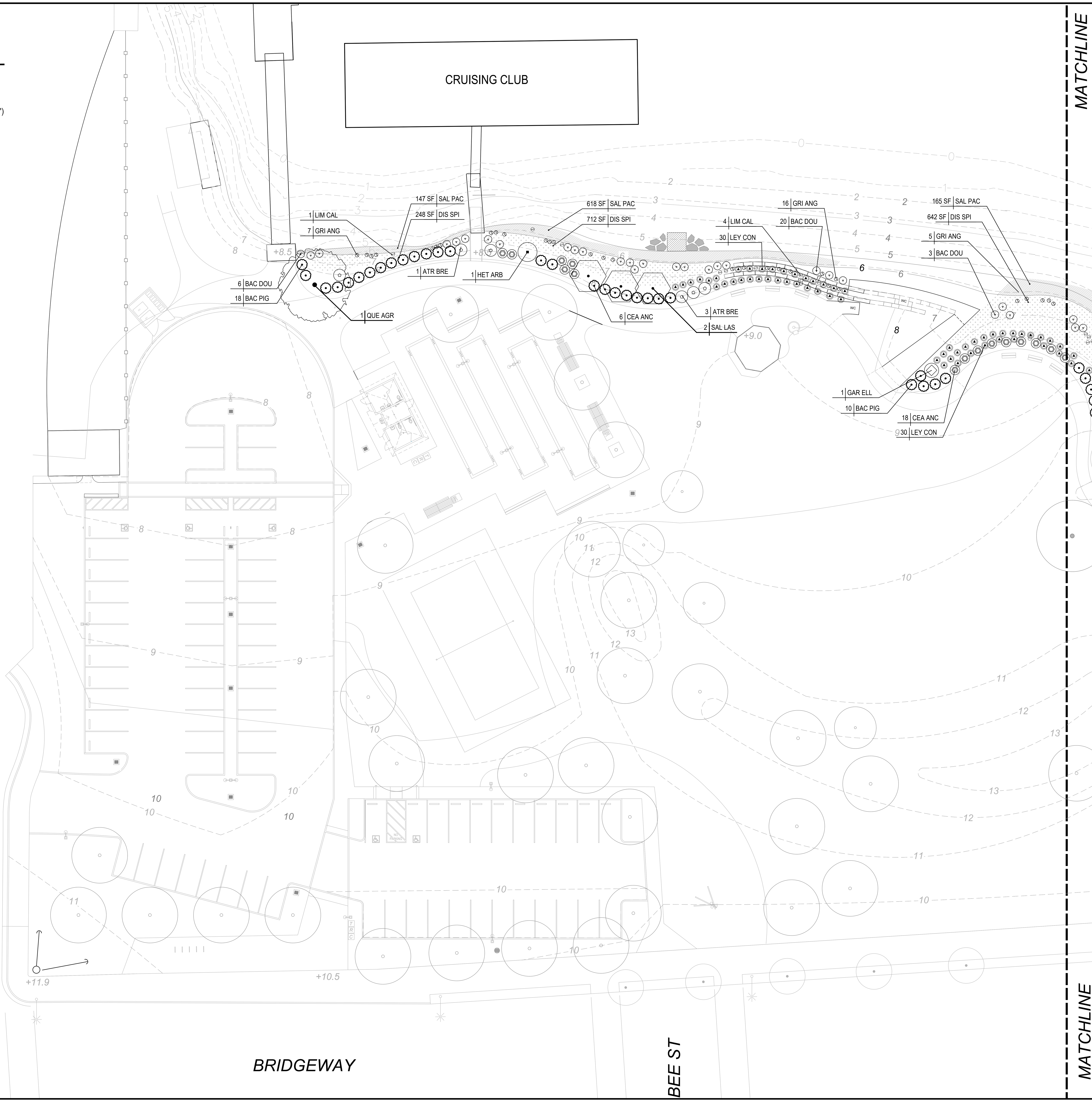
PLANTING SCHEDULE

DRAWN BY: TS / QU CHECKED BY: JM

L6.0

PLANTING LEGEND

[turf pattern]	TURF
[salt grass pattern]	HIGHER HIGH TIDE (9.5') - MEAN HIGHER HIGH (6.01') *DISTICHLIS SPICATA* SALT GRASS
[pickleweed pattern]	MEAN HIGHER HIGH (6.01') - MEAN HIGH TIDE (5.5') *SALICORNIA PACIFICA* PICKLEWEED



rhaa
Landscape Architecture & Planning
225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900
rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

LICENSED LANDSCAPE ARCHITECT — STATE OF CALIFORNIA — Signature — 05-31-2026 Renewal Date — 08-22-2025 Date

Public Works Director:
Date:

SCALE

1" = 20'-0"

0 10' 20' 40'

N

SHEET TITLE

PLANTING PLAN

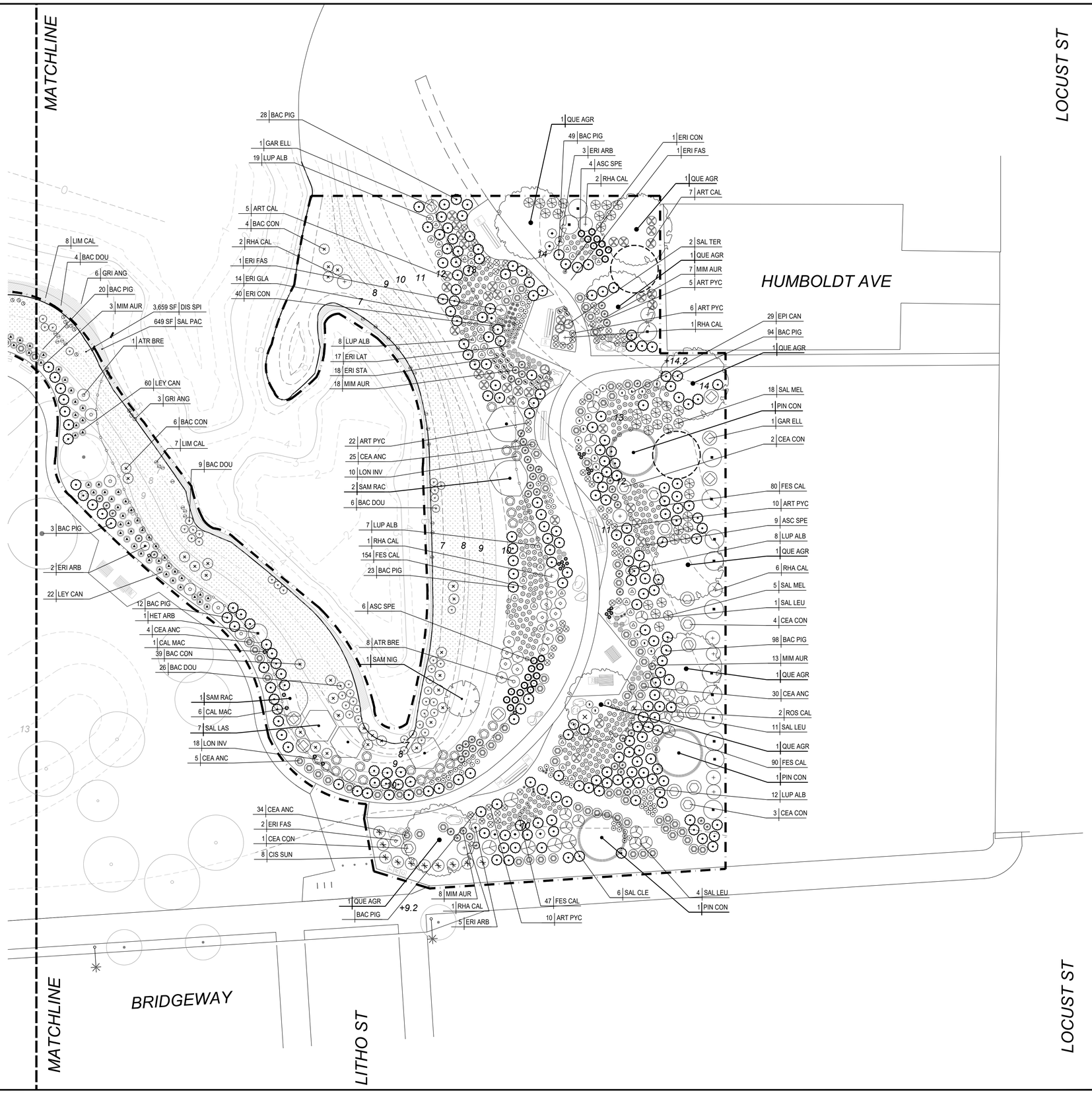
DRAWN BY: TS / QU CHECKED BY: JM

L6.1

Date Plotted: 9/8/2025 4:32 PM

PLANTING LEGEND

- TURF
- HIGHER HIGH TIDE (9.5') - MEAN HIGHER HIGH (6.01')
  DISTICHLIS SPICATA
  SALT GRASS
- MEAN HIGHER HIGH (6.01') - MEAN HIGH TIDE (5.5')
  SALICORNIA PACIFICA
  PICKLEWEED



Date Plotted: 9/8/2025 4:32 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

LICENSED LANDSCAPE ARCHITECT
Jamie King License No.
Signature
05-31-2026
Renewal Date
08-22-2025
Date
STATE OF CALIFORNIA

Public Works Director:
Date:

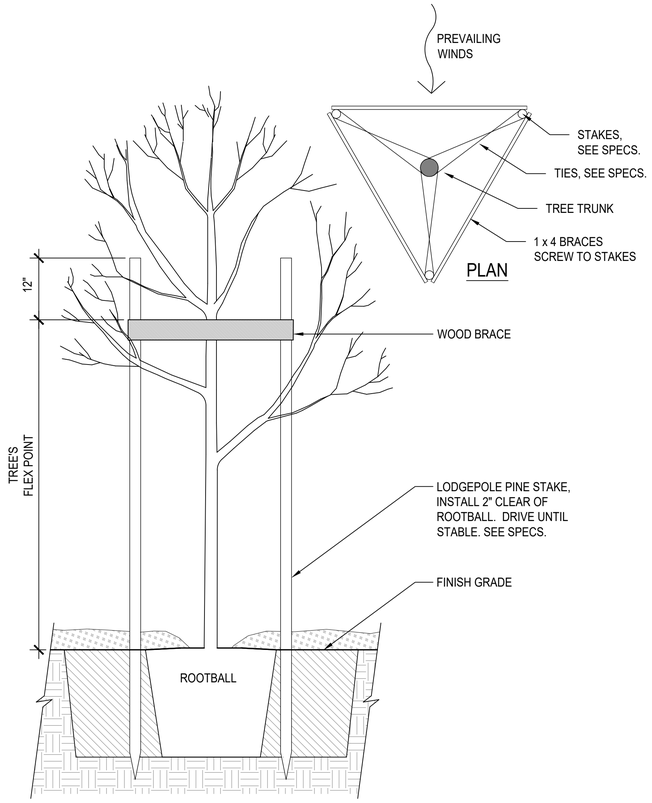
SCALE
1" = 20'-0"
0 10' 20' 40'
N

SHEET TITLE

PLANTING PLAN

DRAWN BY: TS / QU **CHECKED BY: JM**

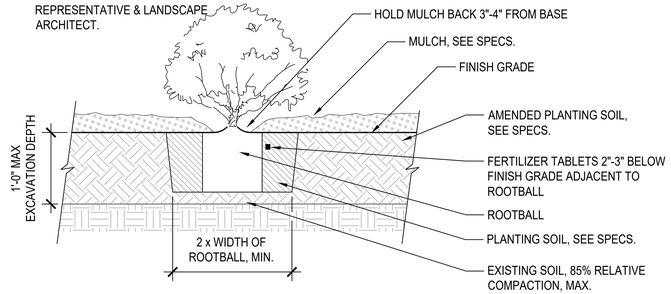
L6.2



4 TREE STAKING

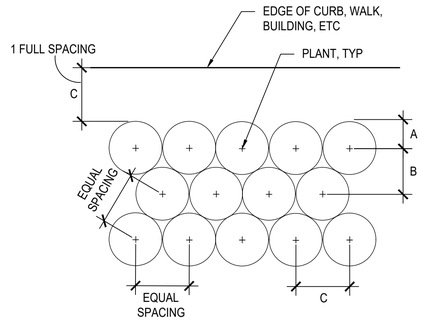
SCALE: 3/4" = 1'-0"

NOTE:
1. SEE SPECS FOR MORE INFORMATION REGARDING PLANT INSTALLATION AND SOIL PREPARATION.
2. DO NOT INSTALL IN WASTE MATERIAL. IF WASTE IS ENCOUNTERED CONTACT CITY REPRESENTATIVE & LANDSCAPE ARCHITECT.



1 SHRUB PLANTING

SCALE: 1" = 1'-0"

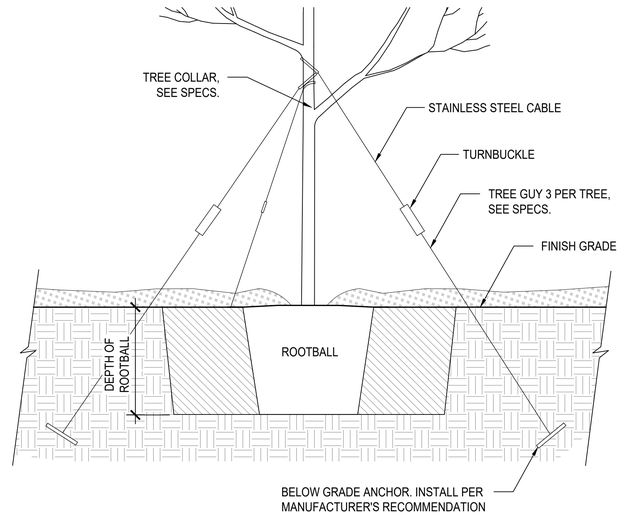


NOTES:
1. SEE PLANTING PLAN FOR SPACING BY PLANT SPECIES.
2. INSTALL TRIANGULATED PLANT LAYOUT, UNLESS OTHERWISE SHOWN ON PLANS.

PLANT SPACING	A	B	C
12"	6"	10"	12"
1'-6"	9"	1'-4"	1'-6"
2'-0"	12"	1'-9"	2'-0"
2'-6"	1'-3"	2'-2"	2'-6"
3'-0"	1'-6"	2'-7"	3'-0"
3'-6"	1'-9"	3'-0"	3'-6"
4'-0"	2'-0"	3'-6"	4'-0"
4'-6"	2'-3"	3'-11"	4'-6"
5'-0"	2'-6"	4'-4"	5'-0"

2 PLANTING LAYOUT

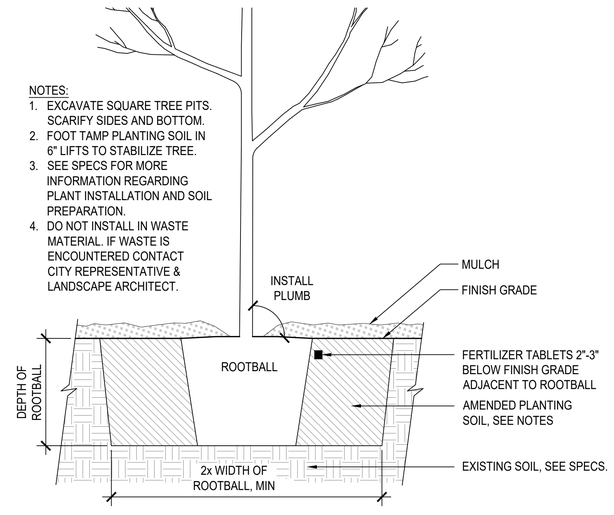
NTS



5 TREE GUYING

NTS

NOTES:
1. EXCAVATE SQUARE TREE PITS. SCARIFY SIDES AND BOTTOM.
2. FOOT TAMP PLANTING SOIL IN 6" LIFTS TO STABILIZE TREE.
3. SEE SPECS FOR MORE INFORMATION REGARDING PLANT INSTALLATION AND SOIL PREPARATION.
4. DO NOT INSTALL IN WASTE MATERIAL. IF WASTE IS ENCOUNTERED CONTACT CITY REPRESENTATIVE & LANDSCAPE ARCHITECT.



3 TREE PLANTING

NTS

Date Plotted: 9/8/2025 4:32 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Bid Documents

DATE

22 AUGUST 2025

REVISIONS

No.	Date	Description
1	09/09/25	ADDENDUM 1

REGISTRATION AND SIGNATURE

LICENSED LANDSCAPE ARCHITECT
Jeanne King License No.
Signature
05-31-2026
Renewal Date
08-22-2025
Date
STATE OF CALIFORNIA

Public Works Director:
Date:

SHEET TITLE

PLANTING DETAILS

DRAWN BY: TS / QU **CHECKED BY: JM**

L6.3

RGH CONSULTANTS

Experience is the difference

GEOTECHNICAL STUDY REPORT

DUNPHY PARK IMPROVEMENTS
BRIDGEWAY BOULEVARD & NAPA STREET
SAUSALITO, CALIFORNIA

Project Number:

1993.39.04.1

Prepared For:

City of Sausalito
Attention: Jon Goldman
420 Litho Street
Sausalito, CA 94965

Prepared By:

RGH Consultants

Santa Rosa Office
1305 North Dutton Avenue
Santa Rosa, CA 95401
P: 707-544-1072

Napa Office
1041 Jefferson Street, Suite 4
Napa, CA 94559
P: 707-252-8105

Middletown Office
P.O. Box 852
Middletown, CA 95461
P: 707-987-4602

Jared J. Pratt
Senior Engineering Geologist

Eric G. Chase
Senior Associate Engineer

CERTIFIED ENGINEERING GEOLOGIST
JARED JACKSON PRATT
No. 2453
STATE OF CALIFORNIA

June 9, 2015

REGISTERED PROFESSIONAL ENGINEER
ERIC G. CHASE
No. 2628
GEOTECHNICAL
STATE OF CALIFORNIA

TABLE OF CONTENTS

TABLE OF CONTENTS (cont'd)

INTRODUCTION

This report presents the results of our geotechnical study for the improvements to be constructed at Dunphy Park in Sausalito, California. In its current condition, the City of Sausalito's Dunphy Park extends to the east from Bridgeway to Richardson's Bay (Bay) and from the extension of Litho Street on the south to Napa Street on the north. Dunphy Park includes a large grass area, scattered mature trees, a sand volleyball court and bocce courts. There is a gravel parking lot along the northern (Napa Street) edge of the park that also extends along a portion of the easterly edge fronting the Cass Gidley Marina and the Cruising Club. An unpaved overflow lot/access roadway exists along the western edge of the Park in former railroad right-of-way. An existing structure is located at Cass/Gidley where the parking lot transitions from west to north. At this corner, a spit extends out into the Bay for a short distance. The Cass/Gidley office building is located on the spit. An asphalt paved bike lane extends along the southerly edge of the park, parallel to Bridgeway. The site location is shown on Plate 1, Appendix A.

We understand the schematic master plan presented to the City Council involves moving the bocce courts to a location adjacent to the volleyball court on the westerly side of the park. A restroom building is planned in the same area as the bocce and volleyball courts. In addition, new fill is proposed within the park to create a bowl-shaped area for use as an amphitheater. The existing parking lot is to be improved and expanded to cover a larger area in the westerly portion of the park and wrap around a portion of the southerly edge of the park. New pathways and walkways are also planned. In addition, improvements are planned by Cass/Gidley and may in the future be anticipated by the Cruising Club. These improvements may include new and/or modified foundations.

SCOPE

The purpose of our study, as outlined in our proposal dated January 27, 2015 and revised February 9, 2015, was to generate geotechnical information for the design and construction of the project. Our scope of services included reviewing selected published geologic data pertinent to the site; evaluating subsurface conditions with borings and laboratory tests; analyzing the field and laboratory data; and presenting this report with the following geotechnical information:

1. A brief description of soil, bedrock and groundwater conditions observed during our study;

2. A discussion of seismic hazards that may affect the proposed improvements; and

3. Conclusions and recommendations regarding:

    a. Primary geotechnical engineering concerns and mitigating measures, as applicable;

    b. Site preparation and grading including remedial grading of weak, porous, compressible and/or expansive surface soils;

    c. Foundation type(s), design criteria, and estimated settlement behavior;

    d. Support of concrete slabs-on-grade;

e. Preliminary pavement thickness based on our experience with similar soils and projects and the results of an R-value test on the anticipated subgrade soils;

f. Utility trench backfill;

g. Geotechnical engineering drainage improvements; and

h. Supplemental geotechnical engineering services.

STUDY

Site Exploration

We reviewed selected geologic references pertinent to the site. The geologic literature reviewed is listed in Appendix B.

On March 12 and 13, 2015, we performed a geotechnical reconnaissance of the site and explored the subsurface conditions by drilling three borings to depths ranging from about 49½ to 63½ feet. These borings were drilled with a track-mounted drill rig capable of rotary wash drilling. In addition, we drilled one boring to a depth of about 5 feet using the 4-inch diameter, solid stem augers from the same track-mounted drill rig. The borings were drilled at the approximate locations shown on the Exploration Plan, Plate 2. The boring locations were determined approximately by pacing their distance from features shown on the Exploration Plan and should be considered accurate only to the degree implied by the method used. Our geologist located and logged the borings and obtained samples of the materials encountered for visual examination, classification and laboratory testing.

Relatively undisturbed samples were obtained from the borings at selected intervals by driving a 2.43-inch inside diameter, split spoon sampler, containing 6-inch long brass liners, using a 140-pound hammer dropping approximately 30 inches. The sampler was driven 12 to 18 inches. The blows required to drive each 6-inch increment were recorded and the blows required to drive the last 12 inches, or portion thereof, were converted to equivalent Standard Penetration Test (SPT) blow counts for correlation with empirical data. Relatively undisturbed samples of Bay Mud were also obtained from the borings at selected depths by hydraulically pushing a 3-inch inside diameter, 30-inch long thin walled Shelby Tube Sampler. Disturbed samples were also obtained at selected depths by driving a 1.375-inch inside diameter (2-inch outside diameter) SPT sampler, without liners or rings, using a 140-pound hammer dropping approximately 30 inches. The sampler was driven 12 to 18 inches, the blows to drive each 6-inch increment were recorded, and the blows required to drive the final 12 inches, or portion thereof, are provided on the boring logs. A Disturbed “bulk” sample of the anticipated subgrade soils was also obtained from boring B-2 and placed in a bucket.

The logs of the borings showing the materials encountered, groundwater conditions, converted blow counts and sample depths are presented on Plates 3 through 6. The soils are described in accordance with the Unified Soil Classification System, outlined on Plate 7. Bedrock is described in accordance with Engineering Geology Rock Terms, shown on Plate 8. An idealized cross section of the conditions encountered in our borings is given on Plate 9.

The boring logs show our interpretation of subsurface soil and bedrock conditions on the date and at the locations indicated. Subsurface conditions may vary at other locations and times. Our interpretation is based on visual inspection of soil and bedrock samples, laboratory test results, and interpretation of drilling and sampling resistance. The location of the soil and bedrock boundaries should be considered approximate. The transition between soil and bedrock types may be gradual.

Laboratory Testing

The samples obtained from the borings were transported to our office and re-examined to verify soil classifications, evaluate characteristics and assign tests pertinent to our analysis. Selected samples were laboratory tested to determine their water content, dry density, classification (Atterberg Limits, percent of silt and clay), shear strength, consolidation characteristics, expansion potential (Expansion Index - EI) and R-value. Results of water content, dry density, classification, shear strength and EI tests are referenced on the boring logs. Results of the classification, triaxial strength, consolidation and R-value tests are presented on Plates 10 through 16.

SITE CONDITIONS

General

Marin County is located within the California Coast Range geomorphic province. This province is a geologically complex and seismically active region characterized by sub-parallel northwest-trending faults, mountain ranges and valleys. The oldest bedrock units are the Jurassic-Cretaceous Franciscan Complex and Great Valley sequence sediments originally deposited in a marine environment. Subsequently, younger rocks such as the Tertiary-age Sonoma Volcanics group, the Plio-Pleistocene-age Clear Lake Volcanics and sedimentary rocks such as the Guinda, Domengine, Petaluma, Wilson Grove, Cache, Huichica and Glen Ellen formations were deposited throughout the province. Extensive folding and thrust faulting during late Cretaceous through early Tertiary geologic time created complex geologic conditions that underlie the highly varied topography of today. In valleys, the bedrock is covered by thick alluvial soils.

Geology

Published geologic maps (Blake, et al., 2000) indicate the property is underlain by Quaternary age artificial fill over marine and marsh deposits (Qmf).

Landslides

Published landslide maps (Rice, et al., 1976) do not indicate large-scale slope instability at the site, and we did not observe active landslides at the site during our study.

Surface

Dunphy Park includes a large grass area, scattered mature trees, a sand volleyball court and bocce courts. There is a gravel parking lot along the northern edge of the park that also extends along a portion of the easterly edge. An unpaved overflow lot/access roadway exists along the western edge of the Park in former railroad right-of-way. An existing structure is located at Cass Gidley where the parking lot transitions from west to north. At this corner, a spit extends out into the Bay for a short distance. The Cass/Gidley office building is located on the spit. An asphalt paved bike lane extends along the southerly edge of the park, parallel to Bridgeway. Natural drainage consists of sheet flow over the ground surface that concentrates in man-made surface drainage elements such as roadside ditches, canals and gutters and natural drainage elements such as swales, ravines and Richardson Bay.

Subsurface

Our borings and laboratory tests indicate that the portion of the site we studied is blanketed by 5½ to 12 feet of heterogeneous fill. Heterogeneous fill is a material with varying density, strength, compressibility and shrink-swell characteristics that often has an unknown origin and placement history. The heterogeneous fill we encountered consists of sand with varying amounts of clay and silt and clay with varying amounts of sand and gravel. These soils exhibit low to medium plasticity (LL = 38-48; PI = 19-26) and moderate expansion potential (EI = 56-60). The heterogeneous fill is underlain by soft silt and clay, referred to locally as Bay Mud, with occasional interbedded layers of gravel or sand. Sandstone bedrock extends from beneath the Bay Mud materials to the maximum depths explored (63½ feet). The sandstone is generally closely fractured, firm to moderately hard, plastic to moderately strong and moderately to highly weathered. A detailed description of subsurface conditions found in our borings is given on Plates 3 through 6, Appendix A. An idealized cross section of the subsurface conditions is presented on Plate 9. Based on Table 20.3-1 of American Society of Civil Engineers (ASCE) Standard 7-10, titled “Minimum Design Loads for Buildings and Other Structures” (2010), we have determined a Site Class of E should be used for the site.

Corrosion Potential

Mapping by the Natural Resources Conservation Service (2015) provides no data for the corrosion potential of the near surface soil for uncoated steel and concrete. Performing corrosivity tests was not part of our requested and/or proposed scope of work. Should the need arise, we would be pleased to provide a proposal to evaluate these characteristics.

Groundwater

We were unable to access the depth to groundwater from our borings because they were drilled using rotary wash techniques. Rotary wash drilling involves circulating fluid as part of the process so it is not possible to measure the groundwater level. Based on our experience, the groundwater level within the park area is likely tidally controlled.

DISCUSSION AND CONCLUSIONS

Seismic Hazards

Seismicity

Data presented by the Working Group on California Earthquake Probabilities (2007) estimates the chance of one or more large earthquakes (Magnitude 6.7 or greater) in the San Francisco Bay region within the next 30 years to be approximately 63 percent. Therefore, future seismic shaking should be anticipated at the site. It will be necessary to design and construct proposed structures in strict adherence with current standards for earthquake-resistant construction.

Faulting

We did not observe landforms within the area that would indicate the presence of active faults and the site is not within a current Alquist-Priolo Earthquake Fault Zone (Bryant and Hart, 2007). Therefore, we believe the risk of fault rupture at the site is low. However, the site is within an area affected by strong seismic activity. Several northwest-trending Earthquake Fault Zones exist in close proximity to and within several miles of the site (Bortugno, 1982). The shortest distances from the site to the mapped surface expression of these faults are presented in the table below.

ACTIVE FAULT PROXIMITY		
Fault	**Direction**	**Distance-Miles**
San Andreas	WSW	7
Hayward	NE	11

Liquefaction

Liquefaction is a rapid loss of shear strength experienced in saturated, predominantly granular soils below the groundwater level during strong earthquake ground shaking due to an increase in pore water pressure. The occurrence of this phenomenon is dependent on many complex factors including the intensity and duration of ground shaking, particle size distribution and density of the soil.

Granular soils were encountered in our borings for this project. The granular soils we observed included sand and gravel with varying amounts of clay and silt within the heterogeneous fill materials encountered above the Bay Mud. We also encountered layers of native sand and gravel, also with varying amounts of clay and silt, within the Bay Mud. In general, the sand and gravel within the heterogeneous fill is not consistently saturated as the groundwater level fluctuates with the changes in tide. Therefore, the heterogeneous fill was excluded from our liquefaction analysis. The seismic impacts on the heterogeneous fill will be covered in the “Densification” section.

As discussed above, sand and gravel layers were encountered within the Bay Mud at the project site. It is not unusual to see sand and gravel layers within Bay Mud. These layers are, by the nature of how they are deposited, typically looser and susceptible to liquefaction. These layers are also typically thin and discontinuous with occasional thicker deposits. For the Dunphy Park site the layers seem to be thicker and extend laterally between the three borings we drilled. Standard Penetration Test (SPT) blow counts from soil borings are used to evaluate liquefaction potential and its impacts. This analysis will be discussed in more details below. We do not have SPT blow counts for all sand and gravel layers encountered because some of these layers were sampled using other techniques. Therefore the analysis described herein focuses on the layers where we have SPT data with the results then applied to the layers for which we do not.

We performed an analysis of the blow count data from our borings using the methods of Seed and Idriss (1982), Seed and others (1985), Youd and Idriss (2001), Idriss and Boulanger (2004) and Idriss and Boulanger (2008). These procedures normalize the blow counts to account for overburden pressure, rod length, hammer energy, and fines (percent of silt and clay) content. Once the blow counts are normalized and adjusted to a clean sand blow count, the cyclic resistance ratio (CRR) for each blow count is then determined using the same procedures referenced above. The CRR is compared to the cyclic stress ratio (CSR) induced by the earthquake. Calculating the CSR requires a peak ground acceleration and design earthquake magnitude.

Peak ground acceleration (PGA) was determined using the methods in the 2013 California Building Code (CBC) and the American Society of Civil Engineers (ASCE) Standard 7-10, titled “Minimum Design Loads for Buildings and Other Structures” (2010). Using the U.S. Seismic Design Maps from the United States Geological Survey (USGS) website (http://geohazards.usgs.gov/designmaps/us/application.php), the site’s latitude and longitude of 37.8615°N and 122.4887°W, respectively, and a site soil Class of E, the PGA for the site is 0.56g. Using this information, the CSR for a M_M 7.5 earthquake at the site ranges from 0.56 to 0.62. The San Andreas fault is most likely controlling the ground motions at the site. According to Petersen (1996), the nearby portion of the San Andreas fault is capable of a M_M 7.9 earthquake. Therefore, the CRR values at the site must be scaled to account for the difference between M_M 7.9 and M_M 7.5. When the scaling factor for magnitude and confining stress corrections presented in Idriss and Boulanger (2004) are applied, the CRR values at the site do not exceed the CSR values. Therefore, we judge that the potential for liquefaction of these sand and gravel layers is high.

There are three potential consequences of liquefaction: bearing capacity failure, lateral spreading toward a free face and settlement. Bearing capacity failure is sudden and extreme settlement of foundations that typically occurs when the liquefied layer is relatively close (typically within two times the footing width, depending on the loads) to the bottom of the foundation. Because the liquefiable layers are within the Bay Mud and foundations will be within the upper portion of the fill, we judge that the potential for bearing capacity failure is low.

Lateral spreading can occur where continuous layers of liquefiable soil extend to a free face. The potentially liquefiable layers at the site are continuous, at least within the project site. However, the continuous layers are located within the Bay Mud and within the project site do not extend to a free face. It is possible that farther from the shoreline there is a free face created due to dredging. Therefore, we cannot preclude the possibility of earthquake-lateral spreading into the Bay.

The third potential consequence of liquefaction is settlement due to densification of the liquefied soils. Potential settlements based on the blow count data and cyclic stress ratios were calculated using the methods of Ishihara and Yoshimine (1992). For the layers encountered in our borings we calculated total settlement ranging from 3 to 6 inches. Because liquefaction settlement is typically erratic it is difficult to estimate differential settlement. History suggests that differential settlement can occur over relatively short distances.

Densification

Densification is the settlement of loose, granular soils above the groundwater level due to earthquake shaking. Typically, heterogeneous fill and granular soils that would be susceptible to liquefaction, if saturated, are susceptible to densification if not saturated. As discussed in the "Liquefaction" section, sand and gravel with varying amounts of clay and silt were encountered within the heterogeneous fill. Based on the density of these soils, we judge that there is a moderate potential for densification to impact structures at the site. Given the amount of fine grained material observed in the fill and the increased density of the upper portions of the fill, we estimate that densification settlement will be up to about 1 inch.

Tsunamis and Seiches

Maps published by the California Emergency Management Agency, in conjunction with the California Geological Survey and the University of California (California Emergency Management Agency, 2009), indicates the site is located a tsunamis inundation zone. Site-specific evaluation of tsunamis and seiche impact to the project is beyond the scope of this study.

Geotechnical Issues

General

Based on our study, we judge the proposed improvements can be built as planned, provided the recommendations presented in this report are incorporated into their design and construction. The primary geotechnical concerns during design and construction of the project are:

1. The presence of soft sediments referred to locally as Bay Mud;
2. The presence of soils susceptible to liquefaction and densification;
3. The presence of heterogeneous fill;
4. The detrimental effects of uncontrolled surface runoff; and
5. The strong ground shaking predicted to impact the site during the life of the project.

Soft Bay Sediments

The soft bay sediments encountered at the site are referred to locally as Bay Mud. Improvements constructed on sites underlain by Bay Mud are highly susceptible to settlement. In particular, fills placed over Bay Mud will settle significantly as well as structures constructed on the fill. The Dunphy Park site, as with most of the margin of Richardson Bay and San Francisco Bay, consists of fill placed over the Bay Mud. In order to assess the settlement for new improvements, one must estimate the settlement that occurred due to the original fill placement, assess how much settlement remains from the original fill placement and calculate the settlement due to the new improvements. These analyses are discussed in the subsequent sections.

Settlement to Date and Remaining Settlement - In order to estimate the settlement that has occurred to date from the fill placed at the site and the settlement remaining, we need the following information: the time frame of fill placement, the thickness of fill, the thickness of the sediment and the time rate of consolidation of the sediment. The fill in this area of Sausalito was reportedly placed in the 1960's. For our analysis, we assumed the fill has been there for 50 years or since about 1965. The thickness of the fill varies at the Dunphy site with fill being about 6 feet thick in most areas and thicker (10 to 12 feet) adjacent to Bridgeway. Because the planned improvements are in the area of the thinner fill section, we used 6 feet of fill for our analysis. The thickness of Bay Mud at the site is a little more difficult to determine for a general analysis. As can be seen from the cross section presented on Plate 9, the Bay Mud thickness is a combination of layers interbedded with layers of sand and gravel. For example, the total Bay Mud thickness in boring B-3 is about 8 feet below the fill and another 17 feet below the sand and gravel layers for a total thickness of 25 feet. In boring B-1, the thickness is a combination of about 11 feet below the fill, 5 feet interbedded within the sand layer, and 22 feet below the sand layer for a total thickness of 38 feet. This variability of thickness combined with depth makes the analysis more complicated. The final piece of our analysis is the time rate of consolidation, which comes from the consolidation tests we performed on samples of the Bay Mud.

Using the above information, the first step in our analysis was to estimate the amount of settlement that has occurred due to the placement of the original fill. First, using the engineering characteristics from our consolidation tests presented on Plates 13 through 15 we calculated the anticipated settlement from the fill. In particular we looked at the conditions in borings B-1 and B-4, which represent the area of the planned improvements. Settlement calculations using the conditions in each of those borings yield about 9 and 5 inches of settlement for borings B-1 and B-4, respectively. If we assume that the Bay Mud does not include sand and gravel layers, the estimated settlement due to the fill increases to about 11½ inches in boring B-1 and 8½ inches in boring B-4.

The second step in this process is to estimate how much settlement has occurred to date due to the fill, and thus how much settlement remains. As presented above, we have assumed the fill has been in place for 50 years. The time rate of consolidation from our laboratory tests indicates a rate of 0.04 square feet per day. The Bay Mud is in what is referred to as a double drainage condition because the soil layers above and below the Bay Mud are granular in nature. This means that as the water is squeezed out of the Bay Mud it can travel vertically in both directions. This is important because it essentially doubles the rate of consolidation. Using the layers that we encountered in our borings, we calculated that over 99% of the settlement due to the fill has already occurred, which means that the settlement remaining due to the fill is

considered negligible. If the sand and gravel layers are thinner than those encountered in our borings, this percentage reduces to about 94%, which means about 6% of the settlement from the fill is remaining. Using the total settlements from above for this condition, the estimated remaining settlement is less than ¾ inch for boring B-1 and about ½ inch for boring B-4.

Settlement Due to New Improvements - The settlement due to new improvements includes fill placed to create the amphitheater and loads from the foundations for the bathroom and other structural improvements. These settlements are calculated for the current condition with the settlement added to the remaining settlement, if any. For a new fill condition, we calculated settlement of 1½ inches per foot of new fill for the existing conditions in boring B-1 and ½ inch per foot of fill for the existing conditions in boring B-4. When we assume the sand and gravel layers are not present, these values increase to 2 and 1 inches per foot of new fill respectively.

It appears that no new fill will be placed in the areas of planned structural improvements. Therefore, settlement is calculated by adding the loading from foundations to the current condition. The load related to foundations depends on the bearing pressure, the type of footing and the width of the foundation. For example, a strip footing foundation with a bearing pressure of 2250 pounds per square foot (psf) and a footing width of 24 inches yields settlement of less than 1 inch. However, increase the width of the footing to 36 inches and the settlement increases to about 1¼ inches. We calculate settlement for various loading conditions with an emphasis on total settlement being less than 1 inch and found that the ideal bearing pressure is about 1500 psf.

Summary - In summary, it is likely that the remaining settlement from the fill placed in the 1960's is negligible at the project site. For areas along the shoreline where the sand and gravel may be thinner, the settlement remaining is likely less than 1 inch. Therefore, settlements from planned improvements need to be calculated based on the loading condition of the planned improvement. For new fill placed at the site, we recommend you estimate 1 to 2 inches of settlement per foot of new fill added, which represents a range of Bay Mud thickness of 40 to 50 feet. Finally, at a bearing pressure of 1500 psf, a structure without new fill should experience less than 1 inch of total settlement. Based on the above settlement conditions, planned structures need to be designed for 1 inch of differential settlement across the building.

Soils Susceptible to Liquefaction

As discussed previously, sand layers within the soft sediments are susceptible to liquefaction. These layers are thicker than we usually see in the soft sediments and are continuous between the three deeper borings that we drilled for this project. Although a free face is not immediately present, it is possible that these layers may extend to where the channel deepens and thus make the project site susceptible to lateral spreading. The more likely result of liquefaction at the site is settlement related to the densification of the layers due to the seismic shaking. As discussed, we calculated settlements ranging from 3 to 6 inches for the layers encountered in our borings. The risk of lateral spreading and settlement impacting the planned improvements can be reduced by supporting structures on deep foundations that gain support below the susceptible layers or by improving these layers by techniques such as vibro-replacement (stone columns) and deep soil mixing. However, given that the planned improvements include a bathroom, grading to create an amphitheater and parking as well as possible improvements to Cass/Gidley and the Cruising Club, these mitigations do not seem cost effective. Therefore, the risk of liquefaction and its consequences must be accepted by the City of Sausalito and those

planning improvements at Cass/Gidley and the Cruising Club. We can provide more detailed information and recommendations regarding deep foundations and ground improvement if requested.

Heterogeneous Fill

Heterogeneous fills of unknown quality and unknown method of placement, such as those found at the site, can settle and/or heave erratically under the load of new fills, structures, slabs, and pavements. Footings, slabs, and pavements supported on heterogeneous fill could also crack as a result of such erratic movements. The detrimental effects of such movements can be reduced by strengthening the soils during grading. This can be achieved on this site by excavating the heterogeneous fill to a depth of 24 inches below existing grade or finished pad grade, whichever is deeper, and replacing it as properly compacted engineered fill.

Foundation, Slab and Pavement Support - After remedial grading, satisfactory foundation support can be obtained from spread footings bottomed on the engineered fill. Interior slab-on-grade floors, exterior slabs and pavements can also be satisfactorily supported on the engineered fill.

On-Site Soil Quality

All fill materials used in the building area and the upper 12 inches of exterior slab and pavement subgrade must consist of on-site soils or be imported select fill, as subsequently described in "Recommendations." We anticipate that, with the exception of organic matter and of rocks or lumps larger than 6 inches in diameter, the excavated material will be suitable for re-use as fill on the project.

RECOMMENDATIONS

General

As discussed previously, the planned improvements are underlain by heterogeneous fill over soft sediments, referred to locally as Bay Mud, that include significant layers of sand and gravel that are susceptible to liquefaction. The planned improvements will be susceptible to settlement related to the Bay Mud and from liquefaction. In addition, the area may be susceptible to earthquake-induced lateral spreading. The risks associated with these conditions must be accepted by the City of Sausalito and other property owners planning improvements in the area.

Seismic Design

Seismic design parameters presented below are based on Section 1613 titled "Earthquake Loads" of the 2013 California Building Code (CBC). Based on Table 20.3-1 of American Society of Civil Engineers (ASCE) Standard 7-10, titled "Minimum Design Loads for Buildings and Other Structures" (2010), we have determined a Site Class of E should be used for the site. Using a site latitude and longitude of 37.8615°N and 122.4887°W, respectively, and the U.S. Seismic Design Maps from the United States Geological Survey (USGS) website (http://geohazards.usgs.gov/designmaps/us/application.php), we recommend that the following seismic design criteria be used for structures at the site.

2013 CBC Seismic Criteria	
Spectral Response Parameter	**Acceleration (g)**
S_S (0.2 second period)	1.500
S_1 (1 second period)	0.630
S_{MS} (0.2 second period)	1.350
S_{M1} (1 second period)	1.513
S_{DS} (0.2 second period)	0.900
S_{D1} (1 second period)	1.009

Grading

Site Preparation

Areas to be developed should be cleared of vegetation and debris. Trees and shrubs that will not be part of the proposed development should be removed and their primary root systems grubbed. Cleared and grubbed material should be removed from the site and disposed of in accordance with County Health Department guidelines. We did not observe septic tanks, leach lines or underground fuel tanks during our study. Any such appurtenances found during grading should be capped and sealed and/or excavated and removed from the site, respectively, in accordance with established guidelines and requirements of the County Health Department. Voids created during clearing should be backfilled with engineered fill as recommended herein.

Stripping

Areas to be graded should be stripped of the upper few inches of soil containing organic matter. Soil containing more than two percent by weight of organic matter should be considered organic. Actual stripping depth should be determined by a representative of the geotechnical engineer in the field at the time of stripping. The strippings should be removed from the site, or if suitable, stockpiled for re-use as topsoil in landscaping.

Excavations

Following initial site preparation, excavation should be performed as planned or recommended herein. Excavations extending below the proposed finished grade should be backfilled with suitable materials compacted to the requirements given below.

Within fill and interior slab-on-grade areas, the old fill should be excavated to a depth of 24 inches below existing grade or finished pad grade, whichever is deeper. The excavation of old fill should also extend at least 12 inches below exterior slab and pavement subgrade. The excavation of old fill should extend at least 5 feet beyond the outside edge of the exterior footings of the proposed buildings and 3 feet beyond the edge of exterior slabs and pavements

and the toe of new fills. The excavated materials should be stockpiled for later use as compacted fill, or removed from the site, as applicable.

At all times, temporary construction excavations should conform to the regulations of the State of California, Department of Industrial Relations, Division of Industrial Safety or other stricter governing regulations. The stability of temporary cut slopes, such as those constructed during the installation of underground utilities, should be the responsibility of the contractor. Depending on the time of year when grading is performed, and the surface conditions exposed, temporary cut slopes may need to be excavated to 1½:1, or flatter. The tops of the temporary cut slopes should be rounded back to 2:1 in weak soil zones.

Fill Quality

All fill materials should be free of perishable matter and rocks or lumps over 6 inches in diameter and must be approved by the geotechnical engineer prior to use. Fill beneath and within 5 feet of the building areas and the upper 12 inches of fill beneath and within 3 feet of exterior slabs and/or pavement edges should be select fill. We judge the on-site soils are generally suitable for use as general and select fill. The suitability of the on-site soils for use as select fill should be verified during grading.

Import Select Fill

Import select fill should be free of organic matter, have a low expansion potential, and conform in general to the following requirements:

SIEVE SIZE	PERCENT PASSING (by dry weight)
6 inch	100
4 inch	90 – 100
No. 200	10 – 60

Liquid Limit – 40 Percent Maximum
Plasticity Index – 15 Percent Maximum
R-value – 10 Minimum (pavement areas only)

Material not conforming to these requirements may be suitable for use as import fill; however, it shall be the contractor's responsibility to demonstrate that the proposed material will perform in an equivalent manner. The geotechnical engineer should approve imported materials prior to use as compacted fill. The grading contractor is responsible for submitting, at least 72 hours (3 days) in advance of its intended use, samples of the proposed import materials for laboratory testing and approval by the soils engineer.

Fill Placement

The surface exposed by stripping and removal of heterogeneous fill should be scarified to a depth of at least 6 inches, uniformly moisture-conditioned to at least 2 percent above optimum and compacted to at least 90 percent of the maximum dry density of the materials as determined by ASTM Test Method D-1557. Approved fill material should then be spread in thin

lifts, uniformly moisture-conditioned to at least 2 percent above optimum and properly compacted. All structural fills, including those placed to establish site surface drainage, should be compacted to at least 90 percent relative compaction. Only approved select materials should be used for fill within building areas and within the upper 12 inches of exterior slabs and pavement subgrades.

SUMMARY OF COMPACTION RECOMMENDATIONS

Area	Compaction Recommendation (ASTM D-1557)
Preparation for areas to receive fill	After preparation in accordance with this report, compact upper 6 inches to a minimum of 90 percent relative compaction.
General fill (native or import)	Compact to a minimum of 90 percent relative compaction.
Structural fill beneath buildings, extending outward to 5' beyond building perimeter	Compact to a minimum of 90 percent relative compaction.
Trenches	Compact to a minimum of 90 percent relative compaction. Compact the top 6 inches below vehicle pavement subgrade to a minimum of 95 percent relative compaction.
Pavements, extending outward to 3' beyond edge of pavement	Compact upper 6 inches of subgrade to a minimum of 95 percent relative compaction.
Concrete flatwork and exterior slabs, extending outward to 3' beyond edge of slab	Compact subgrade to a minimum of 90 percent relative compaction. Where subject to vehicle traffic, compact upper 6 inches of subgrade to at least 95 percent relative compaction.
Aggregate Base	Compact aggregate base to at least 95 percent relative compaction.

Wet Weather Grading

Generally, grading is performed more economically during the summer months when on-site soils are usually dry of optimum moisture content. Delays should be anticipated in site grading performed during the rainy season or early spring due to excessive moisture in on-site soils. Special and relatively expensive construction procedures, including dewatering of excavations and importing granular soils, should be anticipated if grading must be completed during the winter and early spring or if localized areas of soft saturated soils are found during grading in the summer and fall.

Open excavations also tend to be more unstable during wet weather as groundwater seeps towards the exposed cut slope. Severe sloughing and occasional slope failures should be anticipated. The occurrence of these events will require extensive clean up and the installation of slope protection measures, thus delaying projects. The general contractor is responsible for the performance, maintenance and repair of temporary cut slopes.

Foundation Support

Provided the heterogeneous fill is strengthened by remedial grading as recommended herein, proposed structures and structural improvements can be supported on continuous and isolated spread footings that bottom on select engineered fill.

Spread Footings

Spread footings should be at least 12 inches wide and should bottom on select engineered fill at least 12 inches below pad subgrade. Additional embedment or width may be needed to satisfy code and/or structural requirements. Because of the potential for uneven soil support, continuous footings should have sufficient reinforcement to span, as a simple beam, an unsupported distance of approximately 10 feet. In addition, the foundation system should be designed to withstand 1-inch of differential settlement across planned structures.

The bottoms of all footing excavations should be thoroughly cleaned out or wetted and compacted using hand-operated tamping equipment prior to placing steel and concrete. This will remove the soils disturbed during footing excavations, or restore their adequate bearing capacity, and reduce post-construction settlements. Footing excavations should not be allowed to dry before placing concrete. If shrinkage cracks appear in soils exposed in the footing excavations, the soil should be thoroughly moistened to close all cracks prior to concrete placement. The moisture condition of the foundation excavations should be checked by the geotechnical engineer no more than 24 hours prior to placing concrete.

Bearing Pressures - Footings installed in accordance with these recommendations may be designed using allowable bearing pressures of 1000, 1500 and 2000 pounds per square foot (psf), for dead loads, dead plus code live loads, and total loads (including wind and seismic), respectively.

Lateral Pressures - The portion of spread footing foundations extending into select engineered fill may impose a passive equivalent fluid pressure and a friction factor of 350 pcf and 0.35, respectively, to resist sliding. Passive pressure should be neglected within the upper 6 inches, unless the soils are confined by concrete slabs or pavements.

Slab-On-Grade

Provided grading is performed in accordance with the recommendations presented herein, interior and exterior slabs should be underlain by select engineered fill. Slab-on-grade subgrade should be rolled to produce a dense, uniform surface. The future expansion potential of the subgrade soils should be reduced by thoroughly presoaking the slab subgrade prior to concrete placement. The moisture condition of the subgrade soils should be checked by the geotechnical engineer no more than 24 hours prior to placing the capillary moisture break. The slabs should be underlain with a capillary moisture break consisting of at least 4 inches of clean, free-draining crushed rock or gravel (excluding pea gravel) at least ¼-inch and no larger than ¾-inch in size. Class 2 aggregate base can be used for slab rock under exterior slabs.

Slabs should be designed by the project civil or structural engineer to support the anticipated loads, reduce cracking and provide protection against the infiltration of moisture vapor. A vapor barrier should be placed under all slabs-on-grade that are likely to receive an impermeable floor finish or be used for any purpose where the passage of water vapor through the floor is undesirable. RGH does not practice in the field of moisture vapor transmission evaluation or mitigation. Therefore, we recommend that a qualified person be consulted to evaluate the general and specific moisture vapor transmission paths and any impact on the proposed construction. This person should provide recommendations for mitigation of the potential adverse impact of moisture vapor transmission on various components of the structure as deemed appropriate.

Utility Trenches

The shoring and safety of trench excavations is solely the responsibility of the contractor. Attention is drawn to the State of California Safety Orders dealing with “Excavations and Trenches.”

Unless otherwise specified by the City of Sausalito, on-site, inorganic soil may be used as general utility trench backfill. Where utility trenches support pavements, slabs and foundations, trench backfill should consist of aggregate baserock. The baserock should comply with the minimum requirements in Caltrans Standard Specifications, Section 26 for Class 2 Aggregate Base. Trench backfill should be moisture-conditioned as necessary, and placed in horizontal layers not exceeding 8 inches in thickness, before compaction. Each layer should be compacted to at least 90 percent relative compaction as determined by ASTM Test Method D-1557. The top 6 inches of trench backfill below vehicle pavement subgrades should be moisture-conditioned as necessary and compacted to at least 95 percent relative compaction. Jetting or ponding of trench backfill to aid in achieving the recommended degree of compaction should not be attempted.

Pavements

An R-value of 12 was measured on a bulk sample of near-surface soil obtained in the planned parking lot. Because of potential variation in the on-site soils, we selected an R-value of 10 for use in pavement design calculations. Based on the selected R-value, we have computed pavement sections for Traffic Indices (TI) ranging from 5.0 to 7.0 in the table below. The project engineer, in consultation with City officials, should choose the pertinent (TI) for this project.

PAVEMENT SECTIONS		
TI	**ASPHALT CONCRETE (feet)**	**CLASS 2 AGGREGATE BASE (feet)**
7.0	0.35	1.15
6.0	0.25	1.05
5.0	0.20	0.85

* If required

Pavement thicknesses were computed using Caltrans CalFP v1.1 design software and are based on a pavement life of 20 years. These recommendations are intended to provide support for the traffic represented by the indicated Traffic Indices. They are not intended to provide pavement sections for heavy concentrated construction storage or wheel loads such as forklifts, parked truck-trailers and concrete trucks or for post-construction concentrated wheel loads such as self-loading dumpster trucks.

In areas where heavy construction storage and wheel loads are anticipated, the pavements should be designed to support these loads. Support could be provided by increasing pavement sections or by providing reinforced concrete slabs. Alternatively, paving can be deferred until heavy construction storage and wheel loads are no longer present. Loading areas for self-loading dumpster trucks should be provided with reinforced concrete slabs at least 6 inches thick, and reinforced with No. 4 bars at 12-inch centers each way. Alternatively, the asphalt concrete section should be increased to at least 8 inches in these areas.

Prior to placement of aggregate base, the upper 6 inches of the pavement subgrade soils should be scarified, uniformly moisture-conditioned to near optimum, and compacted to at least 95 percent relative compaction to form a firm, non-yielding surface. Aggregate base materials should be spread in thin layers, uniformly moisture-conditioned, and compacted to at least 95 percent relative compaction to form a firm, non-yielding surface. The materials and methods used should conform to the requirements of the City of Sausalito and the current edition of the Caltrans Standard Specifications, except that compaction requirements should be based on ASTM Test Method D-1557. Aggregate used for the base course should comply with the minimum requirements specified in Caltrans Standard Specifications, Section 26 for Class 2 Aggregate Base.

Parking Lot Drainage

Water tends to migrate under pavements and collect in the aggregate courses at low areas on parking lot subgrade soils, such as around storm drain inlets and the thread of paved swales leading to inlets. The ponded water will soften subgrade soils and, under repetitive heavy-wheel loads, will induce inordinately high stresses on the subgrade and pavement components that could result in untimely maintenance. Under-pavement drainage can be improved and maintenance reduced by replacing a 12-inch wide strip (extending at least 15 feet on either side of the inlet) of the select subbase layer or subgrade soils with a subdrain consisting of ¾-inch or 1½-inch free-draining Class 1 Permeable Material. The drain rock should be outletted into the storm drain inlet. Storm drain trenches can be made to serve as pavement subdrains. We should be consulted to verify the suitability of storm drain trenches as pavement subdrains in a case-specific basis.

Where pavements will abut landscaped areas, the pavement baserock layer and subgrade soils should be protected against saturation from irrigation and rainwater with a subdrain, similar to that previously discussed. The subdrain should extend to a depth of at least 6 inches below the bottom of the baserock layer. Alternatively, a grouted moisture cut-off that extends 12 inches below the bottom of the baserock layer should be provided below or immediately behind the curb and gutter.

Wet Weather Paving

In general, the pavements should be constructed during the dry season to avoid the saturation of the subgrade and base materials, which often occurs during the wet winter months. If pavements are constructed during the winter, a cost increase relative to drier weather construction should be anticipated. Unstable areas may have to be overexcavated to remove soft soils. The excavations will probably require backfilling with imported crushed (ballast) rock. The geotechnical engineer should be consulted for recommendations at the time of construction.

Geotechnical Drainage

Surface water should be diverted away from slopes, foundations and edges of pavements. Surface drainage gradients should slope away from building foundations in accordance with the requirements of the CBC or local governing agency. Where a gradient flatter than 2 percent for paved areas and 4 percent for unpaved areas is required to satisfy design constraints, area drains should be installed with spacing no greater than about 20 feet. Roofs should be provided with gutters and the downspouts should be connected to closed (glued Schedule 40 PVC or ABS with SDR of 35 or better) conduits discharging well away from foundations, onto paved areas or into the site's surface drainage system.

Water seepage or the spread of extensive root systems into the soil subgrade of footings, slabs or pavements could cause differential movements and consequent distress in these structural elements. Landscaping should be planned with consideration for these potential problems.

Maintenance

Periodic land maintenance will be required. Surface and subsurface drainage facilities should be checked frequently, and cleaned and maintained as necessary or at least annually. A dense growth of deep-rooted ground cover must be maintained on all slopes to reduce sloughing and erosion. Sloughing and erosion that occurs must be repaired promptly before it can enlarge.

Supplemental Services

Pre-Bid Meeting

It has been our experience that contractors bidding on the project often contact us to discuss the geotechnical aspects. Informal contacts between RGH and an individual contractor could result in incomplete or misinterpreted information being provided to the contractor. Therefore, we recommend a pre-bid meeting be held to answer any questions about the report prior to submittal of bids. If this is not possible, questions or clarifications regarding this report should be directed to the project owner or their designated representative. After consultation with RGH, the project owner or their representative should provide clarifications or additional information to all contractors bidding the job.

Plan and Specifications Review

Coordination between the design team and the geotechnical engineer is recommended to assure that the design is compatible with the soil, geologic and groundwater conditions encountered during our study. RGH Consultants (RGH) recommends that we be retained to review the project plans and specifications to determine if they are consistent with our recommendations. In the event we are not retained to perform this recommended review, we will assume no responsibility for misinterpretation of our recommendations.

Construction Observation and Testing

Prior to construction, a meeting should be held at the site that includes, but is not limited to, the owner or owner's representative, the general contractor, the grading contractor, the foundation contractor, the underground contractor, any specialty contractors, the project civil engineer, other members of the project design team and RGH. This meeting should serve as a time to discuss and answer questions regarding the recommendations presented herein and to establish the coordination procedure between the contractors and RGH.

In addition, we should be retained to monitor all soils related work during construction, including:

- Site stripping, over-excavation, grading, and compaction of near surface soils;
- Placement of all engineered fill and trench backfill with verification field and laboratory testing;
- Observation of all foundation excavations; and
- Observation of foundation and subdrain installations.

If, during construction, we observe subsurface conditions different from those encountered during the explorations, we should be allowed to amend our recommendations accordingly. If

different conditions are observed by others, or appear to be present beneath excavations, RGH should be advised at once so that these conditions may be evaluated and our recommendations reviewed and updated, if warranted. The validity of recommendations made in this report is contingent upon our being notified and retained to review the changed conditions.

If more than 18 months have elapsed between the submission of this report and the start of work at the site, or if conditions have changed because of natural causes or construction operations at, or adjacent to, the site, the recommendations made in this report may no longer be valid or appropriate. In such case, we recommend that we be retained to review this report and verify the applicability of the conclusions and recommendations or modify the same considering the time lapsed or changed conditions. The validity of recommendations made in this report is contingent upon such review.

These supplemental services are performed on an as-requested basis and are in addition to this geotechnical study. We cannot accept responsibility for items that we are not notified to observe or for changed conditions we are not allowed to review.

LIMITATIONS

This report has been prepared by RGH for the exclusive use of the City of Sausalito and their consultants as an aid in the design and construction of the proposed Dunphy Park improvements described in this report.

The validity of the recommendations contained in this report depends upon an adequate testing and monitoring program during the construction phase. Unless the construction monitoring and testing program is provided by our firm, we will not be held responsible for compliance with design recommendations presented in this report and other addendum submitted as part of this report.

Our services consist of professional opinions and conclusions developed in accordance with generally accepted geotechnical engineering principles and practices. We provide no warranty, either expressed or implied. Our conclusions and recommendations are based on the information provided to us regarding the proposed construction, the results of our field exploration, laboratory testing program, and professional judgment. Verification of our conclusions and recommendations is subject to our review of the project plans and specifications, and our observation of construction.

The borings represent subsurface conditions at the locations and on the date indicated. It is not warranted that they are representative of such conditions elsewhere or at other times. Site conditions and cultural features described in the text of this report are those existing at the time of our field exploration on March 12 and 13, 2015, and may not necessarily be the same or comparable at other times.

The scope of our services did not include an environmental assessment or a study of the presence or absence of toxic mold and/or hazardous, toxic or corrosive materials in the soil, surface water, groundwater or air (on, below or around this site), nor did it include an evaluation or study for the presence or absence of wetlands. These studies should be conducted under separate cover, scope and fee and should be provided by a qualified expert in those fields.

APPENDIX A - PLATES

LIST OF PLATES

Reference: Maptech Topoquad, San Francisco North, California Quadrangle

Scale: 1" = 2000'

RGH CONSULTANTS

Job No: 1993.39.04.1 | Date: JUNE 2015

SITE LOCATION MAP
Dunphy Park Improvements
Bridgeway Boulevard
Sausalito, California

PLATE
1

Reference: 2015 Google Earth

Scale: 1" = 50'

RGH CONSULTANTS

Job No: 1993.39.04.1

Date: JUNE 2015

EXPLORATION PLAN
Dunphy Park Improvements
Bridgeway Boulevard
Sausalito, California

PLATE
2

Date(s) Drilled **3/12/15**	Logged By **BPC/REP**	Checked By **EGC**
Drilling Method **Rotary Wash**	Drill Bit Size/Type **3-1/8 inch Drag Bit &Tricone Bit, Casing to 3 feet**	Total Depth of Borehole **63-1/2 feet**
Drill Rig Type **Fraste Multi Drill XL Track Mounted**	Drilling Contractor **Pitcher**	Approximate Surface Elevation **Existing Ground Surface**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **Modified California, SPT, Tube**	Hammer Data **140lb, 30" autotrip**

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Dry Density (pcf)	Water Content (%)	% <#200 Sieve	PI, %	LL, %	Expansion Index (EI)	UC, psf	REMARKS AND OTHER TESTS
	0				MOTTLED BROWN-RED SAND w/CLAY (SC). Medium dense, moist, fine sand. (FILL)								
			14		BROWN SANDY CLAY (CL). Stiff, moist, fine to coarse sand. (FILL)	112	12.4	32.4					
			3		GRAY-BROWN CLAYEY SAND W/GRAVEL (SC). Medium dense, moist, fine to coarse sand. (FILL)								
	5		1		MOTTLED GRAY & ORANGE CLAYEY SAND w/SILT & GRAVEL (SC). Very loose, wet, fine to coarse sand. (FILL)	82	41.2						
			50 psi to 9 feet		GRAY-RED SANDY CLAY w/SILT (CL). Very soft, wet, fine sand. (BAY MUD)								
					GRAY SILT (MH). Very soft, wet. (BAY MUD)								
	10												
			1										
	15												
			12		RED & GRAY SAND W/CLAY & GRAVEL (SP-SC). Medium dense, wet, coarse sand.			9.1					
	20				GRAY CLAYEY SILT (MH). Soft, wet. (BAY MUD)								
			4										
	25				GRAY CLAYEY SAND (SC). Loose, wet, medium to coarse sand.								
			400 psi to 29-1/2 feet,										
	30				GRAY SILT w/CLAY (MH). Soft to medium-stiff, wet. (BAY MUD)								
	35												

RGH CONSULTANTS

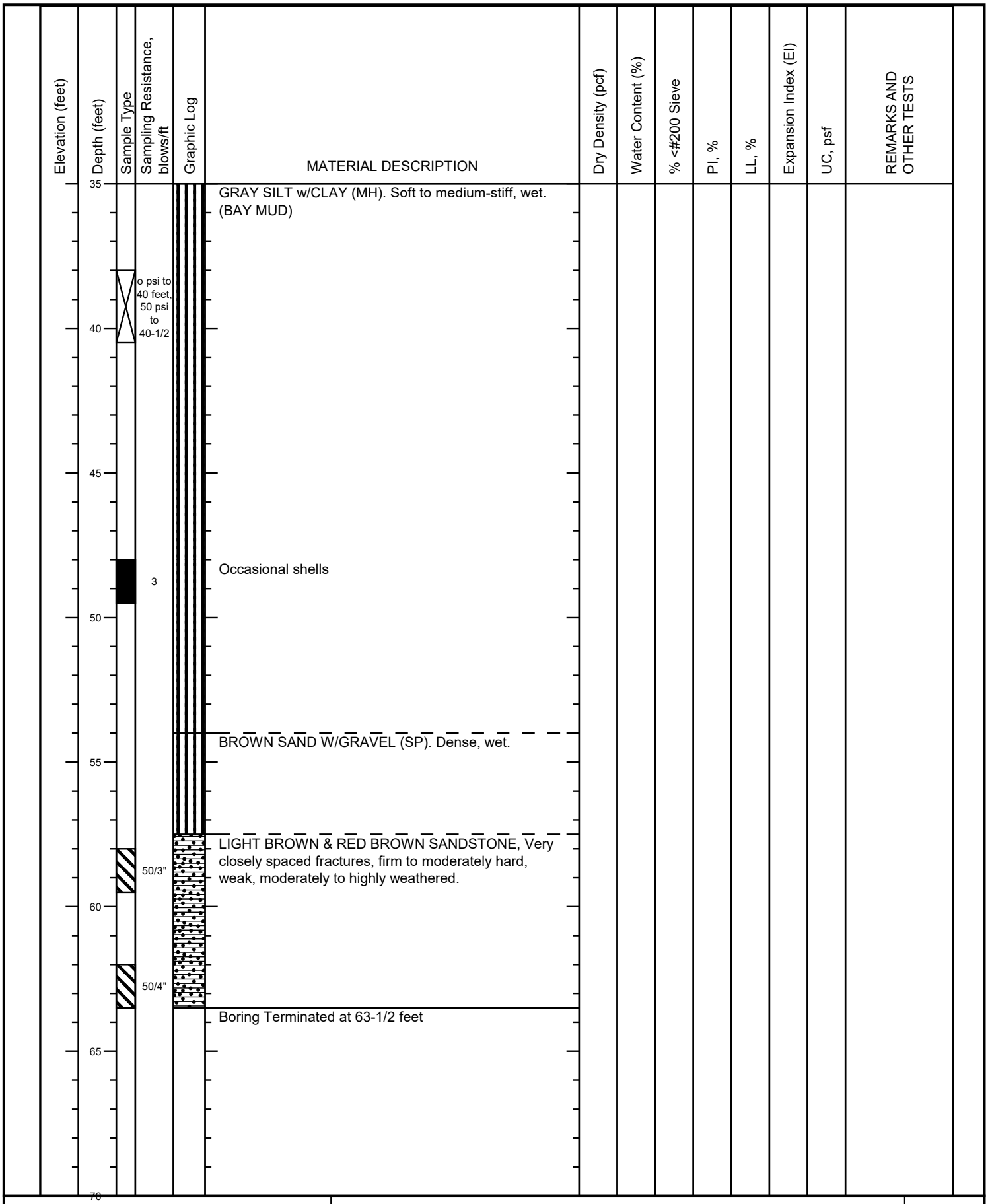
Job No: 1993.39.04.1 | Date: JUNE 2015

LOG OF BORING B-1

Dunphy Park Improvements
Bridgeway Boulevard
Sausalito, California

PLATE

3 A



RGH CONSULTANTS

Job No: 1993.39.04.1 | Date: JUNE 2015

LOG OF BORING B-1
Dunphy Park Improvements
Bridgeway Boulevard
Sausalito, California

PLATE
3B

Date(s) Drilled **3/12/15**	Logged By **REP**	Checked By **EGC**
Drilling Method **Rotary Wash**	Drill Bit Size/Type **4 inch S.S.A**	Total Depth of Borehole **5 feet**
Drill Rig Type **Fraste Multi Drill XL Track Mounted**	Drilling Contractor **Pitcher**	Approximate Surface Elevation **Existing Ground Surface**
Groundwater Level and Date Measured **NFWE**	Sampling Method(s) **Bulk**	Hammer Data **140lb, 30" autotrip**

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Dry Density (pcf)	Water Content (%)	% <#200 Sieve	PI, %	LL, %	Expansion Index (EI)	UC, psf	REMARKS AND OTHER TESTS
	0				GRAY GRAVEL W/SAND (GP). Dense, dry, fine to coarse sand, fine angular gravel to 3/4 inch diameter. (Aggregate Base)								
					BROWN & YELLOW BROWN CLAYEY SAND W/GRAVEL (SC). Loose, moist, fine to coarse sand.			46.7					
	5				Boring terminated at 5 feet. No free water encountered.								
	10												
	15												
	20												
	25												
	30												
	35												

RGH CONSULTANTS

Job No: 1993.39.04.1 | Date: JUNE 2015

LOG OF BORING B-2

Dunphy Park Improvements
Bridgeway Boulevard
Sausalito, California

PLATE **4**

Date(s) Drilled **3/12/15**	Logged By **REP**	Checked By **EGC**
Drilling Method **Rotary Wash**	Drill Bit Size/Type **3-1/8 inch Drag Bit &Tricone Bit, Casing to 8 feet**	Total Depth of Borehole **54-1/2 feet**
Drill Rig Type **Fraste Multi Drill XL Track Mounted**	Drilling Contractor **Pitcher**	Approximate Surface Elevation **Existing Ground Surface**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **Modified California, Tube**	Hammer Data **140lb, 30" autotrip**

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Dry Density (pcf)	Water Content (%)	% <#200 Sieve	PI, %	LL, %	Expansion Index (EI)	UC, psf	REMARKS AND OTHER TESTS
	0				BROWN SILTY GRAVEL w/SAND (GM). Medium dense, dry, fine to coarse sand, fine to coarse subangular gravel to 1" diameter. (FILL)								
			14										
			22		GRAY GRAVEL (GP). Medium dense, dry, fine rounded gravel (Pea Gravel FILL)								
	5		33		DARK BROWN, YELLOW BROWN & OLIVE SANDY CLAY w/GRAVEL (CL). Very stiff, dry, fine to coarse sand, fine to coarse subangular gravel to 1-inch diameter. (FILL)								
					BROWN, DARK GRAY & YELLOW BROWN CLAYEY SAND w/GRAVEL (SC). Dense, dry, fine to coarse sand, fine subrounded gravel to 3/4-inch diameter. (FILL)								
	10		8		DARK GRAY & OLIVE CLAYEY GRAVEL w/SAND (GC). Loose, wet, fine to coarse sand, fine to coarse subrounded gravel to 1-1/2-inch diameter. (FILL)								
					OLIVE & RED BROWN SAND (SP). Medium dense, wet, fine to coarse sand.								
	15		20										
					OLIVE GREY SILT (MH). Very soft, wet. (BAY MUD)								
			100 psi										
					OLIVE GRAY SILTY SAND w/GRAVEL (SM). Loose, wet, fine to coarse sand, fine subangular gravel to 1/2-inch diameter.								
	20												
			100 psi										
	25												
			3		OLIVE GRAY SILT (MH). Soft, wet, some organics. (BAY MUD)								
	30												
			75 psi to 34 feet,										
	35												

RGH CONSULTANTS

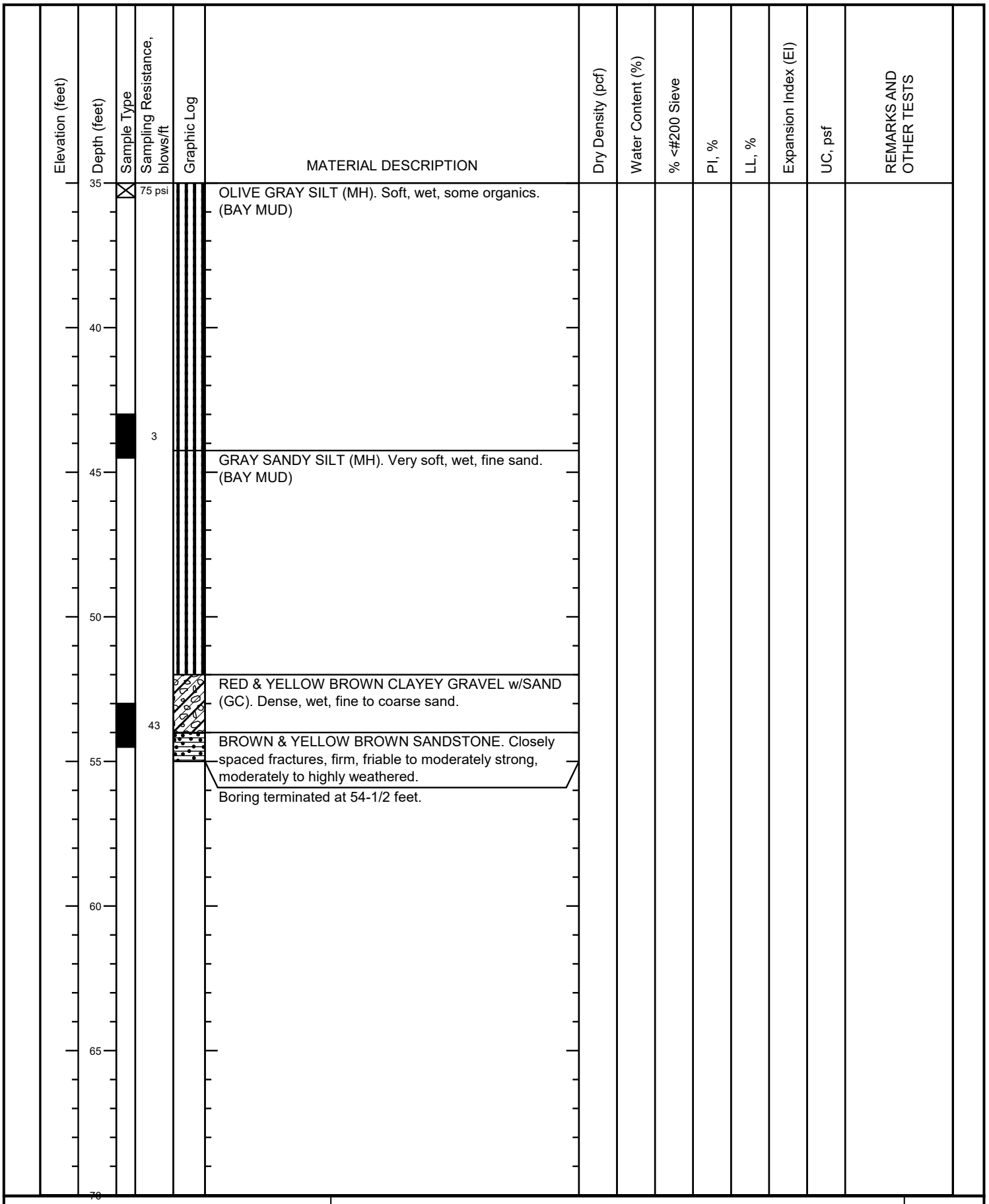
Job No: 1993.39.04.1 | Date: JUNE 2015

LOG OF BORING B-3

Dunphy Park Improvements
Bridgeway Boulevard
Sausalito, California

PLATE

5 A



RGH CONSULTANTS

Job No: 1993.39.04.1 | Date: JUNE 2015

LOG OF BORING B-3
Dunphy Park Improvements
Bridgeway Boulevard
Sausalito, California

PLATE
5B

Date(s) Drilled **3/12/15**	Logged By **REP**	Checked By **EGC**
Drilling Method **Rotary Wash**	Drill Bit Size/Type **3-1/8 inch Drag Bit &Tricone Bit, Casing to 8-1/2 feet**	Total Depth of Borehole **49-1/2 feet**
Drill Rig Type **Fraste Multi Drill XL Track Mounted**	Drilling Contractor **Pitcher**	Approximate Surface Elevation **Existing Ground Surface**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **Modified California, Tube**	Hammer Data **140lb, 30" autotrip**

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Dry Density (pcf)	Water Content (%)	% <#200 Sieve	PI, %	LL, %	Expansion Index (EI)	UC, psf	REMARKS AND OTHER TESTS
	0		13		BROWN CLAYEY SAND (SC). Medium dense, moist, fine to coarse sand, fine to coarse angular gravel to 1" diameter, porous. (FILL)			38.6					
			3			103	17.6						
	5		10		BROWN CLAYEY SAND (SC). Very loose, wet, fine to coarse sand, porous. (FILL)	115	19	20					
					OLIVE GRAY & DARK BROWN SANDY SILT (MH). Stiff, wet, fine to coarse sand. (FILL)								
					OLIVE GRAY SANDY SILT (MH). Very soft, wet. (BAY MUD)								
	10		1		OLIVE GRAY SILT (MH). Very soft, wet, some shell fragments. (BAY MUD)	72	51.1						
	15				OLIVE GRAY SILTY SAND (SM). Very loose, wet, fine sand								
			2										
	20		12		OLIVE GRAY & RED SANDY GRAVEL (GP). Medium dense, wet, fine to coarse sand, fine angular gravel to 3/4 inch diameter.								
	25												
			300 psi to 39 feet, 125 psi		OLIVE GRAY SILT (MH). Soft, wet. (BAY MUD)								
	30												
	35												

RGH CONSULTANTS

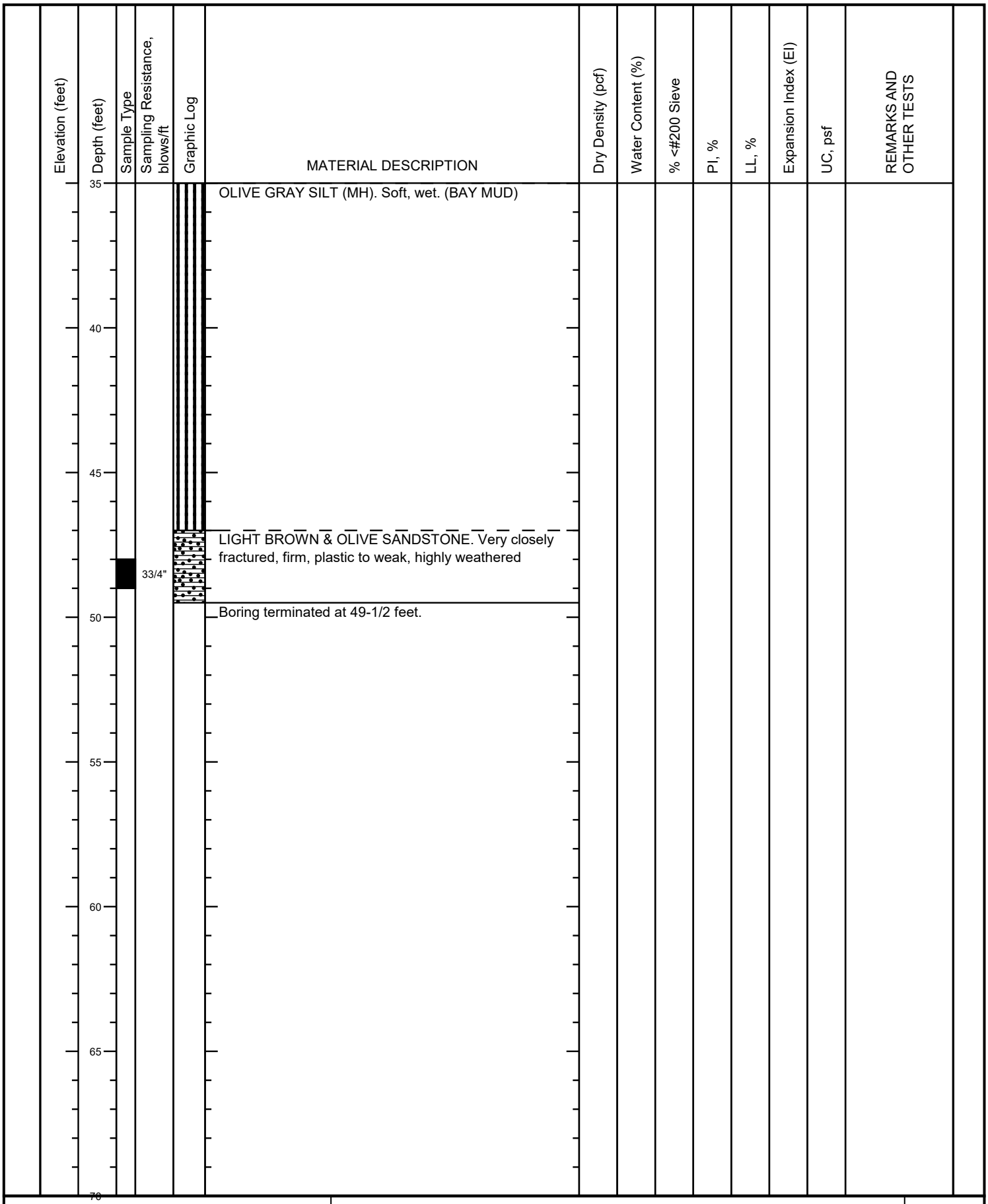
Job No: 1993.39.04.1 | Date: JUNE 2015

LOG OF BORING B-4

Dunphy Park Improvements
Bridgeway Boulevard
Sausalito, California

PLATE

6 A



RGH CONSULTANTS

Job No: 1993.39.04.1 | Date: JUNE 2015

LOG OF BORING B-4
Dunphy Park Improvements
Bridgeway Boulevard
Sausalito, California

PLATE
6 B

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Dry Density (pcf)	Water Content (%)	% <#200 Sieve	PI, %	LL, %	Expansion Index (EI)	UC, psf	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9	10	11	12	13	14

COLUMN DESCRIPTIONS

1. Elevation (feet): Elevation (MSL, feet).
2. Depth (feet): Depth in feet below the ground surface.
3. Sample Type: Type of soil sample collected at the depth interval shown.
4. Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
5. Graphic Log: Graphic depiction of the subsurface material encountered.
6. MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
7. Dry Density (pcf): Dry density, in pcf.
8. Water Content (%): Water content, percent.
9. % <#200 Sieve: % <#200 Sieve
10. PI, %: Plasticity Index, expressed as a water content.
11. LL, %: Liquid Limit, expressed as a water content.
12. Expansion Index (EI): Expansion Index (EI)
13. UC, psf: Unconfined compressive strength, in pounds per square foot.
14. REMARKS AND OTHER TESTS: Comments and observations regarding drilling or sampling made by driller or field personnel.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in psf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

- Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)
- Lean-Fat CLAY, CLAY w/SAND, SANDY CLAY (CL-CH)
- Clayey GRAVEL (GC)
- Silty GRAVEL (GM)
- Poorly graded GRAVEL (GP)
- SILT, SILT w/SAND, SANDY SILT (MH)
- Sandstone
- Clayey SAND (SC)
- Silty SAND (SM)
- Poorly graded SAND (SP)

TYPICAL SAMPLER GRAPHIC SYMBOLS

- Bulk Sample
- 2.5-inch-OD Modified California w/ brass liners
- 2-inch-OD unlined split spoon (SPT)
- Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

- Water level (at time of drilling, ATD)
- Water level (after waiting)
- Minor change in material properties within a stratum
- Inferred/gradational contact between strata
- Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

RGH CONSULTANTS

Job No: 1993.39.04.1 | Date: JUNE 2015

SOIL CLASSIFICATION AND KEY TO TEST DATA

Dunphy Park Improvements
Bridgeway Boulevard
Sausalito, California

PLATE 7

LAYERING

MASSIVE	Greater than 6 feet
THICKLY BEDDED	2 to 6 feet
MEDIUM BEDDED	8 to 24 inches
THINLY BEDDED	2½ to 8 inches
VERY THINLY BEDDED	¾ to 2½ inches
CLOSELY LAMINATED	¼ to ¾ inches
VERY CLOSELY LAMINATED	Less than ¼ inch

JOINT, FRACTURE, OR SHEAR SPACING

VERY WIDELY SPACED	Greater than 6 feet
WIDELY SPACED	2 to 6 feet
MODERATELY SPACED	8 to 24 inches
CLOSELY SPACED	2½ to 8 inches
VERY CLOSELY SPACED	¾ to 2½ inches
EXTREMELY CLOSELY SPACED	Less than ¼ inch

HARDNESS

Soft - pliable; can be dug by hand

Firm - can be gouged deeply or carved with a pocket knife

Moderately Hard - can be readily scratched by a knife blade; scratch leaves heavy trace of dust and is readily visible after the powder has been blown away

Hard - can be scratched with difficulty; scratch produces little powder and is often faintly visible

Very Hard - cannot be scratched with pocket knife, leaves a metallic streak

STRENGTH

Plastic - capable of being molded by hand

Friable - crumbles by rubbing with fingers

Weak - an unfractured specimen of such material will crumble under light hammer blows

Moderately Strong - specimen will withstand a few heavy hammer blows before breaking

Strong - specimen will withstand a few heavy ringing hammer blows and usually yields large fragments

Very Strong - rock will resist heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments

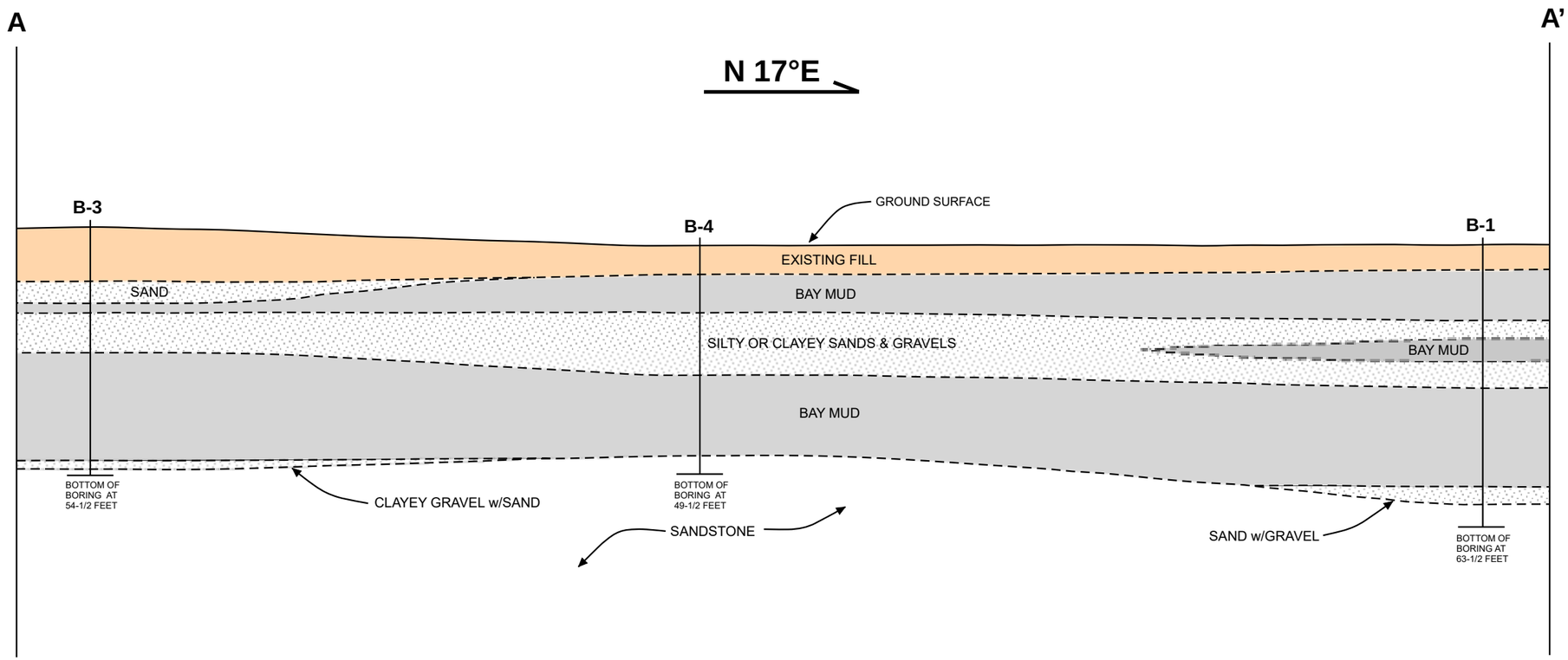
DEGREE OF WEATHERING

Highly Weathered - abundant fractures coated with oxides, carbonates, sulphates, mud, etc., thorough discoloration, rock disintegration, mineral decomposition

Moderately Weathered - some fracture coating, moderate or localized discoloration, little to no effect on cementation, slight mineral decomposition

Slightly Weathered - a few stained fractures, slight discoloration, little or no effect on cementation, no mineral composition

Fresh - unaffected by weathering agents; no appreciable change with depth



30 0 30 feet

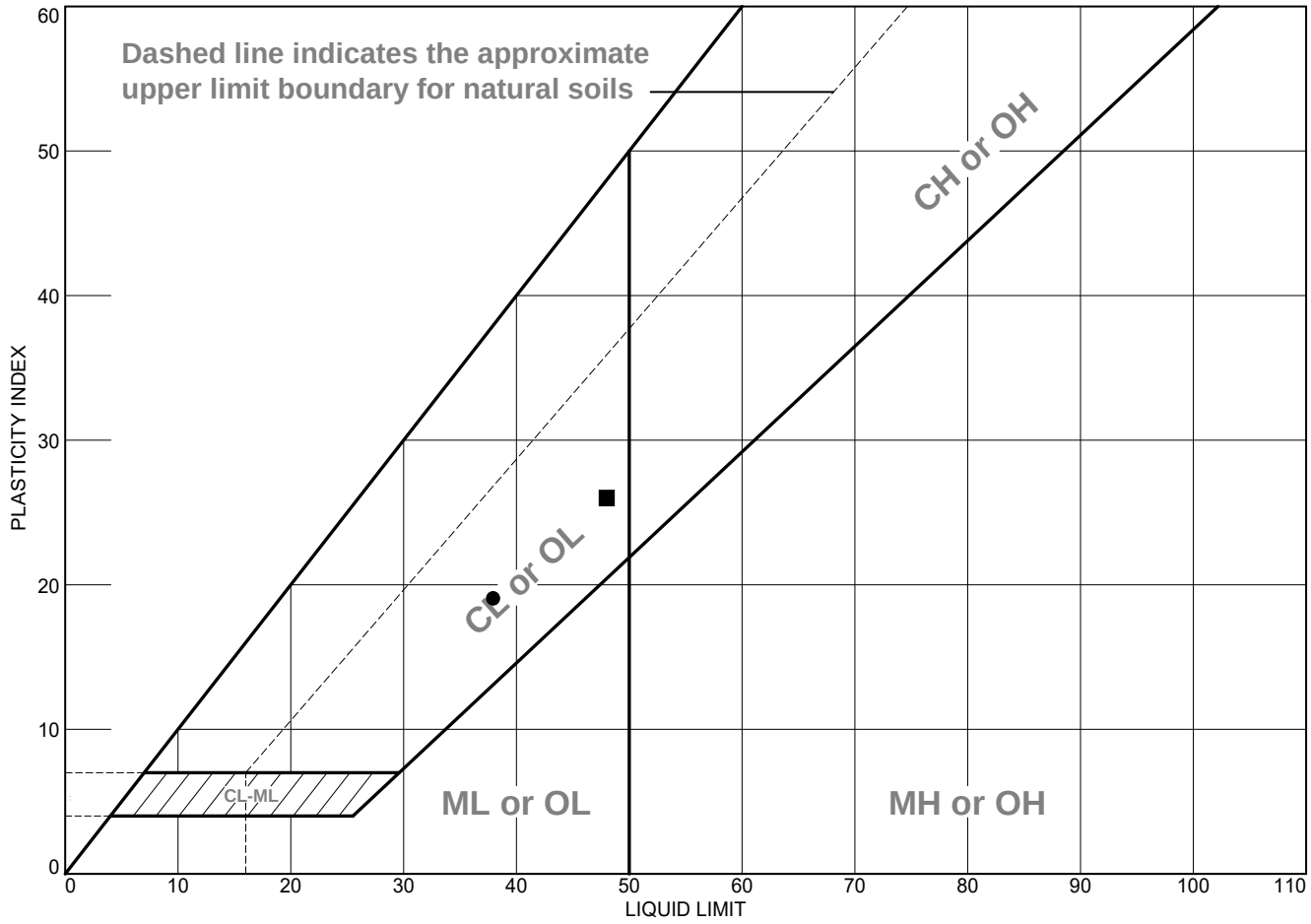
RGH CONSULTANTS

Job No: 1993.39.04.1 | Date: JUNE 2015

CROSS SECTION A-A’
Dunphy Park Improvements
Bridgeway Boulevard
Sausalito, California

PLATE
9

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brn Clayey Sand W/ Gravel (SC)	38	19	19		46.7	SC
■	Brn Clayey Sand W/ Gravel (SC)	48	22	26		38.6	SC

Project No. 1993.39.04.1 **Client:** RGH Consultants

Project: Dunphy Park Improvements

●**Source of Sample:** B-2 **Sample Number:** Bulk

■**Source of Sample:** B-4 **Depth:** 1.5' & 2.0'

Remarks:

●Expansion Index=60

■Expansion Index=56

Tested By: SW

Checked By: GEF

RGH CONSULTANTS

Job No: 1993.39.04.1 | Date: JUNE 2015

CLASSIFICATION TEST DATA

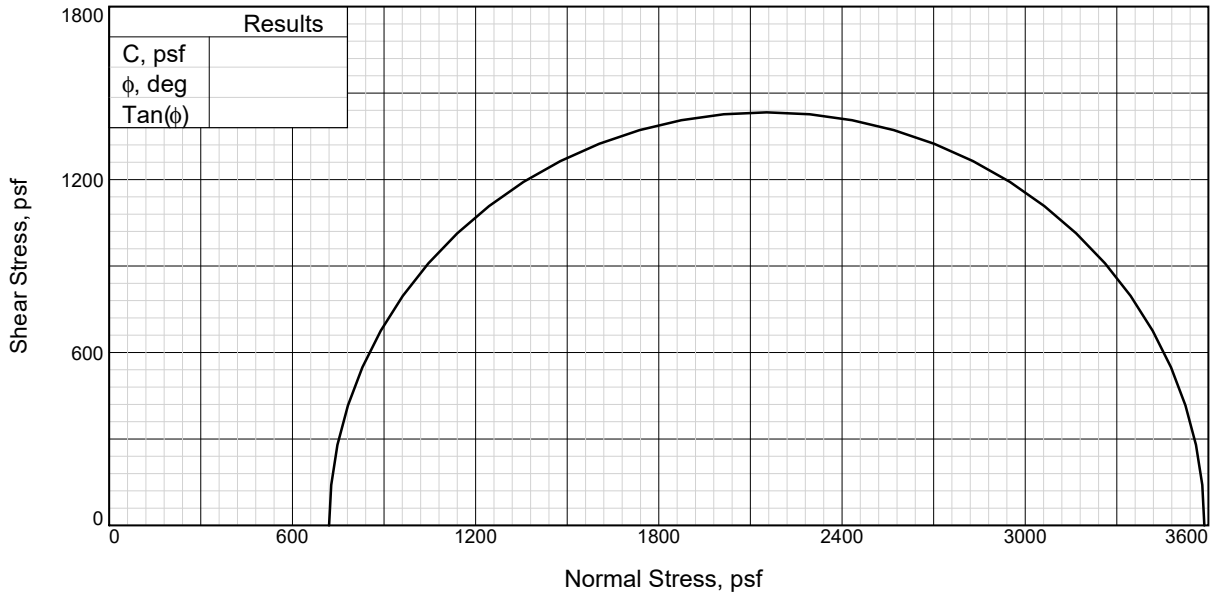
Dunphy Park Improvements

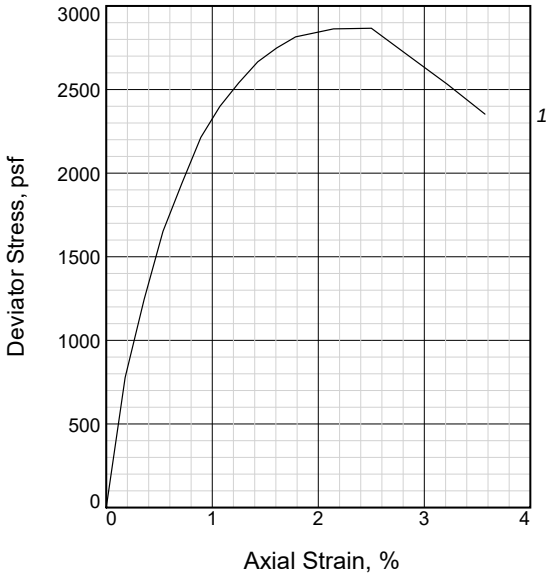
Bridgeway Boulevard

Sausalito, California

PLATE

10





Sample No.		1
Initial	Water Content, %	15.2
	Dry Density, pcf	100.5
	Saturation, %	60.5
	Void Ratio	0.6775
	Diameter, in.	2.390
	Height, in.	5.600
At Test	Water Content, %	15.2
	Dry Density, pcf	100.5
	Saturation, %	60.5
	Void Ratio	0.6775
	Diameter, in.	2.390
	Height, in.	5.600
Strain rate, in./min.		0.060
Back Pressure, psf		0
Cell Pressure, psf		720
Fail. Stress, psf		2867
Ult. Stress, psf		2867
σ_1 Failure, psf		3587
σ_3 Failure, psf		720

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Brn Clayey Sand (SC)

Specific Gravity= 2.70
Remarks:

Tested By: SW
Checked By: GEF

Client: RGH Consultants

Project: Dunphy Park Improvements

Source of Sample: B-4 **Depth:** 2.0'

Proj. No.: 1993.39.04.1 **Date Sampled:** 4/6/15

RGH CONSULTANTS

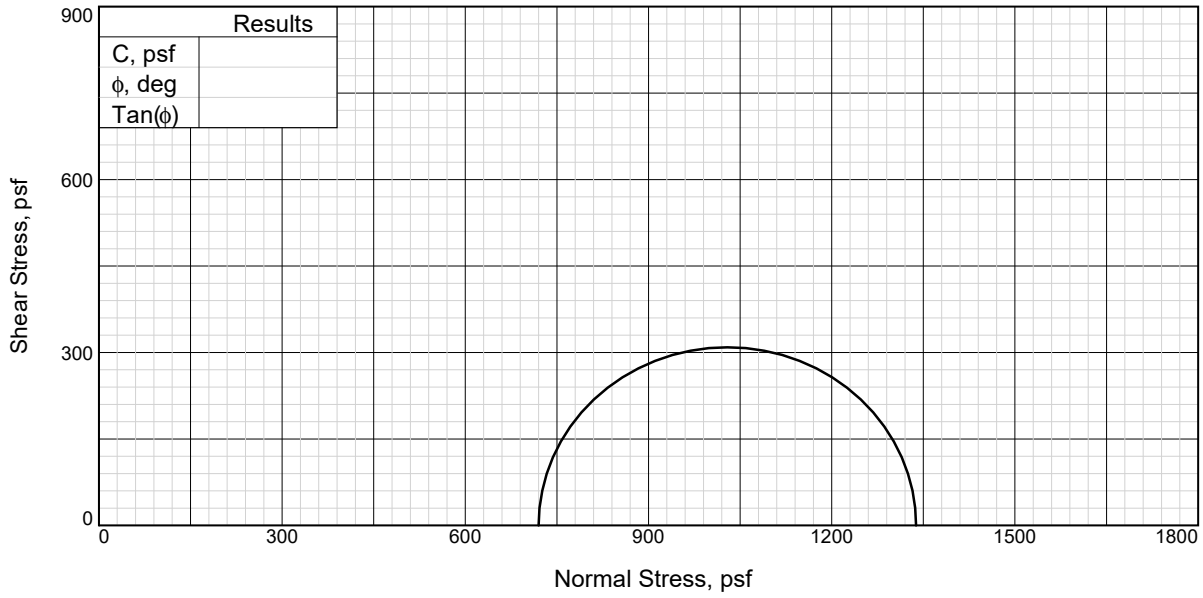
Job No: 1993.39.04.1 | Date: JUNE 2015

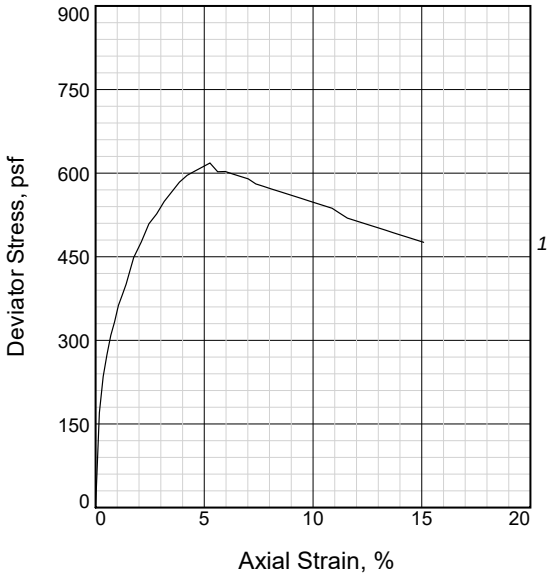
TRIAXIAL TEST DATA

Dunphy Park Improvements
Bridgeway Boulevard
Sausalito, California

PLATE

11





Sample No.		1
Initial	Water Content, %	30.9
	Dry Density, pcf	90.0
	Saturation, %	95.5
	Void Ratio	0.8733
	Diameter, in.	2.410
	Height, in.	5.700
At Test	Water Content, %	30.9
	Dry Density, pcf	90.0
	Saturation, %	95.5
	Void Ratio	0.8733
	Diameter, in.	2.410
	Height, in.	5.700
Strain rate, in./min.		0.060
Back Pressure, psf		0
Cell Pressure, psf		720
Fail. Stress, psf		618
Ult. Stress, psf		618
σ_1 Failure, psf		1338
σ_3 Failure, psf		720

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Grey Clayey Sand (SC)

Specific Gravity= 2.70
Remarks:

Tested By: SW
Checked By: GEF

Client: RGH Consultants

Project: Dunphy Park Improvements

Source of Sample: B-1 **Depth:** 4.0'

Proj. No.: 1993.39.04.1 **Date Sampled:** 4/6/15

RGH CONSULTANTS

Job No: 1993.39.04.1 | Date: JUNE 2015

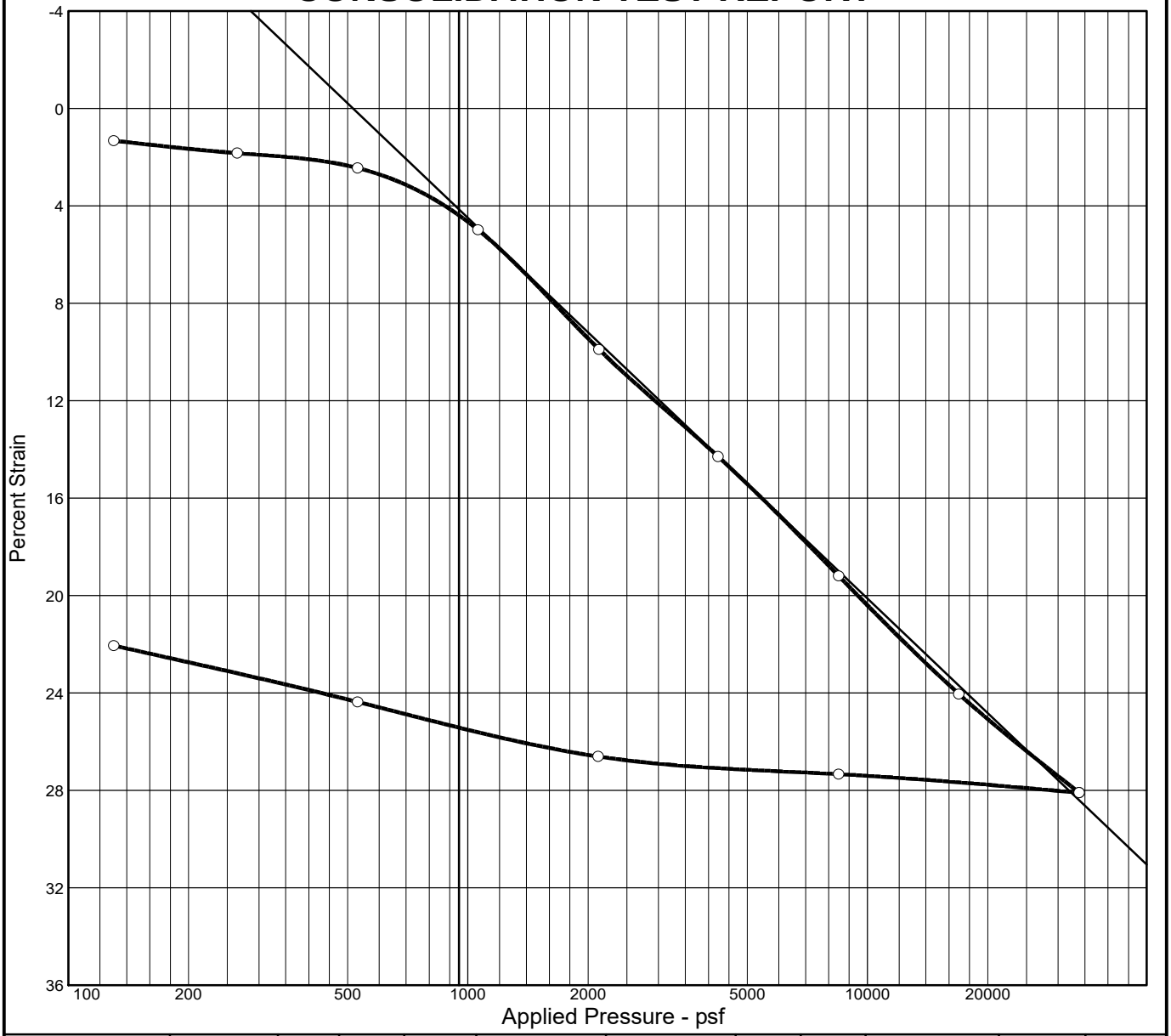
TRIAXIAL TEST DATA

Dunphy Park Improvements
Bridgeway Boulevard
Sausalito, California

PLATE

12

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Swell Press. (psf)	Heave %	e_o
Sat.	Moist.											
99.7 %	44.1 %	76.8			2.70		1007	0.34	0.05			1.195

MATERIAL DESCRIPTION	USCS	AASHTO
Grey Clay (CH)		

Project No. 1993.39.04.1 **Client:** RGH Consultants

Project: Dunphy Park Improvements

Source: B-1 **Elev./Depth:** 7.0'-9.0'

Remarks:

RGH CONSULTANTS

Job No: 1993.39.04.1 | Date: JUNE 2015

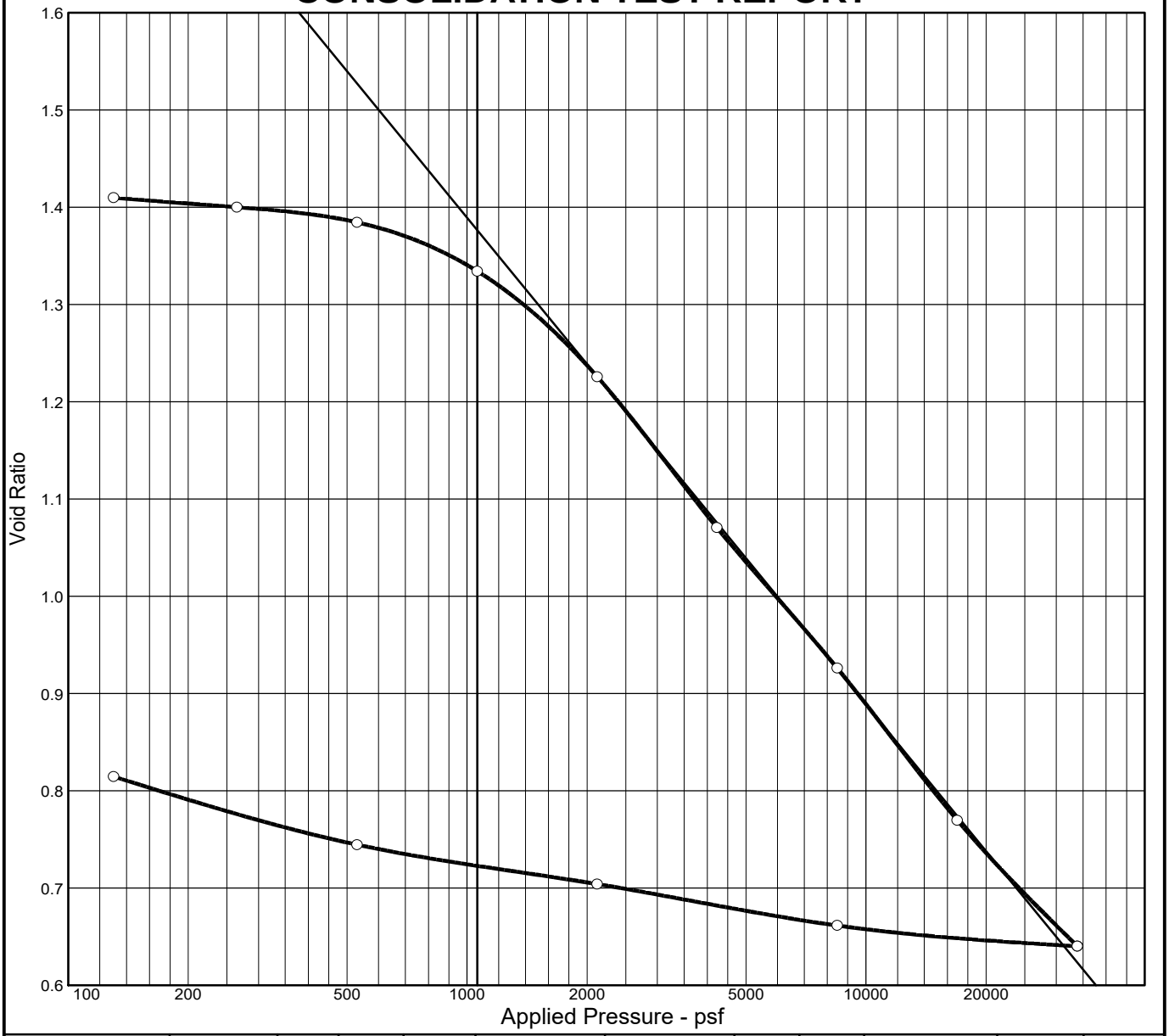
CONSOLIDATION TEST DATA

Dunphy Park Improvements
Bridgeway Boulevard
Sausalito, California

PLATE

13

CONSOLIDATION TEST REPORT



Natural Sat.	Natural Moist.	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Swell Press. (psf)	Heave %	e_o
99.9 %	53.1 %	69.2			2.70		1376	0.50	0.07			1.436

MATERIAL DESCRIPTION	USCS	AASHTO
Grey Clay (CH)	CH	

Project No. 1993.39.04.1 **Client:** RGH Consultants

Project: Dunphy Park Improvements

Source: B-3 **Elev./Depth:** 23.0'

Remarks:

RGH CONSULTANTS

Job No: 1993.39.04.1 | Date: JUNE 2015

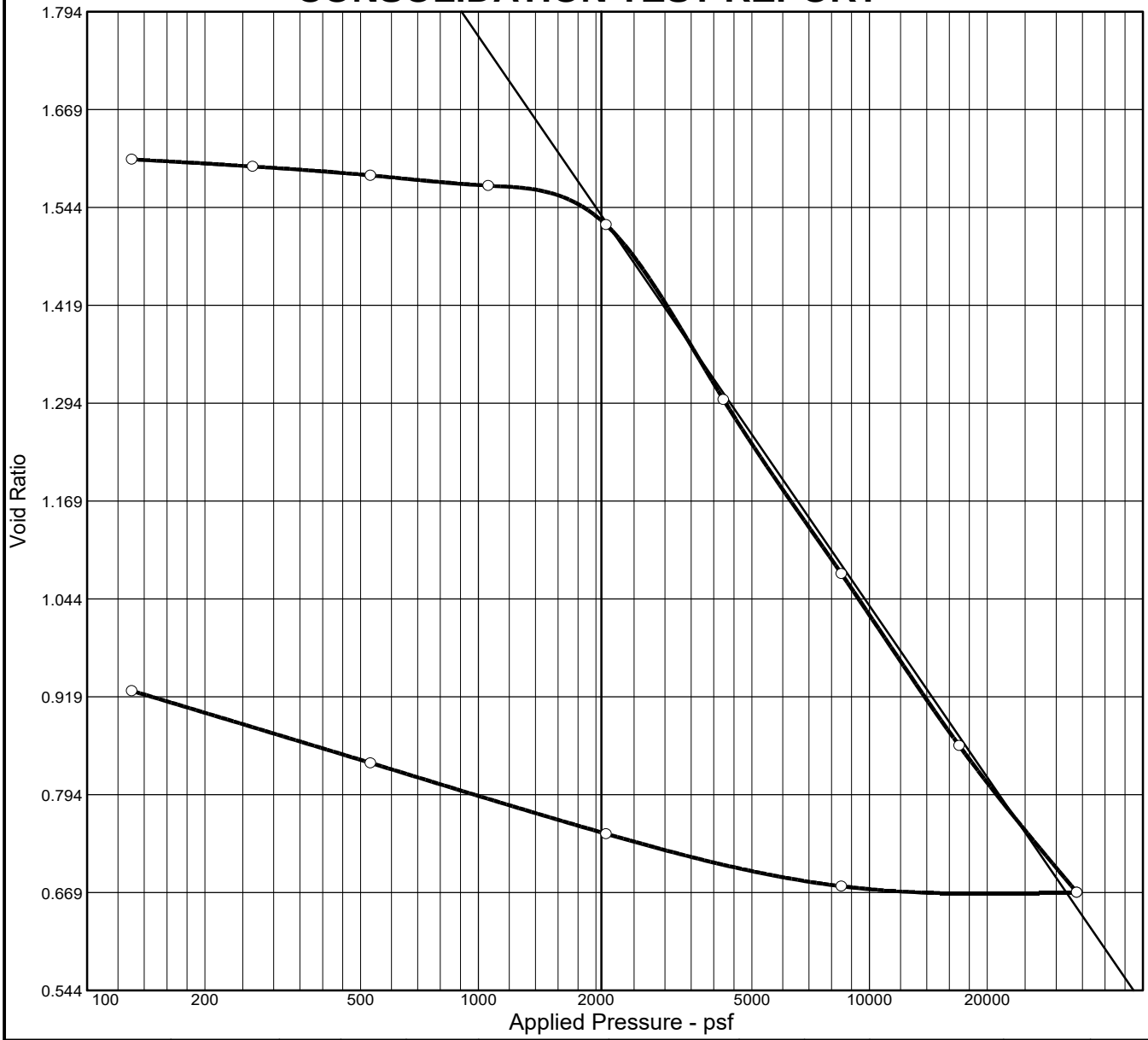
CONSOLIDATION TEST DATA

Dunphy Park Improvements
Bridgeway Boulevard
Sausalito, California

PLATE

14

CONSOLIDATION TEST REPORT



Natural Sat.	Natural Moist.	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Swell Press. (psf)	Heave %	e_o
99.9 %	59.7 %	64.5			2.70		2128	0.73	0.11			1.614

MATERIAL DESCRIPTION	USCS	AASHTO
Grey Clay (CH)	SC	

Project No. 1993.39.04.1 **Client:** RGH Consultants

Project: Dunphy Park Improvements

Source: B-3 **Elev./Depth:** 33.0’

Remarks:

RGH CONSULTANTS

Job No: 1993.39.04.1 | Date: JUNE 2015

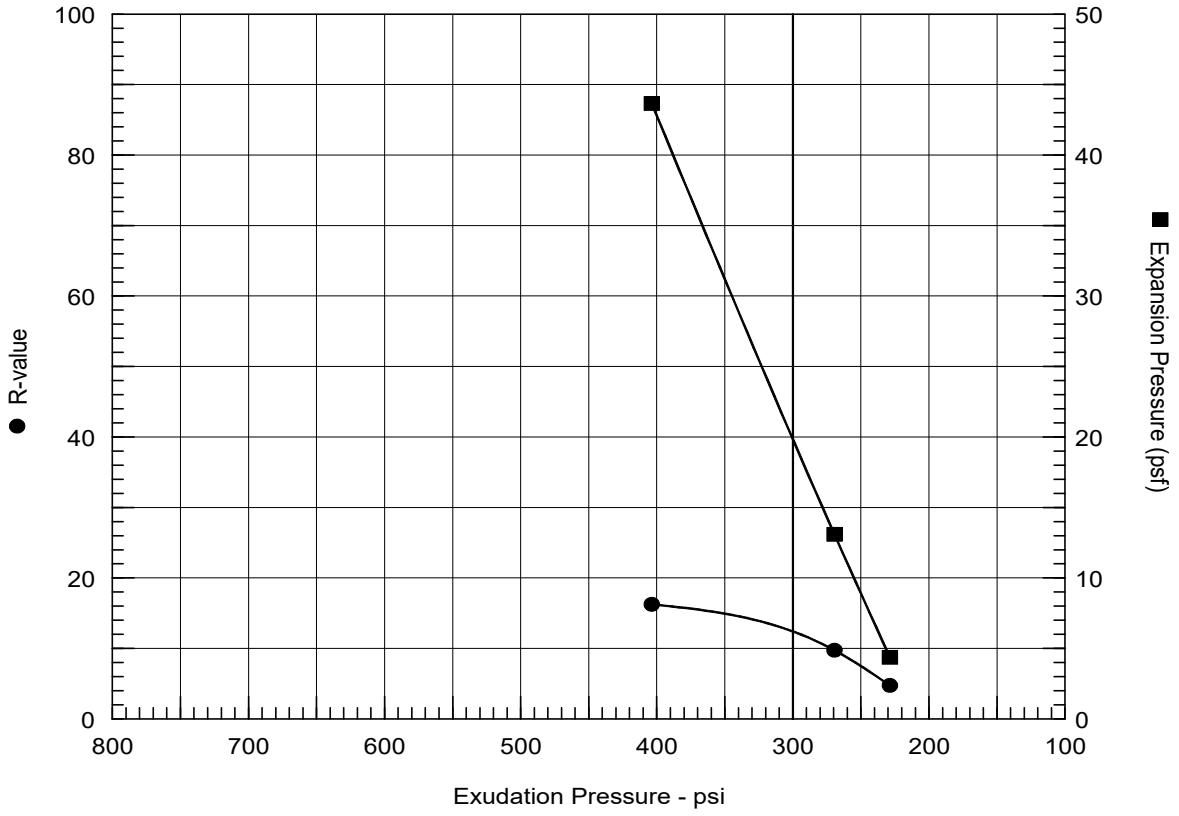
CONSOLIDATION TEST DATA

Dunphy Park Improvements
Bridgeway Boulevard
Sausalito, California

PLATE

15

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	55	110.5	18.8	4	146	2.50	229	5	5
2	100	112.5	17.6	13	133	2.52	269	10	10
3	170	118.6	14.8	44	121	2.53	404	16	16

Test Results	Material Description
R-value at 300 psi exudation pressure = 12 **Exp. pressure at 300 psi exudation pressure =** 20 psf	Brn Clayey Sand W/ Gravel (SC)
Project No.: 1993.39.04.1 **Project:** Dunphy Park Improvements **Source of Sample:** B-2 **Sample Number:** Bulk **Date:** 4/9/2015	**Tested by:** SEF **Checked by:** GEF **Remarks:**

R-VALUE TEST REPORT

RGH CONSULTANTS

Job No: 1993.39.04.1 | Date: JUNE 2015

RESISTANCE (R) VALUE DATA
Dunphy Park Improvements
Bridgeway Boulevard
Sausalito, California

PLATE
16

APPENDIX B - REFERENCES

American Society of Civil Engineers, 2010, Minimum Design Loads for Buildings and Other Structures, ASCE Standard ASCE/SEI 7-10.

Blake, M.C., Jr., Graymer, R.W., and Jones, D.L., 2000, Geologic Map and Map Database of Parts of Marin, San Francisco, Alameda, Contra Costa, and Sonoma Counties, California: U.S. Geological Survey Miscellaneous Field Studies MF-2337, Version 1.0.

Bortugno, E.J., 1982, Map Showing Recency of Faulting, Santa Rosa Quadrangle in Wagner and Bortugno, Geologic Map of the Santa Rosa Quadrangle: California Division of Mines and Geology, Regional Geologic Map Series, Map No. 2A, Santa Rosa Quadrangle, Scale 1:250,000.

Bryant, W.A., and Hart, E.W., Interim Revision 2007, Fault-Rupture Zones in California; California Geological Survey, Special Publication 42, p. 21 with Appendices A through F.

California Building Code, 2013, California Building Standard Commission.

California Emergency Management Agency, California Geological Survey, and University of Southern California, 2009, Tsunami Inundation Map for Emergency Planning, State of California-County of Marin, San Francisco Quadrangle, July 1, 2009.

Idriss, I.M. and Boulanger, R.W., 2004, Semi-Empirical Procedures for Evaluating Liquefaction Potential During Earthquakes, Proceedings of the 11th ICSDEE and 3rd ICEGE, pp. 32-56.

Idriss, I.M. and Boulanger, R.W., 2008, Soil Liquefaction During Earthquakes.

Ishihara, K., and Yoshimine, M., 1992, Evaluation of settlements in sand deposits following liquefaction during earthquakes, *Soils and Foundations* 32(1), 173-88.

Natural Resources Conservation Service, United States Department of Agriculture, accessed April, 2015. Web Soil Survey, available online at http://websoilsurvey.nrcs.usda.gov/.

Petersen, et al., 1996, Probabilistic Seismic Hazard Assessment for the State of California, California Department of Conservation, Division of Mines and Geology, Open File Report 96-08.

Rice, S.J., Smith, T.C., and Strand, R.G., 1976, Geology For Planning: Central and Southeastern Marin County, California, DMG Open-File Report 76-2.

Seed, H.B. and Idriss, I.M., 1982, Ground Motion and Soil Liquefaction During Earthquakes: Earthquake Engineering Research Institute, Berkeley, California.

Seed, H.B., Tokimatsu, K., Harder, L.F., and Chung, R.M., 1985, Influence of SPT Procedures in Soil Liquefaction Resistance Evaluations: Journal of Geotechnical Engineering Division, American Society of Civil Engineers, v. III, no. 12, December, p. 1425-1445.

Working Group on California Earthquake Probabilities, 2007, Uniform California Earthquake Rupture Forecast (UCERF): Notes on Southern California Earthquake Center (SCEC) Web Site (http://www.scec.org/ucerf/).

Youd, T.L., and Idriss, I.M., and 19 others, 2001, Liquefaction Resistance of Soils: summary report from the 1996 NCEER and 1998 NCEER/NSF workshops on evaluation of liquefaction resistance of soils: ASCE Geotechnical and Geoenvironmental Journal, v. 127, no. 10, p. 817-833.

APPENDIX C - DISTRIBUTION

City of Sausalito (6,0,1e)
Attn: Jonathon Goodman
420 Litho Street
Sausalito, CA 94965
JGoldman@ci.sausalito.ca.us

Prunuske Chatham, Inc. (0,0,1e)
Attn: John Ferons
400 Morris Street, Suite G
Sebastopol, CA 95472
jferons@pcz.com

EGC:JJP:bpc:ec:ejw

s:\project files\1751-2000\1993\1993.39.04.1 dunphy park improvements\gs report.doc

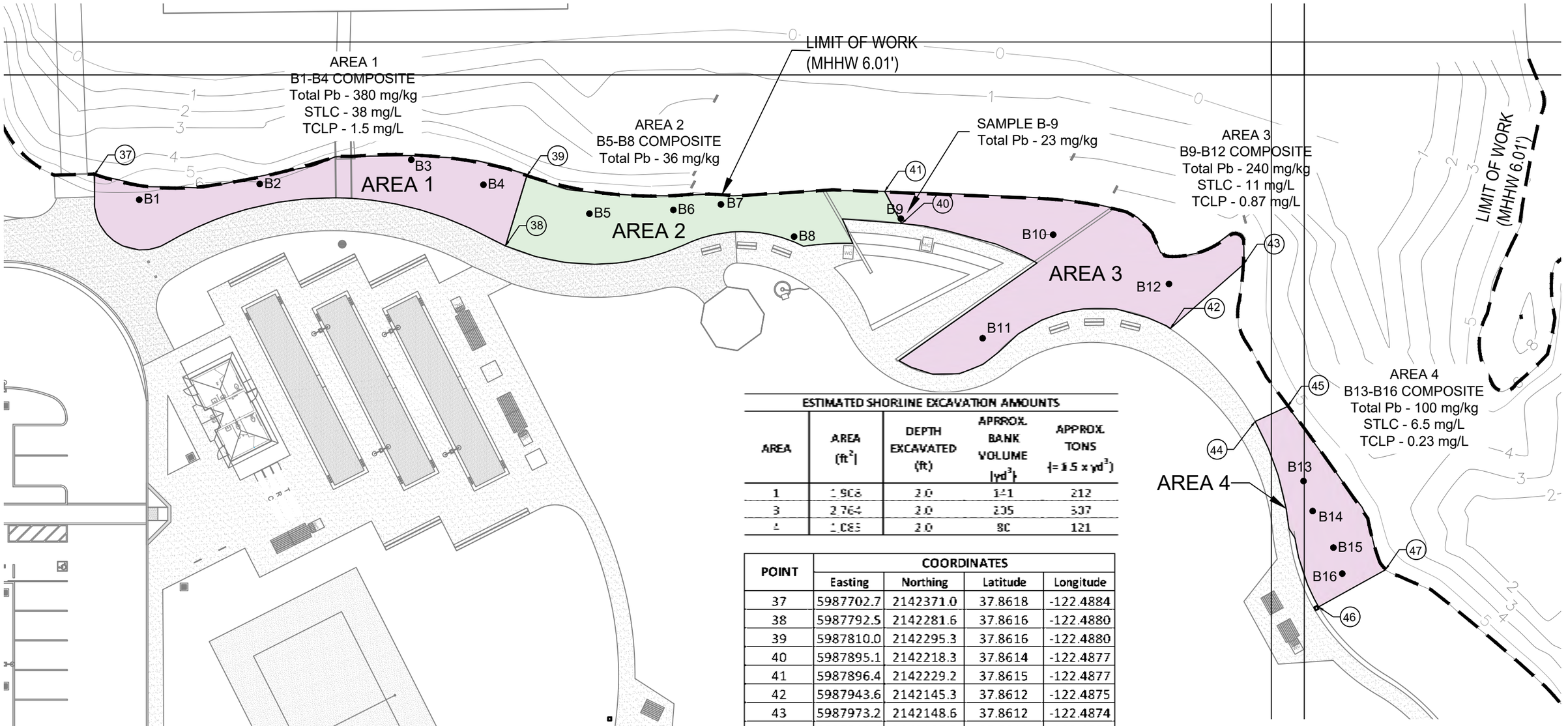


FIGURE 1 (Revised)

ESTIMATED SHORLINE EXCAVATION AMOUNTS

AREA	AREA (ft^2)	DEPTH EXCAVATED (ft)	APPROX. BANK VOLUME (yd^3)	APPROX. TONS (= 1.5 x yd^3)
1	1,908	2.0	141	212
3	2,764	2.0	205	307
4	1,085	2.0	80	121

POINT	COORDINATES			
	Easting	Northing	Latitude	Longitude
37	5987702.7	2142371.0	37.8618	-122.4884
38	5987792.5	2142281.6	37.8616	-122.4880
39	5987810.0	2142295.3	37.8616	-122.4880
40	5987895.1	2142218.3	37.8614	-122.4877
41	5987896.4	2142229.2	37.8615	-122.4877
42	5987943.6	2142145.3	37.8612	-122.4875
43	5987973.2	2142148.6	37.8612	-122.4874
44	5987948.6	2142107.5	37.8611	-122.4875
45	5987959.3	2142105.5	37.8611	-122.4875
46	5987932.1	2142050.2	37.8610	-122.4875
47	5987955.2	2142047.8	37.8610	-122.4875

LEGEND

B1 ● SOIL SAMPLE - (DECEMBER 22, 2020 SAMPLE)

TOTAL LEAD CONCENTRATION <80 MG/KG THRESHOLD

TOTAL LEAD CONCENTRATION >80 MG/KG THRESHOLD

NOTES:
- SAMPLES B1-B4 COMPOSITED TO A SINGLE SAMPLE FOR ANALYSIS.
- SAMPLES B5-B8 COMPOSITED TO A SINGLE SAMPLE FOR ANALYSIS.
- SAMPLES B9-B12 COMPOSITED TO A SINGLE SAMPLE FOR ANALYSIS.
- SAMPLES B13-B16 COMPOSITED TO A SINGLE SAMPLE FOR ANALYSIS.
- SEE ATTACHMENT 1 FOR ANALYTICAL RESULTS
- THE VOLUMES IN THE DRAWING ASSUME AN EXCAVATION DEPTH OF 2.0 FEET

30' 0' 15' 30'

SCALE: 1" = 30'

SHORELINE TESTING LOCATIONS AND REMEDIATION AREAS

LEAD MITIGATION WORK PLAN
DUNPHY PARK IMPROVEMENTS
SAUSALITO, CALIFORNIA

Geo-Logic ASSOCIATES

DRAWN BY:	DATE:	JOB NO.:
RM	MARCH 2021	RM17.1031.00

STORM WATER POLLUTION PREVENTION PLAN

RISK LEVEL 2

DUNPHY PARK IMPROVEMENT PROJECT PHASE 2

MARIN COUNTY, CALIFORNIA

PREPARED FOR COMPLIANCE WITH THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
GENERAL PERMIT FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY
WATER QUALITY ORDER: 2022-0057-DWQ

PREPARED FOR:
CITY OF SAUSALITO
420 LITHO STREET
SAUSALITO, CALIFORNIA 94965

PREPARED BY:
CSWST2
504 REDWOOD BLVD, SUITE 310
NOVATO, CA 94947
415-883-9850

PREPARED ON:
AUGUST 21, 2025

JOB NO: 2500185

RWQCB 2, SAN FRANCISCO BAY - WDID NO. : 2 21C409012

TITLE PAGE

STORMWATER POLLUTION PREVENTION PLAN | WDID:

PROJECT NAME:	DUNPHY PARK IMPROVEMENT PROJECT PHASE 2
RISK LEVEL:	2
PROJECT ADDRESS:	BRIDGEWAY, AT LITHO STREET, SAUSALITO, CA 94965
LEGALLY RESPONSIBLE PERSON (LRP):	ANDREW DAVIDSON
LRP ADDRESS:	420 LITHO STREET, SAUSALITO, CA 94965
LRP PHONE:	(415) 289-4180
APPROVED SIGNATORY (AS):	
AS PHONE:	
DEVELOPER:	CITY OF SAUSALITO
DEVELOPER ADDRESS:	420 LITHO STREET, SAUSALITO, CA 94965
DEVELOPER PHONE:	(415) 289-4176
CONTRACTOR:	
CONTRACTOR ADDRESS:	
CONTRACTOR PHONE:	
JOB SITE LOCATION:	SAME AS PROJECT ADDRESS
SWPPP PREPARER / LICENSE NUMBER:	KRISTINE PILLSBURY / QSD # 00830
COMPANY:	CSWST2
ADDRESS:	504 REDWOOD BLVD, SUITE 310, NOVATO, CA 94947
PHONE:	(415) 883-9850
SWPPP PREPARATION DATE:	August 21, 2025
ESTIMATED START DATE FOR CONSTRUCTION:	October 15, 2025
ESTIMATED END DATE FOR CONSTRUCTION:	April 25, 2026

QUALIFIED SWPPP DEVELOPER (QSD) / LICENSE NUMBER:

QSD COMPANY:

QSD ADDRESS:

QSD PHONE:

QUALIFIED SWPPP PRACTITIONER (QSP) / LICENSE NUMBER:

QSP COMPANY:

QSP ADDRESS:

QSP PHONE:

QSP DELEGATE / LICENSE NUMBER OR CERTIFICATE:

QSP DELEGATE COMPANY:

QSP DELEGATE ADDRESS:

QSP DELEGATE PHONE:

Table of Contents

APPENDICES:

EXHIBITS:

OWNER'S CERTIFICATION

Approval and Certification of the Storm Water Pollution Prevention Plan:

Project Name: DUNPHY PARK IMPROVEMENT PROJECT PHASE 2

Project Number: 2500185

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 evaluated 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, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of find and imprisonment for knowing violations. I am also aware that my user ID and password constitute my electronic signature and any information I indicate I am electronically certifying contains my signature. I understand that my electronic signature is the legal equivalent of my handwritten signature. My signature on this form certifies that my electronic signature is for my own use, that I will keep it confidential, and that I will not delegate or share it with any other person. Should I wish to delegate such authority, I will do so formally in writing and electronically notify the State Water Board using SMARTS of such delegation within 10 days of the delegation. I further certify that I will protect my electronic signature from unauthorized use, and that I will contact the State Water Board, within two business days of discovery, if I suspect that my electronic signature has been lost, stolen or otherwise compromised.

Signed:  Date: 8/28/25

Title: Senior Engineer

Name of Legally Responsible Person: Andrew Davidson

Telephone Number: (415) 289-4180

Name of Approved Signatory: N/A

Telephone Number: N/A

QUALIFIED SWPPP DEVELOPER

Preparer's Certification:

Project Name: DUNPHY PARK IMPROVEMENT PROJECT PHASE 2

Project Number: 2500185

This Stormwater Pollution Prevention Plan and Attachments were prepared under my direction to meet the requirements of the California Construction General Permit (SWRCB Order No. 2022-0057-DWQ). I certify that I am a Qualified SWPPP Developer and in good standing as of the date signed below.

Prepared by:

Signed: _____ Date: August 28, 2025

Title: QSD_00830_____

CSWST2

(415) 883-9850

AMENDMENT LOG

Project Name: DUNPHY PARK IMPROVEMENT PROJECT PHASE 2

Project Number: 2500185

See also Appendix C.

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#

1. SWPPP REQUIREMENTS

1.1 INTRODUCTION

The Dunphy Park Improvement Project is located in Sausalito, CA. It is approximately 1.4 miles East from Highway 101 and Rodeo Avenue junction. The site address and latitude and longitude are provided in Table 1 below.

The total acreage of Dunphy Park is on the order of 4.5 acres, but the area to be disturbed as part of the Phase 2 construction is limited to 2.2 acres. The project consists of an initial soil remediation effort to remove approximately two feet of contaminated soils along the shoreline. Soil removal and replacement requirements will be per the "Interim Final Completion Report Shoreline Soil Excavation, Replacement & Stockpile Removal" prepared by Geo-Logic Associates, dated December 2023 (see Appendix P). New landscaping and pervious granite walking paths that can pass through over an inch of rain per hour will also be included in the project.

See Table 4, below, for estimated impervious areas before and after construction for this project.

Risk Level is determined to be 2.

Additional information for grading, utilities, pervious pavement, and landscaping can be found in the Dunphy Park Improvement Project Phase 2 plans prepared by RHAA.

As seen in Table 5, below, ground-breaking is scheduled to begin in October 2025. Final landscaping to stabilize the site is tentatively scheduled to be complete by April, 2026.

Table 1: Project Location

SITE ADDRESS:	Bridgeway, at Litho Street, Sausalito, CA 94965
LATITUDE:	37.860519
LONGITUDE:	-122.487110

Table 2: TMDL Watershed Information

Is the Site Located in a TMDL Watershed or Waterbody?	Yes. See Exhibit 2 of this SWPPP. Richardson Bay Watershed TMDL: **Pesticides, Toxic Organics, Pathogens, Metals, Invasive Species** CGP 2022 Attachment H TMDL Compliance Action: **Comply with the General Permit**

Table 3: Municipal Separate Storm Sewer System (MS4) Type

Is the project located in a Phase I or Phase II MS4?	Yes
MS4 Type:	Phase II

Table 4: Construction Area, Percent Impervious and Runoff Coefficients

Estimated size of Construction Area:	2.50 Acres
Percentage of the Construction Site Area Impervious (Before Construction):	0% (0.0 acres)
Percentage of the Construction Site Area Impervious	0% (0.0 acres)

(After Construction):	

Table 5: Approximate Construction Schedule (See Appendix E for any Schedule Updates)

PHASE OF CONSTRUCTION	APPROXIMATE BEGIN DATE	APPROXIMATE END DATE
Pre-Construction/Project Kick-off	October 15, 2025	
Final Stabilization		April 15, 2026

The project was assessed and assigned a risk level of 2. The SWPPP has been prepared to comply with California's General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (General Permit) and State Water Resources Control Board (SWRCB) Order No. 2022-0057-DWQ for the Construction General Permit. A copy of the General Permit can be found in Appendix A.

See Appendix B for all Permit Registration Documents (PRDs).

1.2 SWPPP AVAILABILITY AND IMPLEMENTATION

The General Construction Permit (Section XIV.C) requires the SWPPP be available at the construction site during working hours while construction is occurring and shall be made available upon request by a Federal, 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 maps/drawings will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone. A current copy of the site-specific SWPPP and any site inspection reports may be kept in electronic format at the site so long as the information requested by a federal, State or municipal inspector can be made available during an inspection. All maps are to be legible and available in hard copy at the site. The SWPPP shall be implemented concurrently with the start of ground disturbing activities.

1.3 SWPPP AMENDMENTS

The discharger shall amend this SWPPP whenever there is a change in construction or operations which may affect the discharge of significant quantities of pollutants to offsite areas or ground waters. This SWPPP must also be amended if the measures described herein are not achieving the general objectives of reducing pollutants in storm water discharges. The Regional Water Quality Control Board or the City of Sausalito may also require the discharger to amend this SWPPP.

All amendments shall be numbered and listed on the SWPPP Amendment Log in Appendix C, and acknowledged by signature thereon. For each amendment entered on the SWPPP Amendment Log, include a brief amendment description, describing as appropriate the location, reason for change, and modifications involved. All amendments must be signed by the QSD.

Amendments are expected to occur as needed, and will be entered free-hand on this document. For example, the individual erosion control plans for the site are based on site status at various times in the project construction schedule. Over the course of the project, the schedule may change and, in turn, this SWPPP will change accordingly. These changes can be entered on the SWPPP by felt-tip pen, free-hand, and recorded as an amendment in the blank space on the SWPPP Amendment Log. Formal written amendments may also be issued, as needed, and will be recorded in the same manner.

1.4 RETENTION OF RECORDS

Records of all inspections, Compliance Certifications, and Non-Compliance Reporting must be retained for a period of at least three (3) years from the date generated or date submitted, whichever is last. Upon completion of the project's construction and termination of coverage under the General Permit, all records shall be retained by the Owner with a copy of the final SWPPP.

At a minimum site inspection records must include:

1. Inspection date and date the inspection report was written.
2. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.
3. Site information, including stage of construction, activities completed, and approximate area of the site exposed.
4. A description of any BMPs evaluated and any deficiencies noted.
5. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-stormwater controls. Otherwise list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.
6. Report the presence of noticeable odors or any visible sheen on the surface of any discharges.
7. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.
8. Photographs taken during the inspection, if any.
9. Inspector's name, title, and signature.

1.5 NON-COMPLIANCE REPORTING

Occurrences of Non-compliance:

The Owner's Representative shall electronically report any instances of non-compliance with the terms of the General Permit and this SWPPP to the Regional Water Quality Control Board through the SMARTS system. Non-compliance would include such actions as accidental spills or failures of structural controls, Numeric Action Level (NAL) exceedance reports, and Numeric Effluent Limitation (NEL) violation reports. Corrective measures shall be implemented immediately following discovery that water quality standards may have been compromised. The notification shall identify the non-compliance event, including an initial assessment of any impact caused by the event; describe the actions necessary to achieve compliance; and include a time schedule (subject to modifications by the Regional Water Quality Control Board) indicating when compliance will be achieved.

Anticipated Non-compliance:

The Owner shall provide advance notice in writing to the applicable Regional Water Board and local stormwater management agency of any planned changes in site construction activities that may result in non-compliance with this General Permit.

1.6 ANNUAL REPORTING

The General Permit requires that all permittees prepare, certify, and electronically submit an Annual Report through the SMARTS system no later than September 1 of each year. Reporting requirements are identified in Section XVI of the General Permit and at a minimum require:

1. Sampling and analysis results including laboratory reports, analytical methods and reporting limits and chain of custody forms;
2. Corrective actions and compliance activities, including those not implemented;
3. Violations of the General Permit;
4. Date, time, place, and name(s) of the inspector(s) for all sampling, inspections, and field measurement activities, including precipitation measured in inches;
5. Visual observation and sample collection exception records;
6. Training documentation of all personnel responsible for General Permit compliance activities.

1.7 CHANGES TO PERMIT COVERAGE

Coverage under the General Permit is non-transferrable. A new owner of an on-going construction activity must submit a new Notice of Intent (NOI) in accordance with the requirements of the General Permit to be authorized to discharge under the General Permit. An owner who sells property covered by the General Permit shall inform the new owner of the duty to file an NOI and shall provide the new owner with a copy of this SWPPP.

The Owner may change or terminate coverage for a portion of the project under the General Permit when ownership of a portion of the project has been transferred, or when a phase of the project has been completed, for reduced acreage, or to update construction start and end dates.

To update construction start dates to a later date than previously submitted, the Owner must submit time-stamped photo documentation depicting that construction activities have not commenced for the entirety of the site.

To terminate coverage for a portion of the project, the Owner must submit a revised NOI with a revised site map that clearly identifies the newly delineated site, SWPPP revisions as appropriate, photos demonstrating final stabilization and, if applicable, certifications that new landowners have been notified of applicable requirements to obtain permit coverage (including the name, address and phone number of the new landowner). The permit related documents for change in coverage must be electronically submitted via the Storm Water Multiple Application and Report Tracking System (SMARTS) within 30 days of a reduction or increase in total disturbed area.

The Owner shall submit applicable fees outlined in the revised fee notification within 10 calendar days of the notification date. The Change of Information will be returned if fees are not received by the State Water Board within 14 days of the notification date.

Regulatory coverage under the General Permit for added acreage is not approved until the Regional Board approves the Change of Information.

If the increased acreage is one-fourth mile from the existing site boundary and is an acre or larger, the Owner is required to submit a separate Notice of Intent.

1.8 POST CONSTRUCTION STORMWATER PLANS

The Owner shall certify and submit post-construction plans, calculations, and other supporting documentation as a Permit Registration Document in SMARTS.

The Owner shall submit a Change of Information in SMARTS for any revisions to post-construction plans and calculations prior to submitting the Notice of Termination.

Regional Water Board staff may review post-construction plans, calculations and other supporting documentation to verify that the post-construction water balance is accurate; and may request that the discharger make revisions if necessary.

The Owner may use the contact information found online or in Attachment C of the General Permit to request Regional Water Board staff review post-construction plans, calculations and other supporting documentation prior to and during construction.

1.9 INACTIVE PROJECTS

If all construction activities including passive treatment, active treatment systems and/or active equipment will be suspended for 30 days or more, the Owner may submit a Change of Information through SMARTS.

The Change of Information shall include:

1. A revised site map depicting the current status of construction;

2. Photographs showing the temporary stabilization BMPs that were implemented.

Upon approval of the Change of Information by the Regional Board sampling may be suspended and monitoring and inspections may be reduced as follows:

1. QSD shall visit the inactive site within 14 days to verify that the SWPPP is still being implemented accordingly;
2. QSD shall amend SWPPP to address all new conditions not previously considered through COI in SMARTS;
3. QSP or Trained Delegate shall visually inspect the inactive project at least once every calendar month and prior to any weather pattern that is forecast to have 50% or greater chance of 0.5inches or more precipitation in a 24-hour period.
4. QSP or Trained Delegate shall verify that BMP's are functioning in accordance with the SWPPP and implement corrective actions where necessary.

To resume construction or the use of passive treatment, active treatments, and/or use of active equipment, the Owner shall submit a Change of Information through SMARTS along with a revised site map based on current site conditions, to request to resume the project. Upon Regional Water Board approval of the Change of Information, the Owner is required to comply with all applicable requirements of the General Permit to resume construction activities at the site

1.10 NOTICE OF TERMINATION (NOT)

To terminate coverage under the General Permit for a complete project, the Owner must submit, to the Regional Water Quality Control Board a Notice of Termination form (NOT) via SMARTS. The NOT shall be submitted upon completion of construction and within 90 days of meeting all General Permit requirements for termination and final stabilization. A "final site map" and photos demonstrating final stabilization and implementation of applicable Post- Construction BMP's or low impact development features are required to be submitted with the NOT. Additionally a QSP-prepared final Notice of Termination Inspection with the QSP's name and valid QSP number. The construction project is considered complete only when the following conditions have been met:

1. The site will not pose any additional sediment discharge risk than it did prior to construction activity;
2. All elements of the SWPPP have been completed;
3. Construction related equipment, materials, temporary BMP's no longer needed and waste have been removed from the site and disposed of properly;
4. The site is in compliance with all local storm water management requirements including applicable Post- Construction BMPs and/or low impact development features;
5. All disturbed areas of the construction site have been stabilized using materials that:
    - Have a product life that supports the full and continued stabilization of the site;
    - Achieves stabilization without becoming trash or debris; and
    - Minimizes the risk of wildlife entrapment;
6. The Owner has ensured the QSP completed on-site visual inspections and verified the site complies with all Notice of Termination requirements including Post Construction Stormwater BMP's and/or low impact development features;
7. Post-construction stormwater management measures are installed and a long-term maintenance plan that is designed for a minimum of 5 years has been developed describing the responsible parties, schedule and procedures needed to ensure that measures are adequately maintained and functional;
8. The Legally Responsible Person has submitted the information in the Notice of Termination and has submitted and certified through SMARTS.

The Final Site Map shall include the following:

1. Project boundaries, adjacent lands and key features such as roadways and water bodies;
2. Developed drainage basin boundaries and discharge location points;
3. Site entrances, exits, lot boundaries, roads, structures and features related to the project that may be used as a reference;
4. Specific permanent erosion control BMPs, post-construction BMPs and low impact development features;
5. Individual erosion control BMPs including final landscaping identified using hatch patterns, symbols, or shading unique to each BMP;
6. Location, orientation and description of all photos used to document final site conditions and compliance with post-construction requirements; and
7. Areas of the site being transferred to new ownership, and the name and contact information of the owner, if applicable.

Final stabilization has occurred when all soil disturbing activities are completed and substantiates all final stabilization conditions by one of the following methods:

1. 70 percent final cover method – a uniform vegetative cover with 70% site coverage has been established;
2. Revised Universal Soil Loss Equation (RUSLE or RUSLE2) method – computational method accompanied by photos of all site areas to verify site conditions match value used in the method of computation. Photos of all site areas are required to verify pre-construction and post-construction conditions used in the computations; or
3. Custom Method – The Owner may request approval from the Regional Water Board to use a method or analytical model other than 1 and 2, above to demonstrate that the site complies with the "final stabilization" requirements. Photos of all site areas are required to verify the custom method used.

The Notice of Termination will be automatically approved 30 calendar days after the date the Notice of Termination is submitted, unless within the 30 calendar days the Regional Water Board notifies the discharger through SMARTS that the Notice of Termination has been denied, returned, or accepted for review.

All General Permit requirements remain in effect until the Notice of Termination is approved. The LRP will be notified through SMARTS communication when the discharger's General Permit coverage and corresponding WDID number are terminated.

1.11 QSP DELEGATES

The Owner may authorize a QSP to delegate visual inspections, sampling and/or SWPPP and BMP implementation activities to others (delegates) such as, but not limited to, a superintendent, project manager, foreman, contractor or coworker who have received training for their respective tasks. The QSP shall provide training based on guidelines set by the Construction General Permit Training Team in accordance with the Construction General Permit Order Section V.E.

Documentation of formal training is included in Appendix L. The Owner shall ensure that the QSP has determined that the delegate(s) can perform and have a competent understanding of the visual inspection, sampling, and/or SWPPP and BMP implementation tasks prior to fully delegating the responsibility to the individual.

QSP-delegates responsible for implementing the SWPPP are included in Appendix N. The information provided includes the company's name, address and telephone number, along with a contact name and telephone number. This list will be maintained and updated on-site as appropriate.

The Owner shall ensure the QSP-delegate(s) have a system used to record and report issues back to the QSP within 24 hours of when a corrective action is needed.

The QSP-delegate cannot perform the QSD and QSP inspections required in Section V.C.4 or V.D.2 of the Construction General Permit.

1.12 PUBLICLY POSTED NOTIFICATION

The Owner shall post a unique (separate from other public notification) WDID notification form in a site location viewable by the public or readily available upon request if unable to post publicly. The notification shall include correct construction start and end dates.

2. SITE CONDITIONS

2.1 PROJECT AND SITE DESCRIPTION

The Dunphy Park Improvement Project is located in Sausalito, CA. It is approximately 1.4 miles East from Highway 101 and Rodeo Avenue junction. The surrounding area consists mainly of both commercial and single family residential. The site is bound to the north by Napa Street, to the south by Locust Street, to the west by Bridgeway, and to the east by Richardson Bay. The site address and latitude and longitude are provided in Section 1, Table 1.

The total acreage of Dunphy Park is on the order of 4.5 acres, but the area to be disturbed as part of the Phase 2 construction is limited to approximately 2.2 acres. The project consists of an initial soil remediation effort to remove approximately two feet of contaminated soils along the shoreline. Soil removal and replacement requirements will be per the "Interim Final Completion Report Shoreline Soil Excavation, Replacement & Stockpile Removal" prepared by Geo-Logic Associates, dated December 2023 (see Appendix P). New landscaping and pervious granite walking paths that can pass through over an inch of rain per hour will also be included in the project.

Overall the park ranges in elevation but is generally flat, with slopes less than 5%. The portion of soil remediation work along the shoreline within this Phase 2 project consist of slopes in the range of 10-20%. The park drainage either surface flows directly into Richardson Bay or into the park storm drain system that discharge to two outfalls located on the Richardson Bay shoreline.

According to National Resources Conservation Service (NRCS) Web Soil Survey (see attached Exhibit 1), construction will occur on Urban land-Xerorthents complex soils. The geotechnical report entitled, "Geotechnical Study Report: Dunphy Park Improvements, Bridgeway Boulevard & Napa Street, Sausalito, California. Project No. 1993.39.04.1" by RGH Consultants describes the park as underlain by Quaternary age artificial fill over marine and marsh deposits. Groundwater level within the project site is likely tidally controlled.

Project activities include clearing, grubbing, mass and fine grading, landscaping, and pervious walkway construction. Buildings are not proposed to be constructed as part of this project, therefore the project does not have a vertical construction phase.

No existing impervious surfaces within the area are expected to be disturbed as the limits of work are generally along the shoreline. No new impervious surfaces are proposed to be constructed as part of the project. See Section 1, Table 4 for percent impervious before and after the project.

As seen in Section 1, Table 5, ground-breaking is scheduled to begin in October 2025. Final landscaping to stabilize the site will be complete by April 2026.

Risk Level is determined to be 2.

Additional information for grading, utilities, pervious pavement, and landscaping can be found in the Dunphy Park Improvement Project Phase 2 plans prepared by RHAA.

2.2 TOPOGRAPHY AND SITE MAPS

2.2.1 TOPOGRAPHY MAP

Attached in this SWPPP is Topography Map 1 which depicts information in the vicinity of the project site which is managed by the United States Geological Survey in their online National Map Advanced Viewer. The following items are shown as part of Topography Map 1:

1. Flow direction;

2. Topography map extending approximately 0.25 miles beyond the boundary of the construction site;

2.2.2 SITE MAP

Attached exhibits EC1.0, EC1.1, and L0.5-L6.2 are site maps at a scale of 1"=30' providing greater detail of the storm water controls at the construction site. The following items are shown on the site map:

1. Areas of soil disturbance.
2. Surface water locations.
3. Areas of existing vegetation to be preserved.
4. Location of control practices used during construction.
5. Drainage patterns and slopes proposed after completion of grading.
6. Areas used to store materials and wastes.
7. Storage and service areas.
8. Existing and planned pervious paved areas.
9. Location of post-construction control measures which include permanent landscape areas.
10. Sampling Locations

2.3 POLLUTANTS LIKELY TO BE PRESENT IN STORM WATER DISCHARGES

Table 4 lists and describes pollutants that are likely to be present in storm water discharges from the construction site.

Table 4: Potential Pollutants and Sources

POLLUTANT	SOURCE
Petroleum Products	
Diesel, Oil and Grease	Daily operation of Machinery and Heavy Equipment
Lime and Sodas	
Concrete	Site Work Construction, Equipment Cleanup/Washout, Stockpile of Materials
Masonry and Mortar	Stockpile of Materials
Metals	
Paints	Exterior Construction, Equipment Clean-up, Stockpile of Materials
Galvanized Metal	Stockpile of Materials
Metal Fragments	Grinding and Polishing of Metal Surfaces
Colored Finishing Compounds	Exterior Construction, Equipment Clean-up
Chlorinated Solvents	
Thinners, Strippers	Exterior Construction, Equipment Clean-up
De-greasing Agents	Equipment Clean-up and Maintenance

Other Organic Compounds	
Fertilizers	Landscaping Installation and Maintenance
Pesticides	Landscaping Installation and Maintenance
Herbicides	Landscaping Installation and Maintenance
Sedimentation	
Sediments	Grading, Land Clearing, Daily Operation of Site, Erosion from Storm Water Runoff
Trash	All Construction Activities and Phases, including Off-Site Construction
Wood, Glass, Rubber Debris	Contaminated Soils

2.4 TOXIC MATERIALS

There are no toxic materials known to exist on the project site. Nor are any toxic materials expected to be brought to the project site during construction at this time. However, if toxic materials are unearthed, the appropriate agencies will be contacted, a materials management plan shall be prepared and any materials to be disposed of will be transported to a facility licensed to accept the materials for proper disposal.

Table 5: Potential Toxic Materials and Sources

POLLUTANT	SOURCE
Cleaners	Site Work Construction, Equipment Clean-up/Washout
Petroleum Products	Daily operation of Machinery and Heavy Equipment
Vehicle Fluids	Vehicle Operations
Septic Fluids	Portable Toilet Units

3. BEST MANAGEMENT PRACTICES (BMPs)

3.1 SCHEDULE OF BMP IMPLEMENTATION

BMPs must be implemented, modified, and maintained to reflect the phase of construction and the weather conditions. In order to be effective, some BMPs must be installed before the site is disturbed (e.g., to provide protection during grading operations or to reduce or minimize pollution from historic areas of contamination during construction).

3.2 EROSION AND SEDIMENT CONTROL PRACTICES

3.2.1 EROSION CONTROL PRACTICES

A combination which may include some or all of the following erosion control practices will be used to protect site surface soils and prevent soil particles from being detached by rainfall, flowing water and wind. The practices will be installed by the Contractor in accordance with the project schedule and with the attached plans. Also, refer to the CASQA California Stormwater BMP Handbook, Construction Fact Sheets EC-1 through EC-12 and EC-14 through EC-16 for additional information on these and other Erosion Control Practices.

1. Preserving Existing Vegetation: Existing vegetation will be preserved in areas until necessary to be cleared to accommodate construction of buildings, pavement, utilities or installation of final landscaping. Preservation of existing vegetation will diminish the impact of rainfall on exposed soil and escape of sediment into site runoff.
2. Hydraulic Mulch: Hydraulic mulch will be applied to inactive, graded areas for protection from wind and water erosion.
3. Hydroseeding: Hydroseeding will be provided in conjunction with hydraulic mulch in permanently graded or exposed areas, to protect exposed soil from wind and water erosion unless other permanent vegetation is planned for the graded or exposed area. If permanent vegetation is planned, but not to be installed immediately, the graded or exposed area should receive an application of straw mulch, hydraulic mulch or other blanket or covering to protect the soil from wind or water erosion.
4. Straw Mulch: Straw mulch shall be applied to inactive (14 days), graded areas for protection from wind and water erosion.
5. Compost Blankets: A compost blanket shall be applied to inactive (14 days), graded areas for protection from wind and water erosion.
6. Soil Preparation / Roughening: Soil preparation and/or roughening shall be performed as necessary to prepare the soil for additional BMP's or to break up sheet flow (roughening only).
7. Non-Vegetative Stabilization: Non-vegetative stabilization shall be used where vegetative options are not feasible, including, but not limited to: protecting active soil stockpiles, for the stabilization of pedestrian or vehicular pathways and for areas where vegetation will not grow adequately within the construction timeframe.

3.2.2 SEDIMENT CONTROL PRACTICES

A combination of the following sediment control practices will be used to trap soil particles after having been detached and moved by rain, flowing water and wind. Sediment control practices are most effective when used in conjunction with erosion control practices. Sediment control practices will be installed by the Contractor in accordance with the project schedule and with the attached plans. Also, refer to the CASQA California Stormwater BMP Handbook, Construction Fact Sheets SE-1 through SE-14 for additional information on these and other Sediment Control Practices.

1. Silt Fence: Silt fence will be used for site perimeter control and around temporary stockpile or fill areas to detain sediment laden water and promote sedimentation behind the fence.
2. Fiber Rolls: Risk Level 2 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths:

Table 6: Fiber Roll Spacing

Slope Percentage	Sheet flow length not to exceed
0-5%	As Specified by QSD (QSD specifies 35' for this project)
5-25%	35 feet
25-33%	20 feet
33-50%	15 feet
Over 50%	10 feet

3. Catch Basins and Drain Inlet Protection: Proprietary or other inlet protection constructed from a combination of fiber rolls, gravel bag barriers and other Construction site BMP's shall be installed in accordance with sheet SE-10, SE-12 and SE-14 to promote sedimentation behind the barriers or within the devices before sediment-laden runoff is discharged from the site.
4. Water Conservation: Water conservation shall be practiced so that the minimum amount of water is used that is necessary for the effective practice of dust control, and other BMP's to keep dirt, sediment and other possible contaminants from being discharged in runoff from the site.
5. Additional Materials: Additional materials shall be kept at the site in sufficient quantity for emergency preparedness. Additional materials shall include, but not be limited to, fiber rolls, drain rock, burlap sacks and tarps to create covers and additional barriers to promote sedimentation if some portion of the site BMP's experience failure.

3.2.3 PRACTICES TO REDUCE SEDIMENT TRACKING ONTO PUBLIC AND PRIVATE ROADS

The following control practices will be employed to reduce the tracking of sediment onto public and private roads. These practices will help prevent the deposition of sediments into local storm drains. The production of air-borne dust is addressed in the next Section. Also see the attached plans and the CASQA California Stormwater BMP Handbook, Construction Fact Sheet TC-1:

1. Stabilized Construction Entrance: A stabilized construction entrance (and exit, as necessary) will be installed to provide an effective mean of minimizing the tracking of mud and dirt onto public roads by construction vehicles.
2. Limited Access: Access for all construction activity traffic shall be limited to stabilized construction entrances and exits.

3.2.4 WIND EROSION

Dust Control: The following BMPs will generally stabilize the exposed surfaces and thereby minimize suspended or tracked sediment, nutrients, trash, metals, bacteria, oil, grease, and organic particles. For further information, see the CASQA California Stormwater BMP Handbook, Construction Fact Sheet WE-1:

The principal construction phase deterrent to wind erosion is the spraying of water onto dirt surfaces in order to adhere soil particles and minimize wind transport and loss. The Contractor will spray water from a mobile tank truck with mounted sprinkler, applying water at non-erosive rates to avoid causing any runoff. This practice is typically discontinued during the rainy season, except during extended periods of dry weather. It is applied in areas where vehicles are tracking such as future streets, roads, and driveways. Other methods for stabilizing exposed dirt are the establishment of temporary or permanent vegetation, and the installation of impervious surfaces, such as paving and gutters.

Sweeping: The following BMP will serve to remove sediments from hard surfaces within and adjacent to the site. This BMP is applicable on a year-round basis, as long as traffic is entering and leaving the site. For further information, see also the CASQA California Stormwater BMP Handbook, Construction Fact Sheet SE-7:

The Contractor will periodically sweep paved areas to remove dirt and debris from the pavement. On-site sweeping will occur in areas where vehicular traffic is entering from unpaved areas to paved areas. These areas will be swept before each significant predicted rain event, and periodically, as needed, during extended dry periods. Sweeping equipment must have a collector system to avoid depositing debris in the storm drain system. Collected debris may be deposited into areas of open soil, as long as the debris consists mainly of soil material. Otherwise, the collected debris will be disposed of with trash.

3.2.5 PRACTICES TO MINIMIZE CONTACT WITH STORM WATER

The following BMPs will serve to minimize contact of construction vehicles, equipment, and materials with storm water:

1. Vehicle and Equipment Service: In order to prevent and control leaks from equipment and vehicles and to minimize the possibility of toxic pollutant discharge, the following have been implemented (for further information, see also the CASQA California Stormwater BMP Handbook, Construction Fact Sheets NS-8 through NS-10):
    a. No major maintenance/repair for equipment/vehicles is allowed inside the site.
    b. Equipment/vehicles that need maintenance are transported off site.
    c. For minor equipment maintenance, drip pans and drip cloths will be used if it is necessary to drain and replace fluids on-site.
    d. On-site vehicles and equipment will be inspected regularly for leaks and, if necessary, will be repaired immediately.
    e. Any leaks will be immediately cleaned and leaked materials will be properly disposed of.
    f. Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, hydraulic and transmission fluids.
    g. No on-site fuel storage tanks will be allowed.
    h. No vehicle or equipment washing will occur on-site.
2. Material Delivery, Handling and Storage: In order to minimize the potential of polluting runoff, the following procedures will be implemented (for further information, see also the CASQA California Stormwater BMP Handbook, Construction, Fact Sheets WM-1 and WM-2):
    a. Conduct an inventory of the products used and expected to be used and the end products that are produced and expected to be produced. This list will be kept on site with the SWPPP.
    b. All hazardous materials will be labeled and stored according to federal and state regulations.
    c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spills or leaks) or in a storage shed (completely enclosed).
    d. All subcontractors will be trained in proper material delivery, handling and storage practices during the weekly safety meetings.
    e. Hazardous chemicals will not be applied outdoors during wet weather.
    f. A small, covered stockpile of sand will be stored nearby to be used as emergency spill containment.
    g. Cover and berm loose stockpiled materials that are not actively being used (14 days).
    h. Minimize exposure of construction materials to precipitation.
    i. Contain all fertilizers and other landscape materials when they are not actively being used (14 days).
    j. Discontinue the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.

k. Stack erodible landscape material on pallets and covering or storing such materials when not being used or applied.
l. Proper storage instructions will be posted at all times in an open and conspicuous location.
m. MSDS sheets for all materials will be posted at the Superintendent's trailer.
n. Storage areas will be inspected before and after rainfall events and at least weekly throughout the job.
o. Storage areas will be kept clean and well organized.

3. Surface Water Buffer: to maintain natural buffers and/or equivalent erosion and sediment controls when a Water of the US is within 50 feet of the site's earth disturbance, unless infeasible:
    a. Provide and maintain a 50-foot undisturbed natural buffer from the edge of the disturbed area to the top of bank of the Water of the US;
    b. Provide and maintain an undisturbed natural buffer that is less than 50 feet and is supplemented by erosion and sediment controls that achieve, in combination, the sediment load reduction equivalent to a 50-foot natural buffer, calculated by RUSLE-2 or equivalent method;
    c. Provide and maintain erosion and sediment controls that achieve, in combination, the sediment load reduction equivalent to a 50-foot natural buffer, calculated by RUSLE-2 or equivalent method when it is infeasible to maintain an undisturbed natural buffer of any size. Calculations must be approved by the Regional Water Board.

3.2.6 CONSTRUCTION MATERIAL LOADING AND UNLOADING

Loading and unloading areas are located away from storm drains, to limit the possibility of contaminating runoff through accidental spills. Where applicable, the loading and unloading areas are shown on the attached plans, and are also described in the CASQA California Stormwater BMP Handbook, Construction Fact Sheet WM-1.

3.2.7 WASTE MANAGEMENT AND DISPOSAL

The following BMPs will provide techniques for waste disposal practices which will reduce or prevent the discharge of pollutants to storm water. Where applicable, the BMPs are shown on the attached plans, and are also described in the CASQA California Stormwater BMP Handbook, Construction Fact Sheets WM-5 through WM-9.

1. Demolition Waste Management: The demolition of existing buildings and other structures will be properly managed so as to eliminate the discharge of pollutants to the bay. During demolition operations, the demolition site will be monitored and policed daily for litter and debris and dumpsters will be inspected for leaks and secure covers. Arrangements will be made for adequate debris disposal schedule to ensure that adequate amount of disposals is provided and that dumpsters do not overflow. All dumpster will be closed/covered at the end of each day.
2. Sanitary/Septic Waste Management: Portable toilets units are placed away from storm drain inlets and serviced regularly as needed. Liners or bermed tarps are placed below portable toilet units to prevent contamination. Facilities are inspected for leaks on a weekly basis.
3. Solid Waste Management: Waste collection areas have been designated at each building location and are shown on the attached plans.
    a. Containers located in these areas will be emptied regularly, to avoid over filling with resultant trash overflow onto adjacent ground.
    b. The Contractor will train subcontractors and employees on proper waste disposal techniques during the weekly safety meetings.
    c. Erosion control devices tend to collect waste and, therefore, should be inspected and waste removed weekly or as needed. Contractor will also conduct a weekly pick-up of miscellaneous solid waste around the construction site, either prior to the end of the week or prior to any predicted storm event, whichever occurs first.

   d. Cover waste disposal containers at the end of every business day and during a rain event.
   e. Berm waste disposal containers to prevent discharges to the storm water drainage system.
   f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.
4. Wash and Rinse Areas: All wash and rinse areas shall be bermed to prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

3.2.8 PRE-CONSTRUCTION CONTROL PRACTICES

Preconstruction practices which are aimed at reducing sediment and other pollutants in storm water discharges include: Demolition of the existing structures to be able to construct new structures, utilizing more modern and "green" building techniques on the site may also have contributed to a reduction of pollutants in storm water discharges.

3.2.9 SCHEDULE

See Section 1, Table 3 and Appendix E for Construction Schedule.

3.3 RUN-ON AND RUNOFF CONTROLS

The contractor shall effectively manage all storm water run-on to the project site. All run-on shall be routed around disturbed areas to prevent contamination. If contamination occurs, run-on must be brought into compliance with the effluent limitations of the California State NPDES General Permit.

The contractor shall manage all run-off such that it meets the requirements of the General Permit prior to leaving the project site.

3.4 NON-STORM WATER DISCHARGES AND MANAGEMENT

The General Permit prohibits the discharge of non-storm water liquid and waste, with the exception of certain authorized non-storm water discharges. These discharges include irrigation of vegetation and erosion control measures, pipe flushing and testing, street cleaning and water sprayed for dust control, and de-watering of excavations. These discharges must meet the following conditions:

1. Discharged water must be necessary for the performance and completion of the project;
2. The discharge is infeasible to eliminate;
3. The discharge complies with BMPs as described below;
4. The discharge does not cause or contribute to a violation of water quality standards.
5. The discharge complies with other applicable requirements of this general Permit including applicable action levels, effluent limitations and monitoring and reporting requirements;
6. The discharge is not prohibited by an applicable regional or statewide water quality control plan;
7. The discharge is in accordance with other applicable State and Regional Water Board permits; and
8. The discharge does not contain toxic constituents in toxic amounts and does not cause toxicity in the receiving water body.

The following BMPs will be utilized to limit and control non-storm water discharges at the project site. In no case may polluted water be discharged offsite.

Minimize risk of causing pollution from non-storm water discharges by avoiding any such discharges to offsite areas and by ensuring there are sediment control measures installed between the location of discharge and the location of entry into the offsite storm drain system.

1. Conserve water by minimizing the amounts of water used for irrigation and dust control.
2. Clean streets by sweeping rather than by washing, where possible; using only the minimum water necessary to control dust.
3. Locate non-storm water discharges so they will not flow over areas of disturbed soil, potentially causing erosion.

4. One-time discharges shall be monitored during the time that such discharges are occurring. The QSP or a designated, qualified person, will ensure that no materials are discharged in quantities which will have an adverse effect on downstream storm drain systems.
5. Chlorinated water used to disinfect water pipes may not be discharged to the storm water system. All chlorinated water shall be discharged to the sanitary sewer system or otherwise properly disposed of off-site.

3.5 MAINTENANCE, INSPECTION AND REPAIR OF STRUCTURAL CONTROLS

Structural controls require on-going inspection, maintenance and repair. Inspections will be performed in accordance with the procedures described in Section 4.0 of this SWPPP. Maintenance and repair shall be conducted as required, and as determined by the inspections.

The Contractor must also be prepared to respond to any failure of the structural controls. The QSP will be responsible for inspection, maintenance and repair procedures. Emergency contacts are listed in Appendix M. The following materials will be maintained on-site in sufficient quantities to immediately rectify any problems:

1. Fiber rolls with pickets or spikes;
2. Erosion control blankets with pickets;
3. Drain rock;
4. Burlap bags for constructing gravel bag barriers.

3.6 SPILL PREVENTION AND CONTROL

This section describes measures to prevent, control and clean-up spills. Clean-up of spills should be immediate, automatic and routine. They should also be performed by a trained staff member or a licensed cleaning company, if appropriate. Emergency contact numbers are listed in Appendix M.

3.6.1 MINOR SPILLS

Minor spills are those which are likely to be controlled by on-site personnel. After contacting local emergency response agencies, the following actions should occur upon discovery of a minor spill:

1. Contain the spread of the spill.
2. If the spill occurs on paved or impermeable surfaces, clean-up using dry methods (i.e., absorbent materials, cat litter and/or rags).
3. If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
4. If the spill occurs during rain, cover the impacted area to avoid runoff.
5. Record all steps taken to report, contain and clean-up the spill.

3.6.2 MAJOR SPILLS

Major spills are those which are unlikely to be controlled by on-site personnel. On-site personnel should not attempt to control major spills until the appropriate and qualified emergency response staff have arrived at the site. In addition to local authorities, notify the Governor's Office of Emergency Services Warning Center at (800) 852-7550. For spills of federal reportable quantities, also notify the National Response Center at (800) 424-8802. A written report should be sent to all notified authorities.

3.7 POST-CONSTRUCTION STORM WATER MANAGEMENT

This section describes the control practices utilized to reduce pollutants in storm water discharges after all construction phases are complete. These control practices are primarily related to the design of the project, as opposed to the structural controls used during the construction phase.

At the project site, these post-construction control practices will be maintained by the Owner:

Bioretention planter facilities will be incorporated to treat runoff from the athletic field. See Sheet EC1.3 for the location of the bioretention planter facilities.

3.8 OTHER PLANS

1. Included by reference are all construction plans, drawings and maps for the project.
2. "Stormwater Best Management Practice Handbook Portal: Construction", California Stormwater Quality Association (CASQA) dated November 2009.

4. BMP INSPECTION AND MAINTENANCE

4.1 INSPECTION AND MAINTENANCE

Under the General Permit, all dischargers are required to conduct inspections of the construction site prior to anticipated qualifying precipitation events and during and after actual qualifying precipitation events. During extended storm events, inspections must be made during each 24-hour period. A storm event is considered complete after 48 hours of no rainfall. The goals of these inspections are:

1. To identify areas contributing to storm water discharge;
2. To evaluate whether measures to reduce pollutant loadings identified in the SWPPP are adequate and properly installed and functioning in accordance with the terms of the General Permit; and,
3. Whether additional control practices or corrective maintenance activities are needed.

Equipment, materials and workers must be available for rapid response to failures and emergencies as described above. All corrective maintenance to BMP's shall be performed as soon as possible, allowing for appropriate worker safety.

Precipitation forecast information shall be obtained from the National Weather Service Forecast Office and shall be included as part of the checklist weather information.

Qualified SWPPP Developer (QSD):

The QSD will conduct on-site visual inspections as follows:

1. Within 30 days of construction activities commencing on the site;
2. Within 30 days of transfer of duties to a different QSD;
3. Twice Annually, once August through October and once January through March;
4. Within 14 calendar days after a numeric action level exceedance; and
5. Within the time period requested in writing from Water Board staff

Qualified SWPPP Practitioner (QSP):

The QSP will conduct on-site visual inspections as follows:

1. Weekly (Note a pre-, during- or post-qualifying precipitation event inspection also satisfies the weekly inspection requirement);
2. Once every calendar month;
3. Within 72 hours prior to a forecasted Qualifying Precipitation Event (if extended forecast precipitation data (greater than 72 hours) is available from the National Weather Service, the pre-precipitation event inspection may be done up to 120 hours in advance).
4. Once every 24 hours during a Qualifying Precipitation Event (Note Qualifying Precipitation Events are extended for each subsequent 24-hour period forecast to have at least 0.25 inches of precipitation);
5. After a Qualifying Precipitation Event within 96 hours if 0.5 inches or more precipitation is measured during the event;
6. Within 14 days after an numeric action level exceedance
7. Prior to the submittal of the Notice of Termination or Change of Information (for acreage changes) of all or part of the site.

The QSP shall inspect:

1. All immediate access roads to the site daily and prior to any rain event;
2. That the WDID notification form is in a site location viewable by the public and information contained thereon is current.

QSP-Trained Delegate:

The Owner may authorize a QSP to delegate visual inspections, sampling and/or SWPPP and BMP implementation activities to others (delegates) such as, but not limited to, a superintendent, project manager, foreman, contractor or coworker who have received training for their respective tasks. The QSP shall provide training based on guidelines set by the Construction General Permit Training Team in accordance with the Construction General Permit Order Section V.E.

The QSP-Trained Delegate may not perform QSD and QSP inspections required in Section V.C.4 or V.D.2 of the Construction General Permit.

The name and contact number of the QSP and any Delegates trained by the QSP are listed in Appendix M.

Pre-storm inspections are to ensure that BMPs are properly installed and maintained. Post-storm inspections are to assure that the BMPs have functioned adequately. Each inspection shall include all structural and non-structural BMPs installed at the site. Each inspection shall evaluate existing BMPs for adequacy and proper implementation, and shall evaluate whether additional BMPs are required to maintain compliance with the terms of the General Permit.

Each site inspection shall be recorded using the forms provided in the Appendices. If all BMPs are in place, properly maintained, and properly functioning, then the Inspection Report shall be completed indicating the same. Otherwise, the Inspection Report shall include the locations and nature of any corrective measures taken. These Inspection Reports shall be maintained on-site in accordance with Section 5.15, below.

Upon identifying failures or other shortcomings, as directed by the QSP, repairs or design changes to the BMPs must be implemented beginning within 72 hours of identification and completed as soon as possible.

5. CONSTRUCTION SITE MONITORING PROGRAM (CSMP)

5.1 PURPOSE

To demonstrate if the site is in compliance with the Discharge Prohibitions and applicable Numeric Action Levels (NALs)/Numeric Effluent Limitations (NELs) of the General Permit, whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives, whether immediate corrective actions, additional BMPs implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges, and whether BMPs included in the SWPPP/ REAP are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges the following CSMP has been developed.

5.2 APPLICABILITY OF PERMIT REQUIREMENTS

The CSMP outlines the requirements for stormwater and non-stormwater visual observations; stormwater and non-stormwater sample collection.

The QSP shall visually observe and sample discharge for qualifying precipitation events producing precipitation of 1/2 inch or more.

5.3 MONITORING LOCATIONS

Effluent Sampling Locations

1. The QSP shall perform sampling and analysis of storm water discharges to characterize discharges associated with construction activity from the entire project disturbed area.
2. The QSP shall collect effluent samples at all discharge points where storm water is discharged off-site, see EC1.2 for sampling locations.
3. The QSP shall ensure that storm water discharge collected and observed represents the effluent in each drainage area based on visual observation of the water and upstream conditions.
4. The QSP shall monitor and report site run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs or NELs.
5. If an ATS is deployed on site, or a portion on their site, the QSP shall collect ATS effluent samples and measurements from the discharge pipe or another location representative of the nature of the discharge.
6. The QSP shall select analytical test methods from the list provided in Table 7, below.
7. All storm water sample collection preservation and handling shall be conducted in accordance with Section 5.7 “Storm Water Sample Collection and Handling Instructions” below.

5.4 SAFETY

The QSP shall be prepared to collect samples and conduct monitoring and observations until the minimum requirements of the Construction General Permit are completed. It is not required to physically collect samples or conduct visual observation under the following conditions:

1. During dangerous weather conditions such as flooding and electrical storms and high winds above 40 miles per hour;
2. When access to the site is infeasible (e.g. due to snow accumulation) or unsafe;
3. Outside of scheduled site business hours.

If no required samples or visual observation are collected due to these exceptions, the QSP shall include an explanation in the SWPPP and in the Annual Report documenting why the sampling or visual observations were not conducted.

The QSP shall check in with the Contractor's site superintendent to understand the current site conditions and make arrangements to have equipment moved or request to pause or reroute construction traffic in order to safely perform sampling, monitoring and visual inspections.

5.5 VISUAL MONITORING REQUIREMENTS

1. Visual observations need only be made during business hours.
2. Record the time, date and rain gauge reading of all qualifying rain events.

5.5.1 AFTER QUALIFYING RAIN EVENT

1. Visually observe storm water discharges at all discharge locations after a Qualifying Precipitation Event within 96 hours if 0.5 inches or more precipitation is measured during the event.
2. Visually observe the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying precipitation event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.

5.5.2 PRIOR TO QUALIFYING RAIN EVENT

Within 72 hours prior to a forecasted Qualifying Precipitation Event (if extended forecast precipitation data (greater than 72 hours) is available from the National Weather Service, the pre-precipitation event inspection may be done up to 120 hours in advance) Risk Level 2 dischargers shall visually observe:

1. All storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.
2. All BMPs to identify whether they have been properly implemented in accordance with the SWPPP/REAP. If needed, the discharger shall implement appropriate corrective actions.
3. Any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

5.5.3 OBSERVATIONS OF PRESENCE OF POLLUTANTS AND BMP EFFECTIVENESS

For the visual observations described in 5.5.1 and 5.5.2 above, observe the presence or absence of floating and suspended materials, sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.

Within 96 hours after a Qualifying Precipitation Event, if 0.5 inches or more precipitation is measured during the event, QSP shall conduct post rain event visual observations to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.

5.5.4 VISUAL OBSERVATION MAINTENANCE

The QSP shall maintain on-site records of all visual observations, personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

5.6 VISUAL OBSERVATION AND SAMPLE COLLECTION EXEMPTIONS

The QSP shall be prepared to collect samples and conduct visual observation until the minimum requirements of Section 5.5 above is completed. The QSP is not required to physically collect samples or conduct visual observation under the following conditions:

1. During dangerous weather conditions such as flooding and electrical storms.
2. Outside of scheduled site business hours.

If no required samples or visual observation are collected due to these exceptions, the QSP shall include an explanation in the SWPPP and in the Annual Report documenting why the sampling or visual observations were not conducted.

5.7 WATER QUALITY SAMPLING AND ANALYSIS

1. The QSP shall collect storm water grab samples from sampling locations, specified on plans.
2. The storm water grab sample(s) obtained shall be representative of the flow and characteristics of the discharge.
3. The QSP shall, at a minimum, **one sample from each discharge location** per day of the qualifying event.
4. The QSP shall ensure that the grab samples collected of stored or contained storm water are from discharges subsequent to a qualifying precipitation event (producing precipitation of ½ inch or more at the time of discharge).

5.7.1 Storm Water Effluent Monitoring Requirements:

The QSP shall analyze effluent samples for:

1. pH and turbidity.
2. Any additional parameters which the Regional Water Board requires.

5.8 STORM WATER DISCHARGE SAMPLE COLLECTION AND HANDLING

1. The QSP shall comply with test methods, detection limits, and reporting units listed in the table at the end of Section 5.10.
2. The QSP shall ensure that testing laboratories will receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory), and shall use only the sample containers provided by the laboratory to collect and store samples.
3. The QSP shall designate and train personnel to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring Program's (SWAMP) 2008 Quality Assurance Program Plan (QAPrP).

5.9 MONITORING METHODS

1. The QSP shall ensure that all sampling and sample preservation are in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment (including a discharger's own field instruments for measuring pH and turbidity) should be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. Risk Level 2 dischargers shall ensure that all laboratory analyses are conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Board.
2. With the exception of field analysis conducted by the discharger for turbidity and pH, all analyses should be sent to and conducted at a laboratory certified for such analyses by the State Department of Health Services. A Chain of Custody Form shall be requested by the laboratory to be used when handling and shipping samples.
3. Risk Level 2 dischargers shall conduct their own field analysis of pH and may conduct their own field analysis of turbidity if the discharger has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to adequately perform the field analysis.

See the attached Exhibit EC1.2 for sampling locations.

5.10 ANALYTICAL METHODS

The QSP shall comply with test methods, detection limits, and reporting units listed in the Table 7, below.

pH: Risk Level 2 dischargers shall perform pH analysis on-site with a calibrated pH meter or a pH test kit. The QSP shall record pH monitoring results on paper and retain these records in accordance with Section 5.15, below.

Turbidity: The QSP shall perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on-site or at an accredited lab. Acceptable test methods include Standard Method 2130 or USEPA Method 180.1. The results will be recorded in the site log book in Nephelometric Turbidity Units (NTU).

Table 7: Test Methods, Detection Limits, Reporting Units and Applicable NALs/NELs

Parameter	Test Method/ Protocol	Discharge Type	Minimum Detection Limit	Reporting Units	Numeric Action Level
TMDL – Related Pollutant	U.S. EPA-approved test method for specific pollutant parameter	Responsible Dischargers	Depends on the test method	mg/L	Refer to Table H-2 in Attachment H of the General Permit
pH	Field test with calibrated portable instrument	Risk Level 2 Discharges	0.2	pH units	Lower NAL=6.5 Upper NAL=8.5
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	Risk Level 2 Discharges other than ATS	1	NTU	250 NTU
		For ATS Discharges	1	NTU	N/A

5.11 NON-STORM WATER DISCHARGE MONITORING

Visual Monitoring Requirements:

1. The QSP shall visually observe each drainage area for the presence of unauthorized and authorized non-storm water discharges and their sources.
2. Visual observation are only required during daylight hours (sunrise to sunset).
3. The QSP shall ensure that visual observations document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. Maintain on-site records indicating the personnel performing the visual observation, the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

Effluent Sampling Locations:

1. The QSP shall sample effluent at all discharge points where non-storm water and/or authorized non-storm water is discharged off-site.
2. The QSP shall send all non-storm water sample analyses to a laboratory certified for such analyses by the State Department of Health Services.
3. The QSP shall monitor and report run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs.

5.12 NON-VISIBLE POLLUTANT MONITORING REQUIREMENT

1. The QSP shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water.
2. The QSP shall ensure that water samples are large enough to characterize the site conditions.
3. The QSP shall collect samples at all discharge locations that can be safely accessed.
4. The QSP shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.
5. The QSP shall analyze samples for all non-visible pollutant parameters (if applicable) parameters indicating the presence of pollutants identified in the pollutant source assessment required.
6. The QSP shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample.
7. The QSP shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis (for laboratory analysis, all sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136).
8. The QSP shall keep all field /or analytical data in the SWPPP document.

5.13 QUALITY ASSURANCE AND QUALITY CONTROL

The QSP or designee shall comply with the following minimum quality control measures while sampling:

1. Wear clean pair of surgical gloves prior to the collection and handling of each sample at each sample location;
2. Avoid contamination of the interior of the sample bottle; the QSP shall not allow it to come into contact with any material other than the water sample;
3. Avoid allowing rainwater to drip from rain gear or other surfaces into sample bottles;
4. Do not eat, smoke, or drink during sample collection;
5. Do not sneeze or cough in the direction of any open sample bottle;
6. Decontaminate sampling equipment prior to sample collection using a TSP-soapy water wash, distilled water rinse, and final rinse with distilled water.

5.14 NAL EXCEEDANCE REPORT

1. In the event that any effluent sample exceeds an applicable NAL, The QSP shall electronically submit all storm event sampling results to the SRWCB no later than 10 days after the conclusion of the storm event. The RWQCB have the authority to require the submittal of an NAL Exceedance Report.
2. The QSP shall certify each NAL Exceedance Report in accordance with the Special Provisions for Construction Activity.
3. The QSP shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three years after the date the annual report is filed.
4. The QSP shall include in the NAL Exceedance Report:
    a. The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as “less than the method detection limit”).
    b. The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.
    c. A description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

5.15 REPORTING REQUIREMENTS AND RECORD RETENTION

The QSP shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. Risk Level 2 dischargers shall retain all records on-site while construction is ongoing. These records include:

1. The date, place, time of facility inspections, sampling, visual observation, and/or measurements, including precipitation.
2. The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements.
3. The date and approximate time of analyses.
4. The individual(s) who performed the analyses.
5. A summary of all analytical results from the last three years, the method detection limits and reporting units, the analytical techniques or methods used, and the chain of custody forms.
6. Rain gauge readings from site inspections;
7. Quality assurance/quality control records and results.
8. Non-storm water discharge inspections and visual observation and storm water discharge visual observation records (see Sections 8.11 above).
9. Visual observation and sample collection exception records (see Section 8.6 above). The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation, or inspections.

Reports, including NAL, NEL, and Annual, should be submitted to via the SMARTS system.

5.16 WATERSHED MONITORING OPTION

This Section applies to sites that participate in a qualified regional watershed-based monitoring program.

Sites that participate in a qualified regional watershed-based monitoring program should describe their participation and the elements of the General Permit monitoring requirements that have been suspended by the RWQCB in lieu of the watershed monitoring. Include a copy of the RWQCB approval of the watershed monitoring program.

-The watershed monitoring option does not apply to the project site.-

APPENDICES

APPENDIX A

CONSTRUCTION GENERAL PERMIT

The 2022-0057-DWQ Construction General Permit can be downloaded from the State Water Resources Control Board.

(https://www.waterboards.ca.gov/water_issues/programs/stormwater/construction/general_permit_reissuance.html)

APPENDIX B

PERMIT REGISTRATION DOCUMENTS (PRDs):

NOTICE OF INTENT (NOI)

WDID CONFIRMATION

RISK LEVEL ASSESSMENT

ATTACHMENT D.1

RISK DETERMINATION WORKSHEET

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
GENERAL PERMIT FOR STORMWATER DISCHARGES ASSOCIATED
WITH CONSTRUCTION AND LAND DISTURBANCE ACTIVITIES
(GENERAL PERMIT)

The Risk Determination Worksheet in this Attachment serves as guidance for construction stormwater dischargers and may be used to manually calculate the site-specific risk of a construction project. Dischargers are required to submit risk information using the Stormwater Multiple Application and Report Tracking System (SMARTS) as part of filing a Notice of Intent for coverage under the Construction Stormwater General Permit.

Dischargers may use SMARTS to auto-populate values for the soil erodibility factor (K factor), length-slope factor (LS factor), and the receiving water risk (the risk sediment poses to receiving waters) based on the provided latitude and longitude coordinates for the project. SMARTS relies on the same data as the GIS map method, which dischargers can use to confirm the auto-populated values. Dischargers may alternatively use the individual method, a site-specific analysis, to determine the K factor, LS factor, and receiving water risk where GIS data may not accurately reflect the site's characteristics.

Dischargers may use a combination of the GIS map method or individual method to calculate the K factor, LS factor, sediment risk, and receiving water risk in steps 1 and 2, depending on which method is judged to be the most accurate for the site.

SMARTS will automatically determine the combined Risk Level based on the entered information.

Instructions:

Step 1 – Determine sediment risk via one of the following options:

- GIS Map Method - EPA Rainfall Erosivity Calculator & GIS Map
- Individual Method - EPA Rainfall Erosivity Calculator & Individual Data

Step 2 – Determine receiving water risk via one of the following options:

- GIS Map Method - GIS Map of Sediment-Sensitive Watersheds
- Individual Method - Provided Sediment Impaired Water Bodies

Step 3 – Determine combined Risk Level

Step 1 – Sediment Risk Worksheet

The Construction Stormwater General Permit requires dischargers to calculate sediment risk by multiplying the rainfall erosivity (R), soil erodibility (K), and length-slope (LS) factors. Determine the values for each of the factors and use the table below to assess the site-specific sediment risk for the construction project.

a. Rainfall Erosivity (R) Factor

Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-minute intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S.

A guide for the U.S. EPA Rainfall Erosivity Factor Calculator (https://www.waterboards.ca.gov/water_issues/programs/stormwater/smarts/construction/docs/rfactor_guide.pdf) is available to dischargers to assist with calculating the site-specific R factor.

R Factor Value = 6 months: 70.58

b. Soil Erodibility (K) Factor

The soil erodibility (K) factor represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff.

A soil erodibility nomograph is provided on page 4 to assist the discharger with determining the site-specific K factor.

K Factor Value = 0.32

c. Length-Slope (LS) Factor

The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases.

A length-slope table is provided on page 5 to assist the discharger with estimating the weighted LS factor for the site prior to construction.

LS Factor Value = 3.74

d. Watershed Erosion Estimate

Estimate watershed erosion by multiplying the R, K, and LS factors, then use the table below to determine the site-specific sediment risk for the project.

Watershed Erosion Estimate (tons/acre) = R x K x LS = 70.58 x 0.32 x 3.74 = 84.47

Watershed Erosion Estimate (tons/acre)	Site-Specific Sediment Risk
Less than 15 tons/acre	Low
Greater than or equal to 15 tons/acre and less than 75 tons/acre	Medium
Greater than or equal to 75 tons/acre	High

Site-specific Sediment Risk (High, Medium, or Low) = High

e. Sediment Risk GIS Map Method

In addition to the U.S. EPA Rainfall Erosivity Factor Calculator, State Water Board staff has prepared map tools to assist dischargers with estimating site-specific K and LS factors. Dischargers may use the map tools instead of manually determining the K and LS factors using the nomograph on page 4 and tables on page 5. Additionally, SMARTS is equipped with an auto-populate feature that can generate K and LS factors given the project latitude and longitude coordinates.

K Factor Map

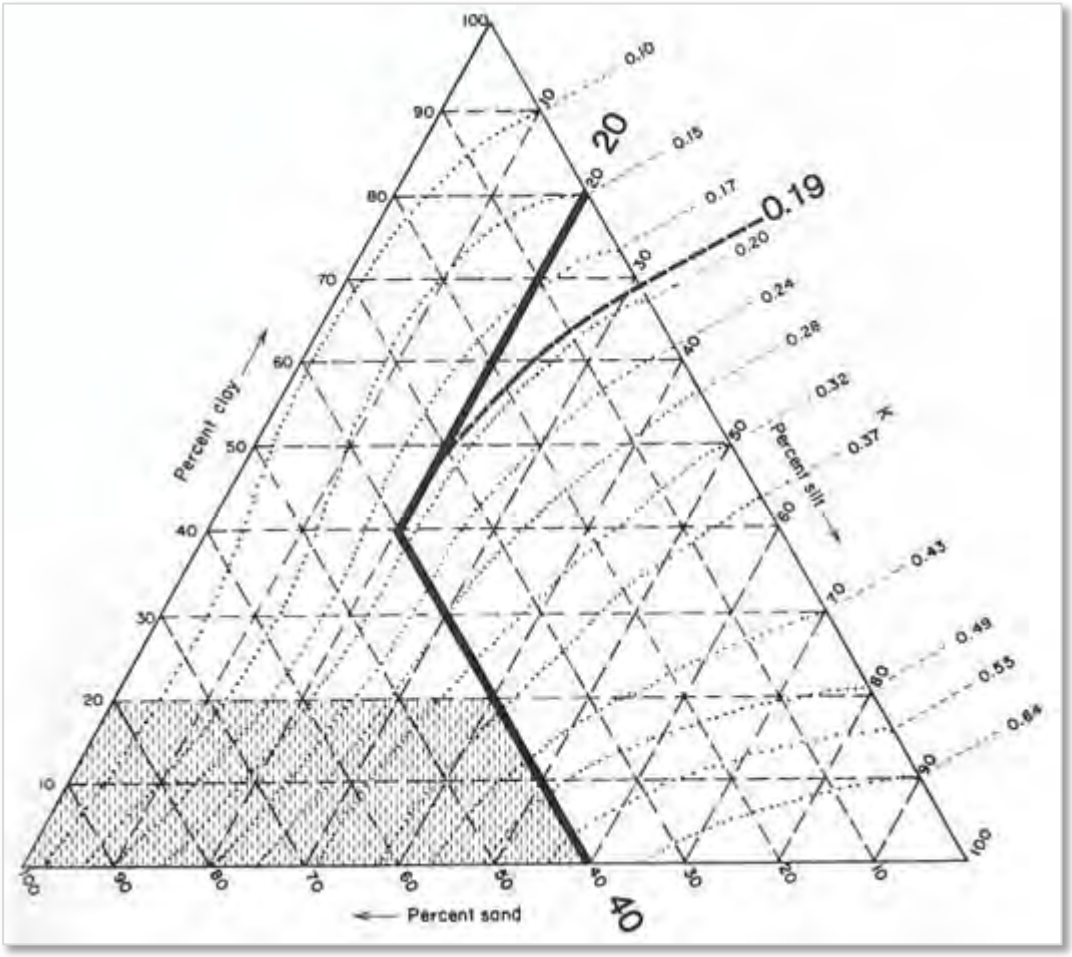
(https://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/constpermits/guidance/k_factor_map.pdf)

LS Factor Map

(https://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/constpermits/guidance/ls_factor_map.pdf)

Soil Erodibility (K) Factor Nomograph

The K factor can be determined by using the nomograph method, which requires that a particle size analysis (ASTM D-422)[1,2] be conducted to determine the percentages of sand, very fine sand, silt, and clay. Use the figure below to determine the appropriate K factor value.



The figure above is the Erickson triangular nomograph used by the USDA to determine the K factor for a soil based on its texture (percent silt plus very fine sand, percent sand, percent organic matter, soil structure, and permeability).

1 ASTM D-422 is the standard test method used for the quantitative determination of the distribution of particle sizes in soils.

2 Environmental Protection Agency, American Society for Testing and Materials (ASTM) Standards, <https://www.epa.gov/sites/default/files/2020-01/documents/sedc_2004-2005_append.pdf> [as of June 22, 2022]

Nomograph from Erickson 1977, as referenced in Goldman et. al., 1986.
Length-Slope (LS) Factor Table for Construction Sites

To determine a construction site's specific LS factor locate the intercept of the site's Sheet Flow Length (ft) and Average Watershed Slope (percent). Table from Renard et. al., 1997.

Sheet Flow Length (ft)	Average Watershed Slope (percent)									
	0.2	0.5	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0
< 3	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.35
6	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.37
9	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.38
12	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.39
15	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.40
25	0.05	0.07	0.10	0.16	0.21	0.26	0.31	0.36	0.45	0.57
50	0.05	0.08	0.13	0.21	0.30	0.38	0.46	0.54	0.70	0.91
75	0.05	0.08	0.14	0.25	0.36	0.47	0.58	0.69	0.91	1.20
100	0.05	0.09	0.15	0.28	0.41	0.55	0.68	0.82	1.10	1.46
150	0.05	0.09	0.17	0.33	0.50	0.68	0.86	1.05	1.43	1.88
200	0.06	0.10	0.18	0.37	0.57	0.79	1.02	1.25	1.72	2.34
250	0.06	0.10	0.19	0.40	0.64	0.89	1.16	1.43	1.99	2.72
300	0.06	0.10	0.20	0.43	0.69	0.98	1.28	1.60	2.24	3.09
400	0.06	0.11	0.22	0.48	0.80	1.14	1.51	1.90	2.70	3.75
600	0.06	0.12	0.24	0.56	0.96	1.42	1.91	2.43	3.52	4.95
800	0.06	0.12	0.26	0.63	1.10	1.65	2.25	2.89	4.24	6.03
1000	0.06	0.13	0.27	0.69	1.23	1.86	2.55	3.30	4.91	7.02

Sheet Flow Length (ft)	Average Watershed Slope (percent)								
	12.0	14.0	16.0	20.0	25.0	30.0	40.0	50.0	60.0
< 3	0.36	0.38	0.39	0.41	0.45	0.48	0.53	0.58	0.63
6	0.41	0.45	0.49	0.56	0.64	0.72	0.85	0.97	1.07
9	0.45	0.51	0.56	0.67	0.80	0.91	1.13	1.31	1.47
12	0.47	0.55	0.62	0.76	0.93	1.08	1.37	1.62	1.84
15	0.49	0.58	0.67	0.84	1.04	1.24	1.59	1.91	2.19
25	0.71	0.85	0.98	1.24	1.56	1.86	2.41	2.91	3.36
50	1.15	1.40	1.64	2.10	2.67	3.22	4.24	5.16	5.97
75	1.54	1.87	2.21	2.86	3.67	4.44	5.89	7.20	8.37
100	1.88	2.31	2.73	3.57	4.59	5.58	7.44	9.13	10.63
150	2.51	3.09	3.68	4.85	6.30	7.70	10.35	12.75	14.89
200	3.07	3.81	4.56	6.04	7.88	9.67	13.07	16.16	18.92
250	3.60	4.48	5.37	7.16	9.38	11.55	15.67	19.42	22.78
300	4.09	5.11	6.15	8.23	10.81	13.35	18.17	22.57	26.51
400	5.01	6.30	7.60	10.24	13.53	16.77	22.95	28.60	33.67
600	6.67	8.45	10.26	13.94	18.57	23.14	31.89	39.95	47.18
800	8.17	10.40	12.69	17.35	23.24	29.07	40.29	50.63	59.93
1000	9.57	12.23	14.96	20.57	27.66	34.71	48.29	60.84	72.15

Step 2 – Receiving Water Risk Worksheet

Receiving water risk is based on whether a project drains to a water body or watershed that is sediment-sensitive. If the answer to either question below is "yes", the project is considered a **high** receiving water risk. If the answer to both questions below is "no", the project is considered a **low** receiving water risk.

1. Does the disturbed area discharge (either directly or indirectly) to a 303(d)-listed water body impaired by sediment? For help with identifying impaired water bodies, please refer to the 2020 – 2022 California Integrated Report (Clean Water Act Section 303(d) - 305(b) Report) (https://www.waterboards.ca.gov/water_issues/programs/water_quality_assessment/2020_2022_integrated_report.html).

OR

2. Does the disturbed area discharge (either directly or indirectly) to a water body with designated beneficial uses of COLD, SPAWN, and MIGRATORY? For help with identifying designated beneficial uses, please refer to the appropriate Regional Water Quality Control Board Basin Plan below.

Region 1 – North Coast Basin Plan
(https://www.waterboards.ca.gov/northcoast/water_issues/programs/basin_plan/)

Region 2 – San Francisco Bay Basin Plan
(https://www.waterboards.ca.gov/sanfranciscobay/basin_planning.html#2010basinplan)

Region 3 – Central Coast Basin Plan
(https://www.waterboards.ca.gov/centralcoast/publications_forms/publications/basin_plan/index.html)

Region 4 – Los Angeles Basin Plan
(https://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/)

Region 5 – Central Valley Basin Plan[3]
(https://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/index.html)

Region 6 – Lahontan Basin Plan
(https://www.waterboards.ca.gov/lahontan/water_issues/programs/basin_plan/index.html)

Region 7 – Colorado River Basin Plan
(https://www.waterboards.ca.gov/coloradoriver/water_issues/programs/basin_planning/)

Region 8 – Santa Ana Basin Plan
(https://www.waterboards.ca.gov/santaana/water_issues/programs/basin_plan/index.html)

3 The Central Valley Basin Plan lists the COLD beneficial use designation as part of the SPAWN and MIGRATORY beneficial uses. Waterbodies will be considered high-risk receiving waters if listed as SPAWN (COLD) and MIGRATORY (COLD).

Region 9 – San Diego Basin Plan
(https://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.html)

Sediment-Sensitive Watershed GIS Map Method

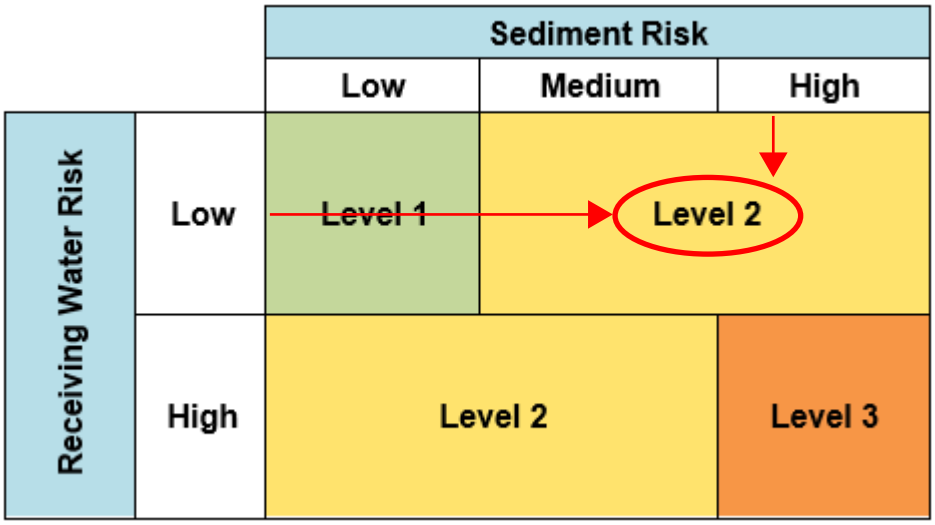
State Water Board staff has prepared a High-Risk Receiving Watershed Map tool (https://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/constpermits/guidance/receivingwaterrisk.pdf) to assist dischargers with determining site-specific receiving water risk. Additionally, SMARTS is equipped with an auto-populate feature that can determine the receiving water risk based on the project latitude and longitude coordinates. Projects located in the watersheds highlighted in red are considered high-risk. Please note that the map option may not reflect the correct receiving watershed, lacking site-specific drainage information.

The discharger is responsible for identifying the appropriate receiving water. If the project does not discharge to the watershed as depicted on the High-Risk Receiving Watershed Map, please contact the appropriate Regional Water Quality Control Board.

Site-Specific Receiving Water Risk (High or Low) = Low

Step 3 – Combined Risk Level Matrix

The below matrix is used to determine the combined Risk Level of the project, factoring in both sediment risk and receiving water risk.



Combined Risk Level (1, 2, or 3) = Level 2

Rainfall Erosivity Factor Calculator for Small Construction

Introduction

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 <https://www.epa.gov/npdes/submitting-notice-intent-noi-notice-termination-not-or-low-erosivity-waiver-lew-under>

- List of states, Indian country, and territories where EPA is the permitting authority (pdf) <https://www.epa.gov/system/files/documents/2022-01/2022-cgp-final-appendix-b-areas-of-permit-cover.pdf>
- Construction Rainfall Erosivity Waiver Fact Sheet <https://www.epa.gov/npdes/construction-rainfall-erosivity-waiver-fact-sheet>
- Small Construction Waivers and Instructions (pdf) <https://www.epa.gov/system/files/documents/2022-01/2022-cgp-final-appendix-c-waivers.pdf>

The R-factor calculation can also be integrated directly into custom applications using the R-Factor web service <https://epa.gov/api-docs/>.

Steps to Calculate an R Factor for your Small Construction Project

1 Select the estimated start and end dates of construction by clicking the calendar icons below and using the dropdown calendar. The period of construction activity begins at initial earth disturbance and ends with final stabilization.

Start Date:

10 / 15 / 2025

End Date:

04 / 15 / 2026

2 Locate your small construction project by entering the address in the search box or by clicking on the map.

Location:

37.860519, -122.487110

Search

Esri, USGS | County of Marin, California State Parks, Esri, TomTom, … Powered by Esri <http://www.esri.com/>

3 Click the "Calculate R Factor" button below.

Calculate R Factor

Facility Information

Start Date: 10/15/2025	**Latitude:** 37.8605
End Date: 04/15/2026	**Longitude:** -122.4871

Calculation Results

Rainfall erosivity factor (R Factor) = **70.58**

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) <https://www.epa.gov/system/files/

documents/2022-01/2022-cgp-final-appendix-b-areas-of-permit-cover.pdf>, you must submit a Notice of Intent (NOI) through the NPDES eReporting Tool (NeT) <https://www.epa.gov/npdes/submitting-notice-intent-noi-notice-termination-not-or-low-erosivity-waiver-lew-under>.Otherwise, you must seek coverage under your state's CGP.

For questions or comments, email EPA's CGP staff at cgp@epa.gov.

No FEAR Act Data <https://www.epa.gov/ocr/whistleblower-protections-epa-and-how-they-relate-non-disclosure-agreements-signed-epa>

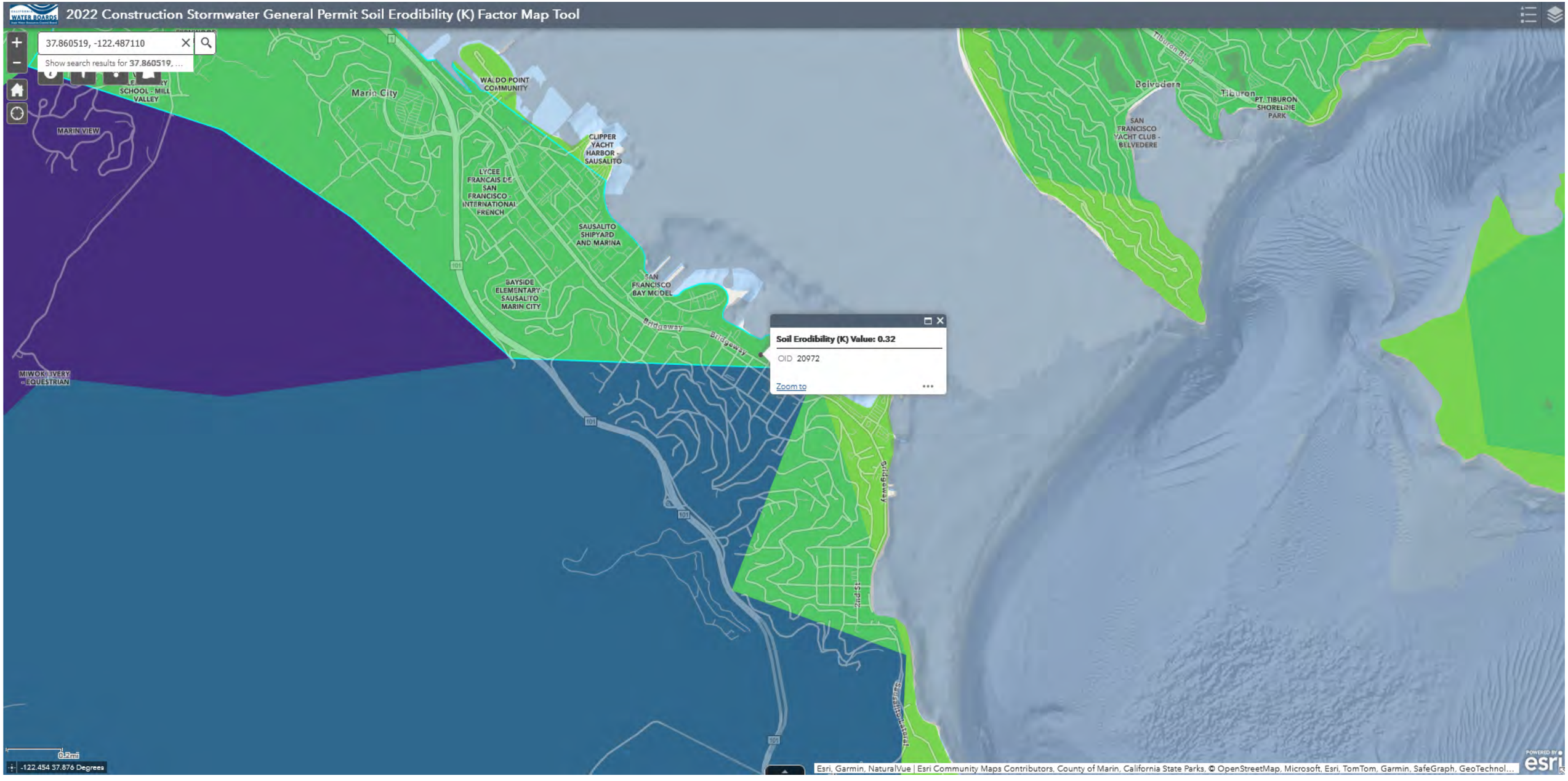
Plain Writing <https://www.epa.gov/web-policies-and-procedures/plain-writing>

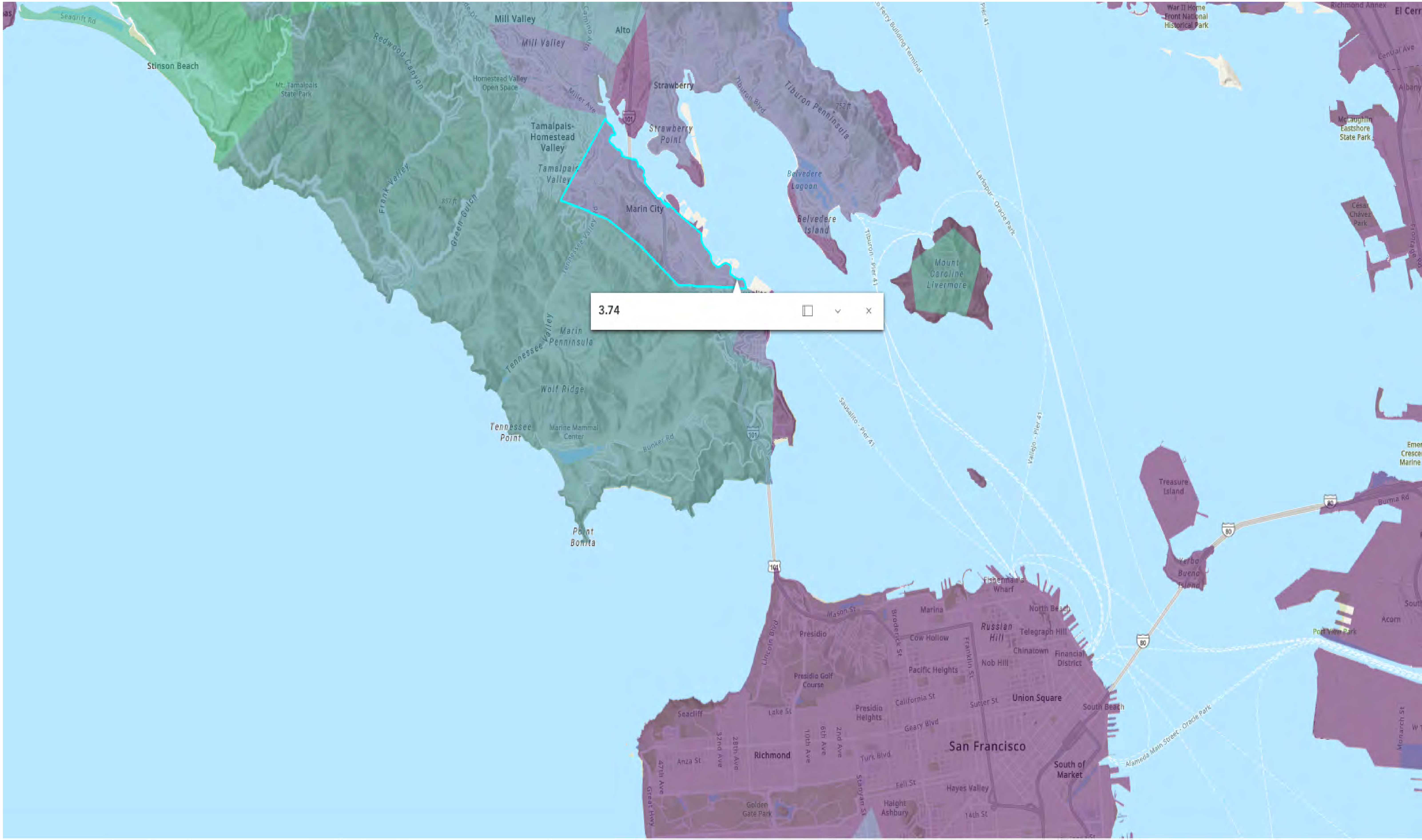
Privacy <https://www.epa.gov/privacy>

Privacy and Security Notice <https://www.epa.gov/privacy/privacy-and-security-notice>

White House <https://www.whitehouse.gov/>

Follow.


2022 Construction Stormwater General Permit Soil Erodibility (K) Factor Map Tool
37.860519, -122.487110
Show search results for 37.860519, ...
Marin City
WALDO POINT COMMUNITY
MARIN VIEW
CLIPPER YACHT HARBOR - SAUSALITO
LYCEE FRANCAIS DE SAN FRANCISCO - INTERNATIONAL FRENCH
SAUSALITO SHIPYARD AND MARINA
BAYSIDE ELEMENTARY - SAUSALITO MARIN CITY
SAN FRANCISCO BAY MODEL
Bridgeway
Belvedere
Tiburon
PT. TIBURON SHORELINE PARK
SAN FRANCISCO YACHT CLUB - BELVEDERE
MIWOK LIVERY - EQUESTRIAN
101
Soil Erodibility (K) Value: 0.32
OID 20972
Zoom to
-122.454 37.876 Degrees
Esri, Garmin, NaturalVue | Esri Community Maps Contributors, County of Marin, California State Parks, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnol...


3.74
Mill Valley
Alto
Strawberry
Strawberry Point
Stinson Beach
Tamalpais-Homestead Valley
Marin City
Tiburon Peninsula
Belvedere Lagoon
Belvedere Island
Mount Caroline Livermore
Marin Peninsula
Wolf Ridge
Tennessee Point
Point Bonita
Treasure Island
Yerba Buena Island
Presidio
Marina
Russian Hill
North Beach
Telegraph Hill
Chinatown
Financial District
Nob Hill
Pacific Heights
Cow Hollow
Union Square
South Beach
San Francisco
South of Market
Hayes Valley
Haight Ashbury
Richmond
Seacliff
Presidio Heights
Golden Gate Park
El Cerrito
Richmond Annex
Albany Hill
Acorn

National Map of Regulated MS4s

APPENDIX C

SWPPP AMENDMENT LOG

Amend.No.	Location	Description	Reason	Sections Amended	By	Date

APPENDIX D

CHANGES TO PRDs

Log of Updated PRDs

The 2022 CGP allows for the reduction or increase of the total acreage 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.

A Change of Information (COI) shall be filed electronically within the timeframe shown in the table below. The SWPPP shall be modified appropriately, with revisions and amendments recorded in the SWPPP Amendment Log at the front of the SWPPP. COIs submitted electronically via SMARTS can be found in this Appendix.

Reason for Filing COI	**Timeline for Filing COI**
Reduction or increase in total disturbed area	Within 30 days of the reduction or increase
Updating site specific BMPs	Within 14 days of design change
Change construction start or end date	At least 14 days prior to the date to be changed
Post-construction plans updated or approved by the municipal stormwater permittee	Within 14 days of approval

---

This appendix includes all of the following updated PRDs (check all that apply):

☐ Change of Information;

☐ Revised Site Map;

☐ Revised Risk Assessment;

☐ New landowner's information (name, address, phone number, email address); and

☐ New signed certification statement.

Signature of [Authorized Representative of] Legally Responsible Person or Duly Authorized Representative	Date
Name of [Authorized Representative of] Legally Responsible Person or Duly Authorized Representative	Telephone Number

APPENDIX E

CONSTRUCTION SCHEDULE

Approximate Construction Schedule as of Date of Preparation of this SWPPP:

PHASE OF CONSTRUCTION	APPROXIMATE BEGIN DATE	APPROXIMATE END DATE
Pre-Construction/Project Kick-off	October 15, 2025	
Final Stabilization		April 15, 2026

Updates:

APPENDIX F

CONSTRUCTION ACTIVITIES, MATERIALS USED AND ASSOCIATED POLLUTANTS

The QSP shall maintain a current list of all activities, materials and associated pollutants at all times during construction.

Table F.1 Pollutant Source Assessment Form

Phase	Activity	Associated Materials or Pollutants	Pollutant Category (1)
Demolition and Pre- Development Site Preparation Phase	Removal of existing structures	Demolition of asphalt, concrete, masonry, framing, roofing, metal structures.	Metals, Oil and Grease, Synthetic Organics
	Treated Wood	Copper, Arsenic, and Selenium	Metals
Grading and Land Development	Vehicle and equipment use	Equipment operation, Equipment maintenance, Equipment fueling	Oil and Grease
	Sanitary waste	Portable toilets, Disturbance of existing sewer lines	Nutrients
	Solid waste	Litter, trash and debris, Vegetation	Gross Pollutants
	Liquid waste	Wash waters, Irrigation line testing/flushing	Metals, Synthetic Organics
	Concrete / Masonry	Acid Wash, Cement and brick dust, Colored chalks, Concrete curing compounds, Glazing compounds, Surfaces cleaners, Saw cut slurries, Tile cutting	Metals, Synthetic Organics
	Utility line testing and flushing	Hydrostatic test water, Pipe flushing	Synthetic Organics
	Soil Amendments & Dust Control	Lime, Gypsum, Plant Gums, Magnesium Chloride, Natural Brines, and Lignosulfonates	Sediment & Synthetic Organics
Streets and Utilities Phase	Asphalt Paving	Hot and Cold Mix Asphalt	Oil & Grease
	Adhesives	PVC Cement	Synthetic Organics
Vertical Construction Phase	Construction – Trash, Debris and Floatables	Bacteria, Viruses, Vectors, Depressed Dissolved Oxygen Levels	Bacteria, Viruses, & Gross Pollutants
	Drywall	Sawcutting Drywall	Metals
	Adhesives	Adhesives, Glues, Resins, Epoxy Synthetics, PVC Cement, Caulks, Scalers, Putty, Sealing Agents, Coal Tars (Naptha, Pitch)	Oil and Grease, & Synthetic Organics

	Plumbing	Solder (Lead, Tin), Flux (Zinc Chloride), Pipe Fitting, Galvanized Metal in Nails, Fences, and Electric Wiring	Metals & Synthetic Organics
	Insulation	Airbone Dust & VOCs	Synthetic Organics
	Roofing	Flashing, Sawcut Slurries, Shingle Scrap, and Debris	Metal, Oil and Grease, & Synthetic Organics
	Painting	Resins, Thinners, Paint Strippers, Solvents, Adhesives, and Sealents	Synthetic Organics
Final Landscaping and Site Stabilization	Landscaping	Pesticides, Herbicides, Fertilizers, Lime and Gypsum, Aluminum Sulfate, & Sulfer	Metals, Nutrients, Synthetic Organics, & Pesticides
	Weed Control	Pesticides	Nutrients & Pesticides

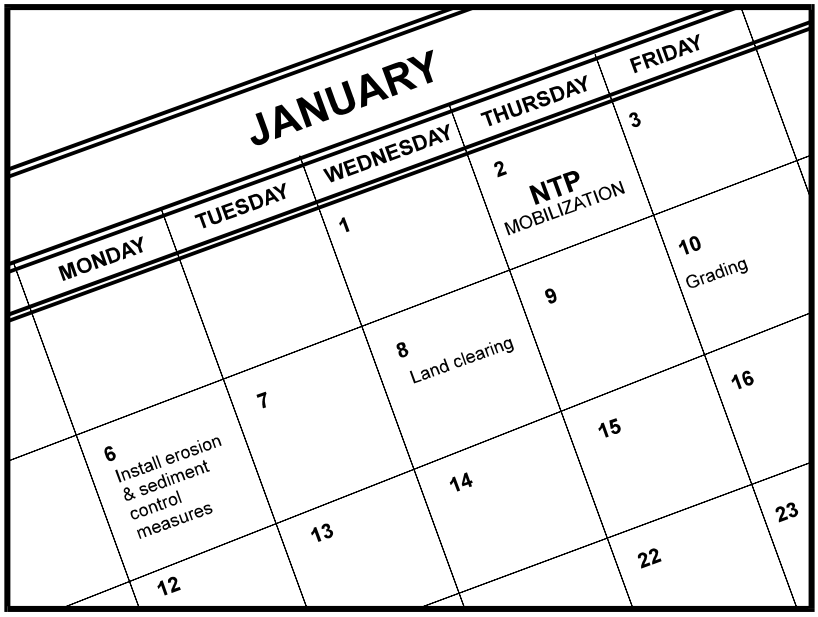
(1) Categories per CASQA BMP Handbook (i.e., Sediment, Nutrients, Bacteria and Viruses, Oil and Grease, Metals, Synthetic Organics, Pesticides, Gross Pollutants, and Vector Production)

APPENDIX G

CASQA BMP HANDBOOK FACT SHEETS

Additional CASQA BMP fact sheets can be downloaded at www.casqa.org

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.
- Avoid soil disturbance during periods with high wind velocities.

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.

Inspection and Maintenance

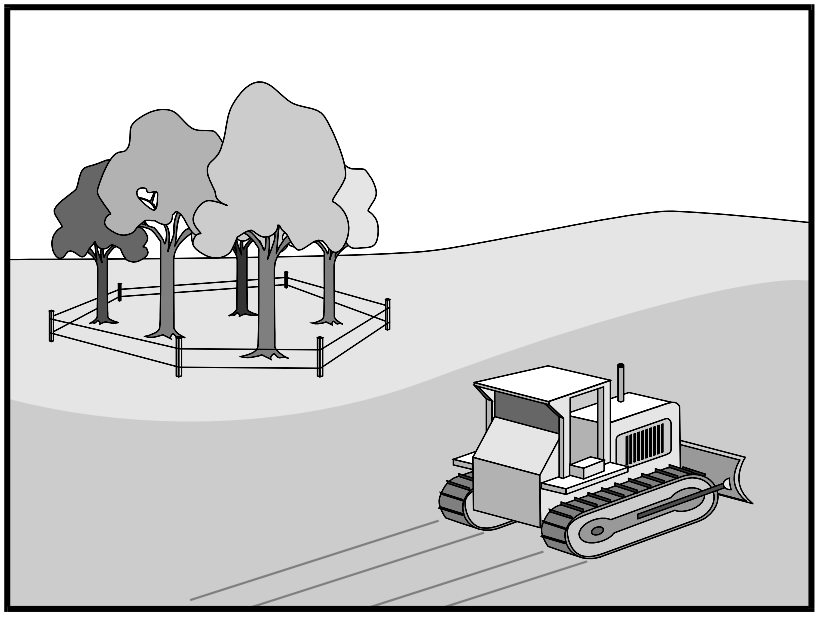
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

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	
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

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.
- Protecting existing vegetation buffers and swales.

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.

- Consider pruning or mowing vegetation instead of removing it to allow for regrowth.
- If possible, retain vegetation buffer around the site and adjacent waterways.

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 trees in the late fall or early spring. Although to note, many native species do not require fertilization.

- 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

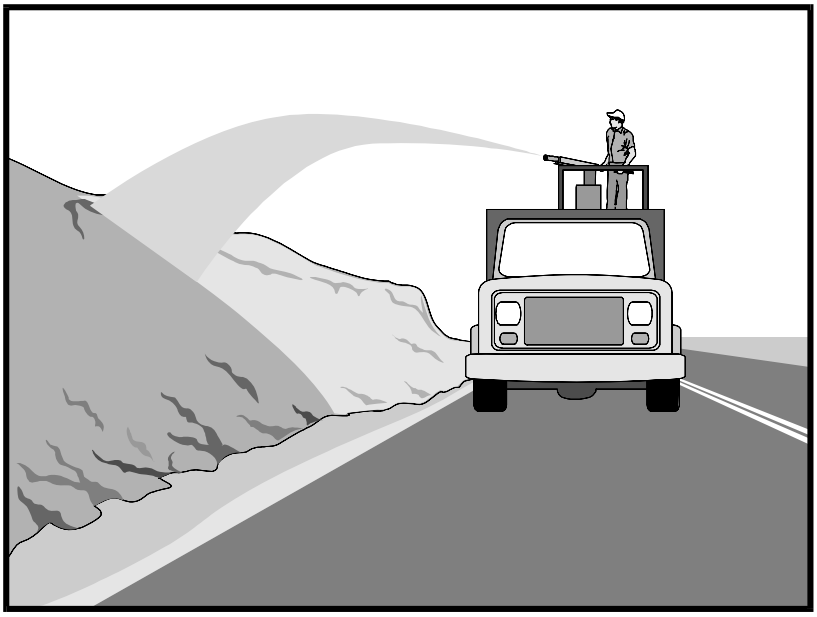
County of Sacramento Tree Preservation Ordinance, September 1981.

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		
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-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.
- To stabilize earthen berms
- Areas seeded by broadcasting or drilling

- Temporary stabilization during high wind conditions

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, compost, 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 Safety Data Sheet (may not include ecological information); products should be evaluated for project-specific implementation by the SWPPP Preparer. Refer to factsheet EC-05 for further guidance on selecting soil binders.
- A water supply is needed to refill hydro mulch equipment tank.
- Cannot be disturbed by walking or driving on the surface after application.
- Recommend using in conjunction with other BMPs (i.e., fiber rolls, etc.).

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.
- 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 lbs. 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 (paper- or corn-based)
  - Wood fibers
  - Cotton
  - Synthetics
  - Compost (see EC-14, Compost Blanket)
  - Straw

- 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 lbs. 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 lbs. 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- or polymer-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. per 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.

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. An 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
HYDRAULIC MULCH BMPs
INSTALLED COSTS

BMP	Installed Cost/Acre
Standard Hydraulic Mulching (SM)	$2,100 - $4,700 per acre
Hydraulic Matrices (HM) and Stabilized Fiber Matrices	
Guar-based	$2,600 - $5,200 per acre
PAM-based	$3,200 - $7,200 per acre
Bonded Fiber Matrix (BFM)	$5,000 - $8,800 per acre
Hydraulic Compost Matrix (HCM)	$3,800 - $4,500 per acre

Source: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004). Adjusted for inflation (2016 dollars) by Tetra Tech, Inc.

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.

Sedimentation and Erosion Control, an Inventory of Current Practices Draft, US EPA, April 1990.

Soil Erosion by Water, Agriculture Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

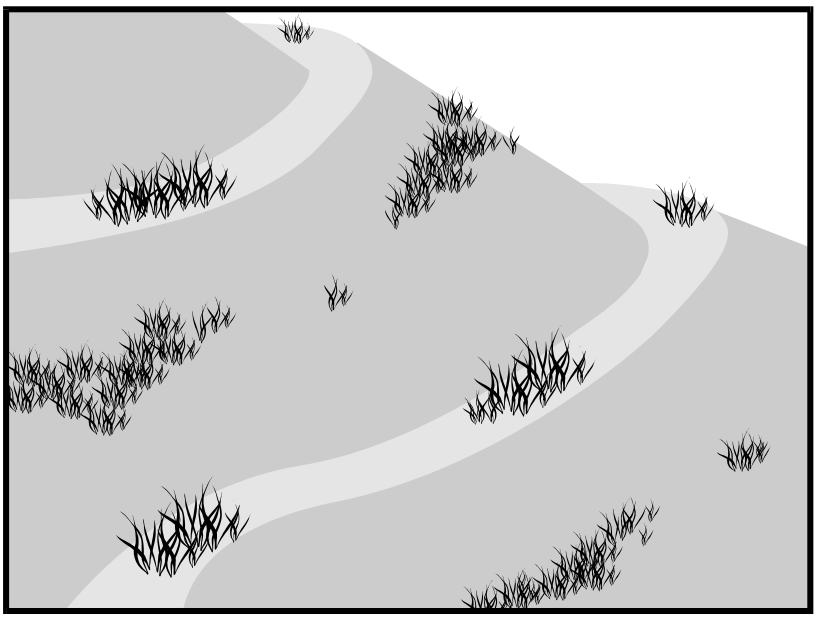
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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, and water with the possible addition of tackifier, compost, mycorrhizae inoculant, fertilizer, and/or soil conditioner, 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 and temporary erosion control is established by means of the mulch component.

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, Geotextiles and Mats) 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.
- To vegetate swales and earthen berms.

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

- Areas not subject to heavy wear by construction equipment or high traffic.

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).
- Vegetation may not establish when hydroseed is applied to very compact soils.
- Mulch may inhibit germination when applied at high rates.
- 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's Safety Data Sheet (SDS), although, note that not all SDS's provide ecological information; products should be evaluated for project-specific implementation by the QSD. Refer to fact sheet EC-05, Soil Binders, 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

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.

Costs

Average cost for installation and maintenance may vary from as low as $2,400 per acre for flat slopes and stable soils, to $5,200 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	$2,400-$5,200

Source: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004). Adjusted for inflation (2016 dollars) by Tetra Tech, Inc.

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.

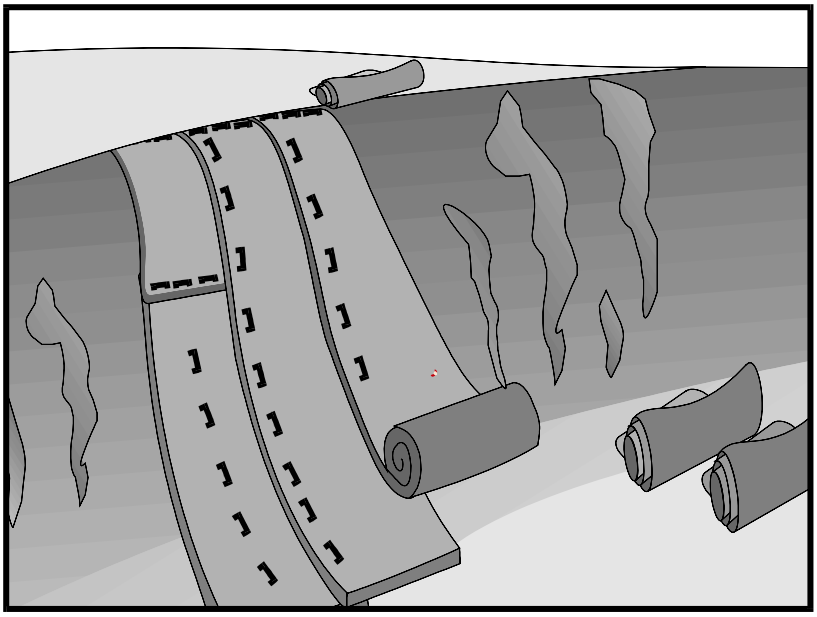
References

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.

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

Rolled Erosion Control Products (RECPs), also known as erosion control matting or blankets, 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).
- Long slopes.
- Slopes where the erosion potential is high.
- Slopes and disturbed soils where mulch must be anchored.

- Disturbed areas where temporary cover is needed, or plants are slow to establish or will not establish.
- 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 and/or sunlight.
- 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 sheeting should be limited to covering stockpiles or very small graded areas for short periods of time (such as through one imminent storm event) until other 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.
- According to the State Water Board's *CGP Review, Issue #2*, only RECPs that either do not contain plastic netting or contain netting manufactured from 100% biodegradable non-plastic materials, such as jute, sisal, or coir fiber should be used due to plastic pollution and wildlife concerns. If a plastic-netted product is used for temporary stabilization, it must be promptly removed when no longer needed and removed or replaced with non-plastic netted RECPs for final stabilization.
- 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. As per State Water Board guidance, RECPs that

contain plastic netting are discouraged for temporary controls and are not acceptable alternatives for permanent controls. RECPs that do not contain plastic netting or contain netting manufactured from 100% biodegradable non-plastic materials such as jute, sisal, or coir fiber should be used.

- RECPs may have limitations in extremely windy climates; they are susceptible to wind damage and displacement. 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.

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. Only biodegradable RECPs can remain on a site applying for a Notice of Termination due to plastic pollution and wild life concerns (State Waterboard, 2016). RECPs containing plastic that are used on a site must be disposed of for final stabilization.

  - **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 geometric 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
Biodegradable	Jute Mesh	$7,700-$9,000
	Curled Wood Fiber	$10,200-$13,400
	Straw	$10,200-$13,400
	Wood Fiber	$10,200-$13,400
	Coconut Fiber	$16,600-$18,000
	Coconut Fiber Mesh	$38,400-$42,200
	Straw Coconut Fiber	$12,800-$15,400
Non-Biodegradable	Plastic Netting	$2,600-$2,800
	Plastic Mesh	$3,800-$4,500
	Synthetic Fiber with Netting	$43,500-$51,200
	Bonded Synthetic Fibers	$57,600-$70,400
	Combination with Biodegradable	$38,400-$46,100

Source: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004). Adjusted for inflation (2016 dollars) by Tetra Tech, Inc.

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

CGP Review #2, State Water Resources Control Board, 2014. Available online at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/training/cgp_review_issue2.pdf.

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.

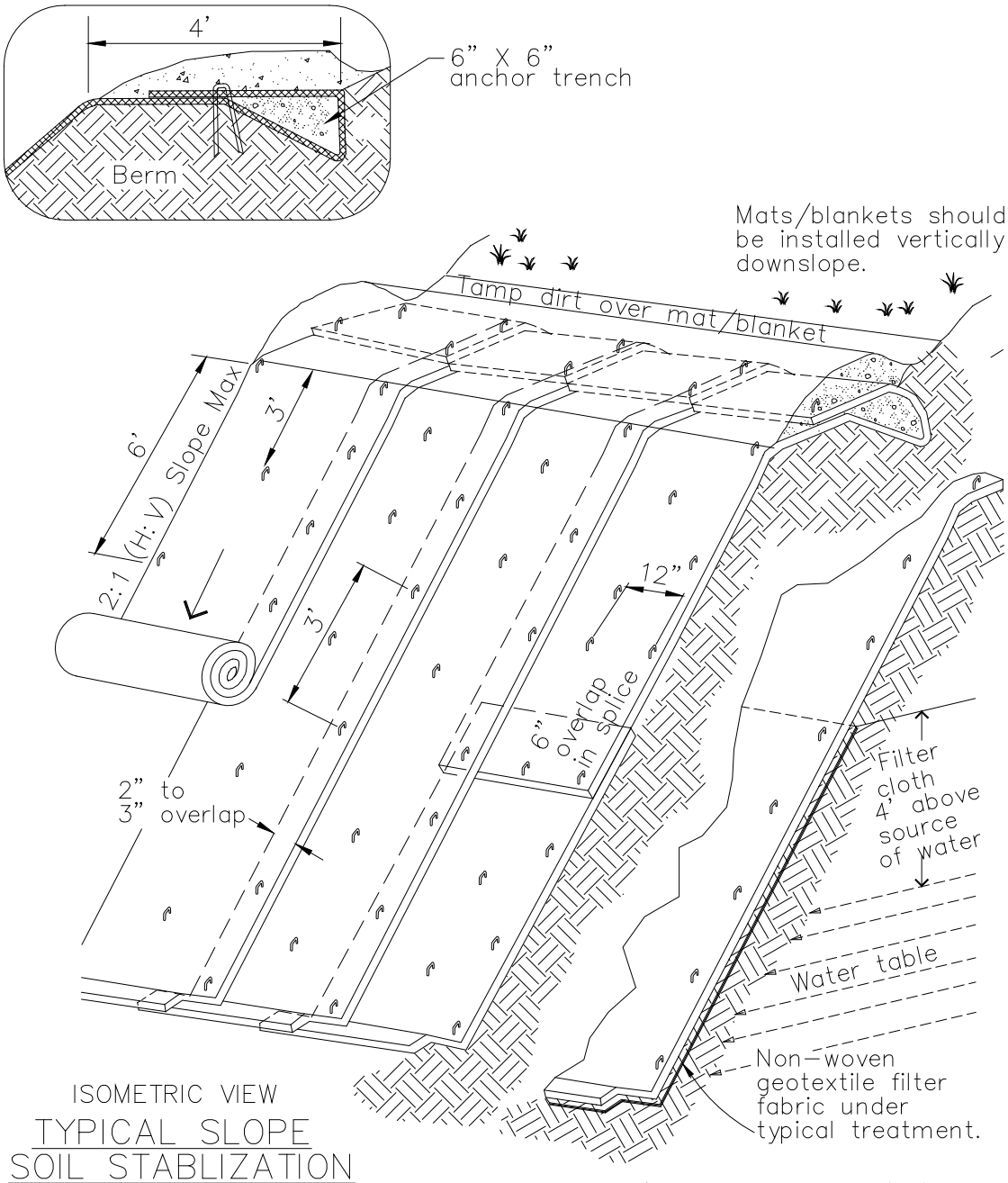
National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

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.



ISOMETRIC VIEW

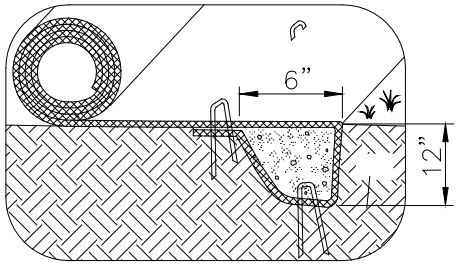
TYPICAL SLOPE
SOIL STABLIZATION
NTS

WET SLOPE LINING
NTS

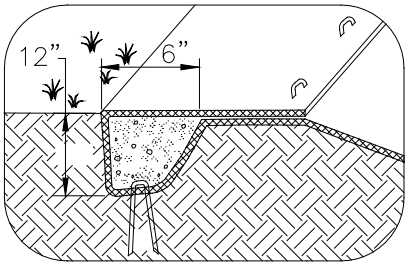
NOTES:

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

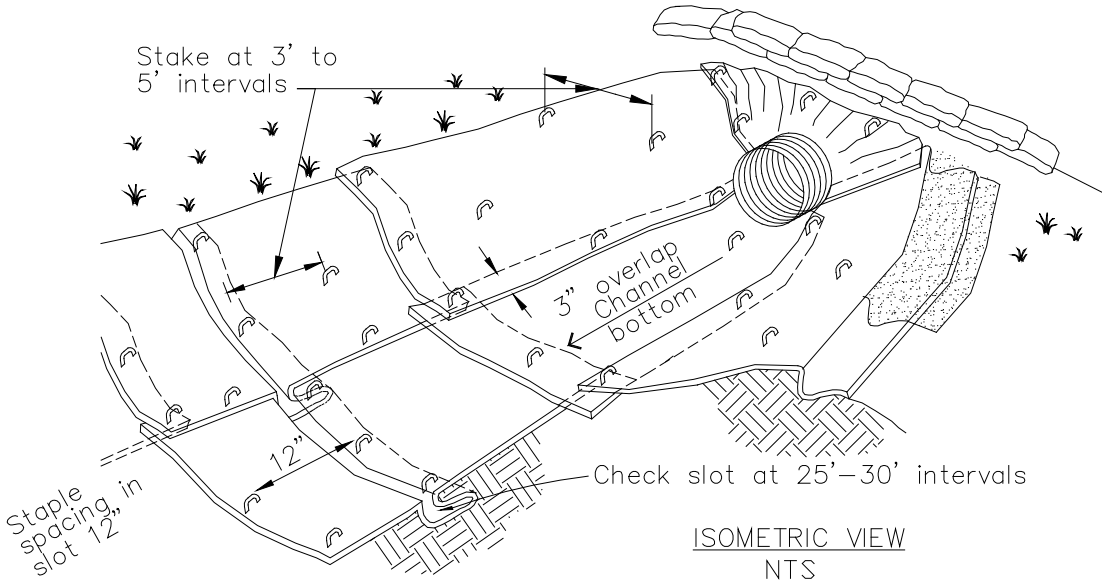
TYPICAL INSTALLATION DETAIL



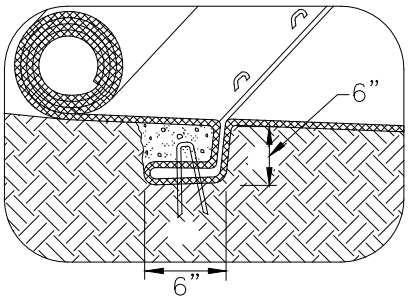
INITIAL CHANNEL ANCHOR TRENCH
NTS



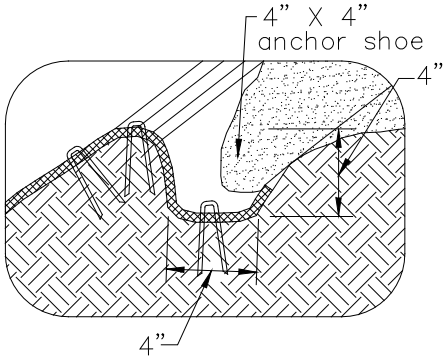
TERMINAL SLOPE AND CHANNEL ANCHOR TRENCH
NTS



ISOMETRIC VIEW
NTS



INTERMITTENT CHECK SLOT
NTS

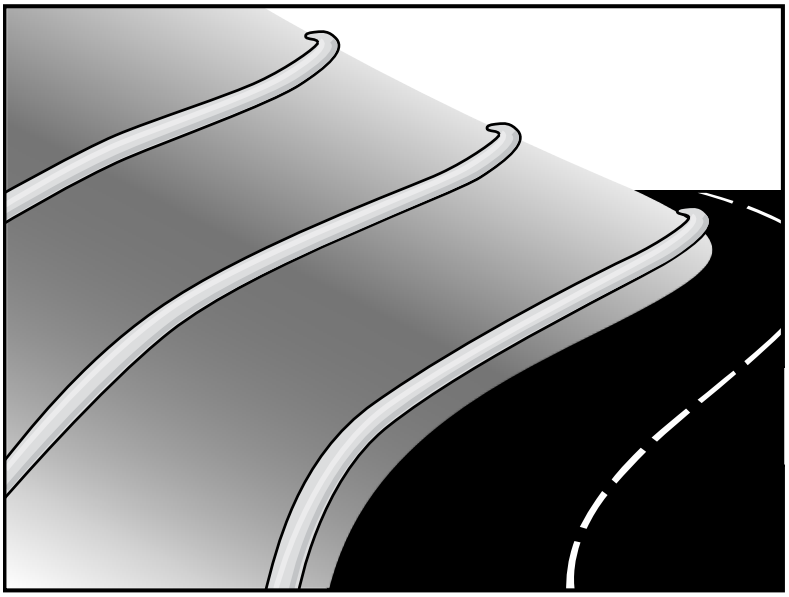


LONGITUDINAL ANCHOR TRENCH
NTS

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

Fiber Rolls SE-5



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 fiber roll (also known as wattles or logs) consists of straw, coir, curled wood fiber, or other biodegradable materials bound into a tight tubular roll wrapped by plastic netting, which can be photodegradable, or natural fiber, such as jute, cotton, or sisal. 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.

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

- At operational storm drains as a form of inlet protection.
- Around temporary stockpiles.

Limitations

- Fiber rolls should be used in conjunction with erosion control, such as hydroseed, RECPs, etc.
- Only biodegradable fiber rolls containing no plastic can remain on a site applying for a Notice of Termination due to plastic pollution and wildlife concerns (State Water Board, 2016). Fiber rolls containing plastic that are used on a site must be disposed of for final stabilization.
- Fiber rolls are not effective unless trenched in and staked. If not properly staked and trenched in, fiber rolls will not work as intended and could be transported by high flows.
- Not intended for use in high flow situations (i.e., for concentrated flows).
- Difficult to move once saturated.
- Fiber rolls have a 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 and roll material.

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, curled wood fiber, or coir bound into a tight tubular roll by netting or natural fiber (see *Limitations* above regarding plastic netting).
- Typical fiber rolls vary in diameter from 6 in. to 20 in. Larger diameter rolls are available as well. The larger the roll, the higher the sediment retention capacity.
- Typical fiber rolls lengths are 4, 10, 20 and 25 ft., although other lengths are likely available.

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). Fiber rolls encased with plastic netting or containing any plastic material will need to be removed from the site for final stabilization. Fiber rolls used in a permanent application are to be encased with a non-plastic material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance; therefore, during the BMP planning phase, the areas where fiber rolls will be used on final slopes, only fiber rolls wrapped in non-plastic material should be selected.

- 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 straw fiber rolls range from $26 - $38 per 25-ft. roll[1] and curled wood fiber rolls range from $30 - $40 per roll[2].

Material costs for PAM impregnated fiber rolls range between $9.00-$12.00 per linear foot, based upon vendor research[1] .

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.

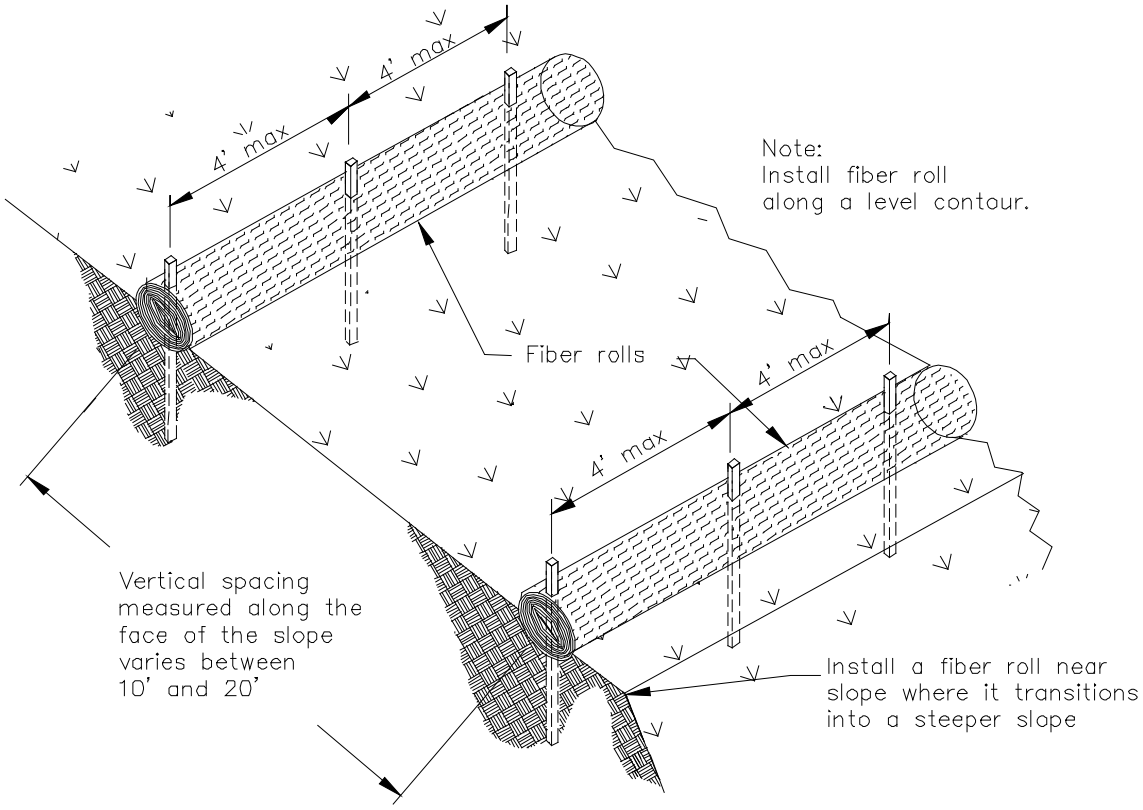
References

General Construction – Frequently Asked Questions, Storm Water Program website, State Water Resources Control Board, 2009 updated in 2016. Available online at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/gen_const_faq.shtml.

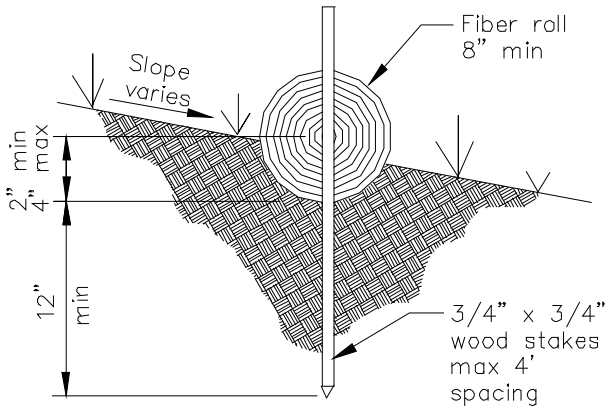
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

[1] Adjusted for inflation (2016 dollars) by Tetra Tech, Inc.
[2] Costs estimated based on vendor query by Tetra Tech, Inc. 2016.

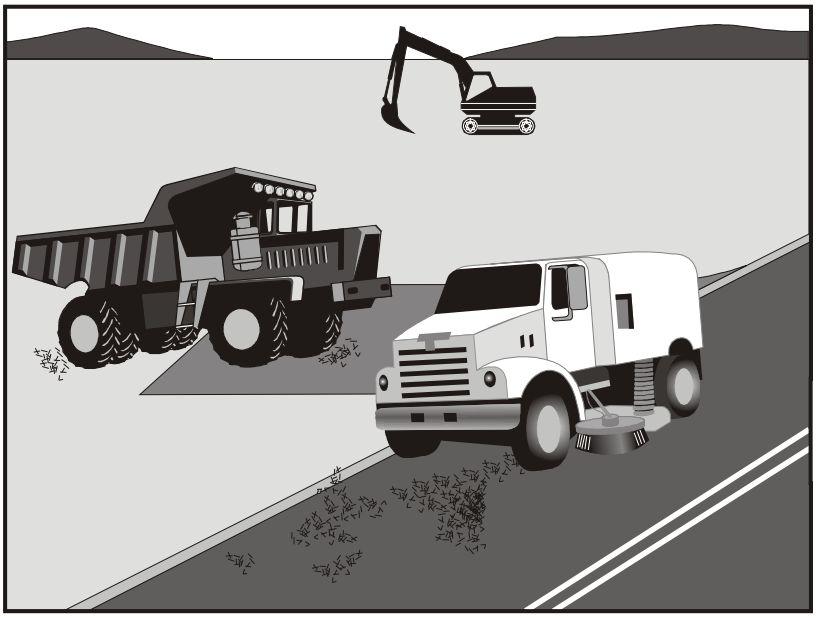


TYPICAL FIBER ROLL INSTALLATION
N.T.S.



ENTRENCHMENT DETAIL
N.T.S.

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).
- Sweeping may be less effective for fine particle soils (i.e., clay).

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.
- 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 $ 650/day to $2,500/day[1], 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

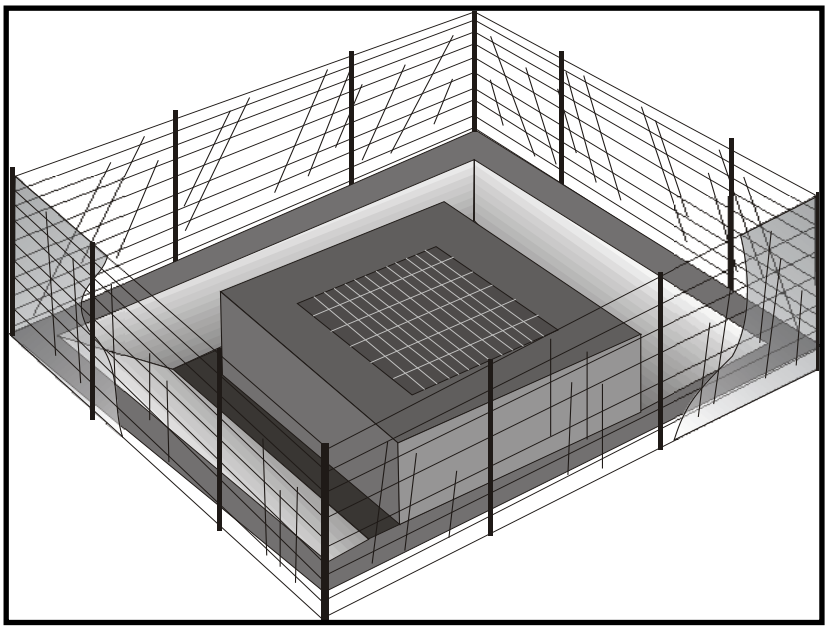
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in 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.

[1] Based on contractor query conducted by Tetra Tech, Inc. November 2016.

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.

- 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.

- ***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.

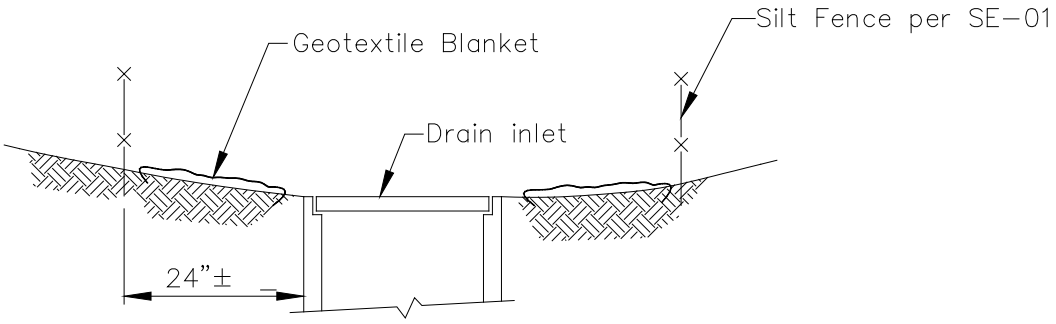
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Inspect and maintain temporary geotextile insert devices according to manufacturer's specifications.
- 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

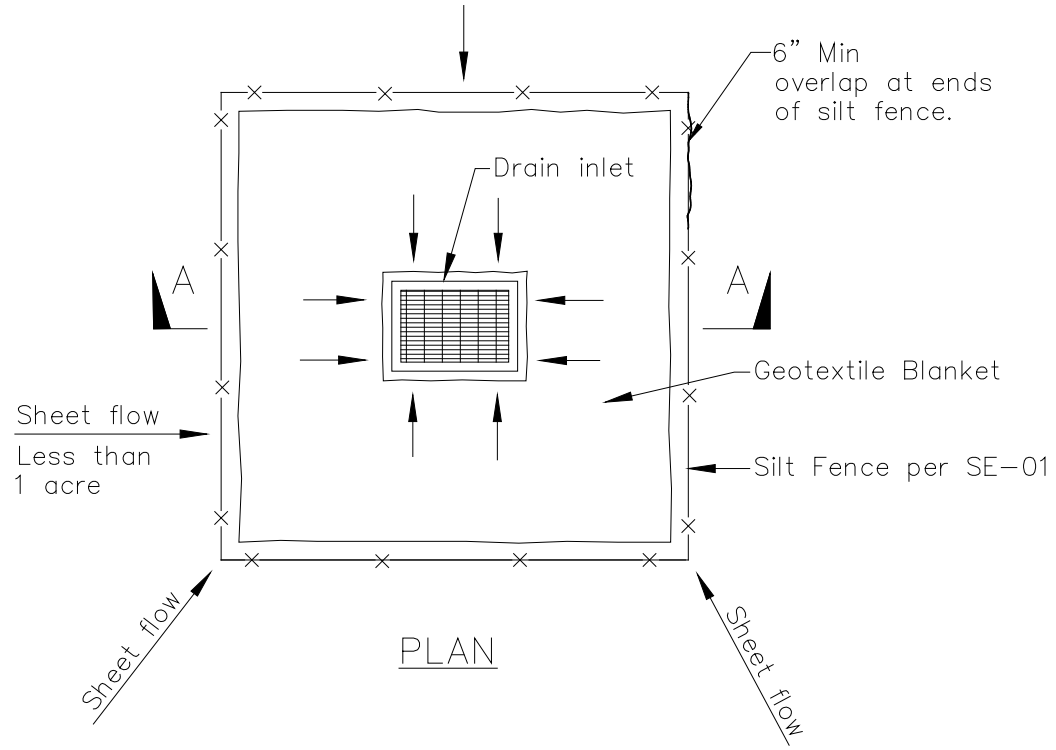
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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.



SECTION A–A

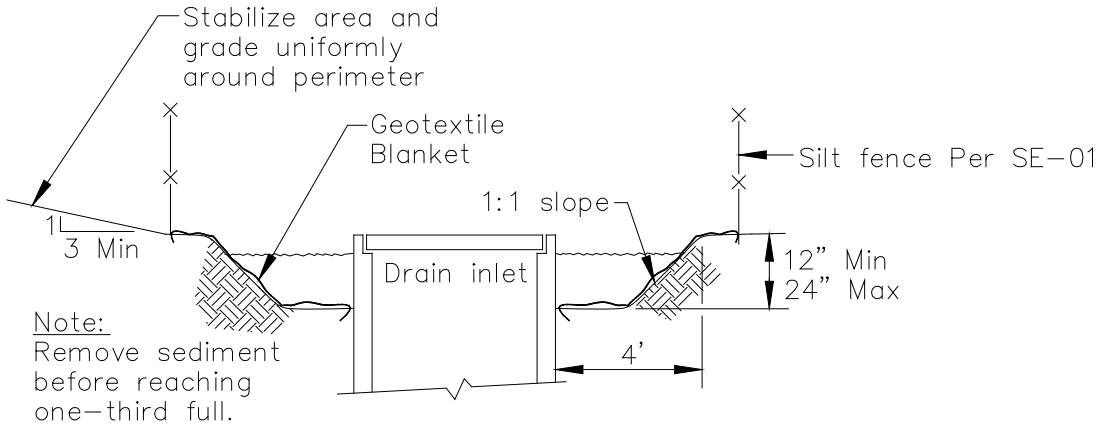


PLAN

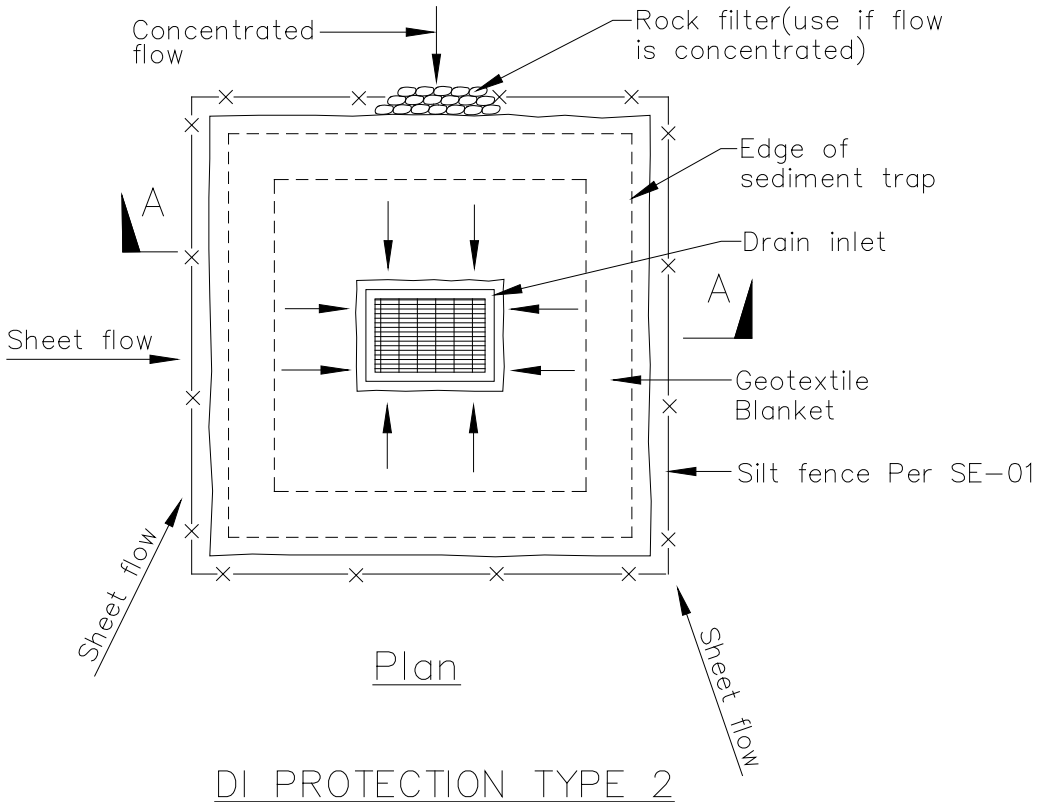
DI PROTECTION TYPE 1
NOT TO SCALE

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.



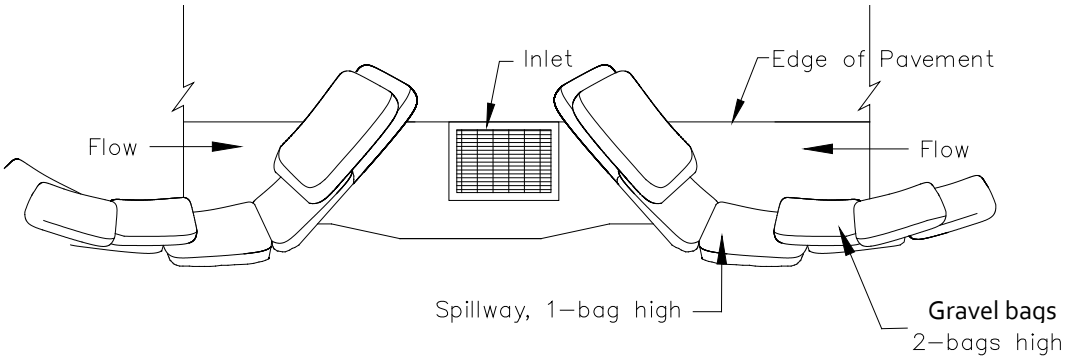
Section A–A



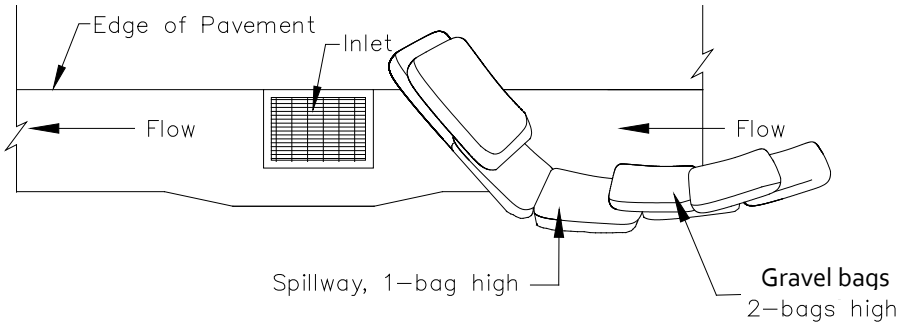
Plan

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.



TYPICAL PROTECTION FOR INLET ON SUMP

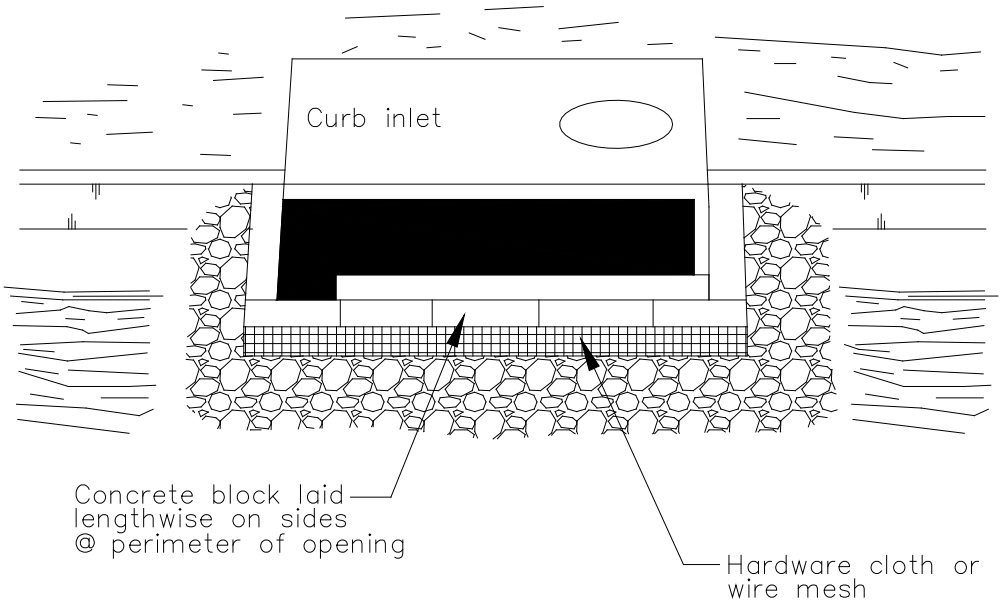


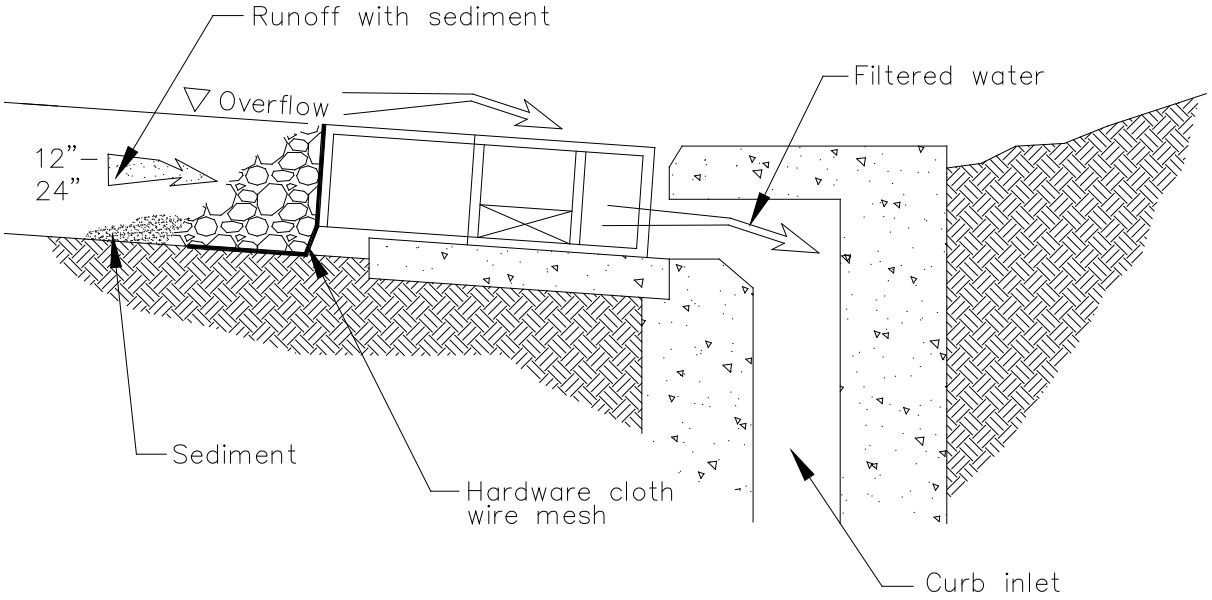
TYPICAL PROTECTION FOR INLET ON GRADE

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.

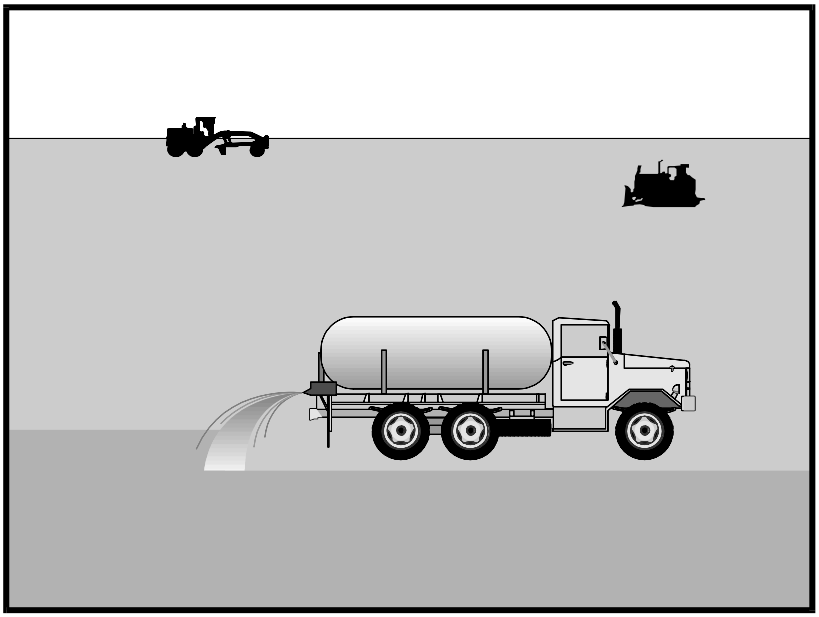
DI PROTECTION TYPE 3
NOT TO SCALE





DI PROTECTION – TYPE 4
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.

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, vinyl, acrylic), clay additives (e.g. bentonite, montmorillonite) 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.

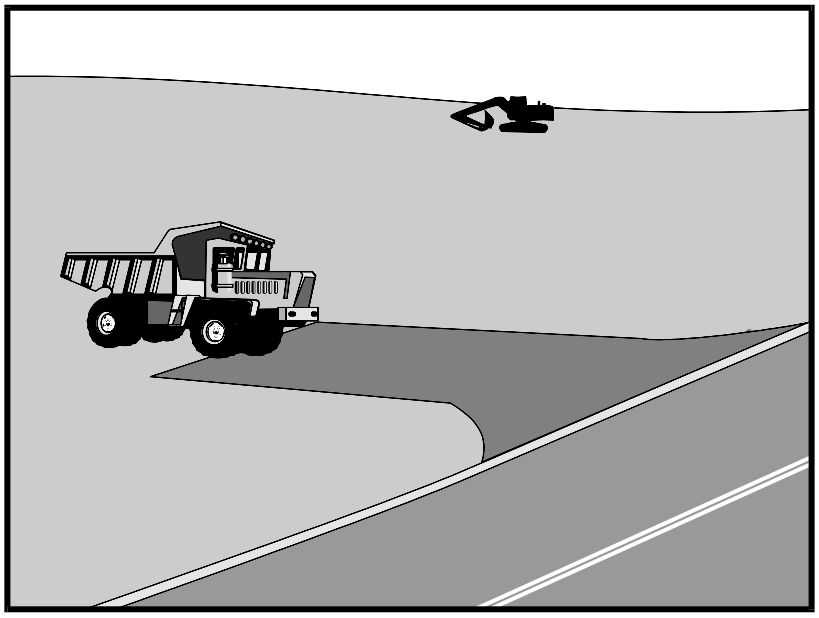
California Air Pollution Control Laws, California Air Resources Board, updated annually.

Construction Manual, Chapter 4, Section 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative", California Department of Transportation (Caltrans), July 2001.

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.

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

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

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.

- 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 $1,500 to $6,100 each, averaging $3,100 per entrance. Costs will increase with addition of washing rack and sediment trap. With wash rack, costs range from $1,500 - $7,700 each, averaging $4,600 per entrance (All costs adjusted for inflation, 2016 dollars, by Tetra Tech Inc.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

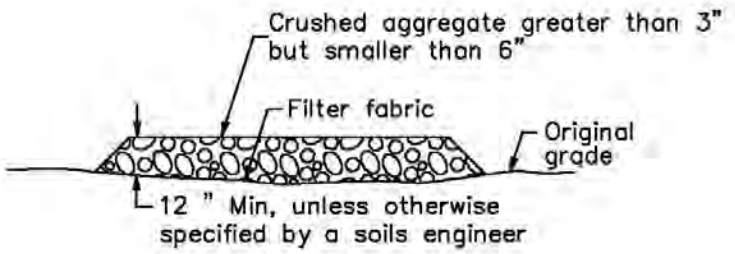
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

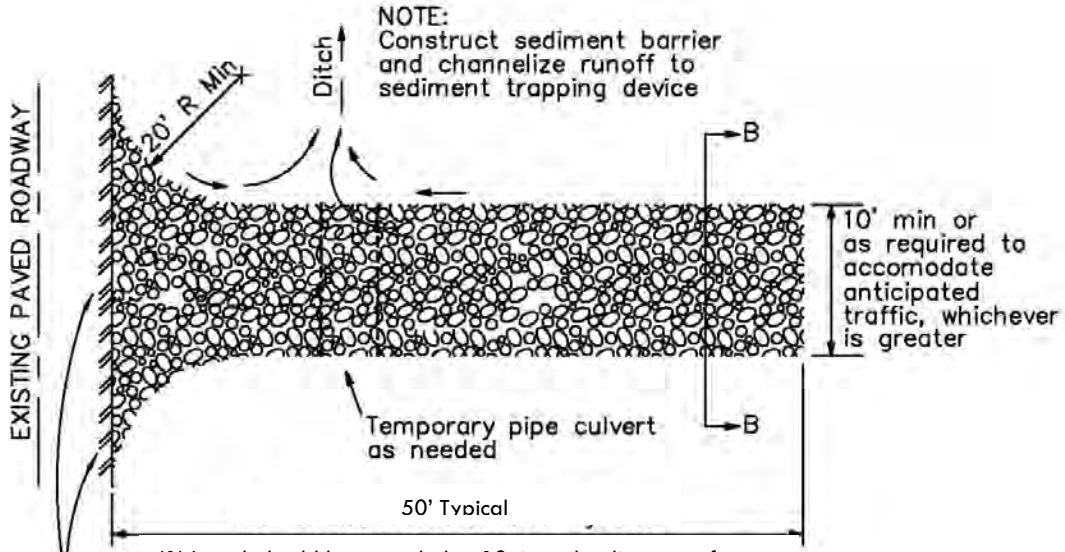
Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

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



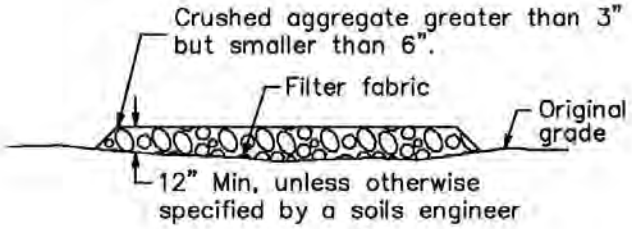
SECTION B–B
NTS



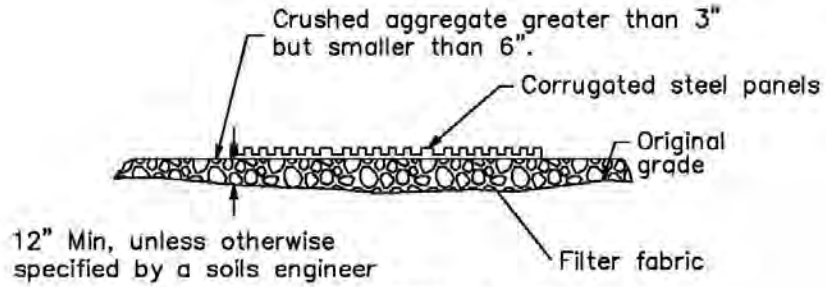
(1) Length should be extended to 12 times the diameter of the largest construction vehicle tire.
(2) On small sites length should be the maximum allowed by site.

PLAN
NTS

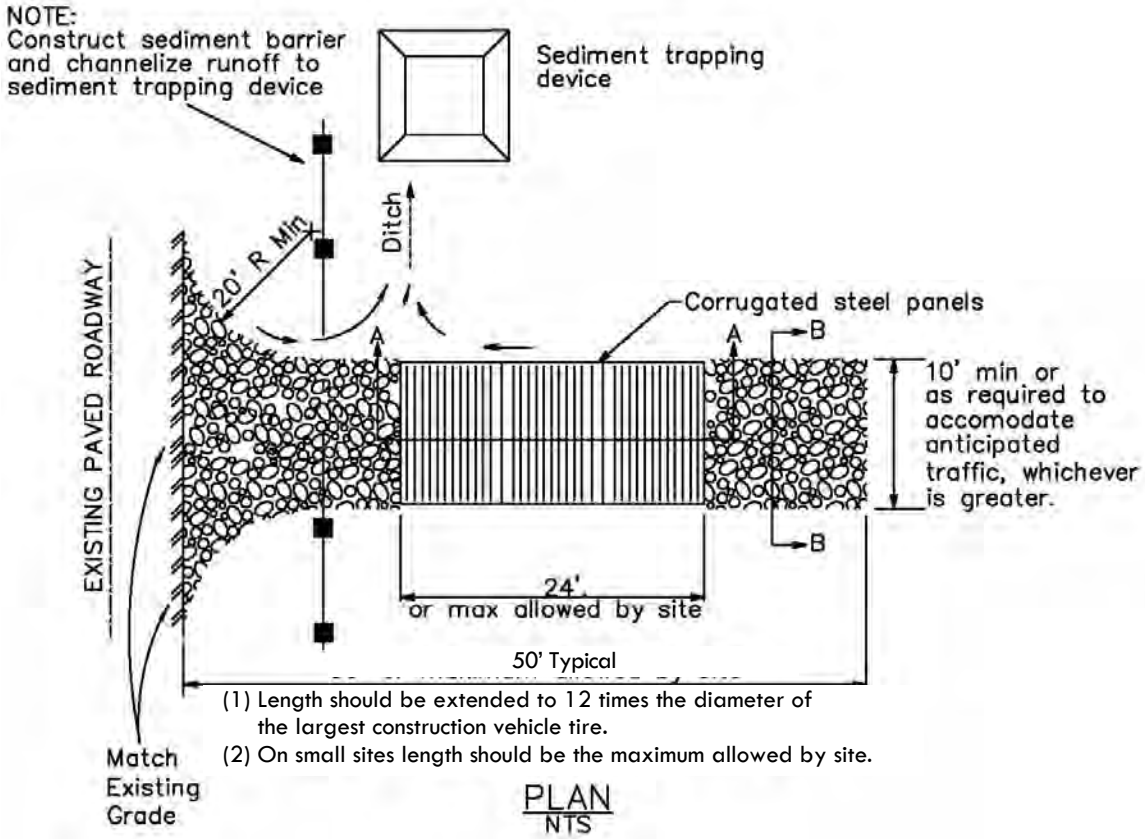
Stabilized Construction Entrance / Exit TC-1



SECTION B–B
NTS



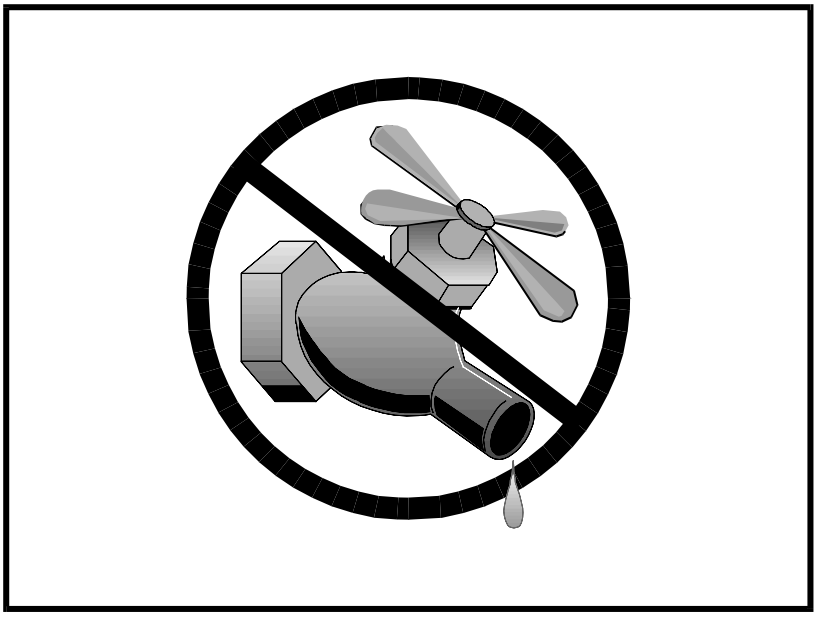
SECTION A–A
NOT TO SCALE



(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
NTS

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.

- Direct construction water runoff to areas where it can soak into the ground or be collected and used.
- 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.

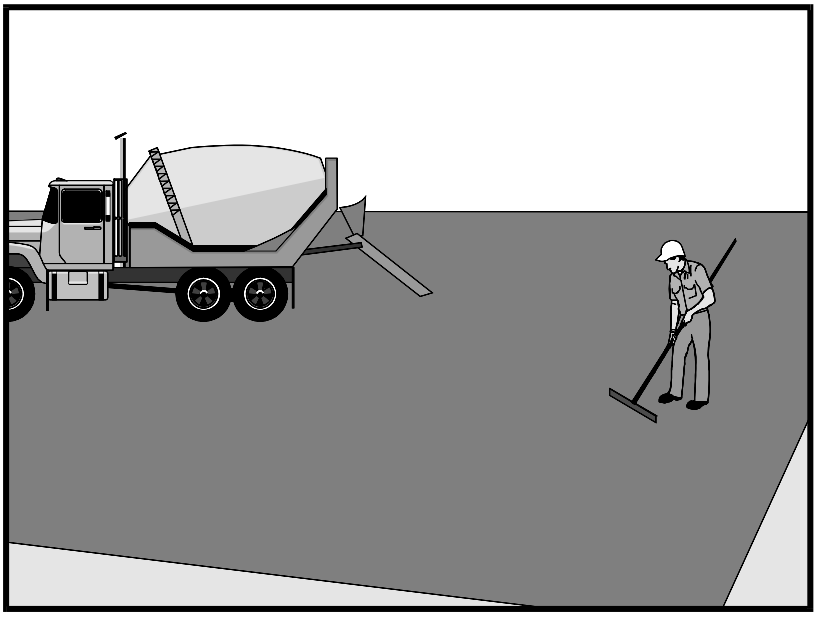
Inspection and Maintenance

- 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.

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

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

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.

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.

- 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.

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

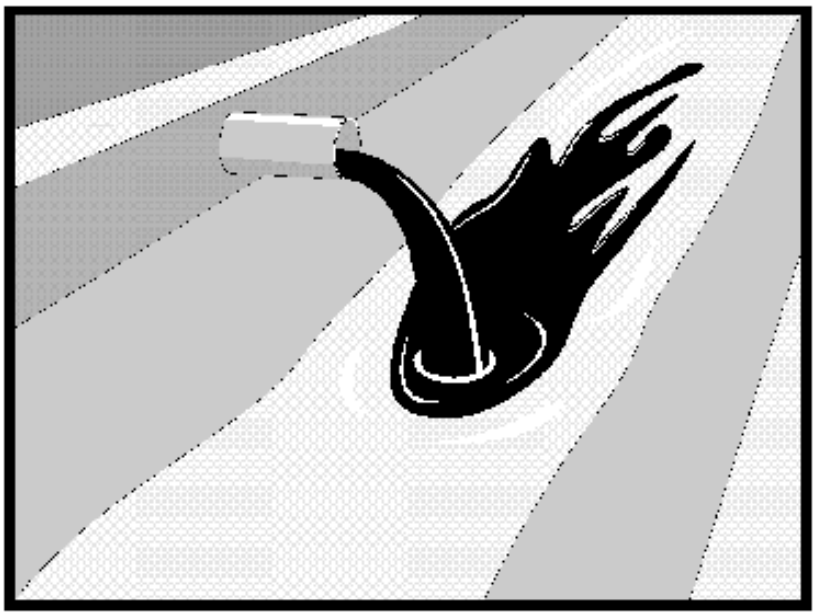
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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.

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.

- 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.

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.

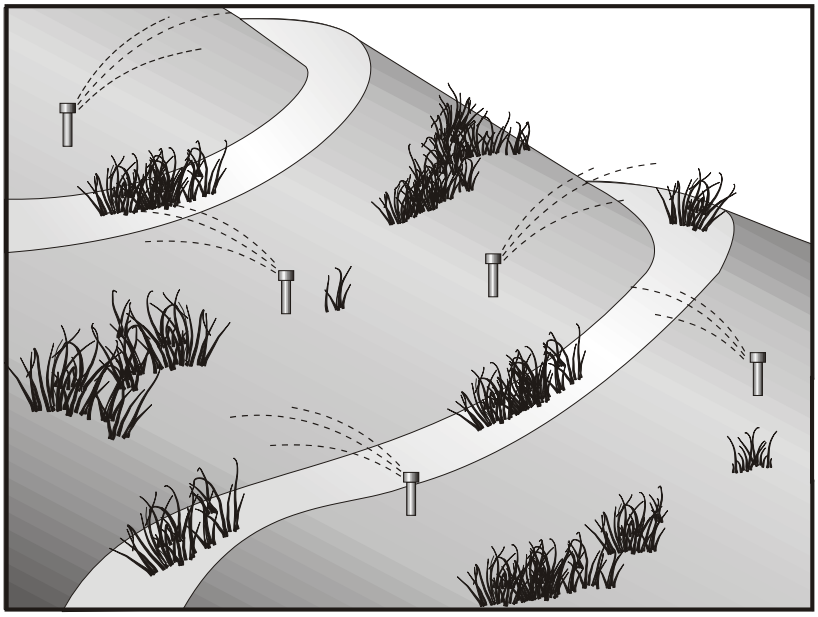
References

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

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

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.

- 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.

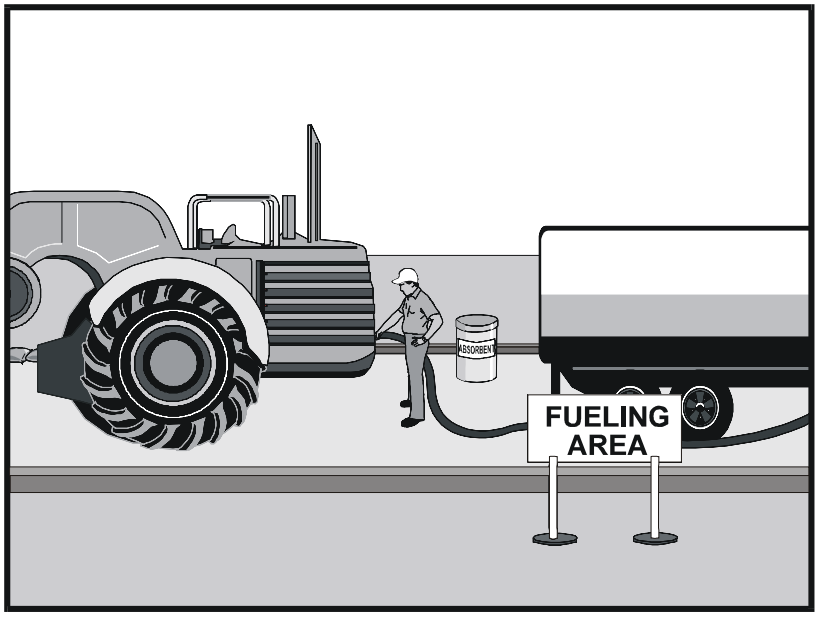
References

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 Fueling NS-9



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

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.

- 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.

- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

References

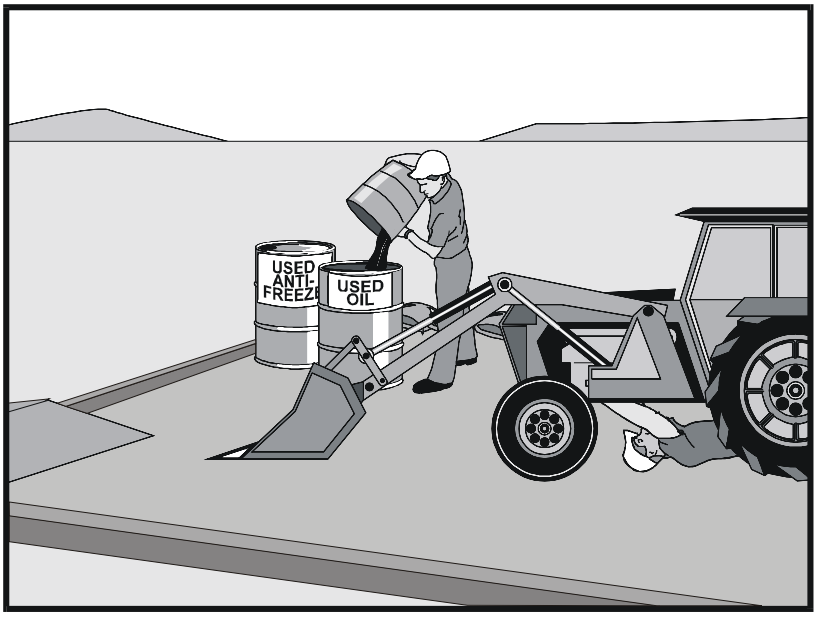
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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



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

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,

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.

- 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.

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.

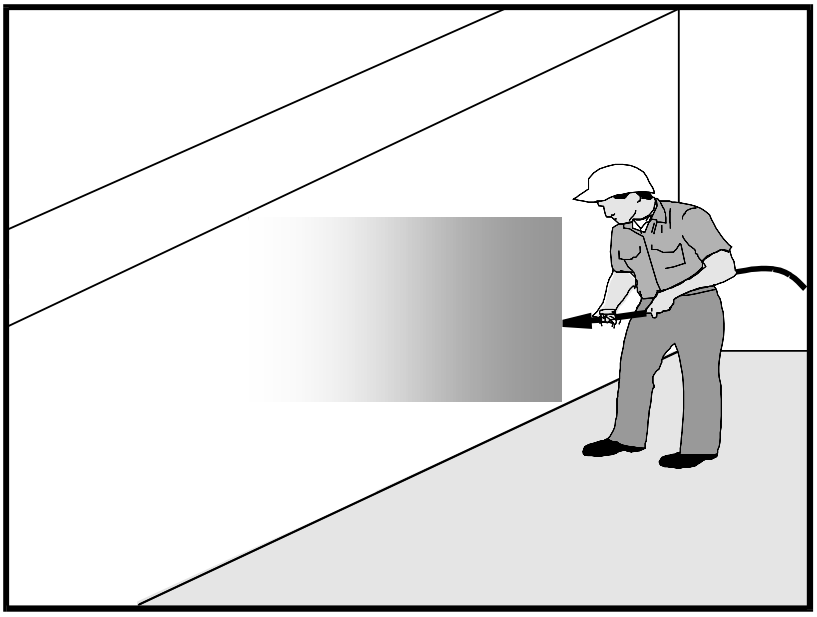
References

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.

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.

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.
- 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

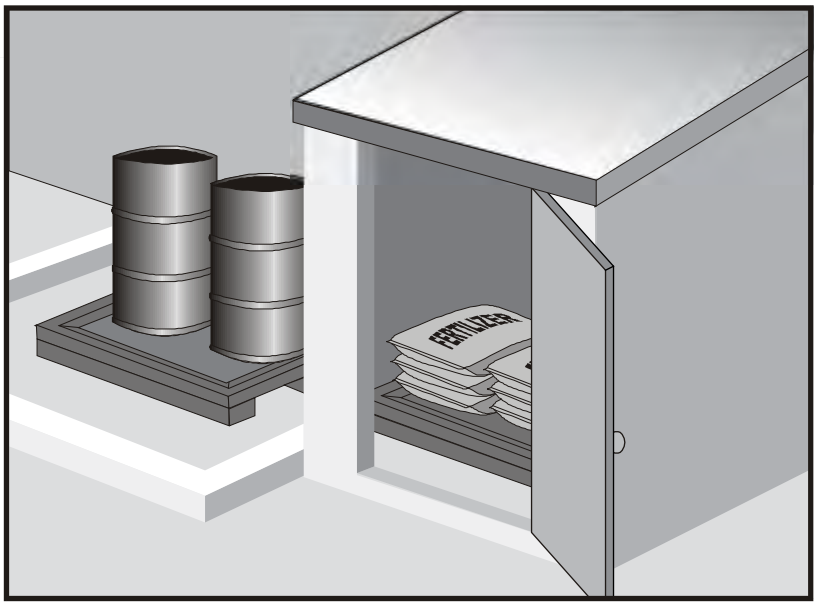
Blue Print for a Clean Bay-Construction-Related Industries: Best Management Practices for Stormwater Pollution Prevention; Santa Clara Valley Non-Point Source Pollution Control Program, 1992.

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.

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**

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

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.

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

- 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.

- 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.

- 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.

- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

References

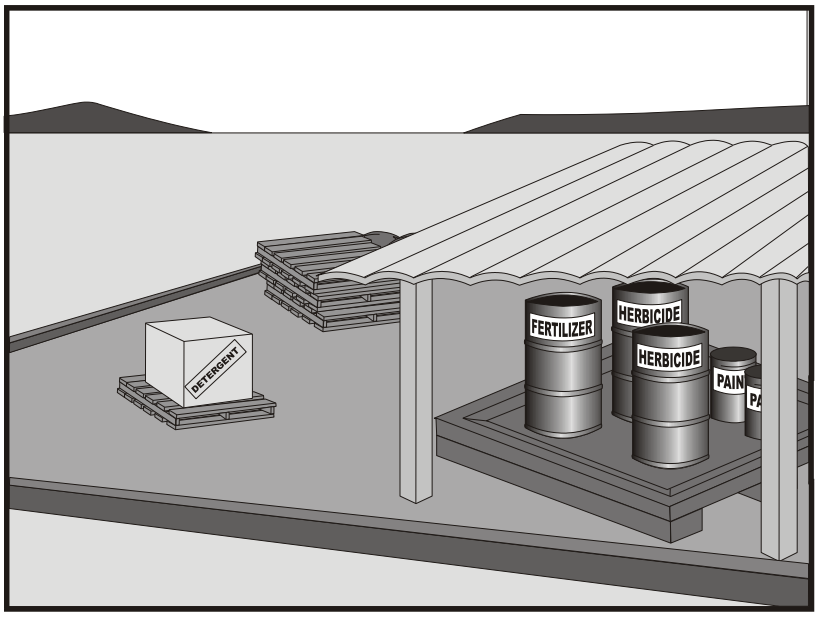
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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

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

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

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.

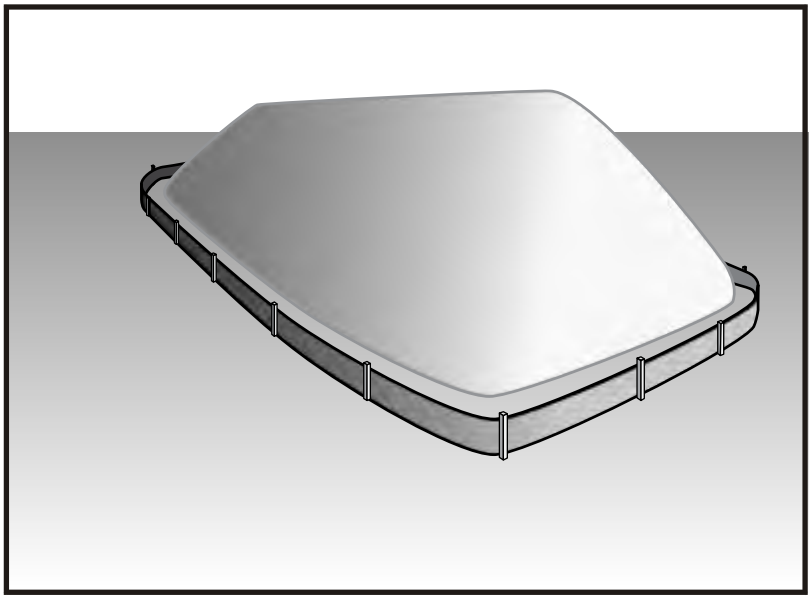
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

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



Treat 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

- 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 run-on 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

- 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 treated wood

- 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.)

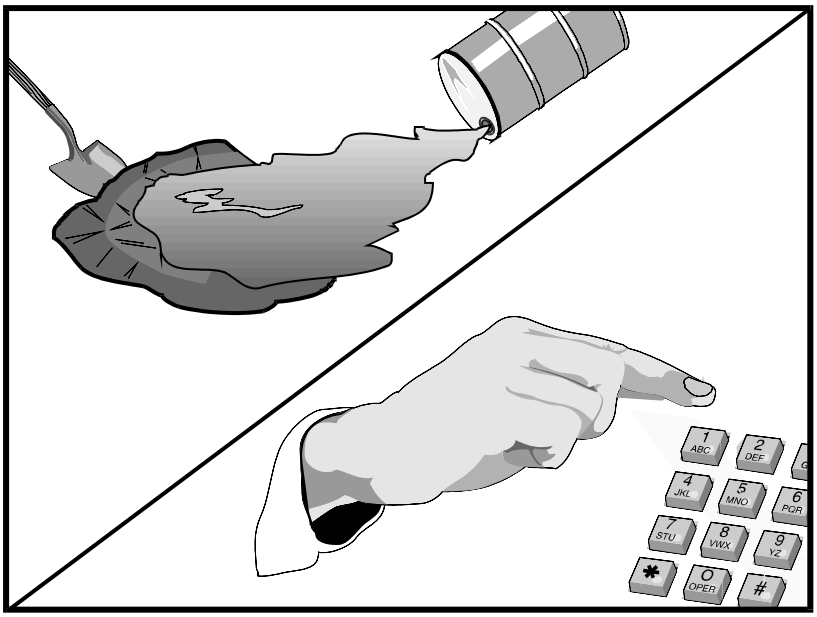
Inspection and Maintenance

- 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

- 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.

- 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.

- 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 spill's 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:

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.

- 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.

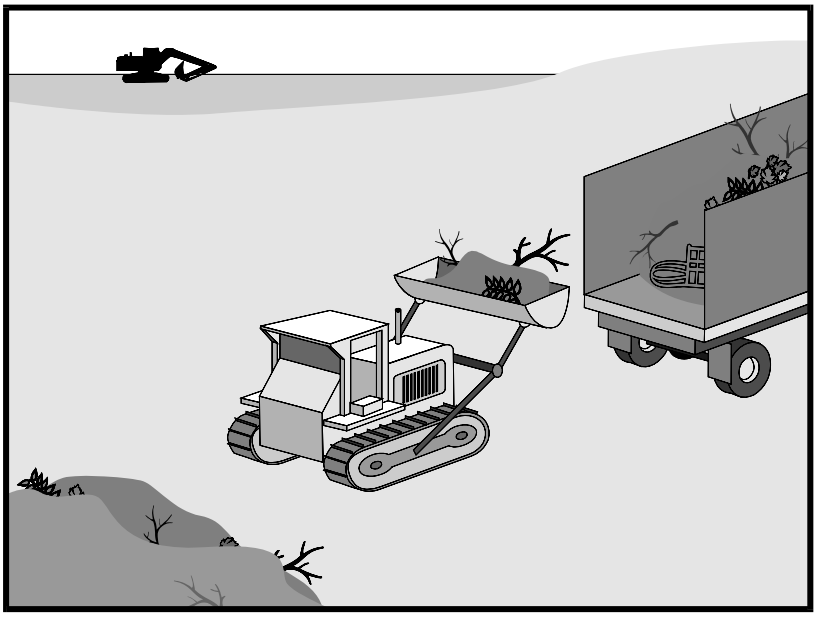
References

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

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

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

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- 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.

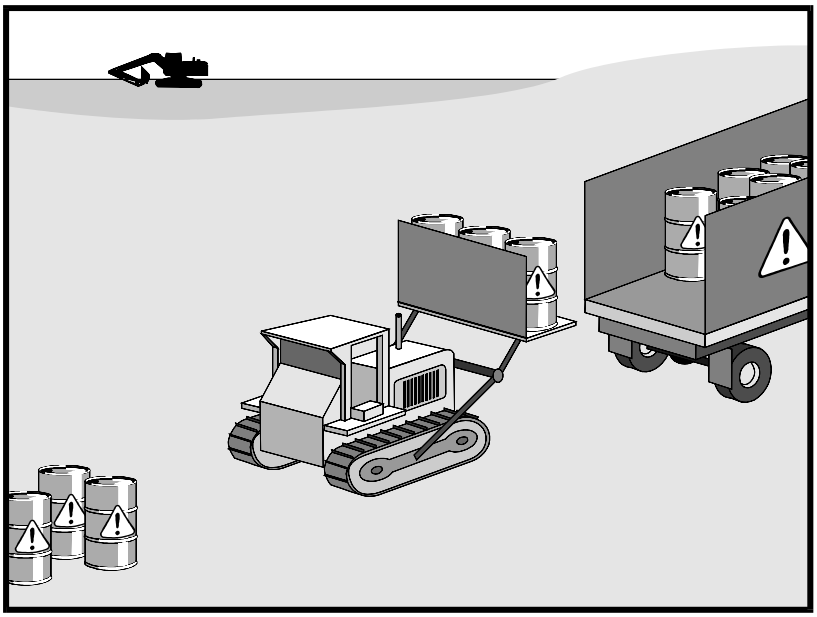
References

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



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

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

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.

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

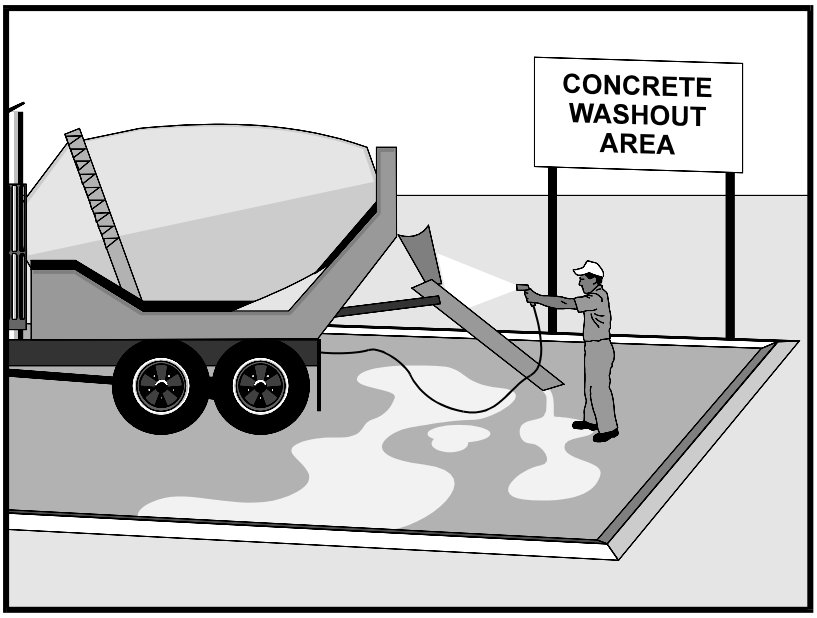
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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.

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.

- 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.

- 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.

- 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.

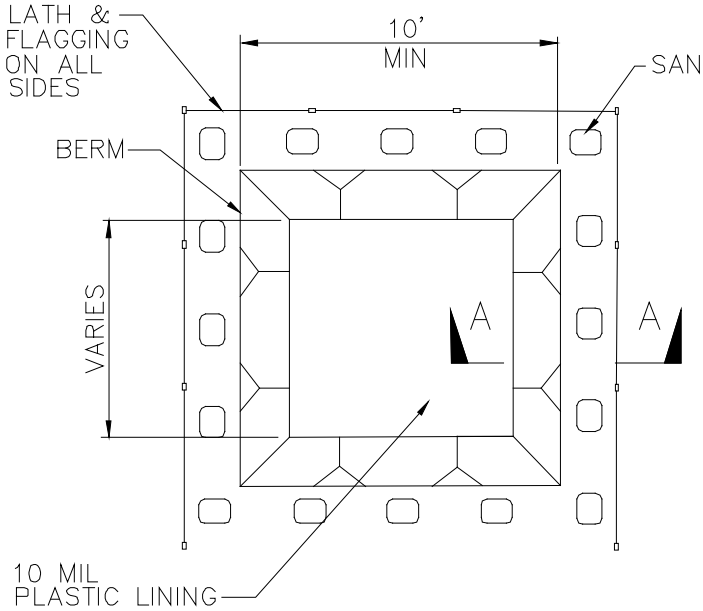
- Inspect washout facilities for damage (e.g. torn liner, evidence of leaks, signage, etc.). Repair all identified damage.

References

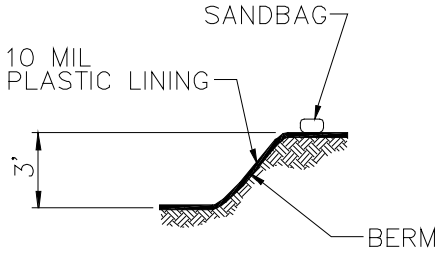
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000, Updated March 2003.

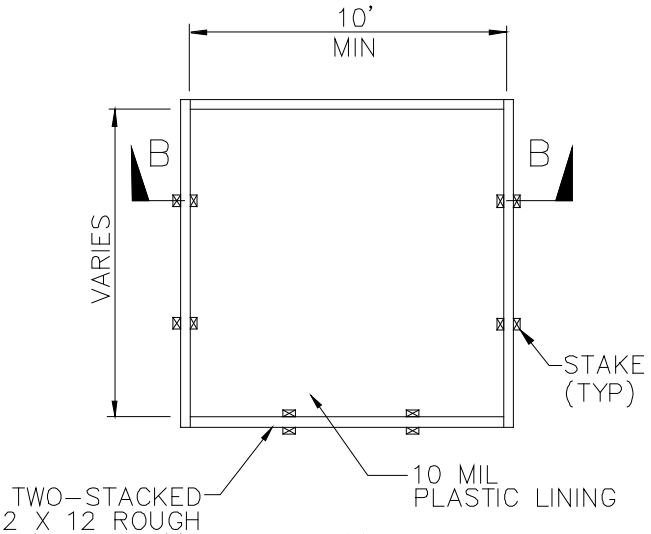
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



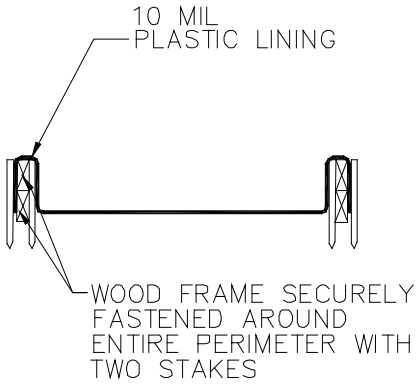
PLAN
NOT TO SCALE
TYPE "BELOW GRADE"



SECTION A–A
NOT TO SCALE



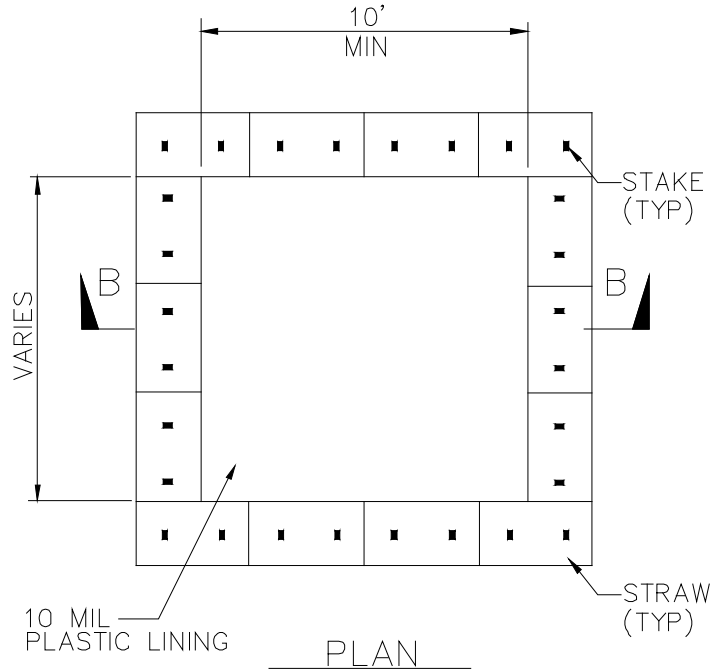
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"



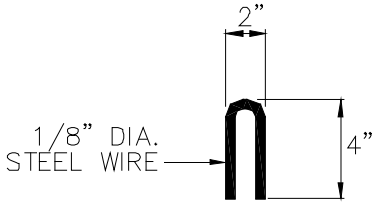
SECTION B–B
NOT TO SCALE

NOTES

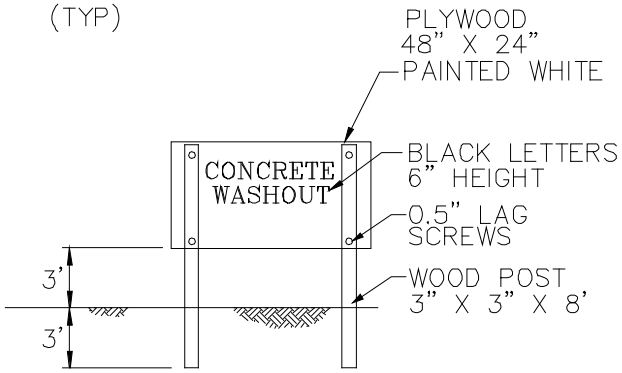
1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



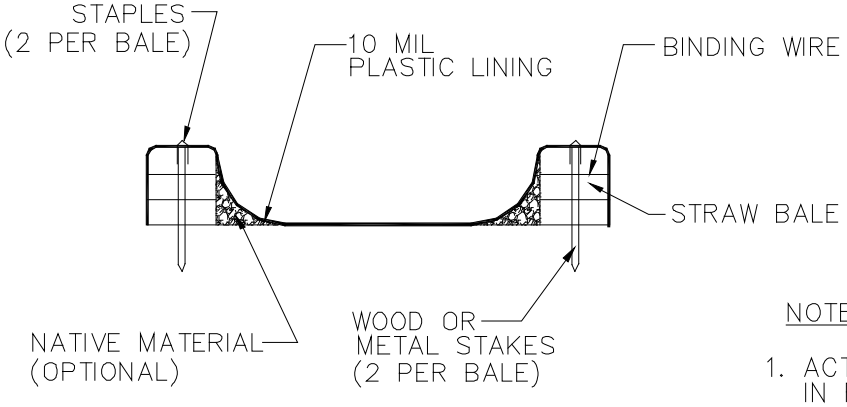
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"
WITH STRAW BALES



STAPLE DETAIL



CONCRETE WASHOUT
SIGN DETAIL
(OR EQUIVALENT)

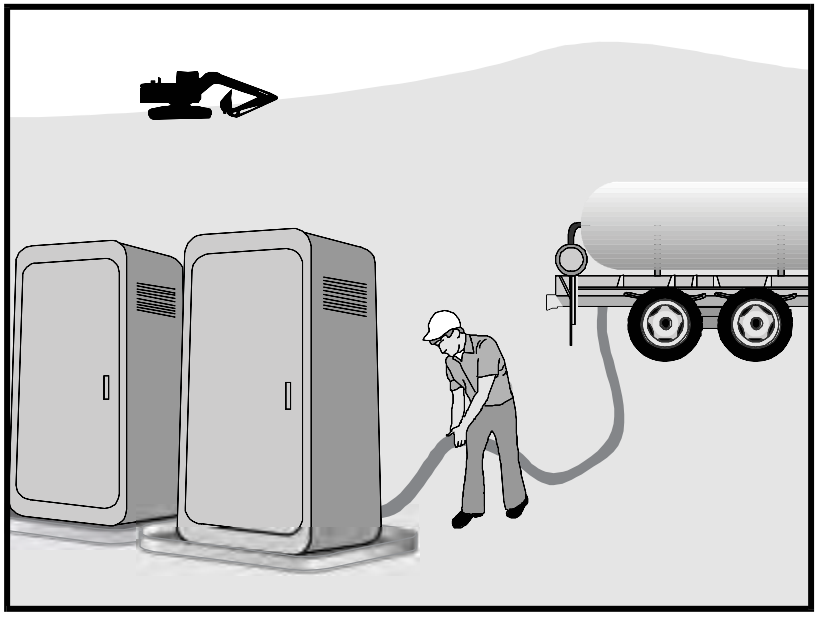


SECTION B–B
NOT TO SCALE

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



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

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

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.

- 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.

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.

APPENDIX H

QSP AND QSP-TRAINED DELEGATE STORM INSPECTION REPORTS

Rain Gauge Log Sheet				
Construction Site Name:				
WDID #:				
Date (mm/dd/yy)	Time (24-hr)	Initials	Rainfall Depth (Inches)	Notes:

Risk Level 2
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: DUNPHY PARK IMPROVEMENT PROJECT PHASE 2	
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
Effluent Sampling Field Log Sheets

Construction Site Name: DUNPHY PARK IMPROVEMENT PROJECT PHASE 2	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:

APPENDIX I

NAL EXCEEDANCE SITE EVALUATION REPORTS

NAL Exceedance Evaluation Summary Report (Field Samples Only) Page __ of __			
Project Name	**Dunphy Park Improvement Project Phase 2**		
Project WDID		**Date Prepared**	
Date of Exceedance			
Calculated Daily Average	☐ **pH ___ pH units** ☐ **Turbidity ____ NTU**		
Type of Exceedance	**NAL Daily Average** ☐ **pH** ☐ **Turbidity**		
Measurement or Analytical Method	☐ **Field meter** **(Threshold Sensitivity for Equipment: _____)**		
Rain Gauge Measurement	**_____ Inches**	**Storm rainfall: _____Inches/ _____ Days**	
Visual Observations on Day of Exceedance ***(Include Photos if taken)***			
Description of BMPs in Place at Time of Event			

NAL Exceedance Evaluation Summary Report (Field Samples Only) Page __ of __	
Initial Assessment of Cause	
Corrective Actions Taken (deployed after exceedance)	
Additional Corrective Actions Proposed	
Report Completed By	_____ **(Print Name, Title)** _____ **(Signature, Date)**

List Attachment(s)

APPENDIX J

QUALIFIED SWPPP DEVELOPER INSPECTION REPORTS

Project Information Name and Site Address:	WDID Number:
Dunphy Park Improvement Project Phase 2 Bridgeway, at Litho Street, Sausalito, CA 94965	
Contractor Name and Address:	Project Site Risk Level: ☐ ~~Risk Level 1~~ ☒ Risk Level 2 ☐ ~~Risk Level 3~~

General Information

Inspectors Name:	Date of Inspection:

Weather Condition:	Precipitation Condition:		Wind Condition:
Check appropriate box	*Check appropriate box*		*Check appropriate box*
☐ Clear	☐ Misty	☐ Heavy Rain	☐ None
☐ Partly Cloudy	☐ Light Rain	☐ Hail	☐ Less than 5 MPH
☐ Cloudy	☐ Rain	☐ Snow	☐ Greater than 5 MPH

Construction Phase:	Site Information:
Check appropriate box	_____ Acres Total Project Area
☐ Mass Grading	_____ Acres Total Project Disturbed Soil Area (DSA)
☐ Building Construction	_____ Acres Current Phase Disturbed Soil Area (DSA)
☐ Suspension of Work (Inactive Site)	_____ Acres Current Phase Inactive Disturbed Soil (DSA)
Notes:_____	Notes:_____

Inspection Type:	Storm Information	
Check appropriate box		
☐ Weekly ☐ Quarterly Non-Storm Water	Time Elapsed Since Last Storm: _____ days	Precipitation Amount From Last Storm: _____ inch(es)
☐ Pre-Storm	Time Storm is Expected: _____ (*time*) _____ (*date*)	Expected Precipitation Amount: _____ inch(es)
☐ During Storm Event	Time Elapsed Since Storm Began: _____ hours-minutes	Precipitation Amount from Storm Recorded From Site Rain Gauge: _____ inch(es)
☐ Post Storm	Time Elapsed Since Storm: _____ hours-minutes	Precipitation Amount for Storm Recorded From Site Rain Gauge: _____ inch(es)

Project Information Name and Site Address:	WDID Number:
Dunphy Park Improvement Project Phase 2 Bridgeway, at Litho Street, Sausalito, CA 94965	

Quarterly Non-Storm Water Discharge Visual Inspection Requirements

Conduct one visual inspection quarterly in each of the following periods: January-March, April-June, July-September, and October-December.

Drainage Areas	**Any presence of of a non-storm water discharge?**		**Any indication of a prior non-storm water discharge?**		**Date discharge was observed**		**Photo(s)**	**Identify source of non-storm water discharge. Required Actions**	**Action No.**
	Yes	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**		
Location 1:	☐	☐	☐	☐	☐	☐	☐		
Location 2:	☐	☐	☐	☐	☐	☐	☐		

Drainage Areas *If any water is retained or stored report the following*	**Presence of floating and suspended materials?**		**Presence of discoloration or turbidity?**		**Presence of orders?**		***Sample taken?**		**Comments Required Actions**	**Action No.**
	Yes	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**		
Location 1:	☐	☐	☐	☐	☐	☐	☐	☐		
Location 2:	☐	☐	☐	☐	☐	☐	☐	☐		

* Sample non-storm water discharge at the location where the discharge leaves the job-site and record location under Drainage Discharge Locations

Drainage Discharge Locations	**Any presence of non-storm water discharge?**		**Any indication of a prior non-storm water discharge?**		**Date and time discharge was observed**	**Photograph(s)**	**Identify source of non-storm water discharge. Required Actions**	**Action No.**
	Yes	**No**	**Yes**	**No**		**Yes**		
Location 1:	☐	☐	☐	☐		☐		
Location 2:	☐	☐	☐	☐		☐		
Location 3:	☐	☐	☐	☐		☐		
Location 4:	☐	☐	☐	☐		☐		

Project Information Name and Site Address:	WDID Number:
Dunphy Park Improvement Project Phase 2 Bridgeway, at Litho Street, Sausalito, CA 94965	

Quarterly Non-Storm Water Discharge Visual Inspection Requirements - Continued -

Drainage Discharge Locations *If any water is flowing report the following*	**Presence of floating and suspended materials?**		**Presence of discoloration or turbidity?**		**Presence of odors?**		**Discharge sample taken?**		**Run-on sample taken?**		**Photograph**
	Yes	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**
Location 1:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Location 2:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Location 3:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Location 4:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

~~**Risk Level 3 Drainage Discharge Locations**~~ ~~*If any water is flowing report the following*~~			~~**Upstream / up-gradient receiving water sample taken?**~~		~~**Downstream / down-gradient receiving water sample taken?**~~		**Comments** **Project is Risk Level 1** **Not Applicable**
	~~**Yes**~~	~~**No**~~	~~**Yes**~~	~~**No**~~	~~**Yes**~~	~~**No**~~	
~~Location :~~	☐	☐	☐	☐	☐	☐	
~~Location :~~	☐	☐	☐	☐	☐	☐	
~~Location :~~	☐	☐	☐	☐	☐	☐	

Illicit Connection/ Illegal Discharge Detection *Observe the job-site and job-site perimeter for illicit connections and illegal discharges*	**Any evidence of illicit connections?**		**Any illegal discharges onto job-site?** **Any illegal dumping?**		**Engineer notified of illicit connection or illegal discharge?**		**Photograph(s)**	**Comments** **Required Actions**	**Action No.**
	Yes	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**		
Location:	☐	☐	☐	☐	☐	☐	☐		
Location	☐	☐	☐	☐	☐	☐	☐		

Project Information Name and Site Address:	WDID Number:
Dunphy Park Improvement Project Phase 2 Bridgeway, at Litho Street, Sausalito, CA 94965	

Site Inspection Report General Comments

Are the BMP's installed as required by the SWPPP for the phase of construction?

☐ Yes ☐ No

Does the SWPPP currently reflect the current site conditions and contractor operations?

☐ Yes ☐ No

Does the SWPPP need to be amended?

☐ Yes ☐ No

Are there any water pollution control concerns on the project site not addressed by the comments /required actions shown above for BMP's based on the field review of the job-site?

☐ Yes ☐ No

If yes provide below details and comment / required actions for each location.

Location	Water Pollution Control Concern	Comment / Required Action	Action No.
.			
.			
.			

Project Information Name and Site Address:	WDID Number:
Dunphy Park Improvement Project Phase 2 Bridgeway, at Litho Street, Sausalito, CA 94965	

Notes and Photograph Descriptions *(Additional Space is provided on page 6/6 for further descriptions, if needed.)*

Notes:

_____

_____

_____

_____

Photograph Descriptions:

Photograph 1:_____

Photograph 2:_____

Photograph 3:_____

Photograph 4:_____

Stormwater Inspection Report Certification

I certify under penalty of law that this Stormwater Inspection Report was performed in accordance with the General Permit. The information contained in this inspection report was gathered form a field site inspection. I am aware that Section 309 (c)(4) of the Clean Water Act (CWA) provides for significant penalties, including fines and imprisonment for knowingly submitting false material statement, representation or certification.

Stormwater Inspector (Name):	Date Report Completed:
Stormwater Inspector Signature:	

Stormwater Inspection Report Acceptance

I certify under penalty of law that this Stormwater Inspection Report was performed in accordance with the General Permit. The information contained in this inspection report was gathered form a field site inspection. I am aware that Section 309 (c)(4) of the Clean Water Act (CWA) provides for significant penalties, including fines and imprisonment for knowingly submitting false material statement, representation or certification.

Accepted by Qualified SWPPP Practitioner (Name):	Date:
Qualified SWPPP Practitioner Signature:	

GENERAL INFORMATION

- If the inspection form does not contain enough lines to report all locations on a job-site, attach additional copies of the form page so that all locations are inspected and reported.
- Obtain forecasted precipitation information from National Weather Service Forecast Office (NOAA) *http://www.srh.noaa.gov/forecast*
- The weather information should be the best estimate of beginning of the storm event, duration of the event, and time elapsed since the last storm.
- Rainfall amounts should be recorded from the project site rain gauge.

STORM VISUAL INSPECTIONS

- For non-visible pollutant inspections report on all locations shown in the SWPPP.

REQUIRED ACTIONS

- All requisite actions reported on this form shall also be reported on form "Stormwater Site Inspection Report - Corrective Actions Summary."
- Locations identified where BMP's are failing or have other shortcomings require implementation of repairs or design changes within 72 hours of identification. Complete BMP repairs or other changes as soon as possible

Additional Notes and/or Photograph Descriptions:_____

APPENDIX K

WEATHER FORECASTING

NOAA Forecast Tracking Form[1]

Project Name:	**Dunphy Park Improvement Project Phase 2**	**Project WDID No:**	

Site Information:
Dunphy Park
Bridgeway, at Litho Street, Sausalito, CA 94965
Site Name, City and Zip Code

Project Risk Level: ■ Risk Level 2 □ Risk Level 3

Date Forecast Reviewed	Time Forecast Reviewed	Date Of Interest	Predicted % Chance of Precipitation[2]	Forecast Printed (Y/N)	QSP/ Designee Print Name	QSP/ Designee Signature

1. This form is provided as an optional tool for use at the discretion of the project QSP.
2. The Predicted Chance of Precipitation must be determined from the NOAA website (www.noaa.gov).

APPENDIX L

TRAINING REPORTING FORM

INDIVIDUAL NAME	PROJECT RESPONSIBILITY	TYPE OF TRAINING	DATE OF TRAINING

APPENDIX M

POINTS OF CONTACT

Agencies:

Marin Countywide Stormwater Pollution Prevention Program (MCSTOPPP)

Contact Name	Phone No.
Staff	415-473-6530

Marin County Health Department

Contact Name	Phone No.
Staff	415-499-6849

Bay Area Regional Water Quality Control Board

Contact Name	Phone No.
Staff	510-622-2300

Governor's Office of Emergency Services Warning Center

Contact Name	Phone No.
Staff	800-852-7550

National Response Center

Contact Name	Phone No.
Staff	800-424-8802

Owner or Owner's Representative:

Contact Name	Phone No.
Andrew Davidson	415-289-4180 (LRP)

Qualified SWPPP Developer (QSD):

Company:

Contact Name	Phone No.

STORM WATER POLLUTION PREVENTION PLAN

Qualified SWPPP Practitioner (QSP):

Company:

Contact Name Phone No.

QSP Delegate(s): _____

Inspector:

Contact Name Phone No.

Contractor:

Contact Name Phone No.

Company:

Contact Name Phone No.

Other:

Description: _____

Contact Name Phone No.

Description: _____

Contact Name Phone No.

Description: _____

Contact Name Phone No.

Description: _____

Contact Name Phone No.

APPENDIX N

CONTRACTORS / SUBCONTRACTORS

Company Names, Contact Names and Telephone Numbers

This list is to be updated by Owner's Rep / Contractor as required.

Company	Contact Name	Phone No.

APPENDIX O

CORRESPONDENCE WITH SWRCB AND RWQCB

EXHIBITS

EXHIBIT 1: NRCS WEB SOIL SURVEY RESULTS

EXHIBIT 2: TMDL WATERSHED OR WATERBODY

TOPOGRAPHY MAP 1: 0.25 MILE RADIUS FROM SITE

EC1.0: GENERAL NOTES AND DETAILS

EC1.1: EROSION CONTROL PLAN

L0.5: SHORELINE TREATMENT DIAGRAM PLAN

L1.1: DEMOLITION PLAN

L2.0: LAYOUT PLAN & GRADING PLAN

L3.0: SOIL PLACEMENT PLAN

L4.0: CONSTRUCTION PLAN

L5.1: IRRIGATION PLAN

L6.0: PLANTING SCHEDULE

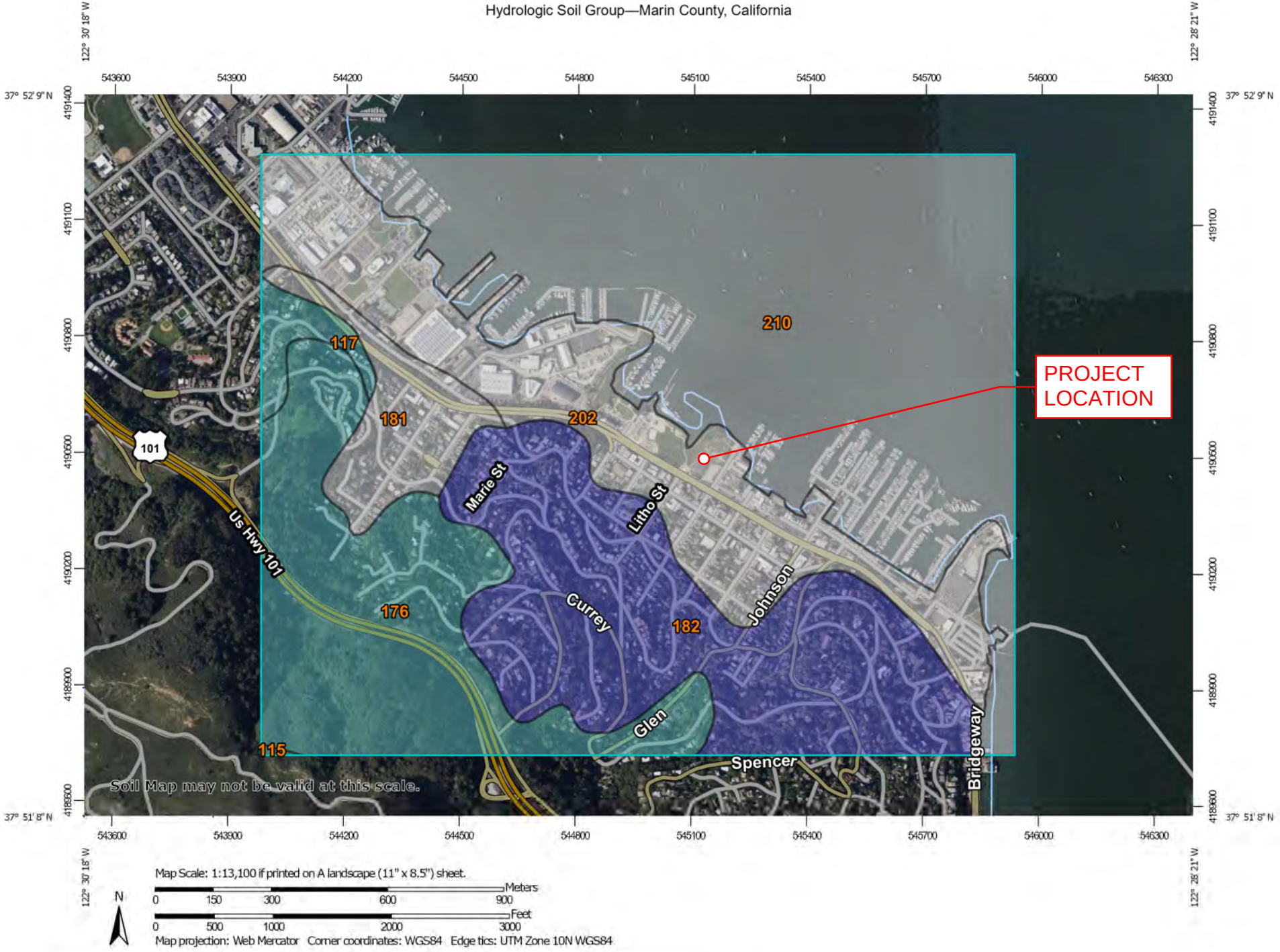
L6.1: PLANTING PLAN

L6.2: PLANTING PLAN

INTERIM FINAL COMPLETION REPORT SHORELINE SOIL EXCAVATION, REPLACEMENT & STOCKPILE REMOVAL REPORT

*The report can be downloaded here: https://cswst2.egnyte.com/dl/FTWjpw7G3kx4

Hydrologic Soil Group—Marin County, California



Map Scale: 1:13,100 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Marin County, California
Survey Area Data: Version 18, Sep 8, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 7, 2021—Mar 31, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
115	Cronkhite-Barnabe complex, 9 to 15 percent slopes	C	0.4	0.1%
117	Cronkhite-Barnabe complex, 30 to 50 percent slopes	C	10.7	1.4%
176	Tamalpais-Barnabe variant very gravelly loams, 30 to 50 percent slopes	C	128.0	17.1%
181	Tocaloma-McMullin-Urban land complex, 15 to 30 percent slopes		33.1	4.4%
182	Tocaloma-McMullin-Urban land complex, 30 to 50 percent slopes	B	154.7	20.6%
202	Urban land-Xerorthents complex, 0 to 9 percent slopes		131.5	17.5%
210	Water		292.2	38.9%
Totals for Area of Interest			**750.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

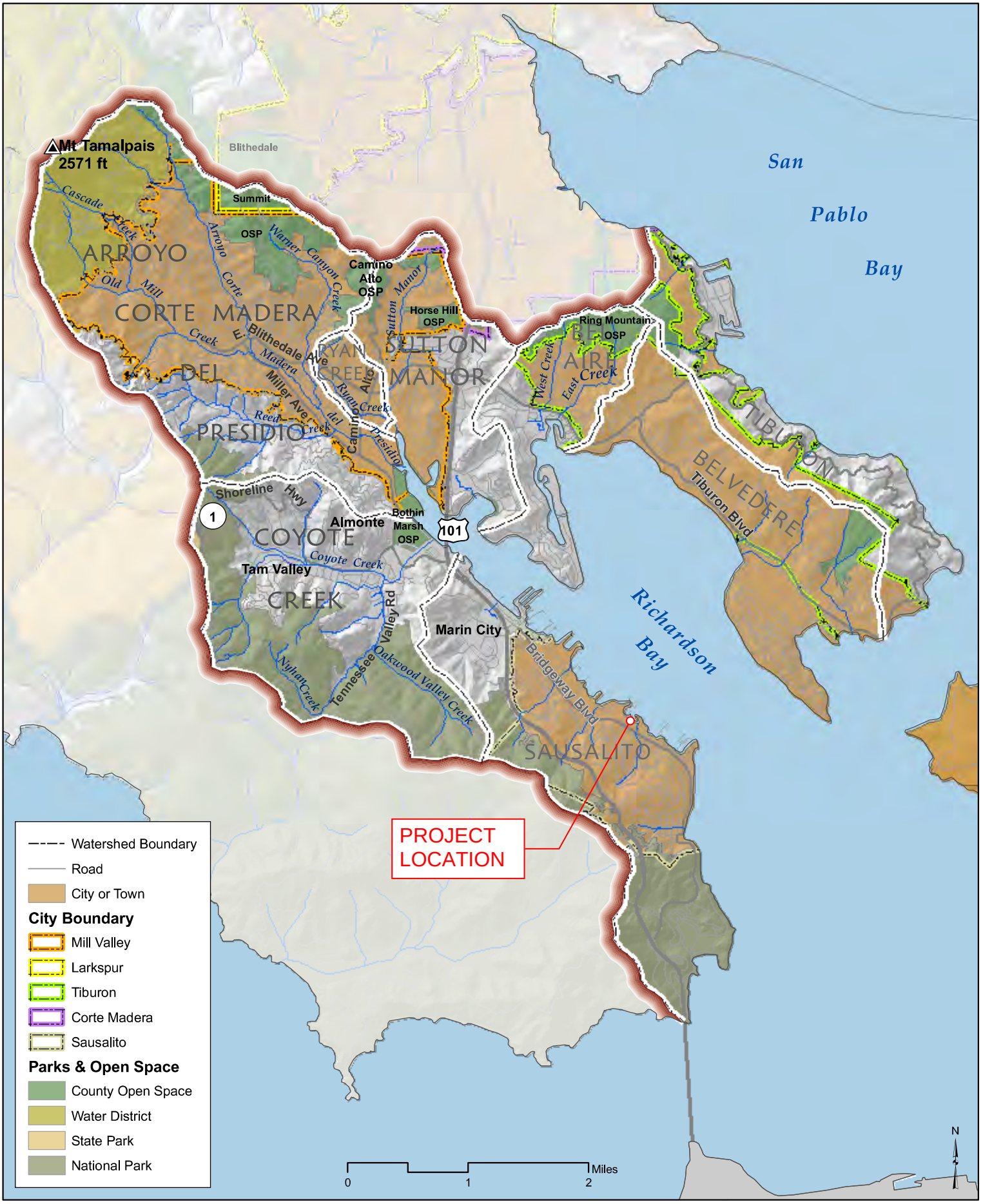
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



Richardson Bay Watershed

Map for general purposes only; not for site-specific planning purposes.

County of Marin
Department of Public Works

www.marinwatersheds.org

How's My Waterway?

Explore, Discover and Learn about your water.

Plan Summary

Plan Information

ID: 38147

This page reflects information provided to EPA by the state on plans in place to restore water quality. These plans could include a TMDL and/or a watershed restoration plan.

Name: RICHARDSON BAY PATHOGENS TMDL

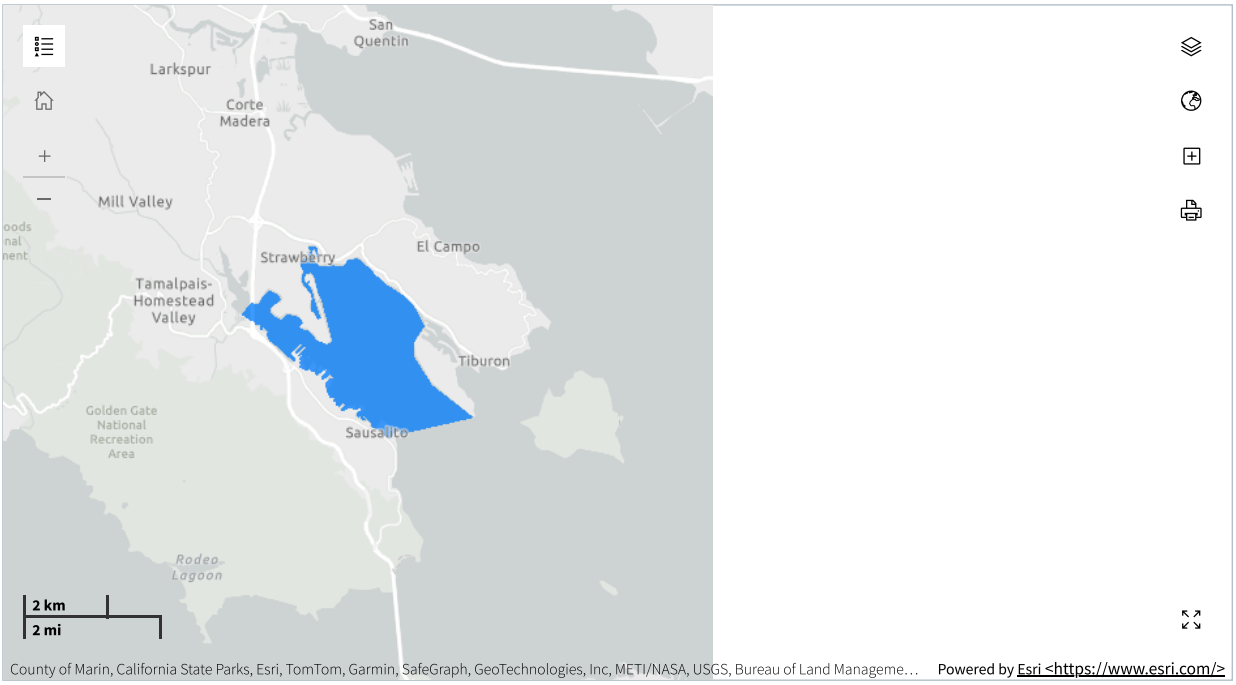
Completed: 2009-12-18

Type: Restoration Plan: TMDL

Status: EPA Final Action

Organization Name (ID): California (CA_SWRCB)

Advanced Filtering (opens new browser tab) **Download Plan Data**



Associated Documents

Links below open in a new browser tab.

- Richardson Bay bacti ltr_fnl.pdf <https://attains.epa.gov/attains-public/api/documents/actions/ca_swrcb/38147/100089>

- RichardsonBay-Pathogens-TMDL-CAdocs-121809.pdf <https://attains.epa.gov/attains-public/api/documents/actions/ca_swrcb/38147/100460>

Impairments Addressed

- ENTEROCOCCUS BACTERIA
- FECAL COLIFORM

Waters Covered

CAB203.130RICHARDSON BAY
Waterbody ID: CAB203.130RICHARDSON BAY
⚠ **[Waterbody not visible on map.]**

Organization Name (ID): California (CA_SWRCB)

Parameters Addressed:

- DIOXIN COMPOUNDS
- FURAN COMPOUNDS
- HIGH COLIFORM COUNT
- MERCURY
- PATHOGENS
- PCBS - DIOXIN-LIKE
- POLYCHLORINATED BIPHENYLS (PCBS)

View Waterbody Report <https://epa.gov/waterbody-report/ca_swrcb/cab203.130richardson bay> (opens new browser tab)

⚠ **No map data available for this waterbody.**

Richardson Bay
Waterbody ID: CAB203120101998092912059_00
⚠ **[Waterbody not visible on map.]**

Organization Name (ID): California (CA_SWRCB)

Parameters Addressed:

- MERCURY
- PATHOGENS
- PRIORITY ORGANICS COMPOUNDS

View Waterbody Report <https://epa.gov/waterbody-report/ca_swrcb/cab203120101998092912059_00> (opens new browser tab)

⚠ **No map data available for this waterbody.**

Richardson Bay
State Waterbody ID: CAB203120101998092912059

How's My Waterway?

Explore, Discover and Learn about your water.

Waterbody Report

Schoonmaker Beach (Richardson Bay)

Assessment Unit ID: CAC203120102011071222241 7

Waterbody Condition: Impaired (Issues Identified)

Existing Plans for Restoration: Yes

303(d) Listed: No

Year Reported: 2024

303(d) List Status: EPA Interim Action

Other Years Reported:
2018 <https://epa.gov/waterbody-report/ca_swrcb/cac203120102011071222241 7/2018>, 2022 <https://epa.gov/waterbody-report/ca_swrcb/cac203120102011071222241 7/2022> (opens new browser tab)

Organization Name (ID): California (CA_SWRCB)

What type of water is this?

Coastal & Bay Shoreline (0.0001 Miles)

Where is this water located?

Information Not Available

Advanced Filtering (opens new browser tab) **Download Waterbody Data (2024)**

Assessment Information from 2024

State or Tribal Nation specific designated uses:

Information on Water Quality Standards <https://www.epa.gov/wqs-tech/state-specific-water-quality-standards-effective-under-clean-water-act-cwa> Expand All

Non-Contact Water Recreation	Good >
Shellfish Harvesting	Impaired >
Water Contact Recreation	Good >

Probable sources contributing to impairment from 2024:

Click a column heading to sort... **Clear Filters**

Source	Parameter	Confirmed
Filter...	Filter...	Filter...
Marina/boating Sanitary On-Vessel Discharges	Pathogens	No
Other Marina/boating On-Vessel Discharges	Pathogens	No
Source Unknown	Pathogens	No

Click a column heading to sort... **Clear Filters**

Assessment Documents

No documents are available

Plans to Restore Water Quality

What plans are in place to protect or restore water quality?

Links below open in a new browser tab.

Plan	Impairments	Type	Completion Date
Richardson Bay Pathogens Tmdl <https://epa.gov/plan-summary/ca_swrcb/38147>	Coliforms, Dioxin Compounds, Furan Compounds, High Coliform Count, Indicator Bacteria, Mercury, Pathogens, Pcbs - Dioxin-Like, Polychlorinated Biphenyls (Pcbs), Priority Organics Compounds	TMDL	2009-12-18

How's My Waterway?

Explore, Discover and Learn about your water.

Waterbody Report

Clipper Yacht Club (part of Richardson Bay)

Assessment Unit ID: CAB203200202011040521213

Waterbody Condition: Condition Unknown

Existing Plans for Restoration: No

303(d) Listed: No

Year Reported: 2024

303(d) List Status: EPA Interim Action

Other Years Reported:
2018 <https://epa.gov/waterbody-report/ca_swrcb/cab203200202011040521213/2018>, 2022 <https://epa.gov/waterbody-report/ca_swrcb/cab203200202011040521213/2022> (opens new browser tab)

Organization Name (ID): California (CA_SWRCB)

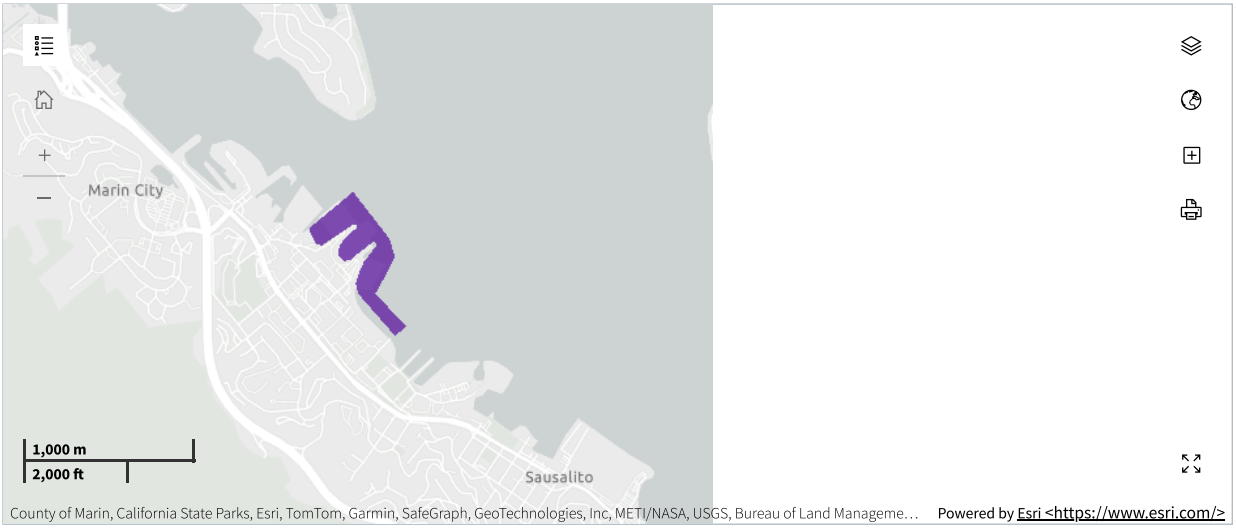
What type of water is this?

Bay (0.0578 Square Miles)

Where is this water located?

Information Not Available

Advanced Filtering (opens new browser tab) **Download Waterbody Data (2024)**



Assessment Information from 2024

State or Tribal Nation specific designated uses:

Information on Water Quality Standards <https://www.epa.gov/wqs-tech/state-specific-water-quality-standards-effective-under-clean-water-act-cwa> Expand All

Estuarine Habitat	Insufficient Info

Probable sources contributing to impairment from 2024:

No probable sources of impairment identified for this waterbody.

Assessment Documents

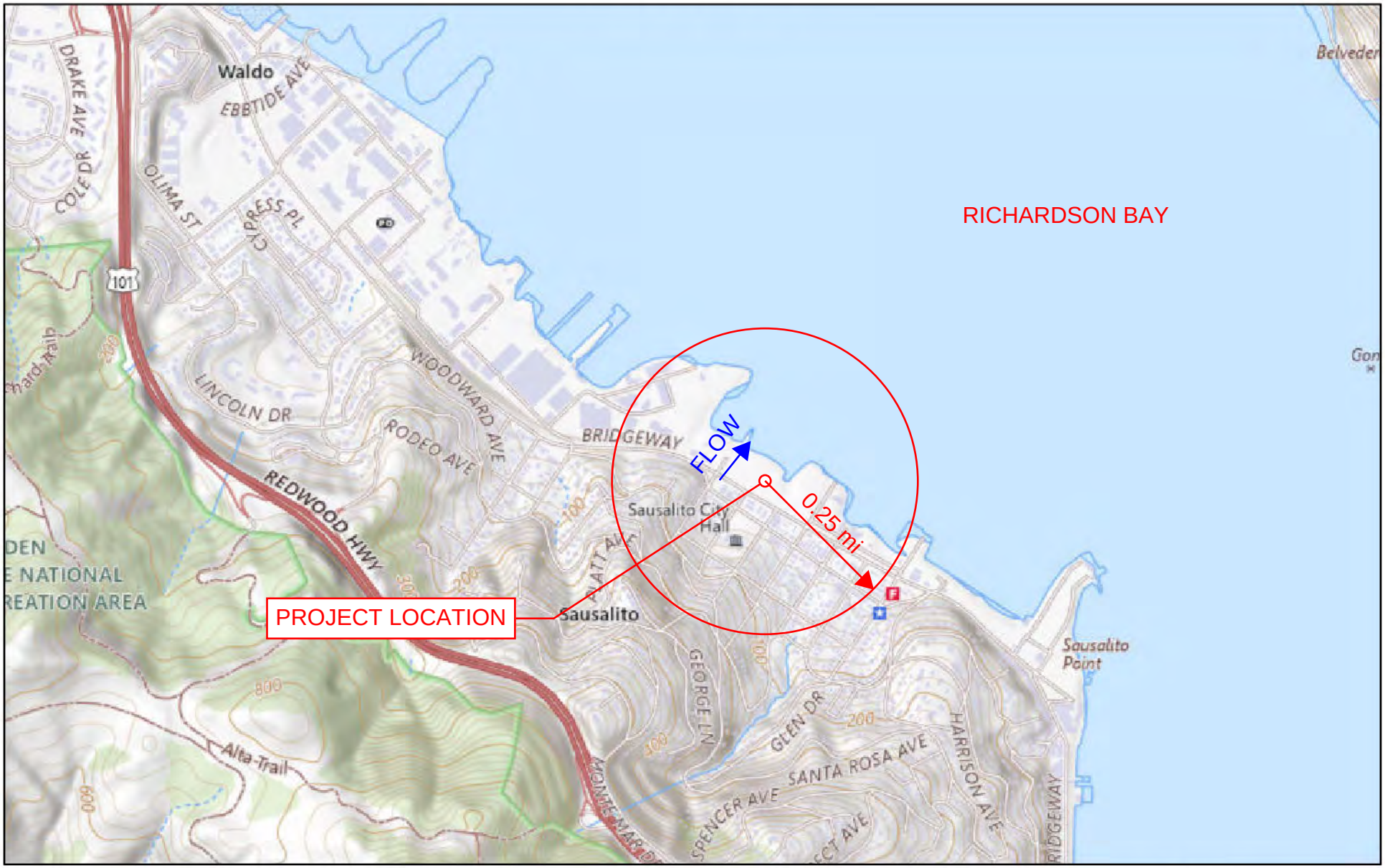
No documents are available

Plans to Restore Water Quality

What plans are in place to protect or restore water quality?

No plans specified for this waterbody.

The National Map Advanced Viewer



8/23/2025

1:18,056

0 0.1 0.2 0.4 mi

0 0.17 0.35 0.7 km

USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography

	BMP	GENERAL DESCRIPTION
	EROSION CONTROL BMPS	
A	PRESERVE EXISTING VEGETATION	EXISTING VEGETATION SHOULD BE PRESERVED AS MUCH AS POSSIBLE. CASQA: EC-2.
B	SOIL COVER	COVER ALL EXPOSED SOIL WITH STRAW MULCH AND TACKIFIER (OR EQUIVALENT). CASQA: EC-3, EC-5, EC-6, EC-7, EC-14, AND EC-16.
C	EROSION CONTROL BLANKETS OR EQUIVALENT	INSTALL EROSION CONTROL; BLANKETS (OR EQUIVALENT) ON ANY DISTURBED SITE WITH 3:1 SLOPES OR STEEPER, KEYED INTO THE GROUND AT LEAST 3 INCHES. USE WILDLIFE-FRIENDLY BLANKETS MADE OF BIODEGRADABLE NATURAL MATERIALS. AVOID USING BLANKETS MADE WITH PLASTIC NETTING OR FIXED APERTURE NETTING. CASQA: EC-7.
D	REVEGETATION	AREAS OF DISTURBED SOIL/VEGETATION SHOULD BE REVEGETATED AS SOON AS PRACTICAL. CASQA: EC-4.
	SEDIMENT CONTROL BMPS	
E	STABILIZED SITE ENTRANCE	STABILIZE SITE ENTRANCE AND TEMPORARY DRIVEWAY. USE 3 TO 4-INCH CRUSHED ROCK FOR A MINIMUM OF 50 FEET (OR AS FAR AS POSSIBLE) TO PREVENT TRACKING SOIL OFFSITE. THIS CAN BE USED IN CONJUNCTION WITH A TIRE WASH OR RUMBLE PLATES. CASQA:TC-1; TC-3.
F	FIBER ROLLS (E.G. STRAW WATTLES)	USE FIBER ROLLS ALONG CONTOURS OF SHORT SLOPES 3:1 OR FLATTER, KEYED INTO GROUND AT LEAST 3-INCHES DEEP (TYPICALLY 25 FEET APART). USE WILDLIFE-FRIENDLY FIBER ROLLS MADE OF BIODEGRADABLE NATURAL MATERIALS. AVOID USING FIBER ROLLS MADE WITH PLASTIC NETTING OR FIXED APERTURE NETTING. CASQA: SE-5.
G	SILT FENCE	INSTALL SILT FENCE ALONG CONTOURS AS SECONDARY MEASURE TO KEEP SEDIMENT ONSITE AND TO MINIMIZE VEHICLE AND FOOT TRAFFIC BEYOND LIMITS OF SITE DISTURBANCE. SILT FENCING MUST BE KEYED IN. CASQA: SE-1.
H	DRAIN INLET PROTECTION	USE PEA-GRAVEL BAGS, (OR SIMILAR PRODUCT) AROUND DRAIN INLETS LOCATED BOTH ONSITE AND IN GUTTER AS A LAST LINE OF DEFENSE. CASQA: NS-2.
	GOOD HOUSEKEEPING BMPS	
I	CONCRETE WASHOUTS	CONSTRUCT A CONCRETE WASHOUT SITE PLACED AT LEAST 50 FEET AWAY FROM STORM DRAINS, WATERBODIES, OR OTHER DRAINAGES. IDEALLY, PLACE ADJACENT TO STABILIZED ENTRANCE. CLEAN AS NEEDED AND REMOVE AT END OF PROJECT. CASQA: WM-8.
J	STOCKPILE MANAGEMENT	COVER ALL STOCKPILES AND LANDSCAPE MATERIAL AND BERM PROPERLY WITH FIBER ROLLS OR SAND BAGS. KEEP BEHIND SILT FENCE, AWAY FROM WATERBODIES. AVOID USE OF PLASTIC SHEETING WHERE POSSIBLE TO KEEP PLASTIC FROM ENTERING WATERBODIES. CASQA: WM-3.
K	HAZARDOUS MATERIAL MANAGEMENT	HAZARDOUS MATERIALS MUST BE KEPT IN CLOSED CONTAINERS THAT ARE COVERED AND UTILIZE SECONDARY CONTAINMENT, NOT DIRECTLY ON SOIL. CASQA: WM-6.
L	SANITARY WASTE MANAGEMENT	PLACE PORTABLE TOILETS NEAR STABILIZED SITE ENTRANCE, BEHIND THE CURB AND AWAY FROM GUTTERS, STORM DRAIN INLETS, AND WATERBODIES. ALL PORTABLE BATHROOMS SHOULD HAVE OVERFLOW PAN/TRAY (MOST VENDORS PROVIDE THESE). CASQA: WM-9.
M	EQUIPMENT AND VEHICLE MAINTENANCE	PAVEMENT EQUIPMENT FLUID LEAKS ONTO GROUND BY PLACING DRIP PANS OR PLASTIC TARPS UNDER EQUIPMENT. CASQA: NS-8, NS-9, AND NS-10.

ABBREVIATIONS

BCDC	SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION
DIA	DIAMETER
DL	DISCHARGE LOCATION
MAX	MAXIMUM
MIN	MINIMUM
NTS	NOT TO SCALE
O.C.	ON CENTER
QSD	QUALIFIED SWPPP DEVELOPER
QSP	QUALIFIED SWPPP PRACTITIONER
SWPPP	STORMWATER POLLUTION PREVENTION PLAN
SWRCB	STATE WATER RESOURCES CONTROL BOARD
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
USGS	UNITED STATED GEOLOGICAL SURVEY
VIF	VERIFY IN FIELD

GENERAL NOTES:

1. ALL MEASURED DISTANCES AND DIMENSIONS ARE SHOWN IN DECIMAL FEET THEREOF.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ACCESS TO THE PARK AND ADJACENT PROPERTIES AT ALL TIMES.
3. THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE FOR, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE ENGINEER.
4. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ADEQUATE DRAINAGE OF THE SITE, DURING INTERIM CONDITIONS OF CONSTRUCTION.
5. CONTRACTOR SHALL PROVIDE ALL MATERIAL, LABOR, EQUIPMENT, FOR INSTALLATION, IMPLEMENTATION, AND MAINTENANCE OF ALL SURFACE WATER POLLUTION PREVENTION MEASURES THROUGHOUT THE FULL EXTENT OF THE PROJECT. SURFACE WATER IS CLASSIFIED AS ANY BODY OF WATER ABOVE GROUND.
6. ALL STREETS SHALL BE SWEPT AND KEPT CLEAN AT THE END OF EACH DAY FOR THE DURATION OF THE PROJECT WORK.

POLLUTION CONTROL NOTES:

1. IF SIGNIFICANT SEDIMENT OR OTHER VISUAL SYMPTOMS OF IMPURITIES ARE NOTICED IN THE STORM WATER, CONTACT THE CITY ENGINEER IMMEDIATELY.
2. CONTRACTOR IS RESPONSIBLE FOR INSPECTION AND RESTORATION OF ALL ASPECTS OF THIS PLAN. SEDIMENT ON SIDEWALKS AND GUTTERS SHALL BE REMOVED BY SHOVEL AND/OR BROOM AND PLACED IN STOCKPILES.
3. ALL DUMPSTERS OR OTHER TRASH STORAGE ENCLOSURES SHALL BE UTILIZED SOLELY FOR NON-HAZARDOUS MATERIALS.
4. ALL EMPLOYEES, CONTRACTORS, AND SUBCONTRACTORS ARE RESPONSIBLE FOR CONFORMING TO THE ELEMENTS SHOWN ON THIS PLAN OR RELATED DOCUMENTS.
5. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS AND FILING ALL PLANS WITH RELATED AGENCIES ASSOCIATED WITH THEIR WORK. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO, PERMITS FOR STORAGE OF HAZARDOUS MATERIALS, DISCHARGE OF GROUNDWATER THAT MAY BE NECCESSARY TO ACCOMPLISH WORK AS SHOWN ON THESE PLANS, BUSINESS PLANS, PERMITS FOR STORAGE OF FLAMMABLE LIQUIDS, GRADING PERMITS, OR OTHER PLANS OR PERMITS REQUIRED BY MARIN COUNTY, THE CITY OF SAUSALITO, OR OTHER AGENCIES. ALL CONTRACTORS, OR SUBCONTRACTORS WORKING ON-SITE ARE INDIVIDUALLY RESPONSIBLE FOR OBTAINING AND SUBMITTING ANY BUSINESS PLANS OR PERMITS REQUIRED BY CITY, STATE OR LOCAL AGENCIES.
6. CONTRACTOR SHALL LOCATE STORAGE, DELIVERY, OR WASH-OUT AREAS, TO SUIT THEIR OPERATIONS. CONTRACTOR TO MAINTAIN SECONDARY CONTAINMENT AS NECESSARY TO PROHIBIT POLLUTION AND TOXIC MATERIALS FROM ENTERING STORM DRAIN.
7. CONTRACTOR SHALL UTILIZE SILT FILTERS DURING CONCRETE CONSTRUCTION NEAR EXISTING STORM DRAINAGE SYSTEM. AFTER COMPLETION OF THE SIDEWALK, DRIVEWAYS, CURB, GUTTER, AND PAVING, THE SILT FILTERS SHALL BE MODIFIED TO BURLAP SACKS FILLED WITH 3/4" DRAIN ROCK OR OTHER ACCEPTED BMP POSITIONED SURROUNDING EACH CATCH BASIN.

EROSION CONTROL NOTES:

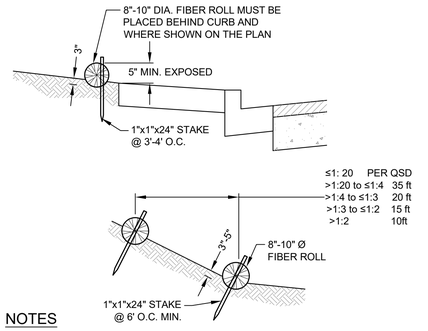
1. NO VEHICLES SHALL BE ALLOWED TO TRACK OR SPREAD SOIL FROM THE CONSTRUCTION AREAS ONTO EXISTING PAVED PUBLIC STREETS.
2. THE EROSION AND SEDIMENT CONTROL MEASURES WILL BE OPERABLE THROUGHOUT THE YEAR. NO GRADING WILL OCCUR BETWEEN OCTOBER 1ST AND APRIL 15TH, UNLESS AUTHORIZED BY THE CITY ENGINEER.
3. DURING THE RAINY SEASON, ALL PAVED AREAS WILL BE KEPT CLEAR OF EARTH MATERIAL AND DEBRIS. THE SITE WILL BE MAINTAINED SO THAT A MINIMUM OF SEDIMENT-LADEN RUNOFF ENTERS THE STORM DRAIN SYSTEM. THESE PLANS SHALL REMAIN IN EFFECT UNTIL THE IMPROVEMENTS ARE ACCEPTED BY THE CITY, AND ALL SLOPES ARE STABILIZED FROM EROSION.

URBAN RUNOFF POLLUTION NOTES:

1. STABILIZE ALL DENUDED AREAS AND MAINTAIN EROSION CONTROL MEASURES CONTINUOUSLY FOR THE DURATION OF THE PROJECT.
2. REMOVE SPOILS PROMPTLY AND AVOID STOCKPILING OF FILL MATERIALS WHEN RAIN IS FORECAST. IF RAIN THREATENS, STOCK- PILED SOILS AND OTHER MATERIALS SHALL BE PROPERLY TARPED.
3. STORE, HANDLE AND DISPOSE OF CONSTRUCTION MATERIALS AND WASTES SO AS TO PREVENT THEIR ENTRY TO THE STORM DRAIN SYSTEM. CONTRACTOR MUST NOT ALLOW CONCRETE, WASHWATERS, SLURRIES, PAINT OR OTHER MATERIALS TO ENTER CATCH BASINS OR TO ENTER SITE RUNOFF.
4. USE FILTRATION OR OTHER MEASURES TO REMOVE SEDIMENT FROM DEWATERING EFFLUENT.
5. NO CLEANING, FUELING OR MAINTAINING VEHICLES ON SITE SHALL BE PERMITTED IN ANY MANNER THAT ALLOWS DELETERIOUS MATERIALS TO ENTER CATCH BASINS OR TO ENTER SITE RUNOFF.
6. CONTRACTOR TO RELOCATE CONCRETE WASHDOWN, VEHICLE STORAGE DELIVERY, AND NON HAZARDOUS WASTE AREAS AS NECESSARY TO FACILITATE THEIR OPERATION AND PROMOTE POLLUTION CONTROL.

BMP IMPLEMENTATION SCHEDULE:

1. BMP'S APPROPRIATE FOR THE WORK BEING DONE SHALL BE IN PLACE AT ALL TIMES.
2. PERIMETER CONTROL, EXISTING INLET PROTECTION, AND CONSTRUCTION ENTRANCE SHALL BE INSTALLED PRIOR TO ANY DEMOLITION.
3. ALL OTHER BMP'S SHALL BE INSTALLED AT COMPLETION OF CONSTRUCTION OF EACH INLET.

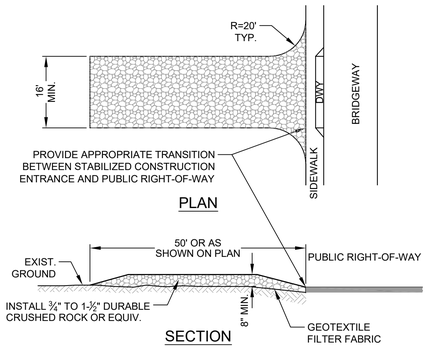


NOTES

1. FIBER ROLLS SHALL BE LAID ALONG CONTOUR (UNO).

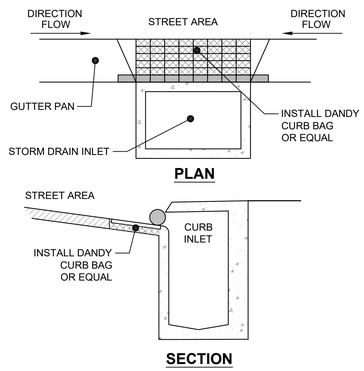
1 FIBER ROLL INSTALLATION DETAILS

SCALE: NTS



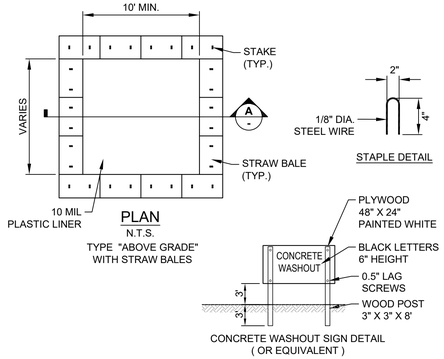
2 TEMPORARY STABILIZED CONSTRUCTION ENTRANCE

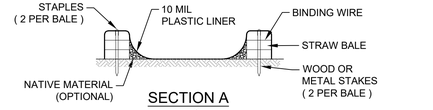
SCALE: NTS



3 INLET PROTECTION

SCALE: NTS



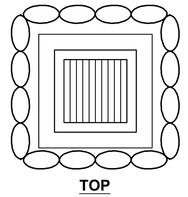


NOTES:

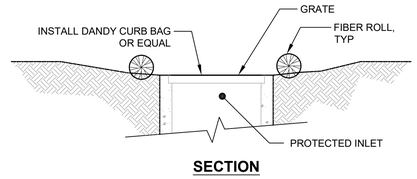
1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FEET OF THE TEMPORARY CONCRETE WASHOUT FACILITY.

4 TEMPORARY CONCRETE WASHOUT DETAIL

SCALE: 1" = 1'



TOP

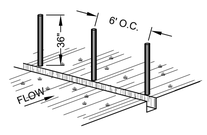


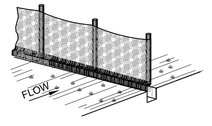
SECTION

5 INLET PROTECTION DETAIL

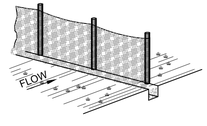
SCALE: NTS

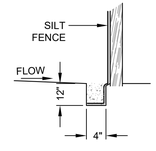
1. SET 4"Ø WOOD OR 1.33 PLF STEEL POSTS 5' IN LENGTH. EXCAVATE A 4"X4" TRENCH UPSLOPE ALONG THE LINE OF POSTS.
2. ATTACH SILT FENCE TO POSTS AND EXTEND IT INTO THE TRENCH.





3. BACKFILL AND COMPACT THE EXCAVATED SOIL.
4. EXTENSION OF FABRIC INTO THE TRENCH.





6 SILT FENCE DETAIL

SCALE: NTS

CSW ST2

ENGINEERING
LANDSCAPE ARCHITECTURE
SURVEYING
URBAN PLANNING

504 REDWOOD BLVD #310
NOVATO, CA 94947
415.883.9850
WWW.CSWST2.COM

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

CSWST2 PROJECT NUMBER

2500185

CONSULTANT

SUBMITTAL

DATE

REVISIONS

No.	Date	Description

REGISTRATION AND SIGNATURE

SCALE

AS SHOWN

0 15' 30' 60'

N

SHEET TITLE

GENERAL NOTES AND DETAILS

DRAWN BY: JD **CHECKED BY: KP**

EC1.0

RICHARDSON BAY

CRUISING CLUB

TYPICAL:
SAMPLING POINT NUMBER AND LOCATION MAY VARY DURING ANY GIVEN STORM.
SAMPLE ALL DISCHARGES OCCURRING THROUGH BARRIER FENCE.
SAMPLE ALL PIPE PENETRATIONS DISCHARGES

LIMIT OF WORK (MHHW 6.01')

LIMIT OF WORK (PROPERTY LINE)

HUMBOLDT AVE

DL1 DL2 DL3 DL4 DL5 DL6 DL7 DL8 DL9 DL10 DL11 DL12 DL13 DL14 DL15 DL16 DL17

100' BCDC SETBACK

100' TYP.

LIMIT OF WORK (BACK OF WALK)

LIMIT OF WORK (PROPERTY LINE)

PT WD S D

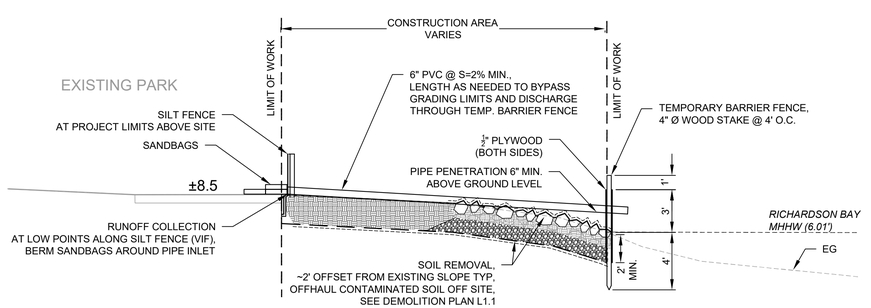
BRIDGEWAY

BRIDGEWAY

NAPA ST

BEE ST

LITHO ST



1 **TYPICAL SECTION**
SCALE: 1" = 5'

LEGEND

- LIMIT OF WORK
- TEMPORARY BARRIER FENCE (SEE DETAIL 1, THIS SHEET)
- FIBER ROLLS (SEE DETAIL 1, SHEET EC1.0)
- SAND/GRAVEL BAG BARRIER
- SILT FENCING (SEE DETAIL 6, SHEET EC1.0)
- CONSTRUCTION ENTRANCE (SEE DETAIL 2, SHEET EC1.0)
- SAMPLING LOCATION
- DIRECTION OF FLOW OR SLOPE
- WD — CONCRETE WASHDOWN AREA (SEE DETAIL 1, SHEET EC1.0)
- D — DELIVERY AREA
- S — NON HAZARDOUS STORAGE
- PT — PORTABLE TOILET WITH LINER
- STORM INLET PROTECTION

NOTE:

1. CONTRACTOR SHALL PLACE FILTER FABRIC, DANDY BAG, OR EQUAL AT ALL CATCH BASINS AND DROP INLETS. TO BE REMOVED AND DISPOSED PRIOR TO CLOSING OUT SITE PER PROJECT SWPPP.
2. PROTECT IN PLACE ALL EXISTING TREES WITHIN THE PUBLIC RIGHT OF WAY.

CSW ST2
ENGINEERING
LANDSCAPE ARCHITECTURE
SURVEYING
URBAN PLANNING
504 REDWOOD BLVD #310
NOVATO, CA 94947
415.883.9850
WWW.CSWST2.COM

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

CSWST2 PROJECT NUMBER

2500185

CONSULTANT

SUBMITTAL

DATE

REVISIONS

No.	Date	Description

REGISTRATION AND SIGNATURE

SCALE
1" = 30'-0"
0 15' 30' 60'
N

SHEET TITLE

EROSION CONTROL PLAN

DRAWN BY: JD **CHECKED BY: KP**

EC1.1

SHORELINE TREATMENT DIAGRAM (NTS)

A. SHORELINE AREA A_CRUISING CLUB
- SOLID WASTE CONTAMINATION
- LEAD CONTAMINATION
- EROSION & STEEP BANK
- LIMITED AREA FOR VEGETATION TO ESTABLISH

B. SHORELINE AREA B _STONE STEPS & “BEACH”
- SOLID WASTE CONTAMINATION
- LEAD CONTAMINATION
- EROSION AT STONE STEPS
- LIMITED AREA FOR VEGETATION TO ESTABLISH

C. SHORELINE AREA C_PARK SHORELINE NORTH
- SOLID WASTE CONTAMINATION
- LEAD CONTAMINATION
- MINOR EROSION AND SMALL BLUFF IN BANK

D. SHORELINE AREA D_PARK SHORELINE SOUTH
- POTENTIAL CULTURAL ARTIFACTS PRESENT
- EROSION AND STEEP BANK
- INVASIVE PLANT SPECIES

E. SHORELINE AREA E_ PARK SHORELINE SOUTH
- EROSION AND STEEP BANK
- INVASIVE PLANT SPECIES
- MINOR EROSION AND SMALL BLUFF IN BANK

Date Plotted: 6/24/2024 6:52 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Draft Marin County LEA Submittal

DATE

REVISIONS

No.	Date	Description

REGISTRATION AND SIGNATURE

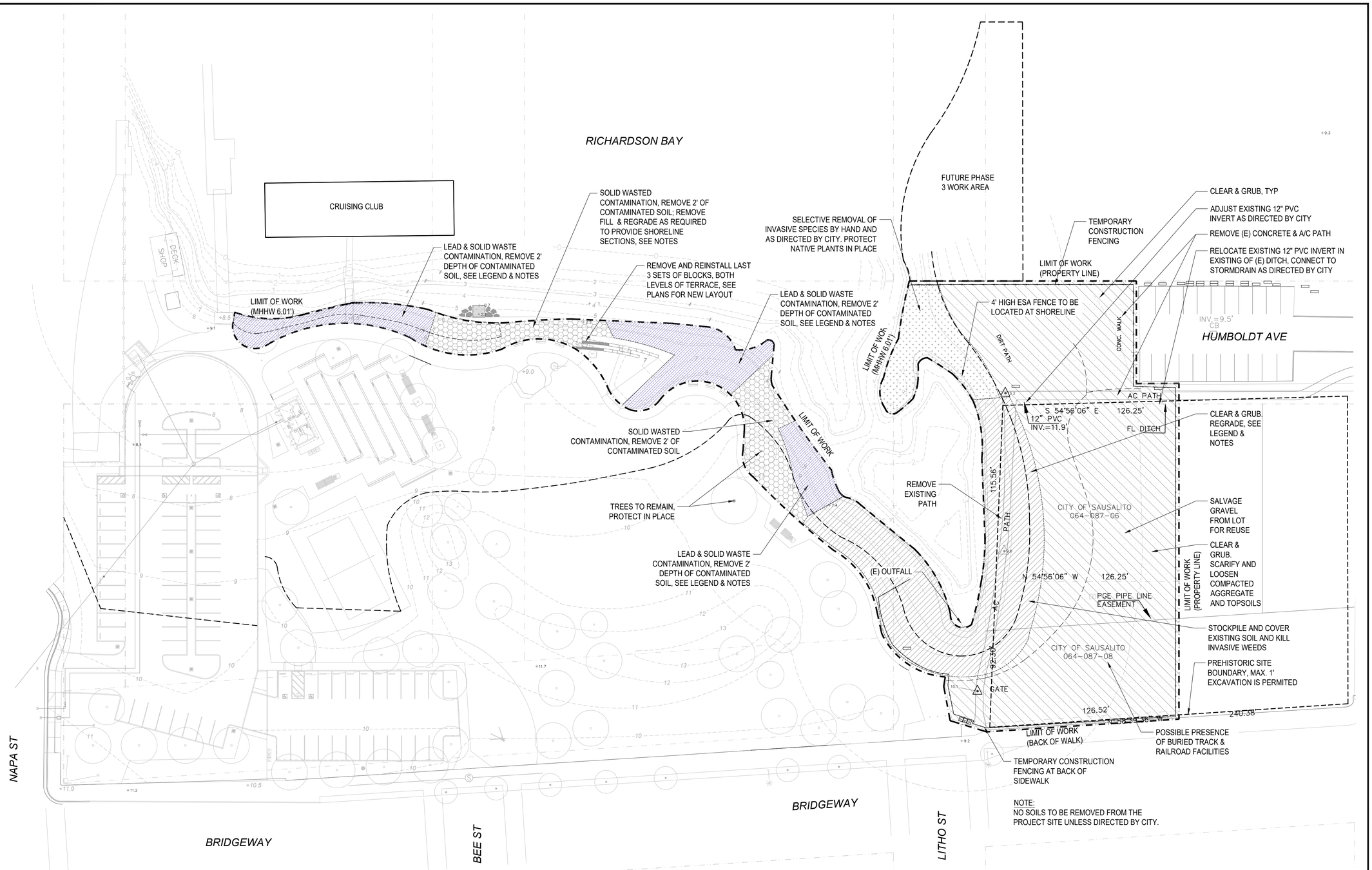
SCALE
1" = 30'-0"
0 15' 30' 60'
N

SHEET TITLE

SHORELINE TREATMENT DIAGRAM

DRAWN BY: TS / QU CHECKED BY: JM

L0.5



LEGEND		
SYMBOL	DESCRIPTION	AREA
	CLEAR & GRUB. REGRADE AS REQUIRED TO PROVIDE SHORELINE SECTIONS (SEE NOTES), OFFHAUL ALL CUT MATERIAL PER CAL RECYCLE REQUIREMENTS.	11,289 SF
	CLEAR & GRUB. SCARIFY AND LOOSEN COMPACTED SOILS. REFER TO SPECIFICATIONS FOR MORE INFORMATION ON SITE & SOIL PREPARATION.	30,443 SF
	SELECTIVE REMOVAL OF INVASIVE SPECIES BY HAND AND AS DIRECTED BY CITY STAFF. ALL NATIVE PLANTS TO BE PROTECTED IN PLACE.	3,083 SF
	LEAD & SOLID WASTE CONTAMINATION, REMOVE 2' DEPTH OF CONTAMINATED SOIL, PER REPORT REQUIREMENTS, SEE NOTES	6,084 SF

	SOLID WASTE CONTAMINATION, REMOVE 2' OF CONTAMINATED SOIL, PER REPORT REQUIREMENTS, SEE NOTES	4,260 SF
	PREHISTORIC SITE BOUNDARY, MAX. 1' EXCAVATION IS PERMITTED	
	PARCEL LINE	
	LIMIT OF WORK LINE	
	100 YEAR XHT 9.53'	

DEMOLITION NOTES

1. CONTRACTOR TO PROTECT IN PACE ALL EXISTING PARK PATHWYAS AND IMPROVEMENTS.
2. CONTRACTOR TO MITIGATE ANY DAMAGE TO EXISTING IMPROVEMENTS INCLUDING GATES & PATHWAYS.
3. SOIL REMOVAL & REPLACEMENT REQUIREMENTS AS PER INTERIM FINAL COMPLETION REPORT SHORELINE SOIL EXCAVATION, REPLACEMENT & STOCKPILE REMOVAL PREPARED BY GEO-LOGIC ASSOCIATES FOR THE CITY OF SAUSALITO, DATED DECEMBER 2023.
4. FOR SHORELINE SECTIONS SEE SHEETS L0.2-L4.4

Date Plotted: 6/24/2024 6:53 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Draft Marin County LEA Submittal

DATE

REVISIONS

No.	Date	Description

REGISTRATION AND SIGNATURE

SCALE
1" = 30'-0"
0 15' 30' 60'
N

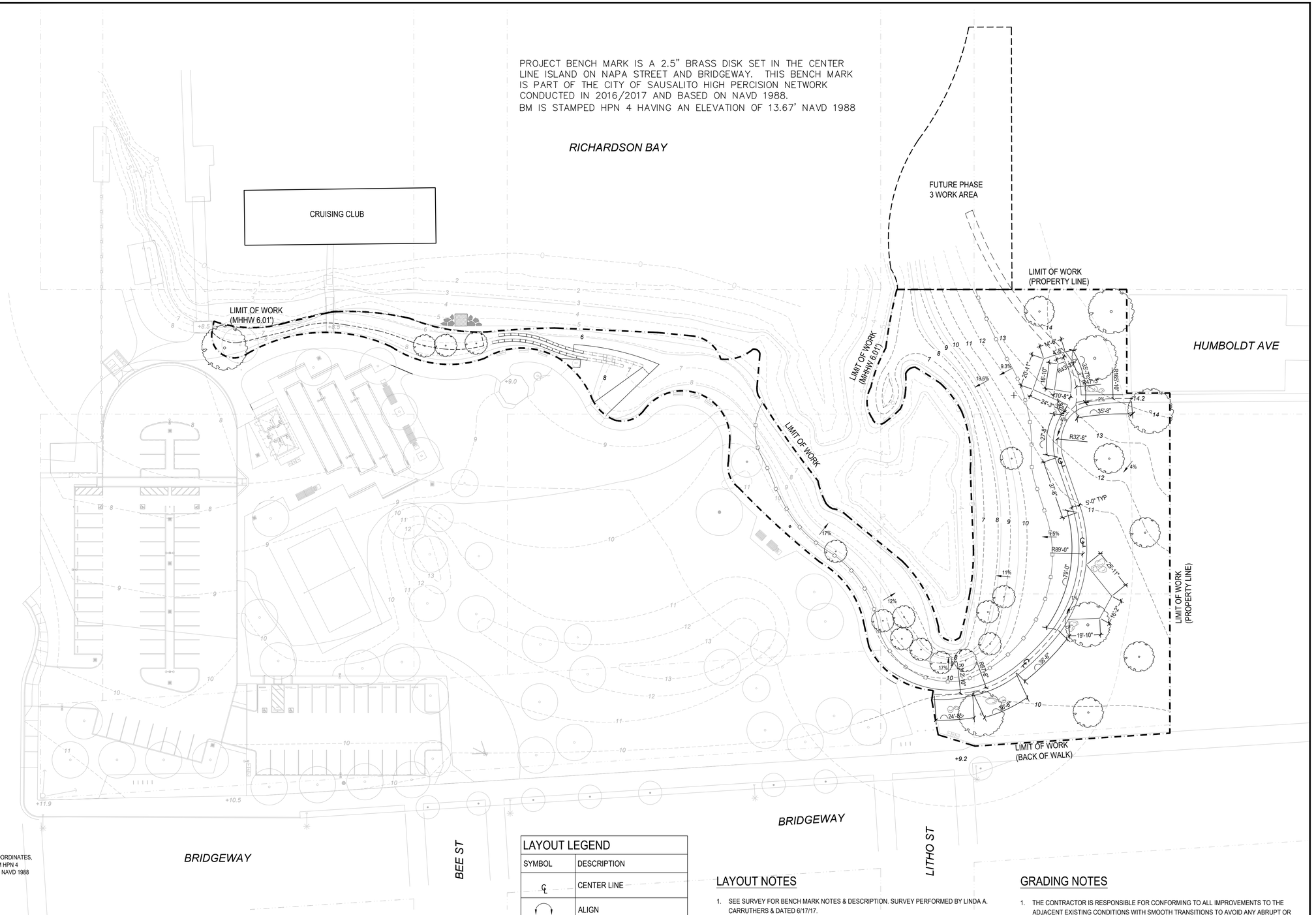
SHEET TITLE

DEMOLITION PLAN

DRAWN BY: TS / QU CHECKED BY: JM

L1.1

PROJECT BENCH MARK IS A 2.5" BRASS DISK SET IN THE CENTER LINE ISLAND ON NAPA STREET AND BRIDGEWAY. THIS BENCH MARK IS PART OF THE CITY OF SAUSALITO HIGH PERCISION NETWORK CONDUCTED IN 2016/2017 AND BASED ON NAVD 1988.
BM IS STAMPED HPN 4 HAVING AN ELEVATION OF 13.67' NAVD 1988



LAYOUT LEGEND

SYMBOL	DESCRIPTION
℄	CENTER LINE
	ALIGN
XX	ARC LENGTH
EQ	EQUAL
(E)	EXISTING
R XX	RADIUS
OC	ON CENTER
	PARCEL LINE
	LIMIT OF WORK

LAYOUT NOTES

1. SEE SURVEY FOR BENCH MARK NOTES & DESCRIPTION. SURVEY PERFORMED BY LINDA A. CARRUTHERS & DATED 6/17/17.
2. THE CONTRACTOR IS RESPONSIBLE TO LAYOUT ALL IMPROVEMENTS AS SHOWN AND SPECIFIED.
3. THE CONTRACTOR SHALL FIELD VERIFY THAT ALL STAKING SET FOR IMPROVEMENTS ARE CONSISTENT WITH THE DESIGN INTENT OF THESE PLANS AND IMMEDIATELY NOTIFY THE OWNER'S REPRESENTATIVE AND LANDSCAPE ARCHITECT OF ANY DISCREPANCY.
4. ALL CURVES TO BE CONTINUOUS WITH SMOOTH TRANSITIONS AS SHOWN IN THE DRAWINGS, UNLESS OTHERWISE NOTED.
5. HORIZONTAL COORDINATES AND DIMENSIONS ARE SHOWN AT THE PRIMARY GEOMETRIC CONTROL POINTS FOR THE IMPROVEMENTS TO AID THE CONTRACTOR WITH THE ESTABLISHMENT OF THE HORIZONTAL LOCATION OF THE IMPROVEMENTS AND ARE BASED ON THE SURVEY AND COORDINATES PROVIDED BY THE CIVIL ENGINEER.
6. THE CONTRACTOR SHALL REFER TO THE ARCHITECTURAL AND ENGINEERING PLANS FOR THE LAYOUT, DIMENSIONS, ANGLES AND ELEVATIONS OF ALL BUILDINGS, STRUCTURES, UTILITIES, CURBS AND GUTTERS.

GRADING NOTES

1. THE CONTRACTOR IS RESPONSIBLE FOR CONFORMING TO ALL IMPROVEMENTS TO THE ADJACENT EXISTING CONDITIONS WITH SMOOTH TRANSITIONS TO AVOID ANY ABRUPT OR APPARENT CHANGES IN GRADES, CROSS SLOPE, HAZARDOUS CONDITIONS, ETC.
2. CONTRACTOR TO NOTIFY THE OWNER'S REPRESENTATIVE OF ANY DISCREPANCIES BETWEEN THE DESIGN INTENT AND EXISTING CONDITIONS AND ANY CONFLICTING INFORMATION REGARDING FINISH GRADES AND ELEVATIONS.
3. ALL EXISTING UTILITY STRUCTURES (SHOWN OR NOT SHOWN ON THE DRAWINGS) WITHIN THE AREA OF WORK SHALL BE ADJUSTED OR RECONSTRUCTED TO THE FINISH GRADES SHOWN AND SPECIFIED.
4. ALL FINISH GRADES AND CONTOURS IN PLANTING AREAS REFER TO FINISH GRADE OF THE MULCHED LANDSCAPE.

Date Plotted: 6/24/2024 6:52 PM

rhaa
Landscape Architecture & Planning
225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Draft Marin County LEA Submittal

DATE

REVISIONS

No.	Date	Description

REGISTRATION AND SIGNATURE

SCALE
1" = 30'-0"
0 15' 30' 60'

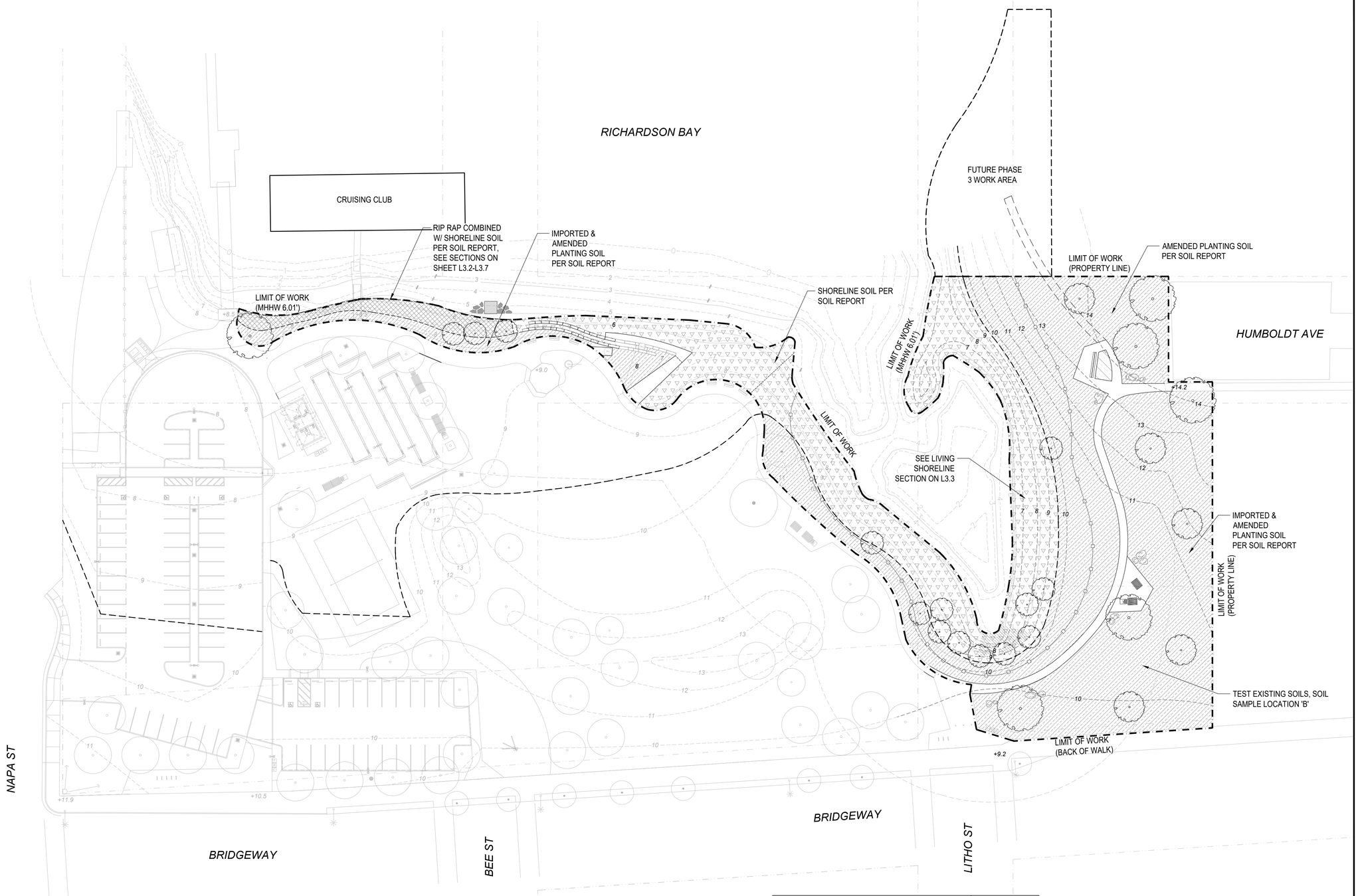
N

SHEET TITLE

LAYOUT PLAN & GRADING PLAN

DRAWN BY: TS / QU CHECKED BY: JM

L2.0



LEGEND		
SYMBOL	DESCRIPTION	AREA
	IMPORTED & AMENDED PLANTING SOIL PER SOIL REPORT	32,918 SF
	RIP RAP W/ SHORELINE SOIL PER SOIL REPORT	3,016 SF
	SHORELINE SOIL PER SOIL REPORT	16,736 SF
	PARCEL LINE	
	LIMIT OF WORK LINE	
	100 YEAR XHT 9.53'	

SOIL MANAGEMENT NOTES

1. CONTRACTOR TO PROVIDE TESTING AND SOIL REPORT FOR (E) SOIL PRIOR TO STOCKPILING PER SPECIFICATIONS. CONTRACTOR TO AMEND ANY SALVAGED SOIL PER SOIL REPORT RECOMMENDATION.
2. REFER TO SPECIFICATIONS FOR DETAILED SOIL AND STOCKPILING INFORMATION.
3. TREES WITHIN NEW PLANTING AREAS TO RECIEVE AMENDED PLANTING SOIL AT 2X ROOTBALL DIMENSION. TREES WITHIN EXISTING TURF AREAS TO RECIEVE AMENDED PLANTING SOIL AT 3X ROOTBALL DIMENSION

Date Plotted: 6/24/2024 6:52 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Draft Marin County LEA Submittal

DATE

REVISIONS

No.	Date	Description

REGISTRATION AND SIGNATURE

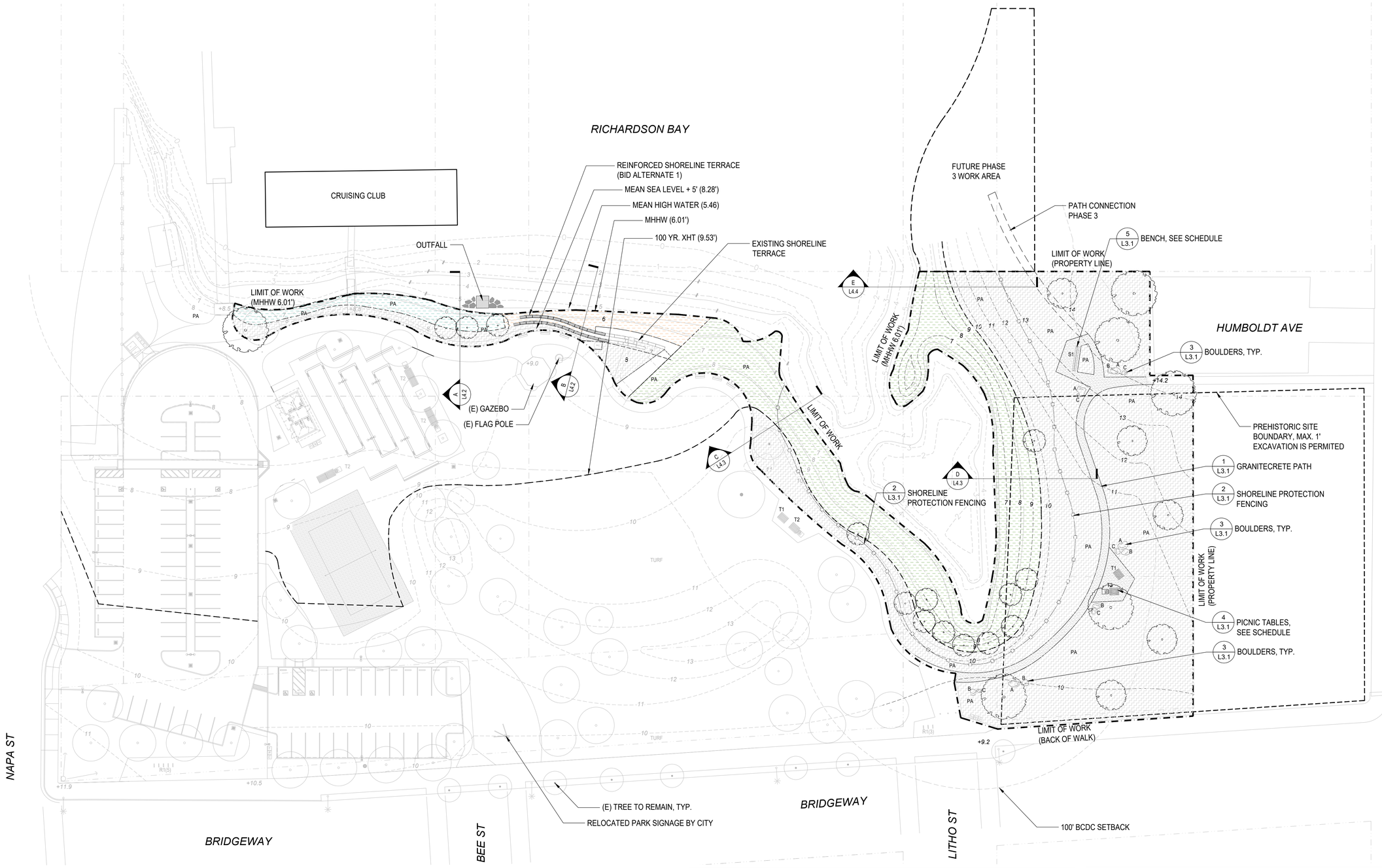
SCALE
1" = 30'-0"
0 15' 30' 60'
N

SHEET TITLE

SOIL PLACEMENT PLAN

DRAWN BY: TS / QU CHECKED BY: JM

L3.0



BOULDER SCHEDULE			
	DIMENSIONS	WIDTH AT GRADE	QTY
A	24"-30"	36"	4
B	18"-24"	30"	5
C	12"-18"	24"	5

FURNISHING SCHEDULE					
SYMBOL	TYPE/SIZE	MATERIAL	MODEL	MANUFACTURER	QTY
S1	16'X24"X16"	STEEL-BLACK	GIANT TIMBER SEAT - MODEL # 221916	TIMBERFORM	1
T1	5'10"X4'5"X2'6"	STEEL-BLACK	PICNIC TABLE (STANDARD) - MODEL # 2162-6	TIMBERFORM	2
T2	7'10"X4'5"X2'6"	STEEL-BLACK	GREENWAY PICNIC TABLE (ACCESSIBLE) - MODEL # 2162-6 SEE 1/L4.4	TIMBERFORM	2

MATERIALS SCHEDULE			
HATCH	DESCRIPTION	PRODUCT INFORMATION	PRODUCT IMAGE
	GRANITECRETE PATH	MFG: TBD PRODUCT: TBD SIZE: TBD COLOR: TBD	
	WOOD DECKING	MFG: TBD PRODUCT: TBD SIZE: TBD COLOR: TBD	

LEGEND		
SYMBOL	DESCRIPTION	AREA
	PARCEL LINE	
	LIMIT OF WORK	
	100 YEAR XHT 9.53'	
	REVETMENT SHORELINE	2,987 SF
	EXTENDED TERRACE WALL SHORELINE	3,363 SF
	LIVING SHORE SHORELINE	28,077 SF
	UPSLOPE PLANTING AREA	

Date Plotted: 6/24/2024 6:52 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Draft Marin County LEA Submittal

DATE

REVISIONS

No.	Date	Description

REGISTRATION AND SIGNATURE

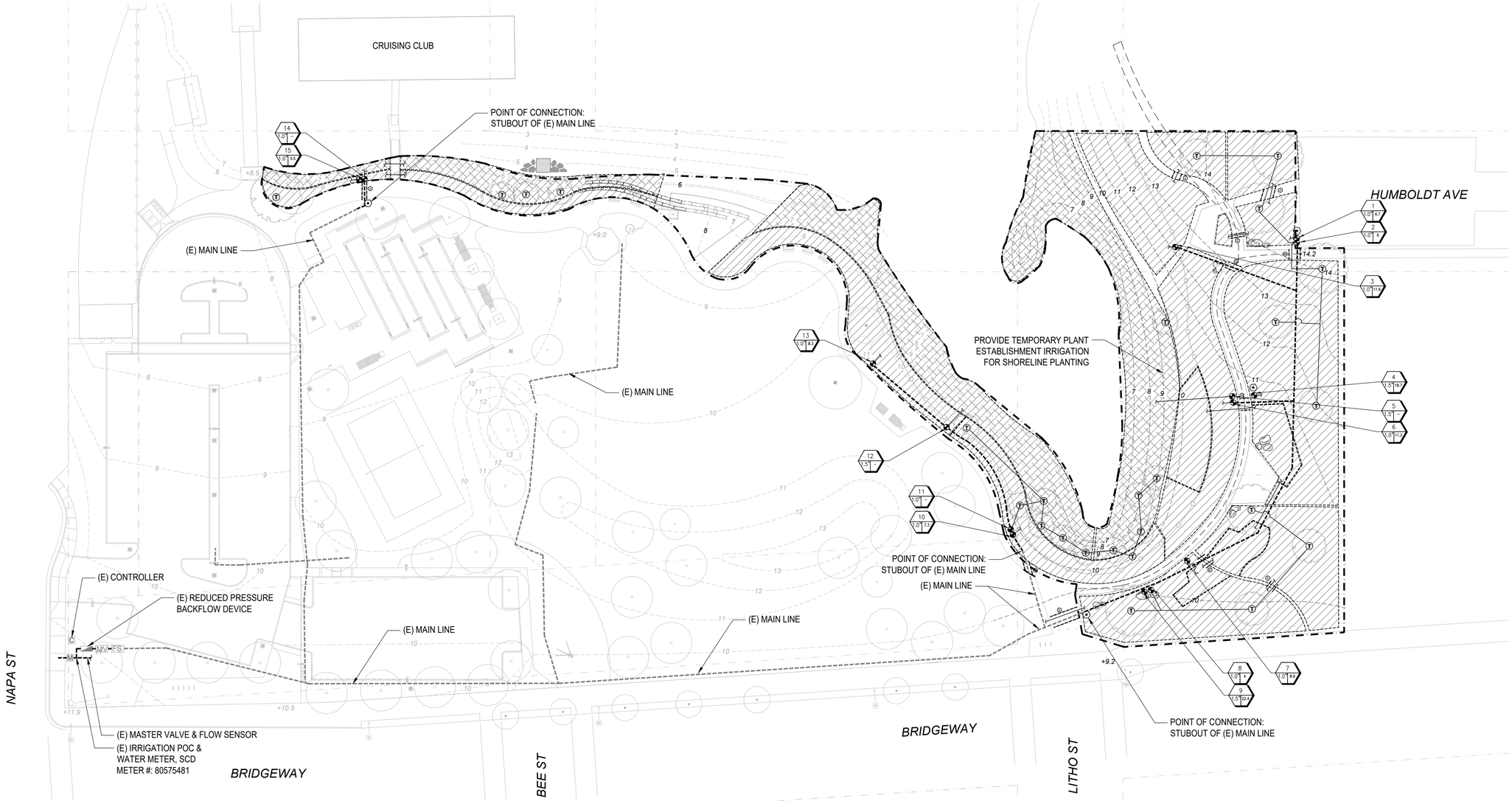
SCALE
1" = 30'-0"
0 15' 30' 60'
N

SHEET TITLE

CONSTRUCTION PLAN

DRAWN BY: TS / QU CHECKED BY: JM

L4.0



Date Plotted: 6/24/2024 6:52 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Draft Marin County LEA Submittal

DATE

REVISIONS

No.	Date	Description

REGISTRATION AND SIGNATURE

SCALE
1" = 30'-0"
0 15' 30' 60'

N

SHEET TITLE

IRRIGATION PLAN

DRAWN BY: TS / QU **CHECKED BY: JM**

L5.1

SHRUBS									
QTY	SYMBOL	ABBREVIATION	SCIENTIFIC NAME	COMMON NAME	SIZE	SPACING	MATURE HEIGHT	MATURE WIDTH	WUCOLS
18		ATR BRE	ATRIPLEX LENTIFORMIS 'BREWERI'	BREWER SALTBUSH	5 GAL	5' O.C.	6'	7'	VL
29		ART CAL	ARTEMISIA CALIFORNICA	CALIFORNIA SAGEBRUSH	5 GAL	4' O.C.	6'	4'	L
53		BAC CON	BACCHARIS PILULARIS 'CONSANGUINEA'	COYOTE BRUSH	5 GAL	4' O.C.	7'	5'	L
10		CEA CON	CEANOTHUS 'CONCHA'	CONCHA CALIFORNIA LILAC	15 GAL	6' O.C.	8'	12'	L
35		EPI CAN	EPILOBIUM CANUM	CALIFORNIA FUSCHIA	1 GAL	3' O.C.	3'	5'	L
62		ERI ARB	ERIOGONUM ARBORESCENS	SANTA CRUZ ISLAND BUCKWHEAT	5 GAL	4' O.C.	5'	6'	VL
12		ERI FAS	ERIGONUM FASCICULATUM VAR. FASCICULATUM	COASTAL CALIFORNIA BUCKWHEAT	5 GAL	4' O.C.	18"	8'	L
12		GAR ELL	GARRYA ELLIPTICA 'EVIE'	SILK TASSEL	15 GAL	5' O.C.	10'	10'	L
3		HET ARB	HETEROMELES ARBUTIFOLIA	TOYON	15 GAL	8' O.C.	8'	8'	L
26		LON INV	LONICERA INVOLUCRATA	BLACK TWINBERRY	5 GAL	4' O.C.	15'	4'	L
63		LUP ALB	LUPINUS ALBIFRONS	SILVER BUSH LUPINE	5 GAL	3' O.C.	3'	4'	L
112		MIM AUR	MIMULUS AURANTIACUS	STICKY MONKEY FLOWER	1 GAL	3' O.C.	3'	3'	L
20		RHA CAL	RHAMNUS CALIFORNICA	COFFEEBERRY	15 GAL	6' O.C.	6'	8'	L
2		ROS CAL	ROSA CALIFORNICA	CALIFORNIA WILDROSE	15 GAL	6' O.C.	8'	10'	L
9		SAL CLE	SALVIA CLEVELANDII	SAGE	1 GAL	4' O.C.	4'	4'	L
28		SAL MEL	SALVIA MELLIFERA	BLACK SAGE	5 GAL	4' O.C.	6'	8'	L
SMALL SHRUBS & PERENNIALS									
3		ACH MIL	ACHILLEA MILLEFOLIUM	YARROW	D-16	1' O.C.	2'	2'	L
23		ASC SPE	ASCLEPIAS SPECIOSA	SHOWY MILKWEED	1 GAL	18" O.C.	4'	4'	L
109		ERI CON	ERIOPHYLLUM CONFERTIFLORUM	GOLDEN YARROW	1 GAL	18" O.C.	2'	1'-6"	L
14		ERI GLA	ERIGERON GLAUCUS	SEASIDE DAISY	1 GAL	18' O.C.	<1'	2'	L
140		ERI GRA	ERIOGONUM GRANDE VAR. RUBESCENS	RED-FLOWERED BUCKWHEAT	5 GAL	2' O.C.	1'	3'	L
43		ERI LAT	ERIOGONUM LATIFOLIUM	COAST BUCKWHEAT	1 GAL	2' O.C.	<1'	2'	L
21		ERI STA	ERIOPHYLLUM STAECHADIFOLIUM	SEASIDE WOOLLY SUNFLOWER	1 GAL	2' O.C.	5'	5'	L
87		ESC CAL	ESCHSCHOLZIA CALIFORNICA	CALIFORNIA POPPY	1 GAL	1' O.C.	2'	2'	VL
101		PHA CAL	PHACELIA CALIFORNICA	ROCK PHACELIA	1 GAL	18" O.C.	1'-6"	2'	VL
		SIS BEL	SISYRINCHIUM BELLUM	BLUE-EYED GRASS	D-16	6" O.C.	2'	6"	L
GROUNDCOVER									
115		ART PYC	ARTEMISIA PYCNOCEPHALA	COASTAL SAGEWORT	1 GAL	30" O.C.	2'	3'	L
582		BAC PIG	BACCHARIS PILULARIS 'PIGEON POINT'	PIGEON POINT COYOTE BRUSH	5 GAL	4' O.C.	2'	6'	L
198		CEA ANC	CEANOTHUS GLORIOSUS 'ANCHOR BAY'	POINT REYES CEANOTHUS	5 GAL	4' O.C.	2'	6'	L
18		CIS SUN	CISTUS PULVERLENTUS 'SUNSET'	SUNSET ROCKROSE	6 GAL	5' O.C.	3'	6'	L
15		SAL TER	SALVIA MELLIFERA 'TERRA SECA'	TERRA SECA SAGE	5 GAL	4' O.C.	2'-6"	5'	L
GRASSES									
64		CAR PRA	CAREX PRAEGRACILIS	FIELD SEDGE	D-16	18" O.C.	<1'	3'-6"	L
371		FES CAL	FESTUCA CALIFORNICA	CALIFORNIA FESCUE	D-16	2' O.C.	3'	3'	L
82		LEY CAN	LEYMUS CONDENSATUS 'CANYON PRINCE'	CANYON PRINCE WILD RYE	1 GAL	42" O.C.	4'	3'	L
1,110		STI PUL	STIPA PULCHRA	PURPLE NEEDLEGRASS	D-16	24" O.C.	3'	2'	VL
VINES									
14		CAL MAC	CALYSTEGIA MACROPHYLLA	CALIFORNIA MORNING GLORY	1 GAL	5' O.C.	4-6'	10'	L
6		LON HIS	LONICERA HISPIDULA	CALIFORNIA HONEYSUCKLE	1GAL	6' O.C.	6-8'	8'	L
LIVING SHORELINE									
79		BAC DOU	BACCHARIS DOUGLASII (GLUTINOSA)	MARSH BACCHARIS	D-16	36" O.C.	3'	3'	L
32		LIM CAL	LIMONIUM CALIFORNICUM	SEA LAVENDER	D-16	18" O.C.	2'	2'	L
*		DIS SPI	DISTICHLIS SPICATA	SALT GRASS	D-16	15" O.C.	1'	1'	L
41		GRI ANG	GRINDELIA STRICTA VAR. ANGUSTIFOLIA	PACIFIC GUMPLANT	D-16	18" O.C.	3'	4'	L
**		SAR PAC	SARCOCORNIA PACIFICA	PICKLEWEED	D-16	1' O.C.	6"	9"	L

TREES											
QTY	SYMBOL	ABBREVIATION	SCIENTIFIC NAME	COMMON NAME	SIZE	SPACING	HEIGHT	SPREAD	NATIVE	WUCOLS	NOTES
2		AES CAL	AESCULUS CALIFORNICA	CALIFORNIA BUCKEYE	36" BOX	PER PLAN	30'	30'	YES	L	
1		LYO FLO	LYONOTHAMNUS FLORIBUNDUS 'ASPENIFOLIUS	CATALINA ISLAND IRONWOOD	24" BOX	PER PLAN	30'	20'	YES	L	
6		PIN CON	PINUS CONTORTA VAR. 'CONTORTA'	SHORE PINE	24" BOX	PER PLAN	25'	25'	YES	L	
5		QUE AGR	QUERCUS AGRIFOLIA	COAST LIVE OAK	36" BOX	PER PLAN	40'	40'	YES	L	
9		SAL LAS	SALIX LASIOLEPIS	ARROYO WILLOW	15 GAL	PER PLAN	20'	20'	YES	L	
2		SAM NIG	SAMBUCUS NIGRA	BLACK ELDERBERRY	24" BOX	PER PLAN	30'	20'	YES	L	
2		SAM RAC	SAMBUCUS RACEMOSA	RED ELDERBERRY	24" BOX	PER PLAN	20'	20'	YES	L	

PLANTING NOTES

1. TREES AND PLANTS HAVE BEEN SELECTED FOR THE LOCAL CONDITIONS AND ARE DROUGHT TOLERANT.
2. ALL SOIL AND SUBSOIL TO BE TESTED BY AN APPROVED ACCREDITED SOIL TESTING LABORATORY, REFER TO SPECIFICATIONS
3. A MINIMUM OF 8 INCHES OF NON-MECHANICALLY COMPACTED SOIL SHALL BE AVAILABLE FOR WATER ABSORPTION AND ROOT GROWTH IN PLANTED AREAS.
4. INCORPORATE COMPOST OR NATURAL FERTILIZER INTO THE SOIL TO A MINIMUM DEPTH OF 8 INCHES AT A MINIMUM RATE OF 6 CUBIC YARDS PER 1000 SQUARE FEET OR PER SPECIFIC AMENDMENT RECOMMENDATIONS FROM A SOILS LABORATORY REPORT.
5. A MINIMUM 3 INCH LAYER OF MULCH SHALL BE APPLIED ON ALL EXPOSED SOIL SURFACES OF PLANTING AREAS EXCEPT IN TURF AREAS, CREEPING OR ROOTING GROUNDCOVERS, AND DIRECT SEEDING APPLICATIONS.
6. APPLY MEADOW GRASSES HYDROSEED MIX AT 40 LBS/ACRE

Date Plotted: 6/24/2024 6:52 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Draft Marin County LEA Submittal

DATE

REVISIONS

No.	Date	Description

REGISTRATION AND SIGNATURE

SHEET TITLE

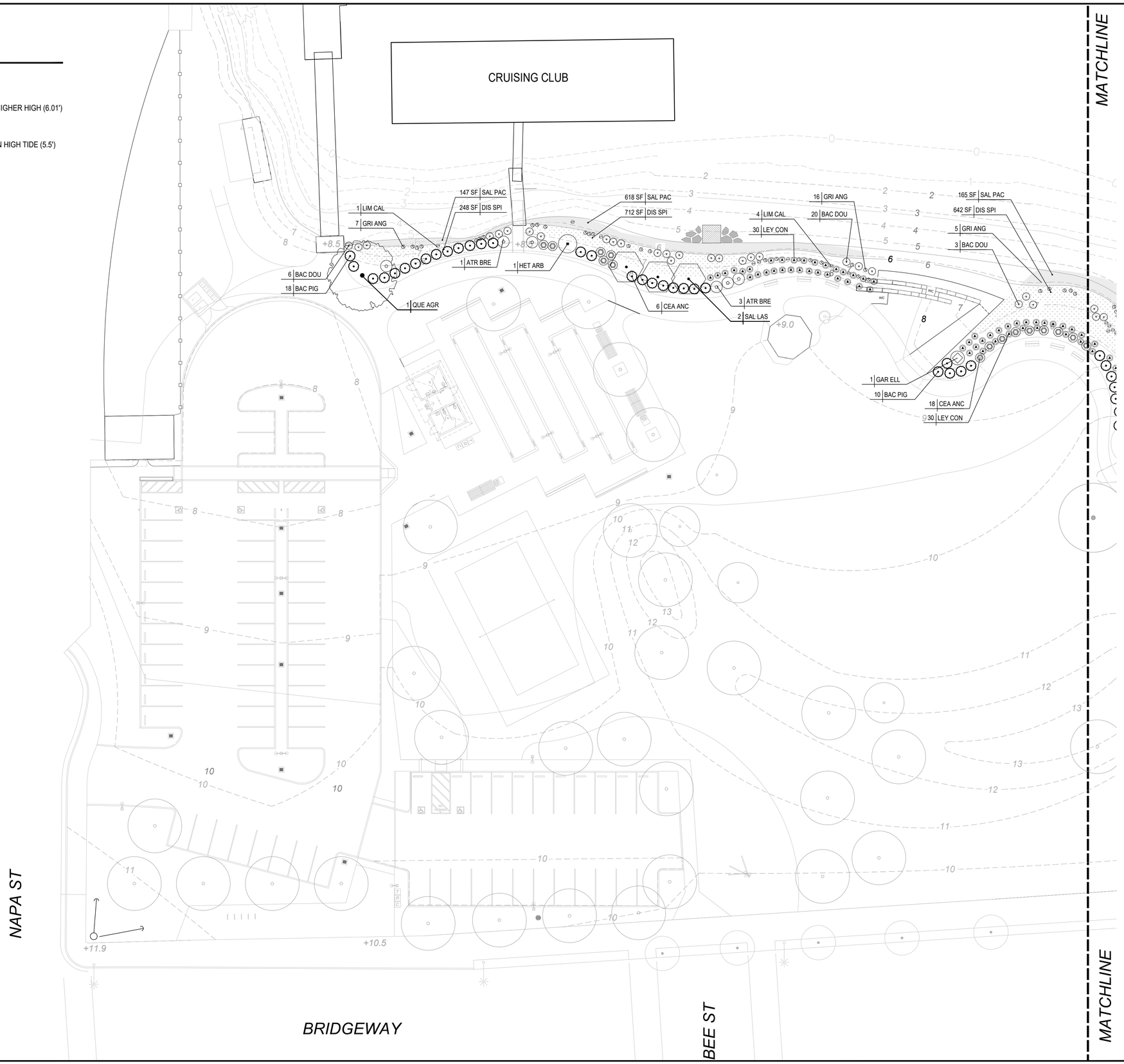
PLANTING SCHEDULE

DRAWN BY: TS / QU CHECKED BY: JM

L6.0

PLANTING LEGEND

- TURF
- HIGHER HIGH TIDE (9.5') - MEAN HIGHER HIGH (6.01')
  DISTICHLIS SPICATA
  SALT GRASS
- MEAN HIGHER HIGH (6.01') - MEAN HIGH TIDE (5.5')
  SALICORNIA PACIFICA
  PICKLEWEED



rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Draft Marin County LEA Submittal

DATE

REVISIONS

No.	Date	Description

REGISTRATION AND SIGNATURE

SCALE
1" = 20'-0"
0 10' 20' 40'
N

SHEET TITLE

PLANTING PLAN

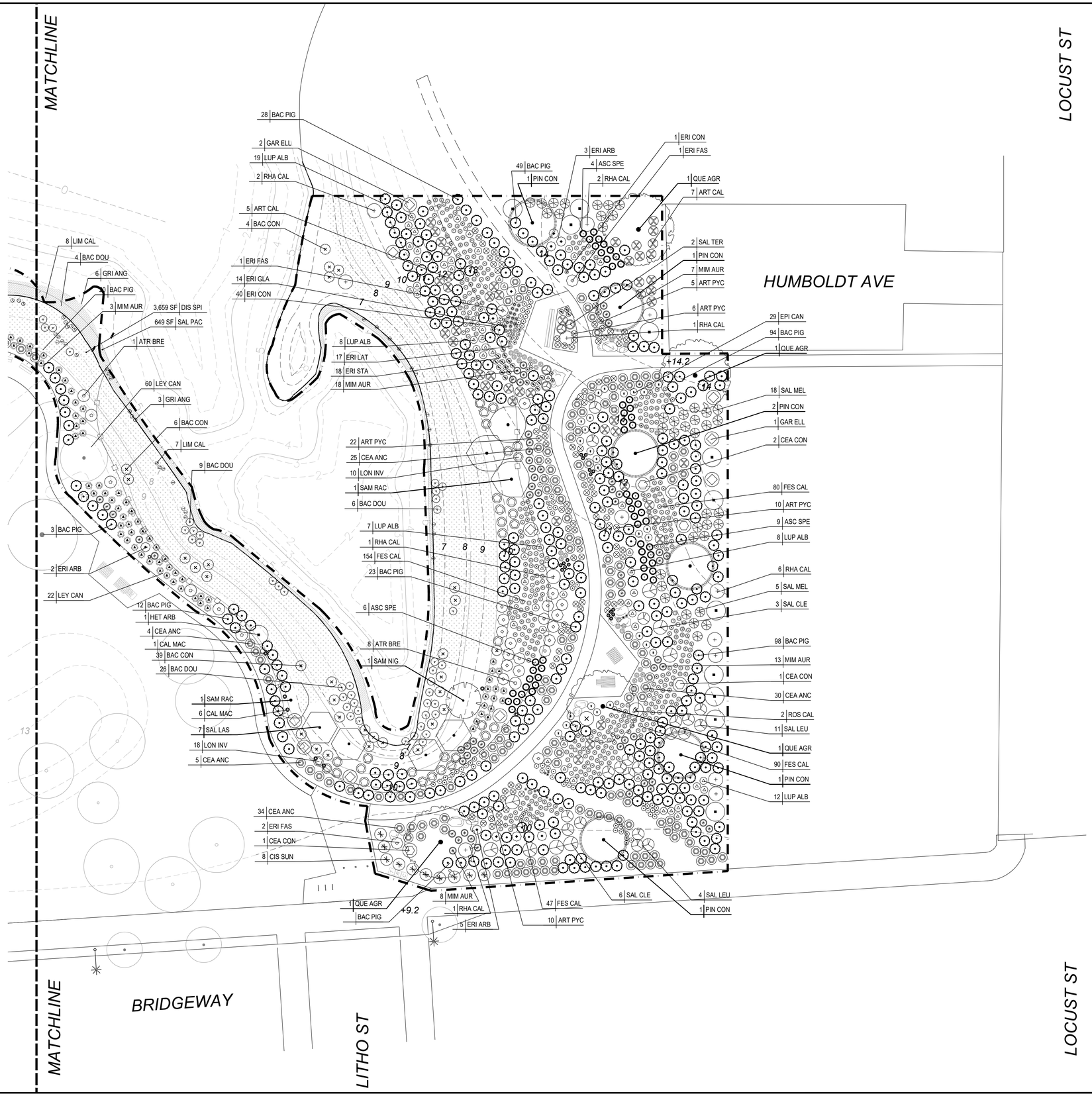
DRAWN BY: TS / QU **CHECKED BY: JM**

L6.1

Date Plotted: 6/24/2024 6:52 PM

PLANTING LEGEND

- TURF
- HIGHER HIGH TIDE (9.5') - MEAN HIGHER HIGH (6.01')
  DISTICHLIS SPICATA
  SALT GRASS
- MEAN HIGHER HIGH (6.01') - MEAN HIGH TIDE (5.5')
  SALICORNIA PACIFICA
  PICKLEWEED



Date Plotted: 6/24/2024 6:52 PM

rhaa
Landscape Architecture & Planning

225 Miller Avenue, Mill Valley, CA 94941
T 415 383 7900 rhaa.com

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

RHAA PROJECT NUMBER

16042A

CONSULTANT

SUBMITTAL

Draft Marin County LEA Submittal

DATE

REVISIONS

No.	Date	Description

REGISTRATION AND SIGNATURE

SCALE
1" = 20'-0"
0 10' 20' 40'
N

SHEET TITLE

PLANTING PLAN

DRAWN BY: TS / QU **CHECKED BY: JM**

L6.2

RICHARDSON BAY

CRUISING CLUB

TYPICAL:
SAMPLING POINT NUMBER AND LOCATION MAY VARY DURING ANY GIVEN STORM.
SAMPLE ALL DISCHARGES OCCURRING THROUGH BARRIER FENCE.
SAMPLE ALL PIPE PENETRATIONS DISCHARGES

LIMIT OF WORK (MHHW 6.01')

LIMIT OF WORK (PROPERTY LINE)

HUMBOLDT AVE

DL1 DL2 DL3 DL4 DL5 DL6 DL7 DL8 DL9 DL10 DL11 DL12 DL13 DL14 DL15 DL16 DL17

100' BCDC SETBACK

100' TYP.

LIMIT OF WORK (BACK OF WALK)

LIMIT OF WORK (PROPERTY LINE)

PT WD S D

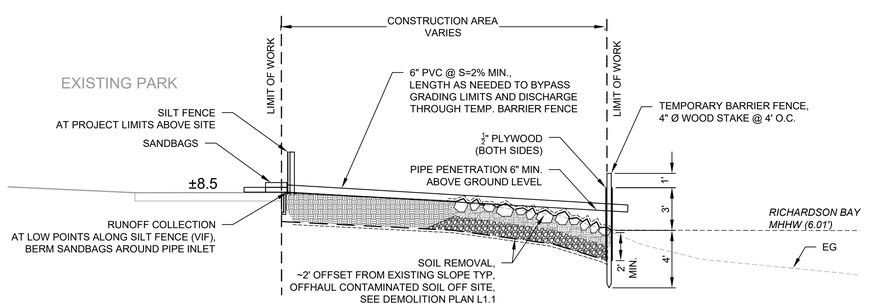
BRIDGEWAY

BRIDGEWAY

NAPA ST

BEE ST

LITHO ST



1 **TYPICAL SECTION**
SCALE: 1" = 5'

LEGEND

- LIMIT OF WORK
- TEMPORARY BARRIER FENCE (SEE DETAIL 1, THIS SHEET)
- FIBER ROLLS (SEE DETAIL 1, SHEET EC1.0)
- SAND/GRAVEL BAG BARRIER
- SILT FENCING (SEE DETAIL 6, SHEET EC1.0)
- CONSTRUCTION ENTRANCE (SEE DETAIL 2, SHEET EC1.0)
- SAMPLING LOCATION
- DIRECTION OF FLOW OR SLOPE
- WD — CONCRETE WASHDOWN AREA (SEE DETAIL 1, SHEET EC1.0)
- D — DELIVERY AREA
- S — NON HAZARDOUS STORAGE
- PT — PORTABLE TOILET WITH LINER
- STORM INLET PROTECTION

NOTE:

1. CONTRACTOR SHALL PLACE FILTER FABRIC, DANDY BAG, OR EQUAL AT ALL CATCH BASINS AND DROP INLETS. TO BE REMOVED AND DISPOSED PRIOR TO CLOSING OUT SITE PER PROJECT SWPPP.
2. PROTECT IN PLACE ALL EXISTING TREES WITHIN THE PUBLIC RIGHT OF WAY.

CSW ST2
ENGINEERING
LANDSCAPE ARCHITECTURE
SURVEYING
URBAN PLANNING
504 REDWOOD BLVD #310
NOVATO, CA 94947
415.883.9850
WWW.CSWST2.COM

PROJECT/CLIENT NAME

Dunphy Park Improvement Project Phase 2

200 Napa Street
Sausalito, CA 94965

Owner:
City of Sausalito
420 Litho St.
Sausalito, CA 94965

CSWST2 PROJECT NUMBER

2500185

CONSULTANT

SUBMITTAL

DATE

REVISIONS

No.	Date	Description

REGISTRATION AND SIGNATURE

SCALE
1" = 30'-0"
0 15' 30' 60'
N

SHEET TITLE

EROSION CONTROL PLAN

DRAWN BY: JD **CHECKED BY: KP**

EC1.1