EXHIBITS V

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CEQA Project Description

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GARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT PROJECT
PROJECT DESCRIPTION

1.0 Project Location and Setting

Regional Setting

The Garberville Sanitary District is located in the unincorporated community of Garberville in northern California, approximately 52 miles south-southeast of Eureka along the south fork of the Eel River and adjacent to U.S. Highway 101 in Humboldt County (Figure 1; USGS Garberville 7.5-minute Quadrangle, Township 4 South, Range 3 East, Section 24, Township 4 South, Range 4 East, Sections 18 and 19, Humboldt Meridian). Garberville has a temperate Mediterranean climate characterized by mild, wet winters and warm, dry summers.

Project Location

The project is located within the boundaries of the Garberville Sanitary District (GSD; the District) in the unincorporated community of Garberville in northern California, approximately 52 miles south-southeast of Eureka along the south fork of the Eel River and adjacent to U.S. Highway 101 in Humboldt County (Figure 1; USGS Garberville 7.5-minute Quadrangle, Township 4 South, Range 3 East, Section 24, Township 4 South, Range 4 East, Sections 18 and 19, Humboldt Meridian). The project is located in several separate areas in and around the town of Garberville:

- the Main/Hurlbutt Tank and Upper Maple Lane Pump Station site (Figures 1 and 2),
- the Wallan Tank and Wallan Pump Station site (Figures 1 and 2),
- the Arthur/Alderpoint Pump Stations site (Figures 1 and 2),
- the Robertson Tank site (Figure 1), and
- the Tobin Well site (Figure 1).

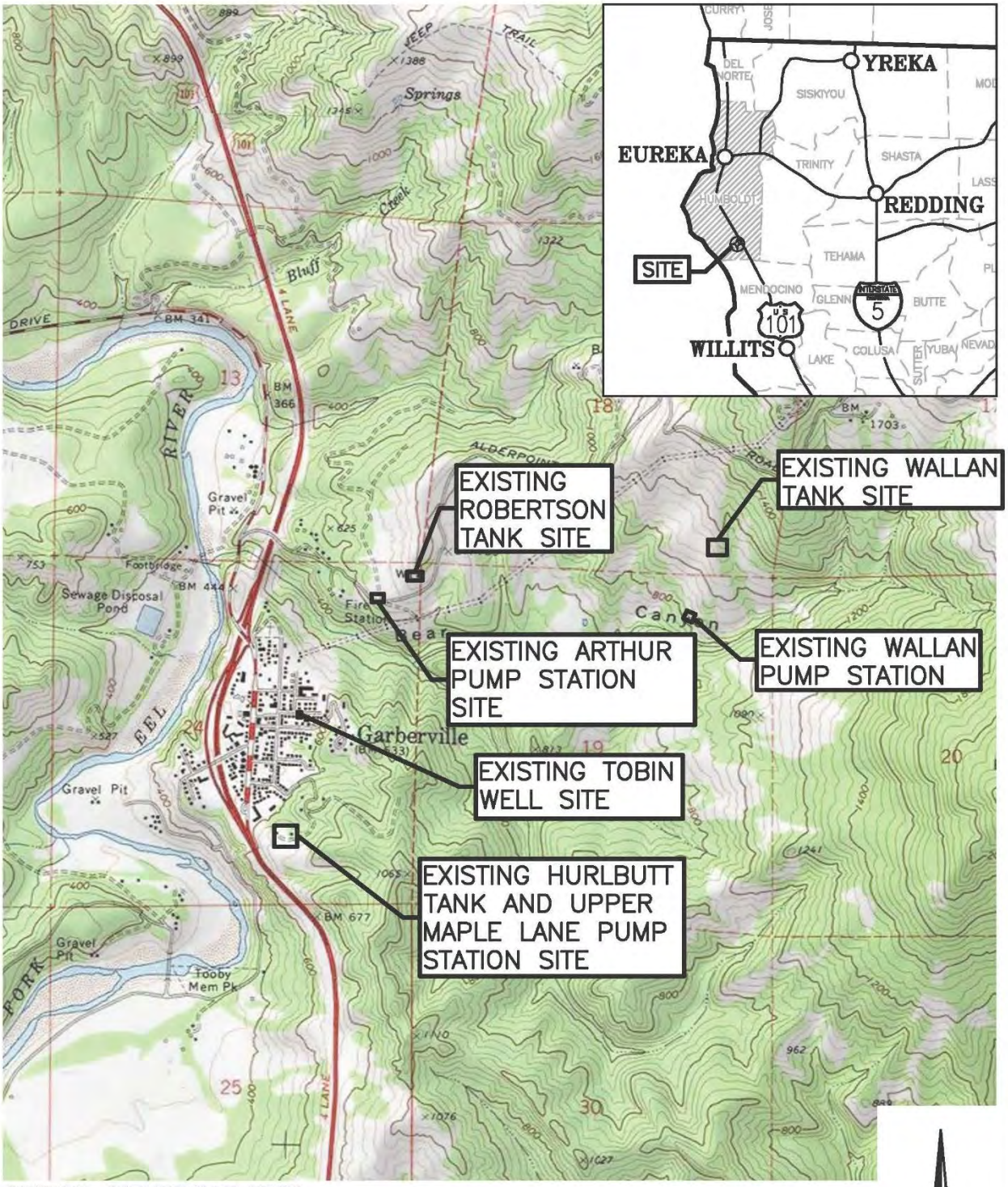
See Table 1 for the project location Assessor's parcel numbers (APNs).

Table 1. Assessor's Parcel Numbers, General Plan, Zoning Designations

Proposed Project Component	APN	General Plan Designation[a]	Zoning Designation[b]
Storage: Existing Main Tank	032-211-011	P	RS-B-5(5)
Storage: Proposed Main Tank	032-211-021	RL	RS-B-5(5)
Storage: Existing Wallan Tank	223-191-006	RE1-5	AE-B-6
Storage: Proposed Wallan Tank	223-191-006	RE1-5	AE-B-6
Storage: Existing Robertson Tank	223-181-020	RA5-20	AE-B-6
Pumping: Existing Upper Maple Lane Pump Station	032-211-011	P	RS-B-5(5)
Pumping: Existing Arthur Pump Station	223-181-025	RA5-20	AE-B-6
Pumping: Proposed Alderpoint Pump Station	223-183-003	PF	AE-B-6
Pumping: Existing Wallan Pump Station	223-191-011	RA40	AE-B-6
Electrical Upgrades: Standby Generators	Various	Various	Various
Standby Generator: Proposed Upper Maple Lane Pump Station	032-211-021	RL	RS-B-5(5)
Standby Generator: Proposed Alderpoint Pump Station	223-183-003	PF	AE-B-6
Standby Generator: Existing Wallan Pump Station	223-191-011	RA40	AE-B-6
Standby Generator: Existing Tobin Well	032-135-002	P	R-1
Instrumentation and Controls Improvements	Various	Various	Various
Distribution Piping	Various	Various	Various

a: General Plan Designations:
P: Public Lands
RL: Residential Low Density
RE: Residential Estates
RA: Residential Agriculture
PF: Public Facility

b: Zoning Designations:
RS: Residential Suburban
AE: Agriculture Exclusive
R-1: Residential One Family



SOURCE: GARBERVILLE USGS 7.5 MINUTE QUADRANGLE

1"=2000'±

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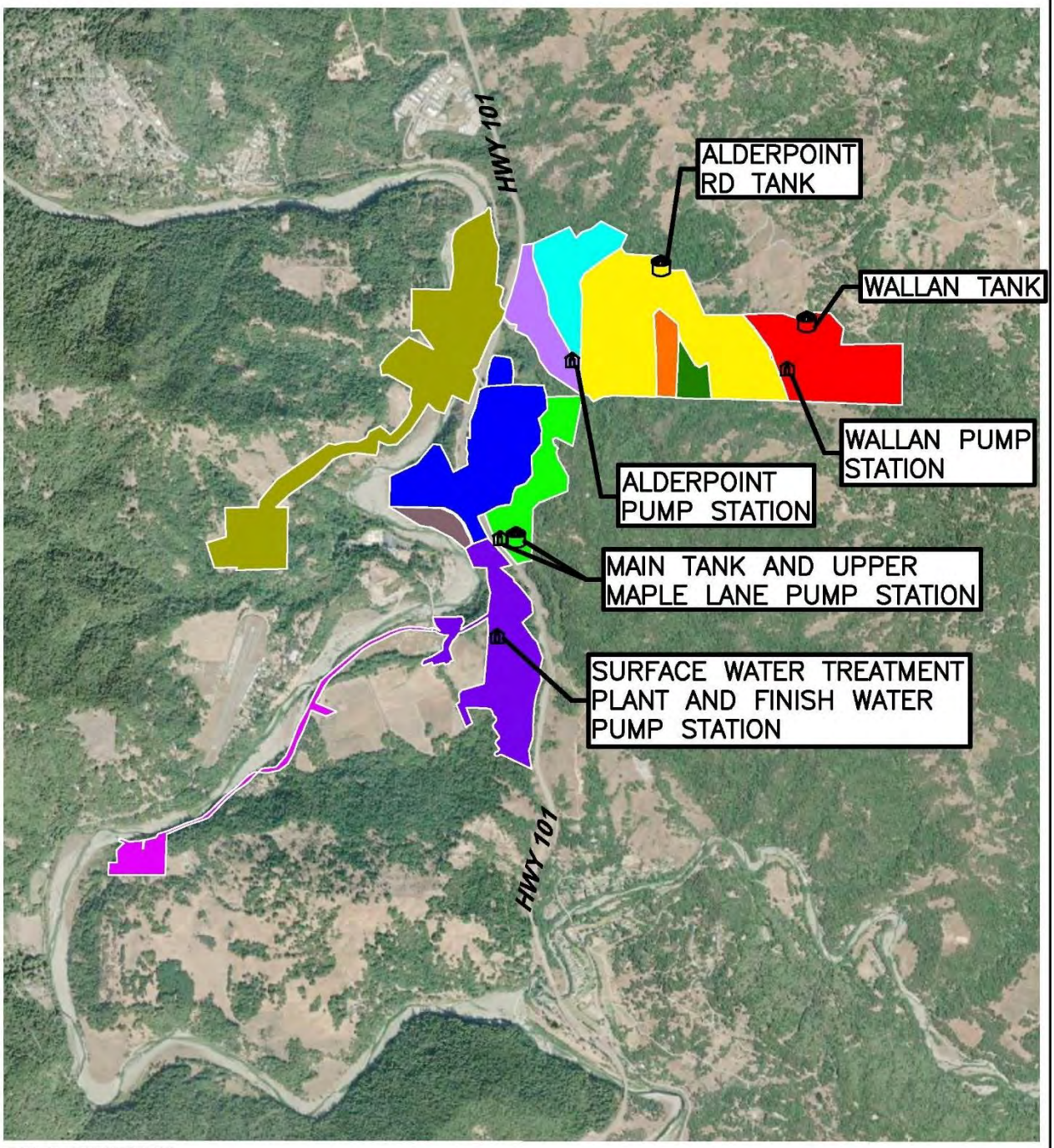
Garberville Sanitary District Garberville Water System Improvements Garberville, California		Site Location Map Existing Features SHN 022067
August 2023	022067-SITE-LCTN	Figure 1



EXPLANATION

TANK	ZONE 1D	ZONE 4B
PUMP STATION	ZONE 1E	ZONE 5
ZONE 1	ZONE 2	
ZONE 1A	ZONE 3	
ZONE 1B	ZONE 4	
ZONE 1C	ZONE 4A	

N

1"=3000'

Garberville Sanitary District Garberville Water System Improvements Garberville, California		Water System Pressure Zone Map SHN 022067
March 2023	022067-WTR-SYST-PRESS-ZONE	Figure 2

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Surrounding Land Uses and Existing Setting

The project is located east of the South Fork Eel River and U.S. Highway 101. The Main/Hurlbutt Tank and Upper Maple Lane Pump Station site is developed with rural residential uses and existing District water system infrastructure. It is surrounded by timberlands to the east, the urbanized Garberville downtown to the north, and U.S. Highway 101 to the west and south. The Wallan Tank and Wallan Pump Station site is developed with rural residential uses and existing District water system infrastructure. It is surrounded by rural residential and agricultural uses. The Arthur/Alderpoint Pump Stations sites are developed with the existing Arthur Pump Station and a CALFIRE station respectively and are surrounded by rural residential and agricultural uses as well as forested areas. The Robertson Tank site is developed with existing District water system infrastructure and is surrounded by rural residential and agricultural uses as well as forested areas. The Tobin Well site is developed with existing District water system infrastructure and is surrounded by single-family residential development.

2.0 Existing Conditions

Overview

The Garberville community is located in northern California, approximately 52 miles south-southeast of Eureka on the south fork of the Eel River and adjacent to U.S. Highway 101 in Humboldt County (Figure 1). Garberville has a population of 818 people according to the 2020 Decennial Census Program estimate.

The District serves the unincorporated town of Garberville and surrounding area with sewer, wastewater, and water services. The District was formed in 1932 for the purpose of providing sanitary sewer services. After purchasing the privately held Garberville Water Company in 2004, the District began providing drinking water to customers in the district. The District owns, operates, maintains, and manages the public drinking water system (CA1210008), which includes two drinking water sources, water treatment facilities, three finished water storage tanks currently in service, multiple pumping stations, and a distribution piping network. The District's service area covers 581 acres, and the water system serves approximately 1,200 people in the Garberville community through approximately 470 service connections. The California State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW) has jurisdiction over the District's drinking water system.

Water System Facilities

Sources

South Fork Eel River Infiltration

The South Fork of the Eel River Infiltration Gallery, located at N 19222330 E 6059360 CCS83, serves as the primary water source for the District. Originally installed in 1940, the river intake system consists of perforated pipes that run horizontally below the surface of the riverbed. These pipes feed into a 16-inch-diameter steel and polyvinyl chloride (PVC) pipe casing within a vertically oriented 4-foot-diameter corrugated metal pipe (CMP) over 40 feet in height, which extends above the 100-year flood level on the east riverbank. Situated within the 16-inch steel casing are two 20-horsepower (HP) variable speed vertical submersible turbine pumps, each with a rated capacity of 350 gallons per minute (gpm) at 153 feet total dynamic head (TDH). The bottom of the pumps sits at an elevation of 289 feet and they discharge to a common 6-inch pipeline that transports raw water to the District's surface water treatment plant (SWTP) on Tooby Ranch Road. The current raw water pumps were installed in 2014 and only one pump operates at a time. A permanent backup generator at the raw water intake can power the pumps during a utility power outage.

Surface water supply capacity for the District is permitted through both a State Water Resources Control Board Right to Divert and Use Water License 3404 (Permit 5487, Application 9686) and Permit 20789 (Application 29981). Together, these allow the District to divert up to 0.75 cubic feet per second (cfs) and, based on the California Department of Fish and Wildlife Lake or Streambed Alteration Agreement Notification No 1600-2012-0030-R1, is further limited to no more than 10% of stream flow as measured at the United States Geological Survey (USGS) gauge station number 11476500 at Miranda. The total quantity of water permitted to be diverted on an annual basis is 245.5 acre-feet per year.

Tobin Well

The Tobin Well, located at 510 Pine Lane, serves as a backup water source for the District and provides water during periods when the Eel River exhibits high turbidity. In 2014, the District installed a duplex variable speed pump system designed to supply 100 gpm at 173 feet TDH. Level controls vary the pump's output to maintain a preset water surface elevation, based on the recharge capacity of the well. Significant drawdown has been noted in the past. Disinfection of the well water is achieved via 12.5% sodium hypochlorite injection drip dosed of 0.5-1.0 milligrams per liter. This source is used very infrequently, primarily during emergencies, such as in late 2017 when the underground chlorine contact chamber failed at the treatment plant.

Treatment

The District's SWTP is located on Tooby Ranch Road at a finished floor elevation of 388 feet. The SWTP began operating in 2014 to replace the aging water treatment plant that was previously located next to the Hurlbutt finished water storage tank at an elevation of approximately 700 feet. SWTP treatment processes include flocculation, direct filtration, and chlorination, followed by finished water pumping into the distribution system. Polymer is injected as a coagulant and filter aid into the raw water supply pipe upstream of the 5,500-gallon, baffled flocculation tank, which is an 8-foot-diameter, 14-foot-long, horizontal cylindrical pressure tank rated for 150 pounds per square inch, gage.

Downstream of the flocculator are two Loprest 9-foot-diameter vertical pressure filters with 6-foot straight shell length. The filters contain 18 inches of filter sand and 12 inches of anthracite with two grades of media support gravel and include associated piping, valves, controls, and accessories. The filtration system requires periodic backwashing of the filter media with finished water. The spent backwash water is stored in a 35,000-gallon, 18-foot diameter welded steel storage tank. Two backwash recycling pumps draw clearwater from the spent backwash water storage tank and inject it back into the treatment system upstream of the filters. Sediment is periodically pumped from the spent backwash tank and trucked to a disposal site.

After exiting the filters, treated water is disinfected using liquid sodium hypochlorite, which is injected upstream of the chlorine contact chamber. That chamber provides chlorination detention time prior to the water entering the distribution system. Originally, the SWTP was constructed with an underground chlorine contact chamber of 30-inch serpentine pipe. That pipe failed in November 2017 and was replaced in 2018 with an aboveground, 20,000-gallon, steel baffled pressure vessel, which provides disinfection contact time.

Duplex finished water pumps located downstream of the chlorine contact tank operate in series with the raw water pumps and deliver finished water to the distribution system and to the Hurlbutt Tank, which is the main finished water storage tank in the District's water system.

The SWTP has a 60-kilowatt, permanently mounted, diesel generator with a fuel tank capacity that will allow for 72 hours of continuous operation. This generator can power the entire SWTP facility during utility power outages.

Distribution and Storage Facilities

The current distribution system includes three active booster pump stations, three operating finished water storage tanks, and five main pressure zones that supply water to customers throughout the District.

Pressure Zones and Booster Stations

After leaving the treatment plant, finished water is pumped into the distribution system through an 8-inch main that runs up Sprowl Creek Road to the downtown distribution piping network where it also connects to an 8-inch pipe that runs to the Hurlbutt finished water storage tank. The Hurlbutt Tank is located on Assessor's parcel number (APN) 032-211-012 at an elevation of approximately 700 feet. The Hurlbutt Tank supplies water to pressure Zones 1 and 2, which accounts for approximately 85.1% of the District's service connections. The tank gravity feeds Zone 1 connections, including those in the downtown core area and a few subzones at lower elevations, which are fed through pressure reducing valves (PRVs). Two vertical submersible Upper Maple Lane Booster Pumps mounted within the Hurlbutt Tank supply water to Zone 2 customers, which consist of residences on Hillcrest Drive and Maple Lane located at elevations above the Hurlbutt Tank.

Previously, the Oak Street Pump Station pumped water to Zone 2 connections. The corrugated metal pump house for the Oak Street Pump Station is now in very poor condition.

The Hurlbutt Tank also gravity feeds the Arthur Pump Station. Situated at an elevation of 659 feet adjacent to Alderpoint Road near the intersection of Arthur Road, the Arthur Pump Station transfers water to the Alderpoint Tank, sited at a base elevation of 915 feet on the north side of Alderpoint Road. The Alderpoint Tank feeds Zone 3 (through a pressure reducing station) and Zone 4 connections. Zones 3 and 4 account for 13.4% of the District's water service connections. The Alderpoint Tank also supplies water to the Wallan Pump Station, at an elevation of 866 feet on the south side of Wallan Road. The Wallan Pump Station pumps water up to the Wallan Tank, the highest tank in the system at an elevation of 1,155 feet. The Wallan Tank serves Zone 5 customers, which account for the remaining 1.5% of service connections in the District's service area.

Table 2 summarizes the five major pressure zones that supply drinking water to service connections throughout the District's service area. Refer to Figure 2 for a map of the District's service area and pressure zones.

Table 3 lists the three booster pump stations in service within the District's distribution system.

Table 2. Pressure Zones and Associated Parameters, Garberville Sanitary District

Pressure Zone	No. of Connec-tions[a]	Elevation Range[b] of Connections (feet)	Portion of Total Water Consumed	Associated Storage Tank	Notes
1	379	Downtown: 497-614; With PRVs: 326-386	80.98%	Hurlbutt	This zone includes all customers that are served by gravity feed from the Hurlbutt Tank, including sub-zones that have PRVs to decrease the pressure. Zone 1 includes sub-zones 1, 1A, 1B, 1C, 1D, and 1E.
2	21	666-725	2.74%	Hurlbutt	This zone is supplied water from the vertical pumps and pneumatic tanks at the Hurlbutt Tank and includes the houses along Hillcrest Drive and Upper Maple Lane.
3	20	677-688	3.84%	Alderpoint	This zone includes customers located primarily on Arthur Road. The Robertson Tank supplied this zone until spring 2022 when the District removed the tank from service and installed a pressure reducing valve (PRV) at the intersection of Alderpoint Rd and Arthur Rd so this zone could be served by Alderpoint Tank.
4	43	627-870	8.31%	Alderpoint	This zone includes the majority of the residences on the north side of Bear Canyon, and includes sub-zones 4, 4A, and 4B.
5	7	868-1108	4.13%	Wallan	This is the highest-pressure zone in the system.
Total	**470**	**326 - 1108**	**100.00%**		

a. Number of connections were tallied based on unique addresses from 2021 usage data.
b. Elevation ranges are approximated based on Google Earth elevation data for residences in each pressure zone.

Table 3. Existing Distribution System Booster Pump Stations in Operation

Pump Station	Type & No. of Pumps	Number & Duty	Rated capacity (gpm[a])	Rated TDH[b] (feet)	Station elevation (feet)	Water Transfer Destination
Upper Maple Lane	Vertical turbine submersible	2 x 100%	60	175	703	Zone 2 connections
Arthur	Horizontal end suction	2 x 100%	70	330	659	Alderpoint Tank
Wallan	Horizontal inline	2 x 100%	50	300	866	Wallan Tank

a. gpm: gallons per minute
b. TDH: total dynamic head

Water Storage Tanks

Storage capacity for the District's drinking water system is currently provided by three water storage tanks located at varying elevations in the District's service area. With the exception of Zone 2, all service connections are supplied by gravity feed from the storage tanks. The Hurlbutt Tank is the main and oldest finished water storage tank in operation. The below-ground concrete tank has a capacity of approximately 180,000 gallons. This tank is located adjacent to a private residence owned by the Swaffar/Hurlbutt family, which owned and operated the Garberville Water Company before selling it to the District in 2004. The Alderpoint Tank is a 200,000-gallon capacity welded steel tank installed in 2015. The Wallan tank is a 20,000-gallon redwood tank constructed in 1978. The Wallan Tank is leaking, and the District lowered its operating water surface elevation (WSE) in order to minimize leakage. The District installed a vertical polyethylene tank adjacent to the Wallan Tank to serve as temporary backup until a replacement tank can be installed.

Table 4 provides details for the District's three in-service water storage tanks.

Table 4. Existing Water Storage Tanks Currently in Service

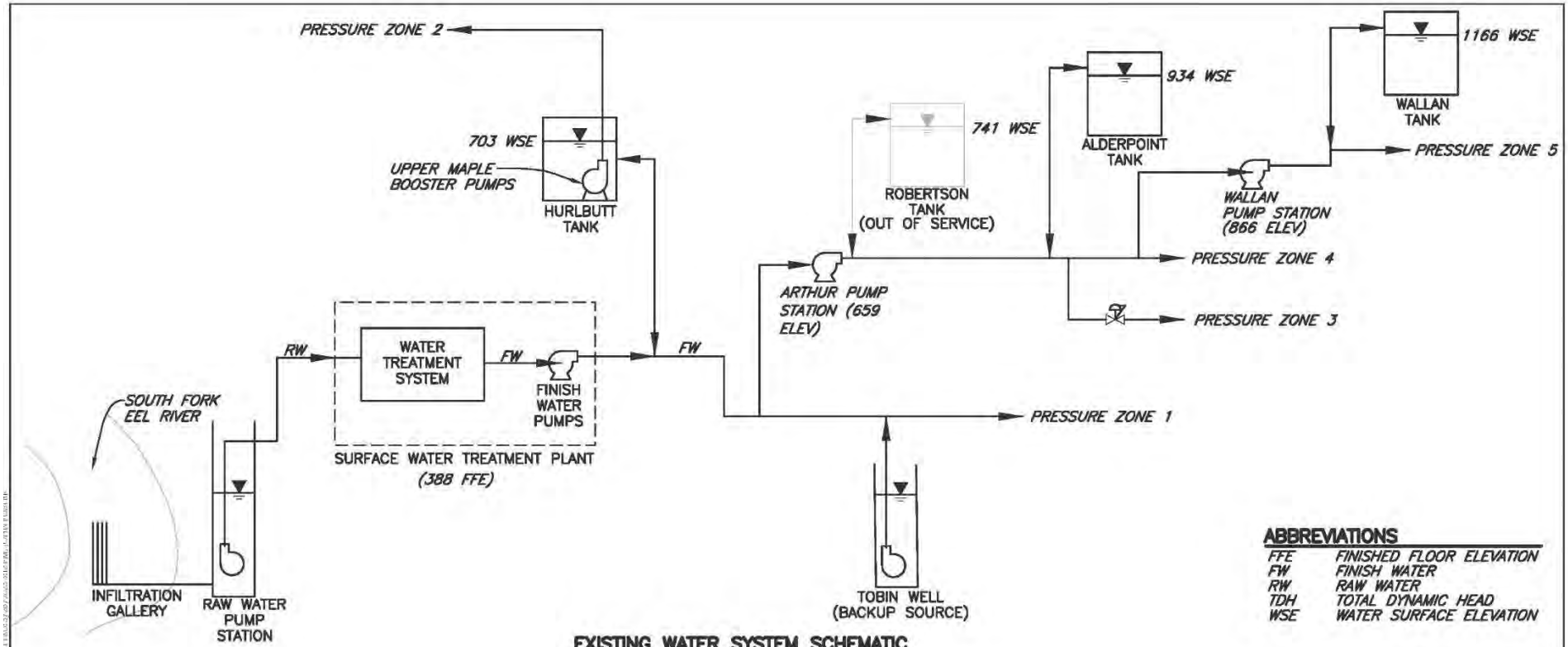
Tank Name	Tank Type	Base Elevation (feet)	Maximum WSE[a] (feet)	Capacity (gallons)	Pressure Zone(s) Served	Comments
Hurlbutt (Main)	In-Ground Concrete	692	703	180,000	1 & 2	Constructed in 1940. Primary storage from treatment plant. All water in the system is stored in this tank prior to being pumped to higher elevation zones.
Alderpoint	Welded Steel	915	934.3	200,000	3 & 4	Installed in 2015. Water for Zone 5 connections passes through this tank before it is transferred to Wallan Tank.
Wallan	Redwood	1,155	1,165.5	20,000	5	Constructed in 1978, operating at reduced water level due to leak. Adjacent poly tank has been installed as temporary backup.
Total Current Storage Tank Capacity				**400,000**	**All**	

a. WSE: water surface elevation

A fourth water storage tank, the Robertson Tank, is a partially buried 50,000-gallon concrete tank installed in 1922 that served pressure Zone 3. The Robertson Tank was taken out of service in February 2022 due to tank failure and slope stability issues adjacent to the tank, and in response to a compliance order from the State Water Resources Control Board. The tank is slated to be demolished as part of the proposed Tanks Replacement Project. The Alderpoint Tank now

serves pressure Zone 3 through a PRV. With the Robertson Tank permanently out of service, the District has a total current finished water storage capacity of 400,000 gallons.

Figure 3 provides an overall schematic of the District's water system facilities. In general, records for the distribution piping network are very lacking. Neither a map of the distribution system nor an accurate record of pipe materials, sizes, and conditions exists for the District's distribution system.



EXISTING WATER SYSTEM SCHEMATIC
NTS

ABBREVIATIONS

FFE	FINISHED FLOOR ELEVATION
FW	FINISH WATER
RW	RAW WATER
TDH	TOTAL DYNAMIC HEAD
WSE	WATER SURFACE ELEVATION

RAW WATER PUMPS	
QUANTITY	2
TYPE	SUBMERSIBLE VERTICAL TURBINE
CAPACITY	350 GPM
TDH	153 FEET
DRIVE	VARIABLE SPEED
POWER	20 HP, 460V 3 PHASE

FINISH WATER PUMPS	
QUANTITY	2
TYPE	VERTICAL IN-LINE CENTRIFUGAL
CAPACITY	350 GPM
TDH	332 FEET
DRIVE	VARIABLE SPEED
POWER	50 HP, 460V 3 PHASE

UPPER MAPLE LANE BOOSTER PUMPS	
QUANTITY	2
TYPE	HORIZONTAL INLINE CENTRIFUGAL
CAPACITY	60 GPM
TDH	175 FEET
DRIVE	CONSTANT
POWER	5 HP, 240V 3 PHASE

WALLAN BOOSTER PUMPS	
QUANTITY	2
TYPE	HORIZONTAL INLINE CENTRIFUGAL
CAPACITY	50 GPM
TDH	300 FEET
DRIVE	CONSTANT
POWER	7.5 HP

HURLBUTT TANK	
TYPE	CONCRETE
SIZE	52' DIA x 11' SWD
CAPACITY	~180,000 GALLON

ALDERPOINT TANK	
TYPE	WELDED STEEL
SIZE	42' DIA x 26' H
CAPACITY	200,000 GALLON

WALLAN TANK	
TYPE	REDWOOD
SIZE	18' DIA x 12' H
CAPACITY	20,000 GALLON

TOBIN WELL PUMPS	
QUANTITY	2
TYPE	SUBMERSIBLE VERTICAL TURBINE
CAPACITY	100 GPM
TDH	173 FEET
DRIVE	VARIABLE SPEED
POWER	7.5 HP

ARTHUR BOOSTER PUMPS	
QUANTITY	2
TYPE	HORIZONTAL END SUCTION CENTRIFUGAL
CAPACITY	70 GPM
TDH	330 FEET
DRIVE	CONSTANT
POWER	15 HP

SHN	Garberville Sanitary District Tanks Replacement Project Garberville, California	Existing Water System Schematic SHN 022067
	March 2023 / 022067-WTR-SYST-SCHEM	Figure 3

Electrical and Controls System

The tank sites in the District's system communicate to pump stations via radio signal. The Hurlbutt Tank calls for water by sending a signal to the SWTP on Tooby Ranch Road, which in turn signals to the raw water and finish water pumps to turn on. Alderpoint Tank and Wallan Tank similarly communicate via radio to their respective pump stations to turn on/turn off based on pre-set tank water levels.

The water treatment plant has a permanent backup generator, which has the capacity to provide full electrical backup of the treatment plant during utility outages. The raw water pump station also has a permanently installed backup generator. No other pump stations have a stationary backup generator. The District has a single trailer-mounted generator that the operations staff moves from location to location to back up the other pump stations in the system during power outages.

Water Demand and Required Tank Storage

Existing Water Demand

The District provided monthly water usage data for all water system connection from June 2014 through December 2021 for each pressure zone. From this data, average monthly water usage was calculated by zone and for the total system, as shown in Figure 4. The bar colors in Figure 4 represent water consumption by pressure zone, with Zone 1 connections consuming the majority of the District's water use.

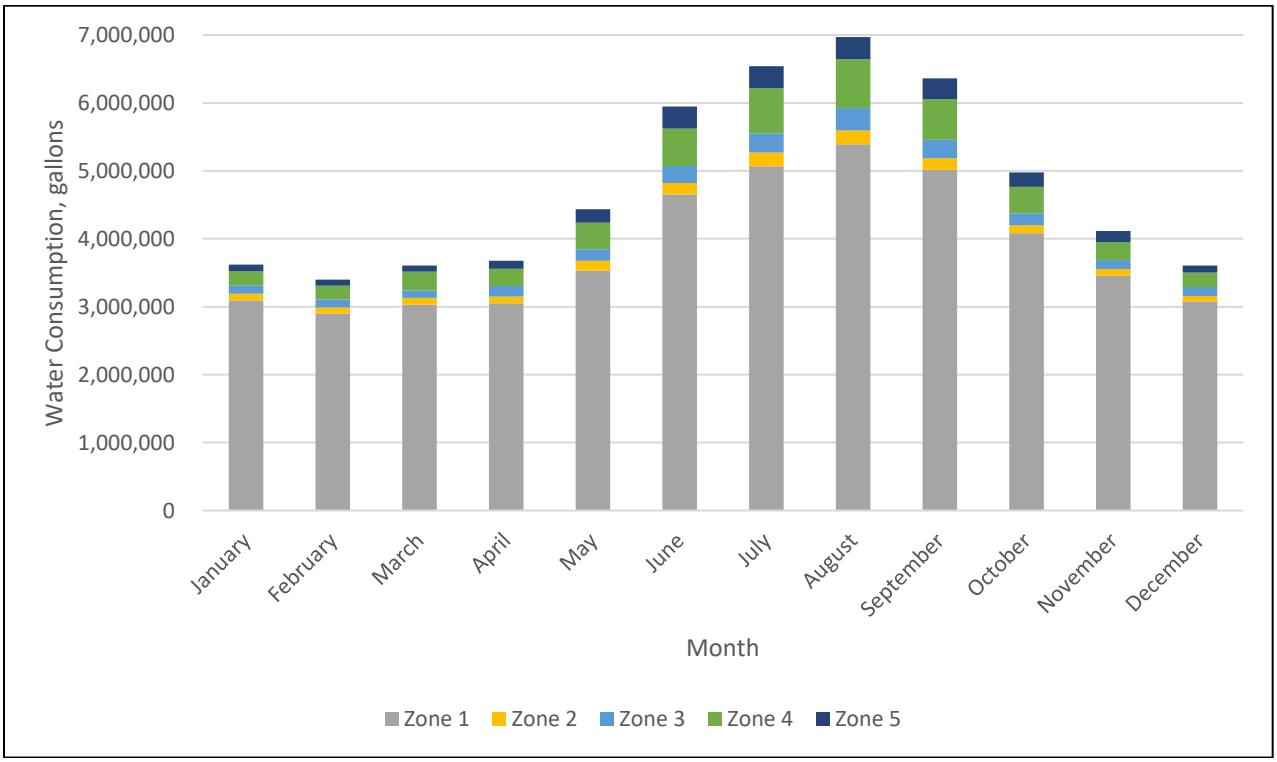


Figure 4. Average Monthly Water Usage, Garberville Sanitary District, 2014-2022.

From the 2014-2021 customer water usage data, maximum month demand was selected for the month of the highest consumption for each pressure zone. Maximum day demand (MDD) was determined using procedures outlined in 22 CCR § 64554, by dividing the maximum monthly usage by number of days in the month and multiplying by a peaking factor of 1.5, the minimum provided in the statute. Table 5 provides the MDD for each of the District's five pressure zones. The total MDD for all five zones combined is 410,585 gallons.

Table 5. Maximum Day Demand for Each Pressure Zone

Pressure Zone	Maximum Monthly Usage (gallons)	Month of Maximum Usage	Peaking Factor	Maximum Day Demand (gallons)
1	6,056,498	June 2014	1.5	302,825
2	253,867	September 2020	1.5	12,693
3	473,392	August 2017	1.5	22,906
4	962,153	August 2017	1.5	46,556
5	512,092	June 2014	1.5	25,605
			Total	**410,585**

The District does not have any industrial customers. Commercial customers like hotels and restaurants have a significant seasonal variation in their consumption. The District increases the flow rate at the raw water intake and SWTP pumps to increase the treatment flow rate during the summer to accommodate the increased demand.

Fire Water Requirements

Pressure Zone 1 includes mixed commercial and residential connections. Zones 2-5 are residential. For residential zones, the Garberville Fire Department requires 1,500 gpm of fire flow for 2 hours, or 180,000 gallons of storage. For commercial facilities, the Fire Department requires 3,500 gpm for 3 hours, which equates to 630,000 gallons of storage for Zone 1.

Required Water Tank Storage Capacity

To determine necessary water storage capacity, the maximum day demand for all zone service connections served by a tank is added to the estimated fire flow requirement. Because the District does not anticipate an increase in population served, growth projections were excluded from tank sizing. Table 6 shows the total storage demand for the Hurlbutt, Alderpoint, and Wallan tanks, which includes MDD plus fire flow requirements.

Table 6. Tank Sizing based on Maximum Day Demand and Fire Protection Requirements

Tank	Zones Served	Maximum Day Demand (MDD) (gallons)	Fire Protection Requirement (gallons)	Combined Capacity (gallons)	3 x MDD (gallons)
Hurlbutt	1 & 2	315,518	630,000	945,518	946,554
Alderpoint	3 & 4	69,462	180,000	249,462	208,386
Wallan	5	25,605	180,000	205,605	76,815

The existing Alderpoint Tank has 200,000 gallons working storage capacity.

Water System Operations & Maintenance Practices

The District's water system operations and maintenance (O&M) practices include weekly visual inspections of tank exteriors and periodic preventative pump maintenance, backwash tank cleaning, filter media replacement at the SWTP, solar panel maintenance, and battery replacement. Instrument calibration is performed at fixed intervals. Raw and finished water turbidimeters are calibrated every 3 months; pH, temperature, and chlorine analyzers are calibrated every 6 months. Operations staff also periodically flush the pumps at the Tobin Well.

The District's maintenance decisions are heavily influenced by available finances, which determine how and when maintenance is completed. Repairs to and replacement of waterlines are generally performed in response to emergencies. Water meters are replaced when they are older and/or broken.

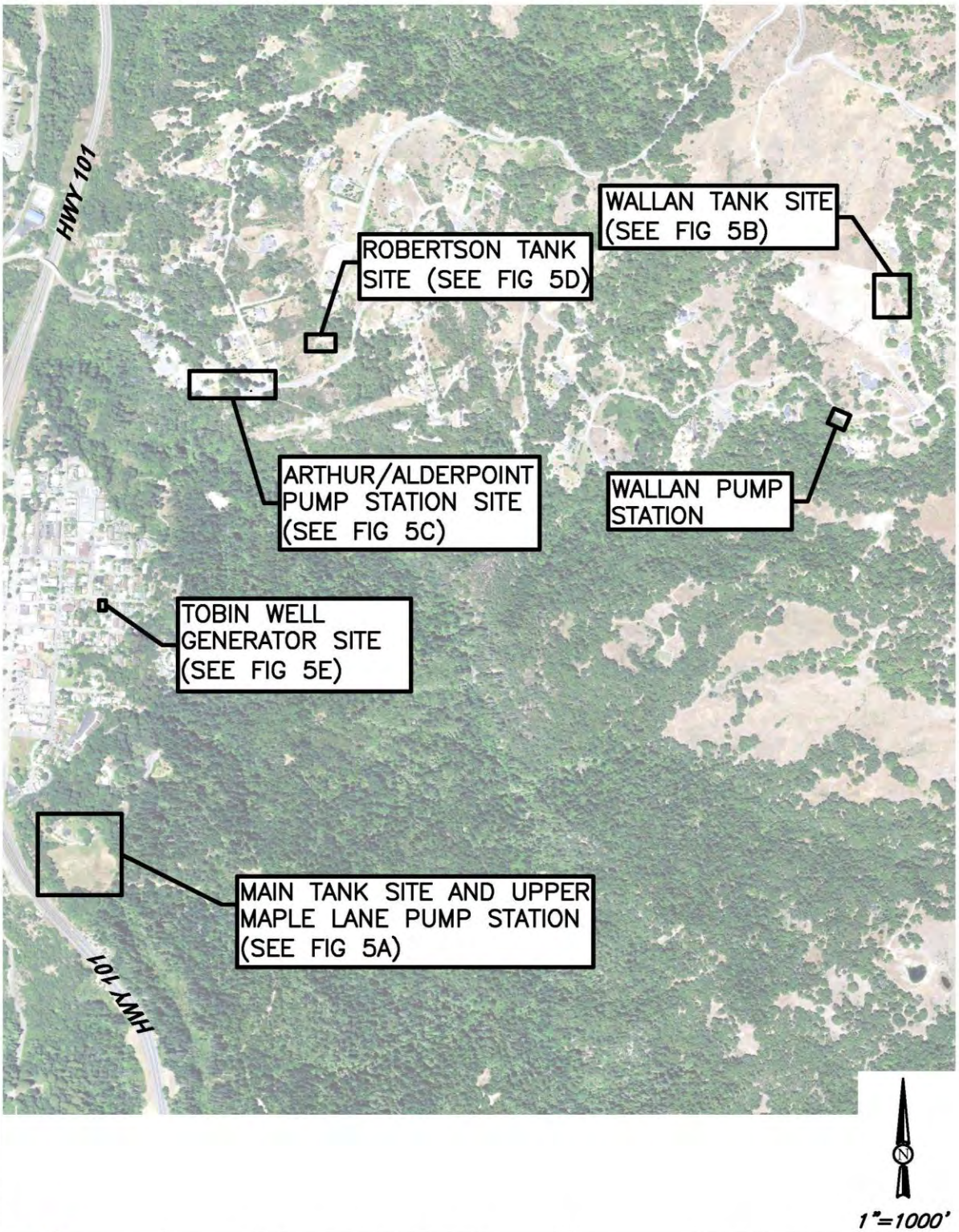
3.0 Proposed Project

Description of Proposed Construction Project

The selected construction project includes the components listed in Table 7 (SHN, 2023a). An overall map of the selected project components is provided in Figure 5. Figures 5A, 5B, 5C, 5D, and 5E show specific project components.

Table 7. Proposed Project Components

Proposed Project Component	Description
Storage: Main Tank	See Figure 5A. Replace the existing, partially underground, 180,000-gallon, concrete storage tank with new, partially underground, 550,000-gallon (approximate) pre-stressed concrete tank at new site approximately 350 feet south of the existing tank. New tank level instrumentation would be installed. The existing Hurlbutt Tank would be demolished as part of this project component. Also, the installation of the new Main Tank would require the installation of a new segment of Zone 1 water main.
Storage: Wallan Tank	See Figure 5B. Replace the existing 20,000-gallon leaking redwood water storage tank with a new, 77,000-gallon, bolted steel, water storage tank at the same site. A new pressure transducer, floats, and radio tower would be installed. The existing redwood tank would be demolished as part of this project component. Also, the installation of the new Wallan Tank would include the installation of a new segment of water main.
Storage: Robertson Tank	See Figure 5D. Existing retired 50,000-gallon concrete storage tank would be demolished along with electrical components, piping, and other appurtenances. The site would be restored to match adjacent ground surfaces. The demolition of this tank would require that a segment of the distribution main near the tank be routed around the tank to maintain service.
Pumping: Upper Maple Lane Pump Station	See Figure 5A. Replace the existing booster pump station with a new pump station at the new Main Tank site. New pumps would include variable speed drives, upgraded bladder tank(s), new electrical service, new pump control panel, and control building. The existing Upper Maple Lane Pump Station would be demolished as part of this project component. Also, the installation of the new Upper Maple Lane Pump Station would require the installation of a new segment of Zone 2 water main and a new service connection to the nearby residence.
Pumping: Alderpoint Pump Station	See Figure 5C. Replace the existing pump station with a new pump station at a lower elevation. A new building with new electrical service would house new higher capacity variable speed drive pumps, new piping, and new motor control panel. The existing Arthur Pump Station would be demolished. Installation of the new Alderpoint Pump Station would require the installation of a new segment of water main and would modify existing radio antenna and/or install an approximately 40-foot-tall unlit communications tower.
Pumping: Wallan Pump Station	Upgrade the existing pump station in the existing building. Upgrades would include new pumps, new pump control panel, and some limited new piping.
Electrical Upgrades: Standby Generators	Appropriately sized, new, permanent, diesel-powered, backup generators would be installed at the Tobin Well (Figure 5E), the Upper Maple Lane Pump Station, and the Alderpoint Pump Station. A trailer-mounted generator would be provided for the Wallan Pump Station.
Instrumentation and Controls Improvements	New instrumentation would be installed at new tanks and pump stations; programmable logic controllers (PLCs) would be replaced or reused, where possible, for system-wide monitoring and controls at the SWTP; radio telemetry would be provided to communicate tank levels to pump stations.



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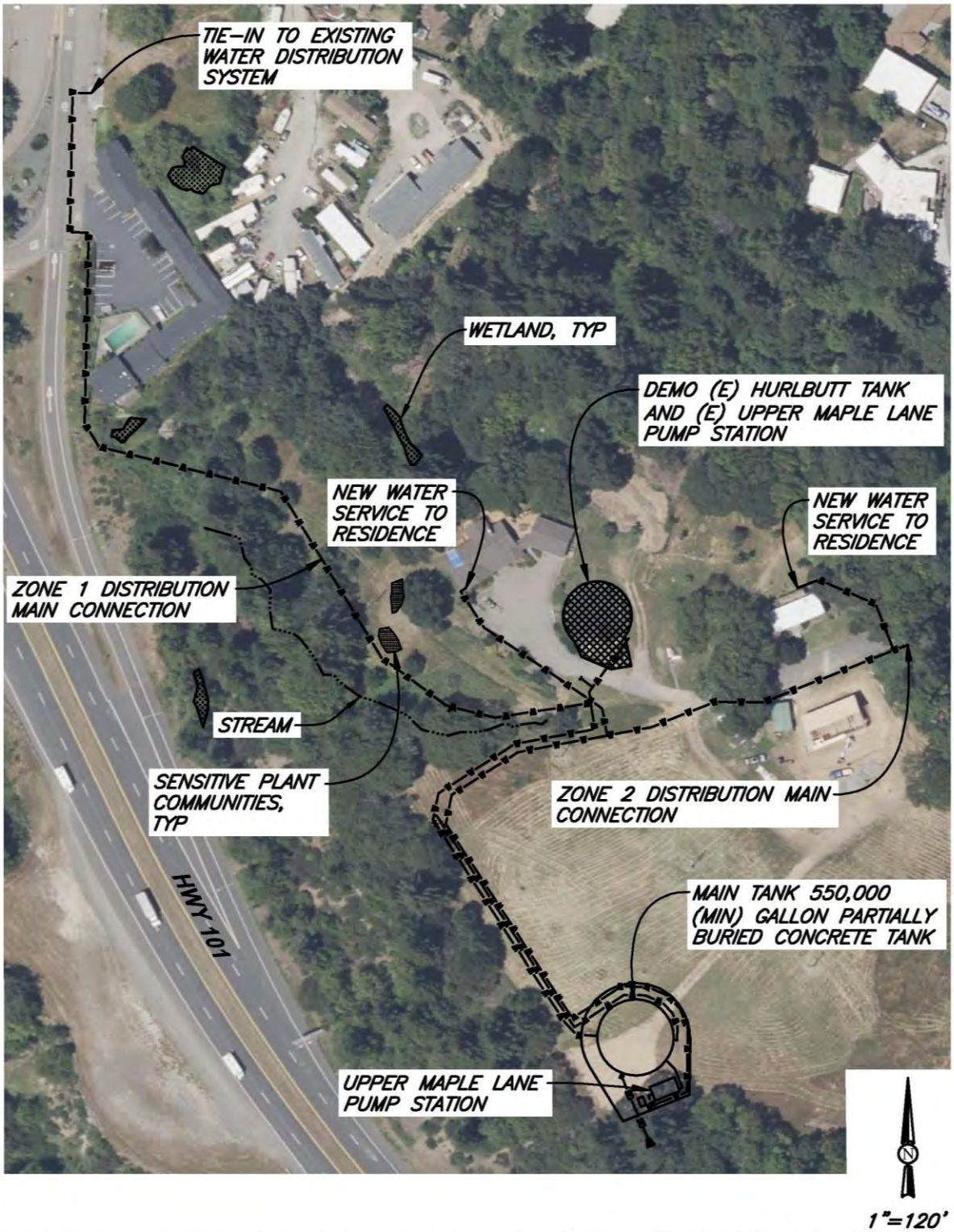
SHN	Garberville Sanitary District Garberville Water System Improvements Garberville, California	Project Overview SHN 022067
	October 2023 / 022067-PROJ-OVER-FIG	Figure 5



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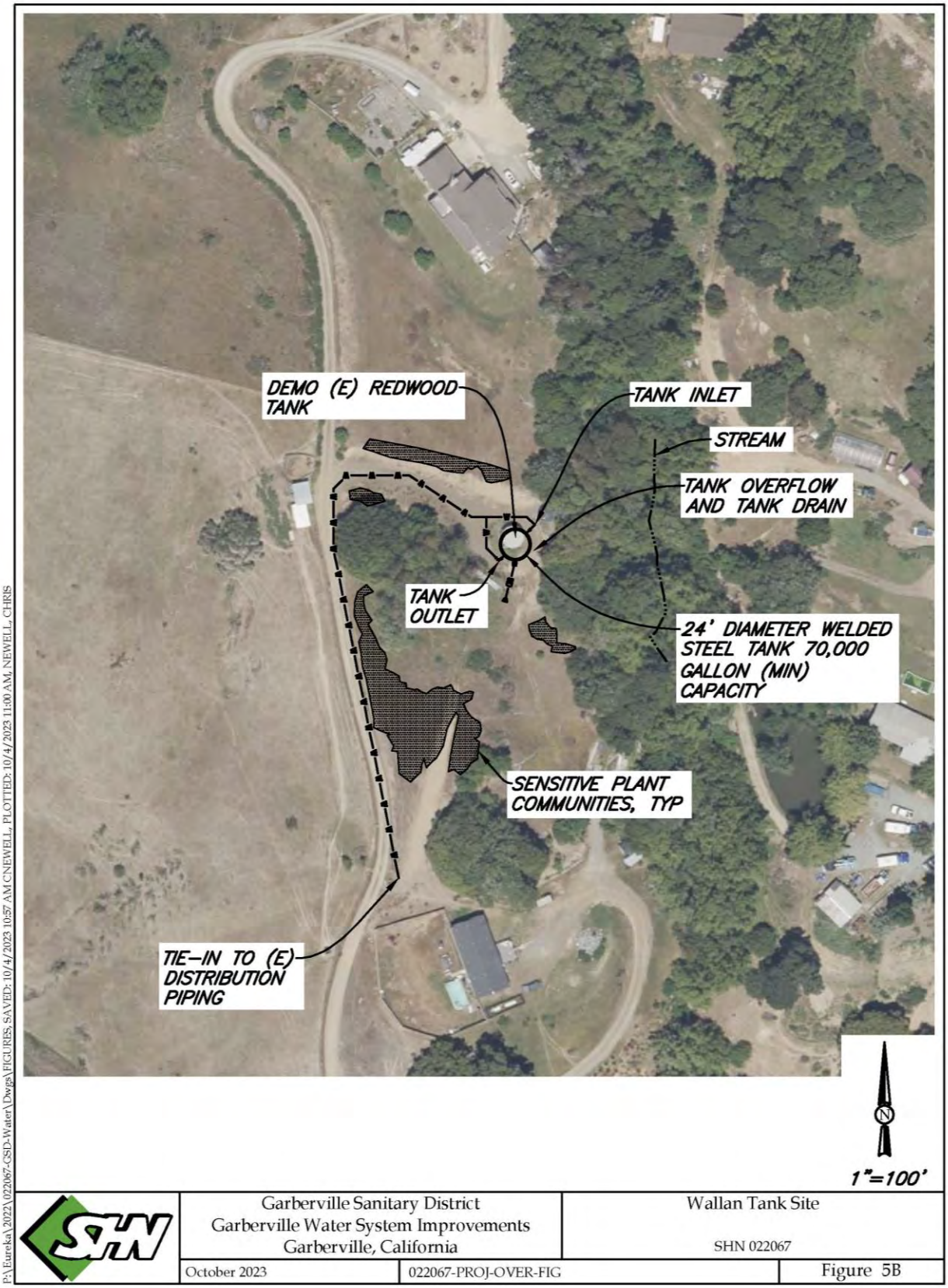
SHN	Garberville Sanitary District Garberville Water System Improvements Garberville, California	Main Tank Site & Upper Maple Lane Pump Station SHN 022067
	October 2023 | 022067-PROJ-OVER-FIG	Figure 5A



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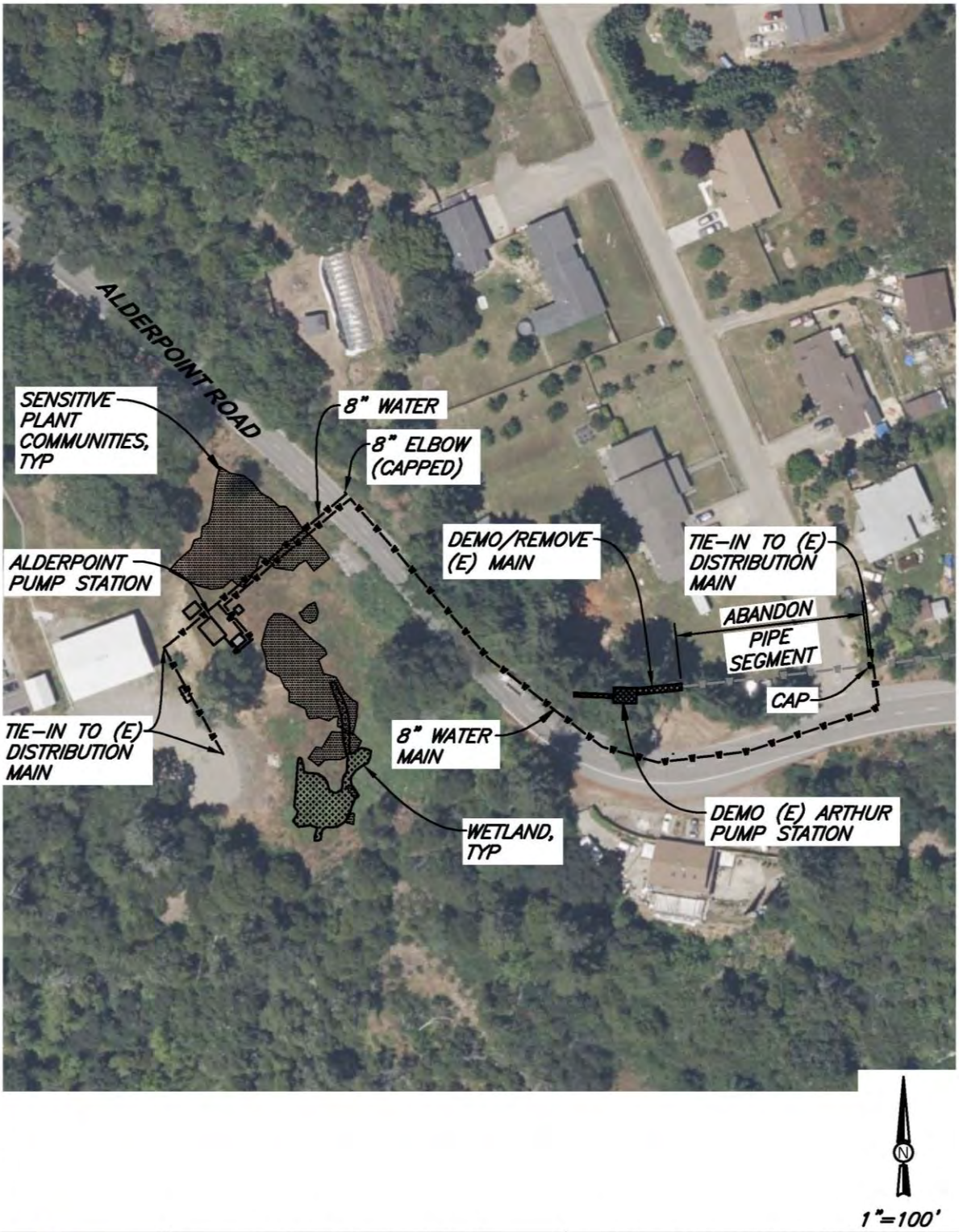
SHN	Garberville Sanitary District Garberville Water System Improvements Garberville, California	Wallan Tank Site SHN 022067
	October 2023 | 022067-PROJ-OVER-FIG	Figure 5B



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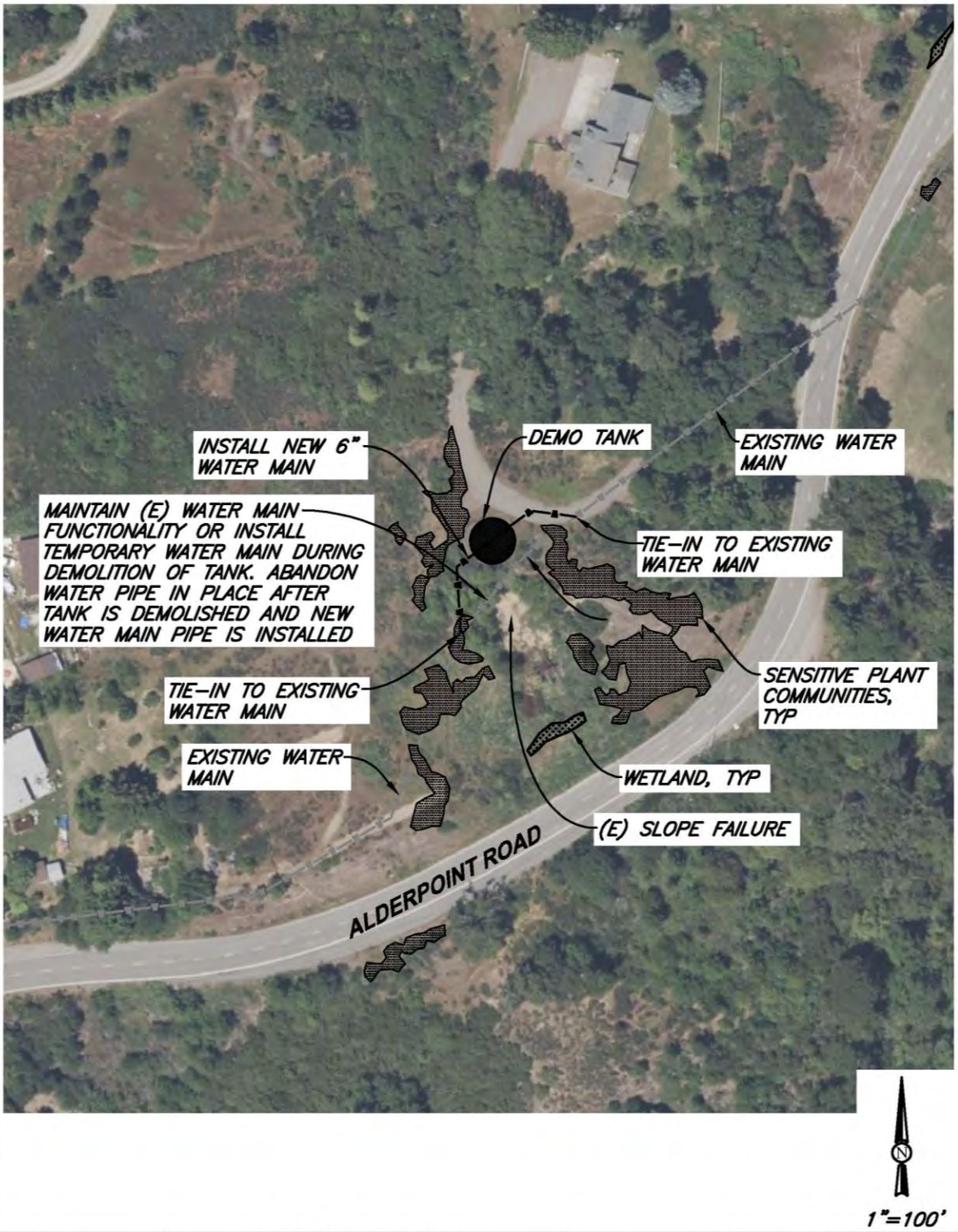
SHN	Garberville Sanitary District Garberville Water System Improvements Garberville, California	Arthur/ Alderpoint Pump Station Sites SHN 022067
	October 2023 | 022067-PROJ-OVER-FIG	Figure 5C



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Garberville Sanitary District Garberville Water System Improvements Garberville, California		Robertson Tank Site SHN 022067
October 2023	022067-PROJ-OVER-FIG	Figure 5D

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SHN	Garberville Sanitary District Garberville Water System Improvements Garberville, California	Tobin Well Generator Site SHN 022067
	August 2023 / 022067-PROJ-OVER-FIG	Figure 5E

Construction Scope of Work for Selected Project

Main Tank

Scope of work at the new Main Tank site includes the following:

- Prepare site and excavate for new partially underground tank.
- Prepare foundation subgrade.
- Construct new prestressed concrete tank.
- Leak test, disinfect, and perform bacteriological testing on tank to prepare for service.
- Install yard piping, overflow, and tank appurtenances.
- Install new 12-inch piping along new access road to Hillcrest Drive, down the slope to U.S. Highway 101 off-ramp and tie to existing line at Redwood Drive.
- Install new 4” piping along new access road and tie to existing line in Hillcrest Drive.
- Backfill excavation.
- Grade site, re-seed disturbed areas, and install screening vegetation.
- Construct new tank access driveway.
- Install security fencing.
- Install level sensing and remote telemetry panel with radio antenna.

Wallan Tank

Scope of work at the new Wallan Tank site includes the following:

- Demolish existing Wallan Tank, foundation, and appurtenances.
- Prepare site for new tank.
- Excavate and construct new tank foundation.
- Construct new bolted steel tank with appurtenances, cathodic protection, and tank coating.
- Leak test, disinfect, and perform bacteriological testing on tank to prepare for service.
- Install yard piping, valves, and overflow/drain outlet.
- Install new piping along access road and tie to existing piping.
- Install security fencing.
- Install new level sensing equipment, and remote telemetry panel with radio antenna.

Upper Maple Lane Pump Station

Scope of work at the new Upper Maple Lane Pump Station at the new Main Tank site includes the following:

- Construct new pump station and controls building.
- Install new pump station and hydropneumatic tanks.
- Install yard piping and valving associated with pump station.
- Install new electrical service and utility meter, stationary standby diesel generator, and automatic transfer switch (ATS).
- Install tank and pump station instrumentation, PLC, motor control panel, building electrical, and remote telemetry panel with radio antenna to communicate with FW pumps at SWTP.

Alderpoint Pump Station

Scope of work for the new Alderpoint Pump Station, which would replace the Arthur Pump Station, at the proposed CALFIRE site includes the following:

- Install new pump station building and building foundation.
- Install new electrical service and utility meter, stationary standby diesel generator, and ATS.
- Install customized duplex pump system with controls.
- Install station piping and valves.

- Install pump station instrumentation and building electrical; modify existing remote telemetry panel; modify existing radio antenna and/or install an approximately 40-foot-tall unlit communications tower. The existing PLC control panel would be reused to control the pump station.
- Install pump station driveway.

Arthur Road Pump Station

Scope of work at the existing Arthur Road Pump Station, which would be replaced by the new Alderpoint Pump Station, includes the following:

- Demolish existing pump station mechanical and electrical equipment.
- Demolish existing building and foundation.
- Cap existing water lines.
- Restore site to match surrounding surface cover and vegetation.

Wallan Pump Station

Scope of work at the existing Wallan Pump Station building includes the following:

- Demolish existing pumps and control panel.
- Install new metal roof, replace siding with fiber cement lap siding, and repaint building exterior.
- Install new pumps.
- Replace limited piping and valves.
- Install pump station instrumentation, pump motor control panel, and building electrical; modify existing remote telemetry panel and radio antenna; reuse existing Allen-Bradley PLC.
- Provide new portable diesel generator.
- Install new manual transfer switch.

Electrical and Control System Upgrades

Generators

In order to increase the reliability of the District's water system, the following generators are proposed to be included with this project. Generators would be sized to provide backup power in the event of electric utility outages. The backup generators are only turned on 1) for emergency use during an emergency power loss, and 2) for regular weekly testing which occurs for 30 minutes/week during daylight hours.

- Alderpoint Pump Station Generator—This would be a permanent generator with a fully integrated automatic transfer switch. The outdoor generator would be provided in a sound-attenuated National Electrical Manufacturers Association (NEMA)-rated enclosure.
- Upper Maple Lane Pump Station Generator—This would be a permanent generator with a fully integrated automatic transfer switch. The outdoor generator would be provided in a sound-attenuated NEMA-rated enclosure.
- Wallan Pump Station Generator—The existing pump station would be provided with a connection for a temporary (trailer-mounted) generator, a trailer-mounted generator, and a manual transfer switch.
- Tobin Well Generator—The existing well station would be provided a permanent generator with a fully integrated automatic transfer switch. The outdoor generator would be provided in a sound-attenuated NEMA-rated enclosure.

Controls Upgrades

The new pumps and tanks would be provided with control features that would be able to be integrated into the District's overall control system. Tank levels would typically be communicated via radio telemetry to pump stations.

Distribution System Piping Replacement

New segments of distribution piping would need to be installed in order to connect the new facilities to the existing distribution system:

- Installation of a new transmission pipe to supply water to/from the distribution system and the new Main Tank. This alignment would run along the proposed access road for the new Main Tank, continuing along the western boundary of the site, descending the slope on the east side of the U.S. Highway 101 offramp, and then running along Redwood Drive to tie-in to the distribution system on the southern end of downtown. This alternative alignment is preferred over the existing transmission main alignment because the alignment of the existing transmission main runs cross country through a steep forested area on the north end of the site and passes under residential trailers in the trailer park at the bottom of the hill. The existing alignment is largely inaccessible, making it difficult to detect leaks and make repairs. Depending on the contractor bids and the timing of project funding, a temporary alternative alignment for the transmission main may be necessary. This alternative would run along the proposed access road for the new Main Tank, cross the existing driveway, and tie-in to the existing distribution main near the existing Hurlbutt Tank, which would be demolished.
- Zone 2 main from Upper Maple Lane Booster Pump Station. Install a new section of distribution pipe between the new Upper Maple Lane Pump Station, located at the new Main Tank site, and tie into the existing Zone 2 main in Hillcrest Drive.
- Transmission main around the Robertson Tank. Prior to the demolition of the Robertson Tank, a new segment of water main would need to be installed around the north side of the tank so that water service can be maintained while the tank is being demolished. Routing the segment of water main around the north side of the tank would also set it back further from an existing slope failure on the south side of the tank, which would help to ensure the long-term reliability of the water main in this area.
- Transmission main for new Alderpoint Pump Station. A new segment of water main would be needed to connect the new Alderpoint Pump Station to the distribution system. The alignment for the new main would be routed from the proposed new pump station location at the CALFIRE facility, along Alderpoint Road, and tie-in to the existing main at the intersection of Alderpoint Road and Arthur Road. Pipe routing would be finalized during the engineering design phase.
- New transmission main to/from the Wallan Tank site. A new segment of transmission main is proposed to be installed along the alignment of the driveway that leads up to the tank to replace the 50-year-old existing tank supply pipe that has minimal to no cover.

Installation of new distribution piping shall include the following:

- Clearing and grubbing
- Trench preparation and backfill
- Pipe installation with tracer wire and warning tape
- Reconnection of impacted services and hydrants
- Addition of air release and blow off valves where appropriate
- Surface restoration

Demolition of Tank Sites

Hurlbutt Tank Site Demolition

Scope of work at the existing Hurlbutt Tank site includes:

- Demolish roofing and appurtenances
- Demolish existing Hurlbutt Tank walls to 3 feet below grade; drill holes through tank foundation to provide for drainage and backfill with drain rock to 3 feet below finish grade.
- Demolish all surrounding concrete flatwork.
- Remove a select portion of the buried yard piping.
- Remove existing Upper Maple Lane Pump Station and pump controls and panels.

- Demolish fence, shed, piping, equipment, and electrical service.
- Backfill with excavation spoils from the new Main Tank in the lower sections and topsoil for the upper 2 feet, regrade, and restore site with vegetation to match surrounding area.

Robertson Tank Site Demolition

Robertson Tank site demolition shall include the following:

- Demolish roofing and appurtenances.
- Remove tank concrete walls to 3 feet below grade; drill holes through remaining tank floor to allow for drainage.
- Dispose of tank roof, concrete (lead/asbestos testing for materials).
- Backfill with drain rock and/or spoils from construction.
- Restore site and vegetation to match surrounding area.

Construction Equipment and Access

Equipment for construction of the project would include cranes, excavators, backhoes, loaders, small skid-steer loaders, flatbed semi-trucks, dump trucks, hydraulic lifts, personnel transport vehicles, service trucks, cement trucks, compaction equipment, and paving equipment. Construction access for the Main/Hurlbutt Tank and Upper Maple Lane Pump Station site would be from Melville Road, Hillcrest Drive, Redwood Drive, and the private driveway serving that property. Construction access for the Wallan Tank site and Wallan Pump Station site would be from Wallan Road and the private driveway serving that property. Construction access for the Arthur and Alderpoint Pump Station sites would be from Alderpoint Road and Arthur Road as well as from CALFIRE's Northern Region Garberville Station. Construction access for the Robertson Tank site would be from Alderpoint Road and the private driveway serving the tank. Construction access for delivering the backup generator at the Tobin Well site would be from Pine Lane.

Land Requirements

New or modified easements and/or property acquisition would be required at the following sites:

- New Main Tank and Upper Maple Lane Pump Station—The District currently owns the parcel where the existing Hurlbutt Tank is located, so the transfer of ownership and easements associated with replacing the Hurlbutt Tank with the new Main Tank would need to be coordinated between the District and the landowner. The parcel for the existing Hurlbutt Tank would be swapped for a similar parcel at the new Main Tank location.

- New Main Tank Distribution Main—With the installation of the transmission main alignment that encroaches into the Caltrans right of way, new easements and Caltrans approval would be required for the new distribution piping from the Main Tank and down to the shoulder of the U.S. Highway 101 offramp to tie-in to the existing distribution system. Replacement of the water main in areas where there is already existing infrastructure, such as in the downtown area, is not expected to require additional easements, just an encroachment permit from the County.

- New Alderpoint Pump Station and Distribution Main—New easements would be required for the new pump station at the CALFIRE site and an encroachment permit from the County for the new segment of distribution main along Alderpoint Road.

Timing of Construction

The District plans to construct the proposed project as soon as the applicable authorizations are approved. Construction activities are anticipated to occur over approximately 19 months in 2024 and 2025 and would occur between the hours of 8:00 a.m. and 5:00 p.m. Monday through Friday, and between the hours of 9:00 a.m. and 5:00 p.m. on Saturdays and Sundays, with no work on holidays.

Best Management Practices and Avoidance and Minimization Measures

The following construction best management practices (BMPs) and avoidance and minimization measures would be implemented during project construction:

- Limit ground disturbance and vegetation clearing to the minimal extent necessary to accomplish project goals.
- If rainfall is forecasted during the time construction activities are being performed, all onsite stockpiles of soil, gravel, and construction debris shall be covered and secured before the onset of precipitation.
- Stabilize exposed soils at the end of the job, using mulch or other erosion control measures.
- All trash shall be removed from the work site and disposed of on a regular basis.
- All spoils and construction debris will be hauled offsite and disposed of at an appropriately permitted upland disposal facility (landfill or recycling plant).
- All equipment used during construction shall be free of oil and fuel leaks at all times.
- All equipment fueling shall be performed more than 100 feet from any wetlands. BMPs for leak protection and fuel handling/storage shall be maintained.
- Hazardous materials management equipment, including oil containment booms and absorbent pads shall be available and immediately on hand at the project site. A registered first-response, professional, hazardous materials clean-up/remediation service shall be locally available on call. Any accidental spill shall be contained rapidly and cleaned up. In the event of a spill, GSD shall notify the appropriate regulatory agencies immediately.
- To minimize wildlife entanglement and plastic debris pollution, any temporary rolled erosion or sediment control products used (such as fiber rolls, erosion control blankets, and mulch control netting) shall either be netting-free, or shall contain plastic-free biodegradable natural-fiber netting (such as jute, sisal, or coir fiber). Degradable plastic netting is not an acceptable alternative. When no longer required, temporary erosion and sediment control products shall be promptly removed.
- To avoid potential impacts to nesting birds, in accordance with the Migratory Bird Treaty Act, one of the following shall be implemented:
    - Conduct vegetation removal and other ground-disturbance activities associated with any construction activities between September and mid-March, when birds are not typically nesting, or
    - If vegetation removal or ground-disturbing activity is to take place during the nesting season (March 15 to August 31 for most birds), a qualified biologist shall conduct a pre-construction nesting bird survey. Pre-construction surveys for nesting pairs, nests, and eggs shall occur within the construction limits and within 100 feet (200 feet for raptors) of the construction limits. If active nests are encountered, species-specific measures shall be prepared by a qualified biologist in consultation with the USFWS and CDFW and implemented to prevent abandonment of the active nest.
- Where project construction activities occur within close proximity (50 feet) to special-status resources, these resources shall be demarcated by high-visibility construction fencing or flagging during the project construction period in a manner sufficient to avoid unintentional impacts.
- Fully implement all conditions of approval required by permit terms.

Water Efficiency

- Water Loss Reduction
    - Tank Replacement—This project would replace the existing in-ground concrete finished water storage tank (Hurlbutt/Main Tank) and the existing redwood drinking water storage tank (Wallan Tank). Both of these existing tanks are significantly leaking, which results in water losses in the distribution system and additional diversions of water from the South Fork of the Eel River. By replacing these tanks with new tanks, the water losses associated with leaking tanks would be eliminated from the system and would leave more water in the river.
    - Distribution System Upgrades—This project would replace a portion of the existing water distribution piping in the system. The existing distribution piping is nearing the end of its useful life and has experienced breaks and leaks. By replacing the aged distribution piping, water losses associated with leaks and water main breaks would be significantly reduced in areas where new distribution piping is installed and would eliminate the additional diversion of water from the river associated with these leaks.
- Reduced Demand for Raw Water— The South Fork of the Eel River contains protected salmonid species and is a wild and scenic river. By eliminating or reducing sources of water loss in the water storage tanks and distribution piping, the demand for raw water from the river would be reduced, since less water would be wasted through leaks and breaks in the system.

Energy Efficiency

- Reduced Treatment Requirements—By eliminating or reducing sources of water loss in the system, as described above, the demand on the water treatment plant would be reduced because less treated water would be wasted through leaks and breaks. This would result in reduced energy consumption associated with operating the surface water treatment plant.
- Reduced Pumping Efforts—By eliminating or reducing sources of water loss in the system, as described above, the demand on the pumping systems would be reduced because less treated water would be wasted through leaks and breaks. This would result in reduced energy consumption associated with pumping raw and treated water.
- Energy Efficient Infrastructure—The new pump stations and pump station modifications associated with this project are expected to result in less energy consumption because they would include equipment that is more energy efficient, such as modern pumps with variable frequency drives.

Adaptative Measures for Climate Change

The recommended project includes the following adaptive measures in response to climate change vulnerabilities:

- All new tanks for the project would be constructed of steel and concrete with no wood materials.
- The new Alderpoint Pump Station would be constructed of fire-resistant materials.
- As part of the construction project, as much clearing and grubbing would be completed around any new pump station structures.
- The increased storage capacity provided by the new tanks would improve firefighting capacity and also improve availability of water for the community during times of drought.
- The project would replace segments of the distribution system with new pipe that would be in better condition than the existing pipe; this would reduce the amount of water that is lost to leaks in the distribution system and generally conserve water, which is particularly important during times of drought.

- The District participates in the Enersponse demand response program.

Operations

The proposed project would alter the location of and improve GSD's water storage and conveyance infrastructure but would not change the type of ongoing operations nor increase the water service area, water withdrawals, or water entitlements.

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Mitigation Monitoring and Reporting Program

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Attachment 2

Mitigation Monitoring and Reporting Program

Garberville Sanitary District - Robertson/Wallan/Hurlbutt Tanks Replacement Project

The California Environmental Quality Act (CEQA) requires that when a lead agency adopts an Initial Study/Mitigated Negative Declaration (IS/MND), it must also adopt a mitigation monitoring and reporting program (MMRP) for all required mitigation measures (CEQA Guidelines Section 15097). This MMRP identifies the monitoring program for mitigation measures identified by the IS/MND to reduce or avoid impacts associated with implementing the proposed Garberville Sanitary District - Robertson/Wallan/Hurlbutt Tanks Replacement Project. The MMRP shall be maintained by Garberville Sanitary District (GSD, the District).

Mitigation Measure	Implementation Phase	Monitoring Phase	Enforcement Agency	Level of Significance After Mitigation	Verification of Compliance		
					Initials	Date	Remarks
AES-1: International Dark-Sky Association Compliance All new outdoor lighting fixtures shall comply with the International Dark-Sky Association's (IDA) requirements for reducing waste of ambient light (that is, shall be "dark sky compliant"). This includes, but is not limited to, requirements for acceptable fixture types and maximum color temperature. The IDA recommendations can be found on their website at the following address: https://www.darksky.org/our-work/lighting/lighting-for-citizens/lighting-basics/.	GSD with the Project Engineer and Construction Contractor shall be responsible for implementing **AES-1** during design and construction.	GSD shall be responsible for confirming compliance following construction and ongoing during project operation	GSD	Less-Than-Significant			
AQ-1: Fugitive Dust Control Measures Compliance with these requirements shall be required to minimize dust generation during construction activity. • All active construction areas (for example, parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered a minimum of two times per day during the dry season; • Hydroseed or apply non-toxic soil stabilizers to inactive construction areas; • Dust-generating activities shall be limited during periods of high winds (over 15 mph); • Suspend excavation and grading activity when winds exceed 25 mph; • All haul trucks transporting soil, sand, or other loose material, likely to give rise to airborne dust, shall be covered; • All vehicle speeds shall be limited to 15 miles per hour within the construction area; • Promptly remove earth or other tracked out material from paved streets onto which earth, or other material has been transported by trucking or earth-moving equipment; and • Conduct digging, backfilling, and paving of utility trenches in such a manner as to minimize the creation of airborne dust.	GSD with the Construction Contractor shall be responsible for implementing **AQ-1** during construction activities.	GSD with Construction Contractor shall be responsible for monitoring **AQ-1** during construction activities.	North Coast Unified Air Quality Management District (NCUAQMD)	Less-Than-Significant			

Mitigation Monitoring and Reporting Program
Garberville Sanitary District - Robertson/Wallan/Hurlbutt Tanks Replacement Project

Mitigation Measure	Implementation Phase	Monitoring Phase	Enforcement Agency	Level of Significance After Mitigation	Verification of Compliance		
					Initials	Date	Remarks
BIO-1: Nesting Bird Surveys To avoid potential impacts to nesting birds, in accordance with the Migratory Bird Treaty Act, one of the following shall be implemented: • Conduct vegetation removal and other ground disturbance activities associated with any construction activities between September and mid-March, when birds are not typically nesting, or • If vegetation removal, structure modification or removal, or ground-disturbing activity is to take place during the nesting season (March 15 to August 31 for most birds), a qualified biologist shall conduct a pre-construction nesting bird survey. Preconstruction surveys for nesting pairs, nests, and eggs shall occur within the construction limits and within 100 feet (200 feet for raptors) of the construction limits. If active nests are encountered, species-specific measures shall be prepared by a qualified biologist in consultation with the USFWS and CDFW and implemented to prevent abandonment of the active nest.	GSD with the Construction Contractor and a Qualified Biologist shall be responsible for implementing **BIO-1** prior to and during any construction activities proposed during the nesting bird season.	GSD with a Qualified Biologist shall be responsible for monitoring **BIO-1** during construction activities.	California Department of Fish and Wildlife (CDFW) and U.S. Fish and Wildlife Service (USFWS)	Less-Than-Significant			
BIO-2: Protect Special-status Bats Within two weeks prior to construction, a qualified bat biologist shall conduct habitat surveys for special-status bats. Survey methodology shall include visual examination of suitable habitat areas and signs of bat use. Trees, water tanks, pump stations, and other potential bat habitats within at least 100 feet of construction activities shall be examined. If habitat exists, species presence and site use patterns shall be documented by using ultrasonic detectors to determine if special-status bat species are present on site. Bat presence in the project area may vary seasonally and annually. Surveys shall be conducted in a manner to detect the presence of hibernating or torpid bats, reproductive colonies and/or migratory stop-over roosts. If no bat utilization or roosts are found, then no further study or action is required. If bats are found to be present within an area of potential impact, or presence is assumed, a bat specialist shall be engaged to advise the best method to prevent impact. This may include, but would not be limited to: • Consultation with the California Department of Fish and Wildlife to determine appropriate measures for protecting bats with young if present, and for implementing measures to exclude non-breeding bat colonies during construction process. • For trees, phased removal of trees where selected limbs and branches not containing cavities are removed on the first day, with the remainder of the tree removed on the second day. • For structures, gradual modification of the habitat itself discouraging continued roosting by any bats that may be present, followed by installing physical barriers to prevent bats from entering the structure(s).	GSD with a Qualified Biologist shall be responsible for implementing **BIO-2** within two weeks prior to construction.	GSD with a Qualified Biologist shall be responsible for monitoring **BIO-2** prior to and during construction activities.	CDFW	Less-Than-Significant			
BIO-3: Avoidance and Minimization Measures to Protect Sensitive Natural Communities The District shall implement the following avoidance and protection measures for sensitive natural communities (purple needlegrass grassland and California oatgrass grassland) that would not be impacted during project construction:	GSD with the Project Engineer and a Qualified Biologist shall be responsible for	GSD with a Qualified Biologist shall be responsible for monitoring **BIO-3**	CDFW	Less-Than-Significant			

Mitigation Measure	Implementation Phase	Monitoring Phase	Enforcement Agency	Level of Significance After Mitigation	Verification of Compliance		
					Initials	Date	Remarks
1. The District shall attempt to avoid or minimize impacts to sensitive natural communities to the greatest extent feasible in the final design plans. 2. Sensitive natural communities shall be clearly identified in the construction documents and reviewed by the District prior to issuing for bid to ensure they are clearly marked as equipment exclusion zones during construction. 3. Prior to construction, temporary fencing shall be installed between the sensitive vegetation communities and the project if construction activities will occur within 50 feet of the sensitive vegetation community, to prevent accidental incursion.	implementing **BIO-3** during design, bidding, and prior to construction.	during construction activities.					
BIO-4: Mitigation for Sensitive Natural Communities Construction within mapped sensitive natural communities (purple needlegrass grassland and California oatgrass grassland) shall be avoided to the greatest extent practicable. If impacts are unavoidable and mapped purple needlegrass grassland or California oatgrass grassland is removed or detrimentally impacted, mitigation would occur. A Mitigation and Monitoring Plan shall be prepared in coordination with the California Department of Fish and Wildlife. The Plan shall be acceptable to the California Department of Fish and Wildlife and include the following elements: proposed mitigation ratios; description and size of the restoration or compensatory area; site preparation and design; plant species; planting design and techniques; maintenance activities; plant storage; irrigation requirements; success criteria; monitoring schedule; and remedial measures. The ratio and conditions of mitigation would be negotiated in consultation with the California Department of Fish and Wildlife. The Plan shall be implemented by the District.	GSD with a Qualified Biologist shall be responsible for implementing **BIO-4** prior to, during, and after construction activities.	GSD with a Qualified Biologist shall be responsible for monitoring **BIO-4** prior to, during, and after construction activities.	CDFW	Less-Than-Significant			
BIO-5: Avoidance and Minimization Measures to Project Wetlands/Waters The District shall implement the following avoidance and protection measures for Waters of the United States and Waters of the State that would not be impacted (filled or excavated) during project construction: 1. The District shall attempt to avoid or minimize impacts to wetlands/waters to the greatest extent feasible in the final design plans. 2. Wetlands/waters shall be clearly identified in the construction documents and reviewed by the District prior to issuing for bid to ensure they are clearly marked as equipment exclusion zones during construction. 3. Suitable perimeter control BMPs, such as silt fences, or straw wattles shall be placed below all construction activities at the edge of surface water features to intercept sediment before it reaches the waterway. These BMPs shall be installed prior to any clearing or grading activities.	GSD with the Project Engineer and a Qualified Biologist shall be responsible for implementing **BIO-5** during design, bidding, and prior to construction.	GSD with a Qualified Biologist shall be responsible for monitoring **BIO-5** during construction activities.	GSD, CDFW, State Water Resources Control Board (SWRCB), North Coast Regional Water Quality Control Board (NCRWQCB)	Less-Than-Significant			
BIO-6: Mitigation for Loss of Wetlands and Waters The District shall avoid fill of jurisdictional wetlands and waters to the extent feasible. If fill cannot be avoided, the District shall compensate for the loss of wetland habitat so that there is no net loss in wetlands. The District shall compensate for impacts to identified wetlands through restoration, rehabilitation, and/or creation of wetland at a ratio of no less than 1:1. A	GSD with a Qualified Biologist shall be responsible for implementing **BIO-6** prior to, during, and	GSD with a Qualified Biologist shall be responsible for monitoring **BIO-6** prior to, during, and	U.S. Army Corps of Engineers (USACE), NCRWQCB, CDFW	Less-Than-Significant			

Mitigation Measure	Implementation Phase	Monitoring Phase	Enforcement Agency	Level of Significance After Mitigation	Verification of Compliance		
					Initials	Date	Remarks
Mitigation and Monitoring Plan shall be prepared in coordination with the NCRWQB, the USACE, and CDFW. Compensation for wetlands shall occur so there is no net loss of wetland habitat at ratios to be determined in consultation with the NCRWQCB. The Plan shall be acceptable to the regulatory agencies with jurisdiction over wetlands and waters and include the following elements: proposed mitigation ratios; description and size of the restoration or compensatory area; site preparation and design; plant species; planting design and techniques; maintenance activities; plant storage; irrigation requirements; success criteria; monitoring schedule; and remedial measures. The Plan shall be implemented by the District. The District shall also compensate for impacts to other waters by obtaining required permits from the U.S. Army Corp of Engineers, the North Coast Regional Water Quality Control Board, and/or the California Department of Fish and Game which shall be received prior to the start of any on-site construction activity. The District shall ensure any additional measures outlined in the permits are implemented.	after construction activities.	after construction activities.					
CR-1: Protocols for Inadvertent Discovery of Cultural Resources If cultural resources are encountered during construction activities, all onsite work shall cease in the immediate area and within a 50-foot buffer of the discovery location. A qualified archaeologist will be retained to evaluate and assess the significance of the discovery, and develop and implement an avoidance or mitigation plan, as appropriate. For discoveries known or likely to be associated with Native American heritage (precontact sites and select historic period sites), the Tribal Historic Preservation Officers (THPOs) and Council Members for the Bear River Band of Rohnerville Rancheria, Round Valley Reservation/Covelo Indian Community, the InterTribal Sinkyone Wilderness Council, and the Wailaki Tribe are also to be contacted immediately to evaluate the discovery and, in consultation with the project proponent, the County, and consulting archaeologist, develop a treatment plan in any instance where significant impacts cannot be avoided. Precontact materials which could be encountered include: obsidian and chert debitage or formal tools, grinding implements, (e.g., pestles, handstones, bowl mortars, slabs), locally darkened midden, deposits of shell, faunal remains, and human burials. Historic archaeological discoveries may include nineteenth century building foundations, structural remains, or concentrations of artifacts made of glass, ceramics, metal, or other materials found in buried pits, old wells, or privies.	GSD with the Construction Contractor shall be responsible for implementing **CR-1** during construction activities.	GSD with the Construction Contractor shall be responsible for monitoring **CR-1** during construction activities.	GSD and the THPOs and Council Members for the Bear River Band of Rohnerville Rancheria, Round Valley Reservation/ Covelo Indian Community, the InterTribal Sinkyone Wilderness Council, and the Wailaki Tribe.	Less-Than-Significant			
GEO-1: Adherence to Engineering Geologic and Geotechnical Investigation Report Recommendations Adherence to all project specific recommendations in the SHN Engineering Geologic and Geotechnical Investigation Report (SHN, 2023c) shall be required during design and construction of the proposed project. Project specific recommendations pertain to topics such as Site Preparation and Grading, Wet Weather Subgrade Protection, Select Engineered Fill, Excavations and Temporary Shoring, Utility Trench Backfill, Soil Corrosion Potential, Foundations, and Retaining Walls.	GSD with the Project Engineer and Construction Contractor shall be responsible for implementing **GEO-1** prior to and during construction activities.	GSD with the Project Engineer and Construction Contractor shall be responsible for monitoring **GEO-1** prior to and during construction activities.	GSD	Less-Than-Significant			

Mitigation Monitoring and Reporting Program
Garberville Sanitary District - Robertson/Wallan/Hurlbutt Tanks Replacement Project

Mitigation Measure	Implementation Phase	Monitoring Phase	Enforcement Agency	Level of Significance After Mitigation	Verification of Compliance		
					Initials	Date	Remarks
GEO-2: Inadvertent Discovery Protocol – Paleontological Resources In the event that fossils or other paleontological resources are encountered during construction (i.e., bones, teeth, or unusually abundant and well-preserved invertebrates or plants), construction activities shall be diverted away from the discovery within 50 feet of the find, and a professional paleontologist shall be notified to document the discovery as needed, to evaluate the potential resource, and to assess the nature and importance of the find. Based on the scientific value or uniqueness of the find, the paleontologist may record the find and allow work to continue, or recommend salvage and recovery of the material, if it is determined that the find cannot be avoided. The paleontologist shall make recommendations for any necessary treatment that is consistent with currently accepted scientific practices. Any fossils collected from the area shall then be deposited in an accredited and permanent scientific institution where they will be properly curated and preserved.	GSD with the Construction Contractor shall be responsible for implementing **GEO-2** during ground-disturbing activities.	GSD with the Construction Contractor shall be responsible for monitoring **GEO-2** during ground-disturbing activities.	GSD	Less-Than-Significant			
NO-1: Construction Noise Limitations The following measures will be implemented during construction activities to reduce noise levels: • Construction activities shall be restricted to the hours between 8:00 a.m. and 5:00 p.m. Monday through Friday, and between the hours of 9:00 a.m. and 5:00 p.m. on Saturdays and Sundays. • Construction activity will not occur on holidays.	GSD with the Construction Contractor shall be responsible for implementing **NO-1** during construction activities.	GSD with the Construction Contractor shall be responsible for monitoring **NO-1** during construction activities.	GSD	Less-Than-Significant			

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Revegetation Mitigation Monitoring and Reporting Plan

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Revegetation Mitigation Monitoring and Reporting Plan

Garberville Sanitary District
Robertson/Wallan/Hurlbutt Tanks
Replacement Garberville, California

Prepared for:

Garberville Sanitary District

March 2024

022067.800

Phone: (707) 441-8855 **Email:** info@shn-engr.com
Web: shn-engr.com • 1062 G Street, Suite I, Arcata, CA 95521

Revegetation Mitigation Monitoring and Reporting Plan

Garberville Sanitary District Robertson/Wallan/Hurlbutt Tanks Replacement Garberville, California

Prepared for:
Garberville Sanitary District

Prepared by:

1062 G Street, Suite I
Arcata, CA 95521
(707) 822-5785

March 2024

QA/QC:SEC___
Reference: 022067.800

Table of Contents

List of Illustrations

Abbreviations and Acronyms

Units of Measure

Term	Definition
lbs	pounds
lbs/acre	pounds per acre
sqft	square feet

Additional Terms

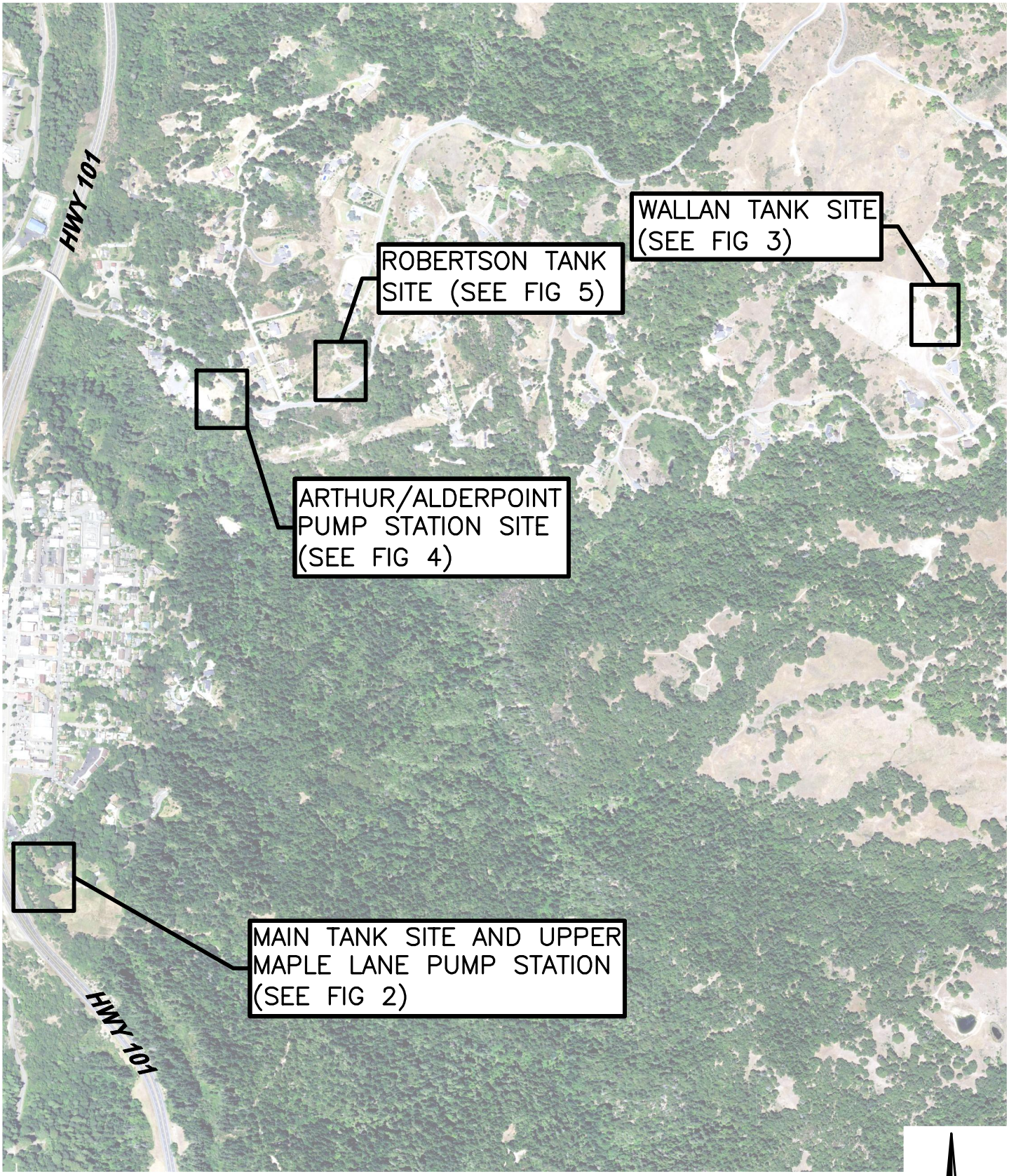
Term	Definition
APN	Assessor's parcel number
BMP	best management practice
CAL FIRE	California Department of Forestry and Fire Protection
CalIPC	California Invasive Plant Council
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CIPC	California Invasive Plant Council
GSD	Garberville Sanitary District
RMMRP	revegetation mitigation monitoring and reporting plan
SWPPP	Storm Water Pollution Prevention Plan
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

1.0 Introduction

This revegetation mitigation monitoring and reporting plan (RMMRP) details the effort needed to mitigate for impacts to purple needlegrass grassland (*Stipa* spp. Herbaceous Alliance) and/or California oatgrass grassland (*Danthonia californica* Herbaceous Alliance) that may occur during construction of Garberville Sanitary District's (GSD's) Robertson/Wallan/Hurlbutt Tanks Replacement Project (Figure 1). These two sensitive vegetation communities as defined by the Manual of California Vegetation or California Department of Fish and Wildlife (CDFW) Natural Communities list occur within the project area and were documented and mapped during preparation of the biological and wetland assessment that was prepared for the project (SHN, 2023). The biological and wetland assessment recommended the following measures which were included as mitigation measures for California Environmental Quality Act (CEQA) compliance:

> **Mitigation Measure BIO-3. <u>Avoidance and Minimization Measures to Protect Sensitive Natural Communities</u>:** GSD shall implement the following avoidance and protection measures for sensitive natural communities (purple needlegrass grassland and California oatgrass grassland) that would not be impacted during project construction:
>
> 1. GSD shall attempt to avoid or minimize impacts to sensitive natural communities to the greatest extent feasible in the final design plans.
> 2. Sensitive natural communities shall be clearly identified in the construction documents and reviewed by GSD prior to issuing for bid to ensure they are clearly marked as equipment exclusion zones during construction.
> 3. Prior to construction, temporary fencing shall be installed between the sensitive vegetation communities and the project if construction activities will occur within 50 feet of the sensitive vegetation community, to prevent accidental incursion.
>
> **Mitigation Measure BIO-4. <u>Mitigation for Sensitive Natural Communities</u>:** Construction within mapped sensitive natural communities (purple needlegrass grassland and California oatgrass grassland) shall be avoided to the greatest extent practicable. If impacts are unavoidable and mapped purple needlegrass grassland or California oatgrass grassland is removed or detrimentally impacted, mitigation would occur. A mitigation and monitoring plan shall be prepared in coordination with the California Department of Fish and Wildlife. The plan shall be acceptable to the California Department of Fish and Wildlife and include the following elements: proposed mitigation ratios; description and size of the restoration or compensatory area; site preparation and design; plant species; planting design and techniques; maintenance activities; plant storage; irrigation requirements; success criteria; monitoring schedule; and remedial measures. The ratio and conditions of mitigation would be negotiated in consultation with the California Department of Fish and Wildlife. The plan shall be implemented by GSD.

Some unavoidable temporary impacts to purple needlegrass grassland are anticipated during construction. No impacts to California oatgrass grassland are anticipated but are possible if construction impacts occur outside of the anticipated work areas. This plan has been prepared in compliance with Mitigation Measure BIO-4 to ensure that any such impacts are successfully mitigated. This RMMRP details appropriate species to be seeded and planted to sufficiently revegetate impacted areas, describes an invasive species prevention and management plan, and describes appropriate monitoring methods to determine revegetation and invasive species management success.



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SHN	Garberville Sanitary District Garberville Water System Improvements Garberville, California	Project Overview Revegetation Plan SHN 022067
	February 2024	022067-REVEG-PLAN-FIG	Figure 1

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The goals of this RMMRP are to:

1. document and quantify impacts to mapped sensitive vegetation communities resulting from the proposed project;
2. where impacts are unavoidable, restore sensitive vegetation communities to pre-project or better conditions;
3. revegetate sensitive vegetation communities disturbed by construction activities related to the replacement of water tanks, pump stations, and distribution lines with appropriate native species;
4. prevent dominance by invasive species (as defined by the California Invasive Plant Council [CalIPC]; CalIPC, 2023) within restored sensitive vegetation communities beyond pre-project levels; and
5. develop a monitoring plan to determine the success of revegetation efforts and invasive species management and develop potential remediation measures should success criteria fail to be met.

2.0 Project Description

GSD proposes improvements to GSD's community water system including replacing water tanks, replacing/upgrading booster pump stations, installing new segments of distribution piping, and replacing/upgrading backup generators, instrumentation, and controls. As of March 2024, GSD has prepared 90% engineering design plans which have avoided and reduced impacts to sensitive vegetation communities compared to the 30% plans. There were, however, unavoidable temporary impacts to sensitive vegetation communities, which are addressed in this RMMRP.

3.0 Existing Conditions

SHN prepared a biological and wetland assessment (SHN, 2023) for this project. The study area and results of the biological and wetland assessment are described in the biological and wetland assessment report and are divided into distinct study areas, which are briefly summarized below.

Section 1 of the study area includes the Wallan Tank site and Wallan Pump Station. The Wallan Tank site and corresponding Pump Station are characterized by sparsely forested slopes dominated by grassland in an area of rural development northeast of the town of Garberville.

The Wallan Pump Station is located south of Wallan Road at the edge of a mixed hardwood and conifer forest, which extends along the south of Wallan Road.

Section 2 of the study area is along Alderpoint Road and includes the Robertson Tank site, the Arthur Pump Station, and the California Department of Forestry and Fire Protection (CAL FIRE) Station. The Robertson Tank is located atop a steep south-southwest-facing slope north of Alderpoint Road in an area of rural development northeast of Garberville. The tank is partially below ground in grassland adjacent to a mixed hardwood and conifer woodland extending down the slope.

The Arthur Pump Station is located just north of Alderpoint Road, between Alderpoint Road and residential development.

The CAL FIRE Station is situated directly south and downslope from Alderpoint Road on a hillside bench. Flat portions of the area are developed with the CAL FIRE Station infrastructure, and this area is dominated by non-native species including landscaping and other cultivated plants. Undeveloped portions of the area are dominated by mixed conifer and hardwood forest specifically on the perimeter of the station area and in the northern portion of the area along Alderpoint Road.

Section 3 of the study area includes the existing Tobin Well site, the existing Hurlbutt Tank site, and the proposed Main Tank site. The Hurlbutt/Main Tanks site is accessed from the southeastern end of downtown Garberville via Melville Road and Hillcrest Drive. The study area encompasses the existing Hurlbutt Tank, a residence, and several other associated structures accessed from a paved driveway northwest of a large gently sloping, mowed, non-native grassland. The proposed location of the new Hurlbutt Tank is on the southwestern edge of the sloping mowed pasture.

3.1 Sensitive Vegetation Communities

Two sensitive vegetation communities as defined by the Manual of California Vegetation or CDFW Natural Communities list occur within the study area. These include purple needlegrass grassland (*Stipa* spp. Herbaceous Alliance) and California oatgrass grassland (*Danthonia californica* Herbaceous Alliance) and appropriate species associations. Portions of these sensitive vegetation communities exist within the immediate vicinity of proposed ground disturbing activity. These locations are shown on Figures 2-5.

Purple needlegrass grassland occupies approximately 26,977.9 square feet (sqft; 0.62 acres) within the study area. Within Section 1, all purple needlegrass grasslands were best described as having the *Stipa pulchra* association, which is characterized by high cover and dominance by purple needlegrass. Purple needlegrass grasslands within the study area displayed an average cover of 80 percent, most of which was flowering at the time of the survey (Appendix 1, Photos 1 and 2). Other species present during the survey included large quaking grass (*Briza maxima*), coast heron's bill (*Erodium cicutarium*), California oatgrass (*Danthonia californica*), rose clover (*Trifolium hirtum*), and purple sanicle (*Sinicola bipinnatifida*), among others. The most prevalent invasive species within the grassland was large quaking grass, and cover percentage should be noted in further observations. Purple needlegrass grassland within the study area is generally on open, herbaceous-dominated, south-facing slopes in locations with a history of minimal recent disturbance. More disturbed areas display much higher cover by non-native annual grasses.

California oatgrass grassland occupies approximately 5,063.86 sqft (0.11 acres) within the study area. The majority of the California oatgrass grassland is in Section 2 with three distinct occurrences totaling 4,005.15 sqft (0.09 acre). The majority of the California oatgrass grassland occurrences do not meet an association level description. However, the largest California oatgrass grassland mapped within the study area (at the CAL FIRE Station in Section 2) is best described using the *Stipa pulchra* association, as there is a low percentage of purple needlegrass present within the grassland dominated by California oatgrass. California oatgrass within the study area displayed a wide range of dominance by California oatgrass (Appendix 1, Photos 3 and 4). High quality examples exhibited up to 70 percent cover by California oatgrass; however, most were less than 50 percent cover by California oatgrass. Other species present during the survey included smooth cat's ear (*Hypochaeris glabra*), large quaking grass (*Briza maxima*), ripgut brome (*Bromus diandrus*), and Purdy's iris (*Iris purdyi*), among others. California oatgrass grassland within the study area is generally on open, herbaceous-dominated slopes with varied aspects, mainly in areas with irregular mowing.

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1"=60'

Garberville Sanitary District Garberville Water System Improvements Garberville, California		Main Tank Site & Upper Maple Lane Pump Station SHN 022067
February 2024	022067-REVEG-PLAN-FIG	Figure 2

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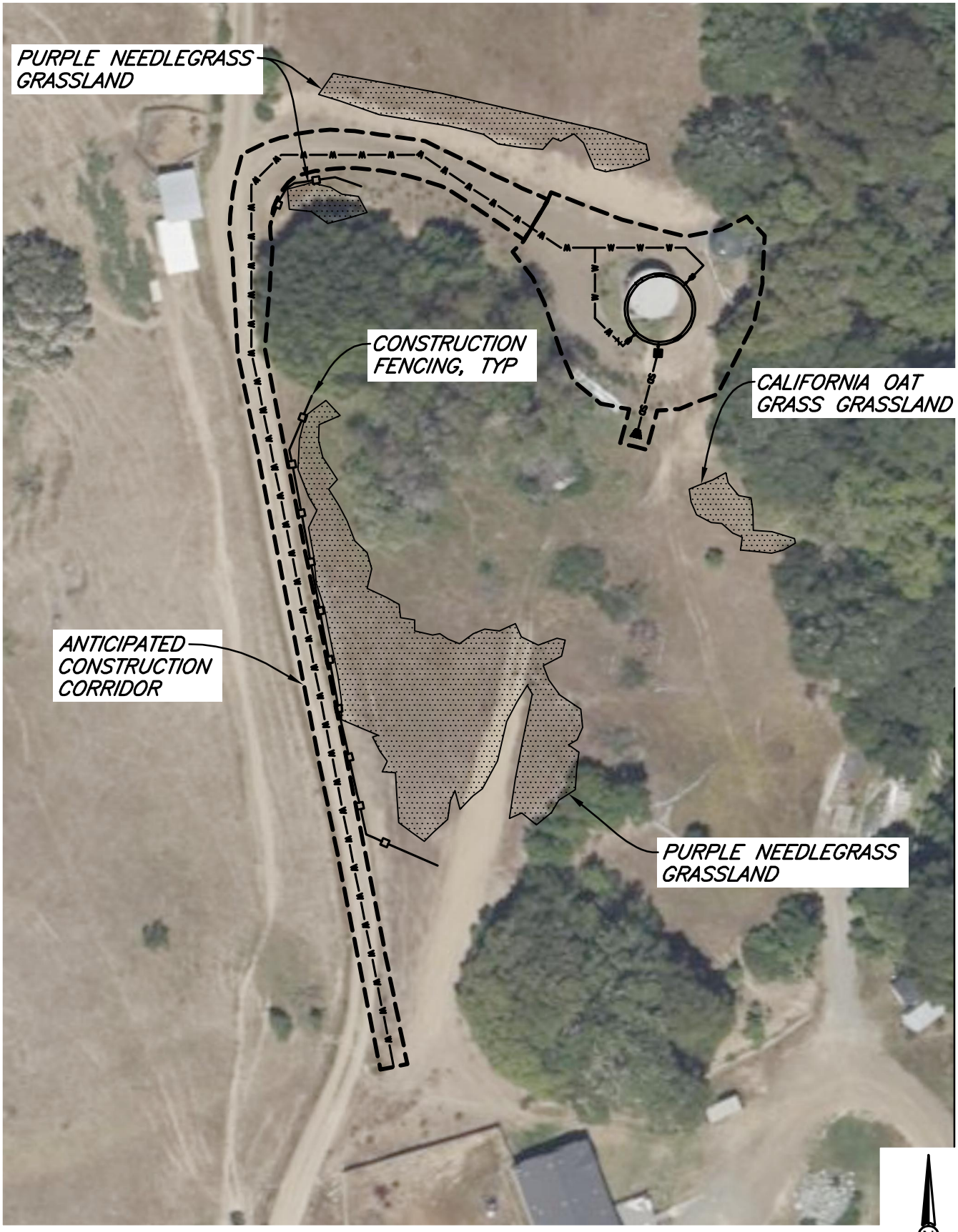

SHN	Garberville Sanitary District Garberville Water System Improvements Garberville, California	Wallan Tank Site Revegetation Plan SHN 022067
	February 2024	022067-REVEG-PLAN-FIG	Figure 3

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Garberville Sanitary District
Garberville Water System Improvements
Garberville, California

Arthur / Alderpoint Pump Station Sites
Revegetation Plan
SHN 022067

February 2024 | 022067-REVEG-PLAN-FIG | Figure 4

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SHN	Garberville Sanitary District Garberville Water System Improvements Garberville, California	Robertson Tank Site Revegetation Plan SHN 022067
	February 2024	022067-REVEG-PLAN-FIG	Figure 5

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4.0 Anticipated Impacts

The 90% engineering design plans were able to avoid and reduce impacts to sensitive vegetation communities in all locations compared to the 30% plans. Table 1 shows the areas of sensitive natural communities expected to be temporarily impacted. The only location where a sensitive vegetation community is anticipated to be impacted is at Arthur/Alderpoint Pump Station. All other locations of sensitive vegetation communities are not anticipated to be impacted. A total of approximately 485 sqft of temporary impact to purple needlegrass grassland (Figure 4) is anticipated. All expected temporary impacts to sensitive vegetation are anticipated to result from ground disturbance during construction (trenching, grading, and so on). No areas of sensitive vegetation are anticipated to be permanently impacted following successful implementation of this revegetation mitigation monitoring and reporting plan. See Section 6.1 (post-construction impact assessment) regarding documentation of any additional unexpected areas impacted during construction that may require additional sensitive vegetation community mitigation.

To reduce potential impacts, the plan will also follow recommendations and requirements outlined within the stormwater pollution prevention plan (SWPPP) and best management practices (BMPs). This includes the use of silt fences, straw wattles, exclusionary fencing, and the revegetation of appropriate plant species seeded and planted within the disturbed area.

Disturbed areas will need to be revegetated and managed following completion of ground disturbing activity to prevent the establishment of invasive species. Invasive species management will consist of invasive species removal and monitoring of the disturbed area. If invasive species introduction or encroachment occurs, resulting in a greater density of invasive species than the surrounding undisturbed area, then adaptive management plans will be developed. Restoration requirements will be reassessed during post-construction evaluation of impacts.

Table 1. Sensitive Vegetation Community Impacts
Garberville Sanitary District

Sensitive Vegetation Community	Location	Figure	Total Sensitive Vegetation Community Area	Total Area Impacted	Percent Impacted
			sqft[a] (acres)	sqft	
Purple Needlegrass Grassland	Arthur/Alderpoint Pump Station	4	26,978 (0.62)	485	1.8%
Total Impact Area				**485**	

a. sqft: square feet

5.0 Responsible Parties

The following participants are responsible for the installation, monitoring, and management of this revegetation effort and invasive species management plan. The responsibilities of each party are described below.

5.1 Project Proponent

The project proponent, GSD, will be ultimately responsible to ensure that the approved revegetation and invasive species management and monitoring plan is implemented and successful. GSD will be responsible for financing the preparation, planting, maintenance, and monitoring of the revegetation areas.

5.2 Project Biologist

Monitoring of the revegetation area will be the responsibility of a qualified biologist. The project proponent is responsible for retaining the project biologist. The project biologist will coordinate with GSD staff to assist with interpreting revegetation and management goals and performance standards.

After each annual monitoring event, the project biologist will provide GSD with a written list of items in need of attention in a report documenting the progress of the study area's revegetation. The project biologist will be responsible for identifying areas requiring remedial measures, such as invasive species removal, and for directing the implementation of such measures.

6.0 Implementation

6.1 Post-Construction Impact Assessment

A post-construction impact assessment will be conducted following completion of ground disturbing activity to assess sensitive vegetation communities within the immediate vicinity of construction activity for unexpected impacts that may occur during construction. If necessary, the RMMRP can be adjusted to better reflect the actual impacts resulting from construction. Should additional impacts to sensitive vegetation communities occur, then the area of impact will be recorded and restored in the same manner as proposed in this plan, including species, density, installation, and monitoring protocol.

The planting plan detailed in Section 6.2 will be amended if the impact areas are different than expected and will be submitted as part of the as-planted plan.

6.2 Planting Plan

Purple needlegrass (*Stipa pulchra*) (and California oatgrass [*Danthonia californica*] if impacted) will be reestablished within the impacted areas using a combination of both seed broadcasting and plug planting. An additional five species will be seeded onsite to increase diversity and resiliency of the native grassland within the impact area (Table 2). A combination of grass plugs with seeding acts as a two-pronged approach to the revegetation of the impacted grasslands, which maximizes the likelihood of successful restoration. This approach is particularly necessary when restoring either California oatgrass or purple needlegrass grasslands, because these species are slower growing and can initially be outcompeted by invasive annuals prior to becoming fully established (NRCS, 2008; NRCS, 2005).

6.2.1 Grass Plug Installation

A total of 970 plugs are required to properly revegetate the 485 sqft of impact area to prevent the spread of nonnative species and to restore ecosystem connectivity and functionality within the grasslands (Table 2). In all impacted grassland areas, there shall be two grass plugs planted per square foot of impacted area for a total of 485 purple needlegrass plugs. Grass plugs should be grown in tall, narrow growing cells approximately 2 to 3 inches wide and 7 to 10 inches deep with inward protruding

ribs that are vertically oriented to discourage root spiraling (Landis, 2010), and increase the likelihood of survival. Grass plugs should be spaced somewhat evenly and planted 6 to 12 inches apart on center for ideal growth and cover (Huddleston, 2004). Semi-dense planting in conjunction with native seeding will encourage vigorous establishment of native grasses and discourage the colonization of disturbed areas by invasive species. Soils should be loose and ripped to a depth of 12 inches within the planting area to encourage root development.

6.2.2 Seed Application

Seed application will occur within the entire impacted area of 485 sqft, including areas planted with plugs. This seed mix can also be used in other areas of ground disturbance for erosion control but would not be considered part of this plan. Within the purple needlegrass grassland, purple needlegrass will be seeded at a rate of 25 lbs/acre for a total of 0.28 lbs needed to revegetate the impact area (Table 2). Within California oatgrass grassland (if any is disturbed and becomes subject to this plan), California oatgrass will be seeded at a rate of 40 lbs per acre (lbs/acre). The seed mixes include five additional herbaceous species that will promote diversity within the grasslands. This includes western yarrow (*Achillea millefolium* var. *occidentalis*), Tolmie's star tulip (*Calochortus tolmiei*), soap plant (*Chlorogalum pomeridianum*), blue dicks (*Dipterostemon capitatus*), and western buttercup (*Ranunculus occidentalis*). Together these additional five species make up 0.70 lbs of the total 0.98 lbs of seed mix. See Table 2 for a list of species to be planted and pounds per species needed for the project area's seeding. It should be noted that seed quantities are based on the differing weights of individual seeds of each species that will be used to achieve the appropriate number of seeds per square foot. These seed application rates are designed to create a resilient grassland that will persist amid the encroachment of aggressive non-native species.

Seeding should be done in all areas using a seed broadcasting tool which evenly disperses available seed. It may be helpful to mix the seed in a 1:1 ratio with a sterilized mix such as vermiculite or clean, dry sand to aid in even seed dispersal. After seeds have been broadcasted in the impacted area, it is important to rake in (no deeper than 0.5-inches) and lightly tamp the soil where seed was spread.

Following seed application and plug planting, weed free straw shall be used to cover all exposed soil to prevent erosion during early fall storms prior to the germination and establishment of the seeds. Straw mulching shall utilize at least 2 to 4 inches of clean, weed-free, straw (such as rice or barley). No bare soil should be visible, and straw should be adjusted around plugs so that they are not covered by straw. If necessary, straw wattles shall be installed such that they avoid planted grass plugs.

A temporary fence shall be installed around each revegetation area to reduce the likelihood that young plants will be grazed, trampled, or damaged during germination and establishment. Temporary fencing shall meet the requirements for excluding wildlife such as deer and shall not be shorter than 7 feet. The utilization of temporary signage conveying “habitat restoration in progress” is also recommended. Temporary fencing shall be removed prior to the completion of the monitoring period, and ideally shall be removed after 1 or 2 years. Recommendations for removal of temporary fencing will be discussed in annual monitoring reports and will be coordinated with GSD.

No formal irrigation system is proposed; however, the revegetation effort would benefit from irrigation and GSD may set up temporary overhead irrigation if desired.

Table 2. Revegetation Plant List
Garberville Sanitary District

Latin Name	Common Name	Method of Planting	Plugs per species	Pounds (lbs)	Plugs per Sqft[a]	Location	Notes
Revegetation Species							
Achillea millefolium var. *occidentalis*	western yarrow[b]	seed scatter	none	0.017 lbs (0.5 ounces)	N/A	Where designated	Do not buy 'colorful' European yarrow
Calochortus tolmiei	Tolmie's Star Tulip[c]	seed scatter	none	0.17 lbs (2.8 ounces)	N/A	Where designated	None
Chlorogalum pomeridianum	soap plant[d]	seed scatter	none	0.17 lbs (2.8 ounces)	N/A	Where designated	None
Dipterostemon capitatus	blue dicks[f]	seed scatter	none	0.17 lbs (2.8 ounces)	N/A	Where designated	None
Ranunculus occidentalis	western buttercup[b]	seed scatter	none	0.17 lbs (2.8 ounces)	N/A	Where designated	None
Stipa pulchra	purple needle grass[e]	seed scatter & plugs	970	0.28 lbs (4.4 ounces)	2	Where designated	See plug planting guidelines
Total Revegetation Plants			**970 plugs**	**0.98 lbs**			

a. sqft: square foot
b. Available at Silver Falls Seed Company
c. Available at Willamette Wildlings
d. Available at Klamath-Siskiyou Native Seeds
e. Available at Larner Seeds
f. Available at Theodore Payne Foundation Store

6.3 Schedule

The proposed revegetation plan will be initiated immediately following the completion of ground disturbing work. Should ground disturbing activity span more than one construction season, then the revegetation area will need to be temporarily stabilized using ground cover and erosion control measures described within the SWPPP. Within the revegetation areas, only non-vegetative erosion control measures should be used to prevent the establishment of other ground cover that could compete with the planted and seeded species. Suitable temporary soil stabilization includes jute mat, coir mat, wood chip mat, straw mat/wattle, or straw mulch. Straw mulching shall utilize at least 2 to 4 inches of clean, weed-free, straw (such as rice or barley).

Planting and seeding shall occur during the most ideal seeding window between September and November. Erosion control and soil preparation will occur immediately following the completion of construction activities with seeding and planting occurring at a later time to utilize the ideal seeding and planting windows. In this case, erosion control ground over would need to be temporarily removed for seed broadcasting and plug planting. Seeding should occur immediately before the first significant soaking fall rains within the seeding window from September to November. This will allow seeds to be "watered in" and will ensure that adequate and natural moisture levels will reach the broadcasted seeds.

If seeds are planted too early, it is much more likely they will be predated. If they are planted too late, germination rates and survival may be reduced.

Plugs should be planted following the first soaking rain, or in the late fall and early winter months, but should not be planted later than January 31 to give the plugs time to become established prior to the dry season.

The Humboldt County Planning Department and CDFW will be notified at least 1 month before the work is to begin and shall be given the name and contact information of the party responsible for supervising and documenting implementation of the revegetation plan.

6.4 Maintenance During the Three- to Five-Year Monitoring Period

Regular monitoring and maintenance should be conducted to facilitate the successful establishment of the desired native species within the revegetation area. Mowing once or twice a year, or low intensity grazing is recommended and will reduce competition between nonnative and native species. Use of these techniques have been shown to improve survival rates of native perennial bunchgrasses when competing against invasive annuals by reducing the cover of non-native species (Stromberg, 2007).

A qualified biologist will evaluate and implement the need for invasive species eradication, when necessary, in order to minimize competition that could prevent the establishment of native species within the revegetation area. Weeds shall be removed by hand or other manual means such as more frequent targeted mowing. The use of herbicide for weed control shall not be permitted, except in extraordinary circumstances, and only with approval from CDFW. The methods used for regular maintenance and invasive species eradication shall be outlined and by a qualified biologist should the need arise.

Maintenance will be conducted as necessary to meet the project restoration requirements. As native habitat develops within the revegetation area, the need for maintenance activities (for example, invasive species management) should decrease over the monitoring period.

7.0 Project Restoration Requirements

Successful revegetation will be defined as the restoration of impacted grassland to pre-project conditions or better. This includes restoring or increasing purple needlegrass cover in purple needlegrass grassland (and California oatgrass cover in any impacted California oatgrass grassland). It also includes maintaining invasive and non-native species cover to pre-project levels or better and soil stabilization.

Success criteria for the revegetation areas include:

- Cover by native vegetation is greater than or equal to the cover percentage identified prior to disturbance; 80-percent cover by purple needlegrass within restored purple needlegrass grasslands (and 50-percent cover by California oatgrass within any restored California oatgrass grasslands)
- Cover by invasive species within disturbed areas is less than or equal to the cover found in adjacent undisturbed areas after 3-5 years of monitoring
- Stabilization of soil within the areas of soil disturbance

8.0 Monitoring and Reporting Program

As part of the monitoring program, both qualitative (visual assessment) and quantitative sampling will be performed by a qualified ecologist/biologist. This assessment will be used to make maintenance recommendations in annual reports, which will evaluate the success of the revegetation efforts. Monitoring will occur annually for 3 to 5 years during peak bloom (April–June) after revegetation efforts are completed. If success criteria have been met by year three, and the trajectory of the vegetation composition shows continued success within the revegetation area, then a final report will be written indicating successful revegetation and completion of monitoring efforts and submission to CDFW for final review. Should success criteria not be met by year three, or the trajectory of the vegetation composition shows that revegetation efforts will fail or are in jeopardy of not meeting the success criteria, then monitoring shall continue for the full 5 years of monitoring. See Section 8.0 Corrective Action should the success criteria fail to be met by year five following completion of the revegetation efforts.

8.1 Qualitative Visual Assessment

During each monitoring event, visual observations of conditions within the revegetation area will be noted. The qualitative visual assessment will aid in evaluating the overall success of the revegetation area and the need for any remedial measures.

Particular attention will be paid to the following:

- Health and vigor of plants
- Natural recruitment of native species
- Spread and increase of invasive species cover within the revegetation area
- Introduction of invasive species not currently present within the immediate area
- Soil stability and erosion potential

8.2 Quantitative Sampling

Quantitative comparative vegetation data will be collected annually in the late spring/early summer and will be the primary method to determine the success of the revegetation efforts. Representative comparative plots will be used to assess the effectiveness of the revegetation effort by measuring the cover of native vegetation, cover by nonnative vegetation, and any change observed between years. Each plot within the revegetation area will have a corresponding reference plot within the sensitive vegetation community outside of the area of disturbance as a control with which to compare the cover of invasive species, native species composition, and native grass cover.

A total of four, 1-square-meter plots (two plots in impact areas and two paired reference plots) will be used to monitor the revegetation areas. This will consist of two plots within the purple needlegrass grassland impact area adjacent to the CAL FIRE station and two paired reference plots within the adjacent undisturbed purple needlegrass grassland. Plot locations will be determined following the completion of construction activities and will be described within the as-planted report. Within each plot all species will be recorded along with absolute cover by each species present. This information will be used to determine species richness and cover by native and nonnative species within each plot. The location of each plot inside the revegetation areas will be randomly selected by a qualified biologist and paired with a plot within the target sensitive vegetation community outside of the area of disturbance in

a location that has similar and comparative vegetation in quality and quantity to that which occurred within the impact area at a time prior to construction activities.

In order to determine the success of the revegetation effort, richness and cover by native species and invasive species within the revegetation area will be compared to richness and cover by native and invasive species within the target sensitive vegetation community outside of the impact area.

8.3 Photo Documentation

In addition to the quantitative and qualitative assessments, several permanent stations for photo documentation will be established within and adjacent to the revegetation area. Photos will be taken prior to any construction activities for the proposed project as a baseline and will be included as part of each annual monitoring report. Photo stations and their bearings will be established prior to the beginning of construction activities but are subject to change after the post-construction impact assessment is complete. Photo station locations will be recorded in the as-planted report, and the same locations and bearings will be used in each successive annual monitoring report.

8.4 Annual Reports

A brief "as planted" report will be produced after planting to verify which species were planted and where. Annual status reports on the revegetation and invasive species management shall be submitted to CDFW by October 31 of each year following the initial planting for the length of the monitoring period. Recommendations for any corrective action necessary to ensure the continued success of the revegetation efforts will be included in the report.

9.0 Corrective Action

In the event that the monitoring program identifies any condition that significantly affects the project restoration requirements indicated above (Section 7.0), or if the project restoration requirements are not achieved after 5 years, a corrective action plan will be developed by GSD in consultation with CDFW. Recommendations for specific corrective actions will be reviewed and evaluated in conjunction with field observation data. A corrective action plan will be submitted to CDFW prior to completion of any action. The project proponent shall be fully responsible for any failure to meet the performance standards of the revegetation plan. All failed areas shall be replanted with the same maintenance, monitoring, and reporting for another 5 years.

10.0 References

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---. (2008). *Plant Guide CALIFORNIA OATGRASS Danthonia californica.* USDA. *https://plants.usda.gov/DocumentLibrary/plantguide/pdf/pg_daca3.pdf*

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Stromberg, M. R., C. M. D'antonio, T. P. Young, J. Wirka, and P. R. Kephart. (2007). *California Grassland Restoration*. Ecology and Management of California Grasslands, 254-280.

Sensitive Grassland Photos

1

Photo 1: Purple needlegrass grassland representative conditions, looking east near the Wallan Tank site. Note dense cover by purple needlegrass and abundant seed production. Photo taken April 27, 2022.

Photo 2: Looking northeast near the Wallan Tank site, purple needlegrass grassland representative conditions in the dry season. Note dense cover by purple needlegrass and abundant seed production. Photo taken July 5, 2023.

Photo 3: California oatgrass meadow looking south. California oatgrass is dominant within this area near the Wallan Tank site. Photo taken April 27, 2022.

Photo 4: Looking north near the Wallan Tank site, California oatgrass meadow looking uphill during the dry season. California oatgrass is dominant within this small area near the Wallan Tank site. Photo taken July 5, 2023.

Eureka, CA | Arcata, CA | Redding, CA | Willits, CA | Fort Bragg, CA | Coos Bay, OR | Klamath Falls, OR

Permits D

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CURRENT PLANNING DIVISION
PLANNING AND BUILDING DEPARTMENT
COUNTY OF HUMBOLDT

3015 H Street, Eureka, CA 95501
Phone (707) 445-7541 • Fax (707) 268-3792
http://www.humboldtgov.org/156

Applicant
Garberville Sanitary District
Attn: Jennie Short, Project Manager
PO Box 211
Garberville, CA 95542

Agent
SHN
Attn: Stein Coriell, AICP, Senior Planner
1062 G Street, Suite I
Arcata, CA 95521

Owners

APN	Owner	Mailing Address
032-121-009	SCOWN ENTERPRISES	PO BX 98 GARBERVILLE, CA 95542-0098
032-135-002	GARBERVILLE SANITARY DISTRICT	PO BX 211 GARBERVILLE, CA 95542-0211
032-211-011	GARBERVILLE SANITARY DISTRICT	PO BX 211 GARBERVILLE, CA 95542-0211
032-211-021	SWAFFAR GREGORY R & MEGAN L TR	1240 BENTLEY DR CALISTOGA, CA 94515
032-211-035	SWAFFAR GREGORY R & MEGAN L TR	1241 BENTLEY DR CALISTOGA, CA 94515
223-181-020	WALL LINDA W TR	PO BOX 245 MIRANDA, CA 95553
223-181-024	PUZIN DONALD S & PATRICIA A	PO BX 1082 REDWAY, CA 95560-1082
223-181-025	LANGLEY PHILLIP G & MARY T	30 ARTHUR RD GARBERVILLE, CA 95542
223-183-003	CALIFORNIA STATE OF	CDF STATION
223-191-006	CARMICHAEL SCOTT & MAYTANES DEBRA	PO BOX 57 GARBERVILLE, CA 95542
223-191-011	SLEEPER JERRY L & ALMA C	12624 NS 3565 RD SEMINOLE, OK 74868

APPEAL PERIOD COMPLETION LETTER

Date April 19, 2024

Assessor Parcel Number: 032-121-009, 032-135-002, 032-211-011, 032-211-021, 032-211-035, 223-181-020, 223-181-024, 223-181-025, 223-183-003, 223-191-006 and 223-191-011

Record Number PLN-2023-18803

Contact Rodney Yandell - 268-3732

Description
A General Plan Conformance Review and a Special Permit for the Garberville Sanitary District (GSD) to replace the existing 180,000-gallon, in-ground, concrete, finished water storage tank (Hurlbutt/Main Tank) and a 20,000-gallon, failing, redwood drinking water storage tank (Wallan Tank) with two new increased capacity tanks. In addition, the failing Robertson Tank, which has been taken out of service, would be demolished. The new Main Tank would be an in-ground, approximately 550,000-gallon, pre-stressed concrete tank located on an adjacent parcel and similar elevation to the existing tank. The existing Wallan Tank would be replaced with an approximately 77,000-gallon bolted steel tank. Both of the existing tanks in operation are leaking and lack sufficient storage capacity for maximum daily consumption and fire suppression; they also do not meet current seismic design standards. In addition, the GSD proposes to replace or upgrade three booster pump

stations (Upper Maple Lane Pump Station, Arthur/Alderpoint Pump Station, and Wallan Pump Station). The existing Upper Maple Lane Pump Station is located in the existing Hurlbutt Tank and would be demolished when the Hurlbutt Tank is demolished. A new Upper Maple Lane Pump Station would need to be constructed at the site of the new Main Tank. The existing Arthur Pump Station is in poor condition and has operational deficiencies that would be improved when this pump station is replaced by the Alderpoint Pump Station. The Wallan Pump Station is in poor condition and requires upgrades to meet the operational requirements of the new Wallan Tank. New backup generators would be installed at each replaced or upgraded booster pump station and at the Tobin Well. The proposed project includes conveyance of the existing Hurlbutt/Main Tank parcel (APN: 032-211-011) to the existing landowner and creation of a separate legal parcel for the proposed 550,000-gallon tank on APN: 032-211-021 for development of the access road and ground disturbances to install water lines to the new 550,000-gallon Main tank. The Special Permit is required for work proposed within the streamside management area (SMA) of an unnamed ephemeral stream on APN: 032-211-021. As Lead Agency, the Garberville Sanitary District adopted a Mitigated Negative Declaration (State Clearinghouse #2023100664) pursuant to Section 15074 of the CEQA Guidelines.

Decision

The project was approved by the Planning Commission on April 4, 2024.

Appeal Completion

The appeal period for this project has been completed and no appeal has been requested.

Effective Date

The effective date is April 19, 2024.

Expiration Date

The expiration date is April 19, 2026.

PLANNING AND BUILDING DEPARTMENT
PLANNING DIVISION
COUNTY OF HUMBOLDT

3015 H Street, Eureka, CA 95501
Phone (707) 445-7541 • Fax (707) 268-3792

Planning Division Decision Packet

The following packet of information includes your Planning Division permit results. **Please review the enclosed permit packet carefully.** The packet contains important information such as appeal periods, permit conditions and the expiration date for your permit(s). Please take particular note of the following:

1. **Your permit is subject to one or more appeal periods.** Your permit is not effective until all appeal periods have ended. See appeals procedure information included in this packet.

2. **All permit conditions must be completed prior to the expiration date.** Your permit(s) may also include conditions from other state or local agencies. If you have questions or need assistance, please contact the specific agency or department that issued the conditions.

3. **Proof of completion is required for most permit conditions**. For efficient staff review of condition completion, please consolidate proof of completion for all conditions into one package.

4. **You are responsible for tracking the expiration date of your permit(s).** An extension process is available if you need more time.

5. **Additional federal, state or local regulatory requirements may apply to your project.** These requirements may be administered by agencies other than the Planning Division, including any mitigation monitoring. It is your responsibility to obtain all necessary approvals before starting your project.

6. **Call your assigned planner if you have any questions.** Your assigned planner's contact information is provided below.

Rodney Yandell, Senior Planner
Voice: 707-268-3732
Fax: 707-268-3792
ryandell@co.humboldt.ca.us

CURRENT PLANNING DIVISION
PLANNING AND BUILDING DEPARTMENT
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Notice of Planning Commission Decision

Date: April 19, 2024

Assessor Parcel Number: 032-121-009, 032-135-002, 032-211-011, 032-211-021, 032-211-035, 223-181-020, 223-181-024, 223-181-025, 223-183-003, 223-191-006 and 223-191-011

Permit: PLN-2023-18803

Contact: Rodney Yandell - 268-3732

Description
A General Plan Conformance Review and a Special Permit for the Garberville Sanitary District (GSD) to replace the existing 180,000-gallon, in-ground, concrete, finished water storage tank (Hurlbutt/Main Tank) and a 20,000-gallon, failing, redwood drinking water storage tank (Wallan Tank) with two new increased capacity tanks. In addition, the failing Robertson Tank, which has been taken out of service, would be demolished. The new Main Tank would be an in-ground, approximately 550,000-gallon, pre-stressed concrete tank located on an adjacent parcel and similar elevation to the existing tank. The existing Wallan Tank would be replaced with an approximately 77,000-gallon bolted steel tank. Both of the existing tanks in operation are leaking and lack sufficient storage capacity for maximum daily consumption and fire suppression; they also do not meet current seismic design standards. In addition, the GSD proposes to

replace or upgrade three booster pump stations (Upper Maple Lane Pump Station, Arthur/Alderpoint Pump Station, and Wallan Pump Station). The existing Upper Maple Lane Pump Station is located in the existing Hurlbutt Tank and would be demolished when the Hurlbutt Tank is demolished. A new Upper Maple Lane Pump Station would need to be constructed at the site of the new Main Tank. The existing Arthur Pump Station is in poor condition and has operational deficiencies that would be improved when this pump station is replaced by the Alderpoint Pump Station. The Wallan Pump Station is in poor condition and requires upgrades to meet the operational requirements of the new Wallan Tank. New backup generators would be installed at each replaced or upgraded booster pump station and at the Tobin Well. The proposed project includes conveyance of the existing Hurlbutt/Main Tank parcel (APN: 032-211-011) to the existing landowner and creation of a separate legal parcel for the proposed 550,000-gallon tank on APN: 032-211-021 for development of the access road and ground disturbances to install water lines to the new 550,000-gallon Main tank. The Special Permit is required for work proposed within the streamside management area (SMA) of an unnamed ephemeral stream on APN: 032-211-021. As Lead Agency, the Garberville Sanitary District adopted a Mitigated Negative Declaration (State Clearinghouse #2023100664) pursuant to Section 15074 of the CEQA Guidelines.

Decision

The project was approved by the Planning Commission on **April 4, 2024** by Resolution **24-018** and is subject to the attached Conditions of Approval.

Appeals

This project may be appealed by any aggrieved person within **10 working** days. The last day to appeal to the Board of Supervisors is 5:00 p.m. on April 18, 2024 .
Information regarding appeals is included with this notice.

Conditions of Approval

Please review these conditions carefully as other permits may be required before the project commences. In accordance with County Code, this approval may be revoked or rescinded, in whole or in part, if certain grounds are found to exist (See Humboldt County Code §312-14).

Effective Date

If no appeal is initiated, the day after all appeal periods end will become the effective date of the permit. If an appeal has been initiated the effective date will depend on the outcome of the appeal.

Expiration Date

You will receive an expiration letter stating the effective date and the expiration date at the end of the appeal period.

Extensions

If the conditions for your project cannot be met before the expiration date, you may apply for an extension with the Planning Division. Extension applications must be submitted with the appropriate fees before the permit expiration date. If the permit expires, a new permit application must be filed and accompanied by applicable fees. The new permit may be subject to different processing requirements and standards. Contact your assigned planner if you have any questions about extensions.

Changes or Modifications to Project

If your project needs minor changes or major modifications, review and approval of the project by the Planning Division is required. Applications for changes or modifications must be filed and accompanied by applicable fees. Contact your assigned planner if you think your project needs to be changed or modified.

RESOLUTION OF THE PLANNING COMMISION
OF THE COUNTY OF HUMBOLDT

Resolution Number: 24-018

Record Number: PLN-2023-18803

Assessor's Parcel Numbers: 032-121-009, 032-135-002, 032-211-011, 032-211-021, 032-211-035, 223-181-020, 223-181-024, 223-181-025, 223-183-003, 223-191-006 and 223-191-011.

Resolution by the Planning Commission of the County of Humboldt conditionally approving the Garberville Sanitary District Water System Improvements General Plan Conformance Review and Special Permit.

WHEREAS, the Garberville Sanitary District submitted an application and evidence in support of approving General Plan Conformance Review and Special Permit; and

WHEREAS, the County Planning Division has reviewed the submitted application and evidence and has referred the application and evidence to involved reviewing agencies for site inspections, comments, and recommendations; and

WHEREAS, the Garberville Sanitary District as the lead agency under CEQA adopted a Mitigated Negative Declaration (MND) for the proposed project, and the County of Humboldt as a responsible agency under CEQA considers the environmental effects and concurs with the findings of the MND; and

WHEREAS, Attachment 2 in the Planning Division staff report includes evidence in support of making the required findings for approving the proposed project (Record Number: PLN-2023-18803); and

WHEREAS, the Humboldt County Planning Commission held a duly-noticed public hearing on **April 4, 2024**, and reviewed, considered, and discussed the application for the General Plan Conformance Review and Special Permit, and reviewed and considered all evidence and testimony presented at the hearing.

Now, THEREFORE BE IT RESOLVED, that the Planning Commission makes all the following findings:

1. **FINDING:** **Project Description:** A General Plan Conformance Review and Special Permit for the Garberville Sanitary District (GSD) to replace the existing 180,000-gallon, in-ground, concrete, finished water storage tank (Hurlbutt/Main Tank) and a 20,000-gallon, failing, redwood drinking water storage tank (Wallan Tank) with two new increased capacity tanks. In addition, the

failing Robertson Tank, which has been taken out of service, would be demolished. The new Main Tank would be an in-ground, approximately 550,000-gallon, pre-stressed concrete tank located on an adjacent parcel and similar elevation to the existing tank. The existing Wallan Tank would be replaced with an approximately 77,000-gallon bolted steel tank. Both of the existing tanks in operation are leaking and lack sufficient storage capacity for maximum daily consumption and fire suppression; they also do not meet current seismic design standards. In addition, the GSD proposes to replace or upgrade three booster pump stations (Upper Maple Lane Pump Station, Arthur/Alderpoint Pump Station, and Wallan Pump Station). The existing Upper Maple Lane Pump Station is located in the existing Hurlbutt Tank and would be demolished when the Hurlbutt Tank is demolished. A new Upper Maple Lane Pump Station would need to be constructed at the site of the new Main Tank. The existing Arthur Pump Station is in poor condition and has operational deficiencies that would be improved when this pump station is replaced by the Alderpoint Pump Station. The Wallan Pump Station is in poor condition and requires upgrades to meet the operational requirements of the new Wallan Tank. New backup generators would be installed at each replaced or upgraded booster pump station and at the Tobin Well. The Special Permit is required for work proposed within the streamside management area (SMA) of an unnamed ephemeral stream on APN: 032-211-021. The proposed project includes conveyance of the existing Hurlbutt/Main Tank parcel (APN: 032-211-011) to the existing landowner and creation of a separate legal parcel for the proposed 550,000-gallon tank (APN: 032-211-021) on APN: 032-211-021 for development of the access road and ground disturbances to install water lines to the new 550,000-gallon Main tank.

EVIDENCE: a) Project File: PLN-2023-18803

2. **FINDING:** **CEQA**: The requirements of CEQA have been complied with/ The County is a Responsible Agency under CEQA and has considered the environmental effects of the project as shown in the MND. There are no significant and unavoidable impacts on the environment as a result of the proposed project.

EVIDENCE: a) The Garberville Sanitary District adopted an MND for this project (SCH #2023100664). All potentially significant impacts

can be mitigated to less than significant levels with the incorporated Mitigated Monitoring and Reporting Program.

b) The MND includes an analysis of the proposed project. The MND was circulated from October 25, 2023, to November 28, 2023.

c) The MND prepared for the project found no impact, or less than significant impacts on Agriculture and Forestry Resources, Greenhouse Gas Emissions, Hazards and Hazardous Materials, Hydrology and Water Quality, Land Use and Planning, Mineral Resources, Population and Housing, Public Services, Recreation, Transportation, Tribal Cultural Resources, Utilities and Service Systems, and Wildfire.

d) The MND includes mitigation measures for potential significant impacts to Aesthetics, Air Quality, Biological Resources, Cultural Resources, Geology and Soils, and Noise. With the implementation of these mitigation measures there are no significant and unavoidable impacts from the proposed project.

3. FINDING: The proposed development is in is in conformance with all applicable policies and standards in the Humboldt County General Plan (General Plan) and Garberville Redway Alderpoint Benbow Community Plan 1987 (GRBAP).

EVIDENCE: a) The project is to upgrade and maintain existing community water system infrastructure and associated ancillary development. The proposed project supports the use within the land use designations.

b) The replacement of the existing water storage tanks and improvement to the electrical systems and distribution lines will maintain adequate storage for the Garberville Sanitary District. The replacement of the current water storage tanks will not expand the District's service area, water withdraws or customer entitlements, but will replace two undersized water tanks and associated infrastructure to ensure the water system is properly functioning.

c) The proposed project will have no net effect on housing densities. The parcels were not included in the 2019 County Housing Inventory. The purpose of the Project is to upgrade and maintain existing community water system infrastructure and associated ancillary development in order to maintain an

adequate water supply facilitating achievement of the County's housing goals and programs of the Housing Element for the Garberville area.

d) The subject parcels are located within areas of moderate to high instability and outside of any Alquist-Priolo fault hazard area. Assessor Parcel Numbers (APNS): 032-211-021 and 223-191-006 contain mapped historic landslides areas as shown on the Humboldt County WebGIS (GIS). Development on APN: 032-211-021 is located approximately 365 feet southwest of the mapped area. The parcels are located outside of the flood zone and areas of liquefaction. The parcels are within high to very high fire hazard severity zone. The parcels are within the State Responsibility Area (SRA) for fire protection and within the Garberville Fire Protection District who responds to structural fires and medical emergencies. The proposed project will increase water storage to meet the minimum requirements for fire protection.

Development on APN: 223-191-006 is located within the mapped area. An *Engineering Geologic and Geotechnical Investigation Report* (Geologic Report) prepared by SHN dated August 2023 indicated they did not observe any features related to recent landsliding (tension cracks, seeps, springs, rills, or gullies) at the proposed new infrastructure sites. The Geologic Report contained several general geotechnical recommendations that were incorporated into the ISMND that requires the applicant to adhere to the recommendations to ensure the project has a less than significant impact. Conditions of approval require the Applicant to obtain all Federal, State and local permits required for the project, including grading permits from the Humboldt County Building Inspection Division. Planning staff concludes the mitigation measures as adopted by GSD and adhering to Conditions of Approval would ensure the project would not increase hazard risk.

e) The project was referred to the Northwest Information Center (NWIC), the Bear River Band of Rohnerville Rancheria and the Intertribal Sinkyone Wilderness Council. NWIC responded noting that the previous studies were completed for portions of the project area and recommended further study and coordination with local Tribes. According to the *Final Initial Study Checklist and Proposed Mitigated Negative Declaration for the Garberville Sanitary District Robertson/Wallan/Hurlbutt Tanks Replacement Project* (ISMND; State Clearinghouse

#2023100664), a Cultural Resources Investigation was prepared for the project. One previously documented historic building complex, the Garberville Forest Fire Station (P-12-000930) was documented on the CALFIRE parcel where the Alderpoint Pump Station is proposed. Because these buildings are not proposed for any alterations, nor is the immediate view around the buildings, or in the station in general as part of the current project, utilizing the rear of the property for project elements as proposed was determined to not impact the ability for this site to convey significance now or in the future.

The *Cultural Resources Investigation* identified the Hurlbutt Tank, Upper Maple Lane Pump Station, and Robertson Tank as being more than 50 years of age. However, they were recommended not eligible under the significance criteria set forth for built environment resources. No further recommendations were given for the demolition of these structures. The Cultural Resources Investigation found that no recommendations were needed for the Wallan Tank, Arthur Pump Station, or Wallan Pump Station.

Under Assembly Bill (AB) 52, the Applicant sent notification letters to local Native American tribes on July 25, 2023 (Bear River Band of the Rohnerville Rancheria, Round Valley Reservation/Covelo Indian Community, and Wailaki Tribe). No responses were received to the AB 52 consultation request. The Bear River Band of Rohnerville Rancheria and the Intertribal Sinkyone Wilderness Council did not respond to the County referral. Although discovery of cultural resources (including historical resources) during project construction was not anticipated, the ISMND included a mitigation measure to adhere to Inadvertent Study protocols.

f) According to the *Final Initial Study Checklist and Proposed Mitigated Negative Declaration for the Garberville Sanitary District Robertson/Wallan/Hurlbutt Tanks Replacement Project* (ISMND; State Clearinghouse #2023100664; ISMND), there is the potential for status-status plant and animal species to occur in the project area. Additionally, there were wetlands and watercourses identified with the project area (see additional findings related the Streamside Management Area and Wetlands Ordinance in Finding #4b below). The ISMND contained 6 mitigation measures related to biological resources to ensure the project would an a less than significant effect on the environment, including biological resources.

A referral was sent to CDFW on November 20, 2023, and CDFW responded on February 26, 2024, indicating that they are aware of the project and issues were resolved with GSD during circulation of the ISMND. The CDFW requested the GSD to notify CDFW for the intake and trenching for the new main distribution line on APN: 032-211-021, which GSD has done already, and the Final Steamed Alteration Agreement (Final SAA) is in progress. Conditions of approval require the Applicant to obtain all Federal, State and local permits required for the project. Planning staff concludes the mitigation measures as adopted by GSD and adhering to Conditions of Approval would ensure impacts to biological resources minimized.

4. FINDING: The subject parcels are zoned Residential One Family (R-1 APN: 032-135-002), Community Commercial with a Design Review Combining zone (C-2-D; APN: 032-121-009), Residential Suburban with a Special Building Site combining zone allowing for 5 acres of building site area (RS-B-5(5)); APNs: 032-211-011, 032-211-021, and 032-211-035) and Agriculture Exclusive with a Special Building Site combining zone (AE-B-6; APNs: 223-181-020, 223-181-024, 223-181-025, 223-183-003, 223-191-006, 223-191-011). The proposed development is consistent with the purposes of the R-1, C-2-D, RS-B-5(5)) and AE-B-6 zones.

EVIDENCE: a) The project is to upgrade and maintain existing community water system infrastructure and associated ancillary development. The proposed project supports the uses within the zoning districts.

b) A Special Permit is required for work proposed within the streamside management area (SMA) in accordance with §314-61.1 Streamside Management Areas and Wetlands Ordinance (SMAWO). Associated work within the SMA would occur within the SMA buffer for an unnamed ephemeral stream on APN: 032-211-021 for development of the access road and ground disturbances to install water lines to the new 550,000-gallon Main tank. A *Biological and Wetland Assessment – Revision 1*, prepared by SHN dated October 2023, identified a total of 538 feet of stream within 2 locations within the project area. Development within the SMA would be limited to the encroachment into the 50-foot buffer of the ephemeral stream on APN: 032-211-021 and would be less than 538 feet. The development would include excavation, backfilling and

compaction of fill, and implementation of erosion control. Development within the SMA is subject to mitigation measures in the ISMND related to biological and geological resources, including use of perimeter control BMPs, such as silt fences, or straw wattles, placed at the edge of surface water features to intercept sediment before it reaches the waterway. The Applicant is required to adherence to all project specific recommendations in the *Engineering Geologic and Geotechnical Investigation Report* prepared by SHN dated August 2023 during design and construction of the proposed project. Applicant has a Streambed Alteration Agreement pending with the California Department of Fish and Wildlife (CDFW). A referral was sent to CDFW on November 20, 2023, and CDFW responded on February 26, 2024, indicating that they are aware of the project and issues were resolved with GSD during circulation of the ISMND. The CDFW requested the GSD to notify CDFW for the intake and trenching for the new main distribution line on APN: 032-211-021, which GSD has done already, and the Final Steamed Alteration Agreement (Final SAA) is in progress. Conditions of approval require the Applicant to obtain all Federal, State and local permits required for the project. Planning staff concludes the mitigation measures as adopted by GSD and adhering to Conditions of Approval would ensure impacts to the SMA are minimized. Therefore, staff recommends approval of the Special Permit. All other development setbacks will be met by the proposed project.

c) Development on APN: 032-121-009 is limited to trenching and installation of a distribution line that will remain underground. No new structures are proposed at this location; therefore, further design review is not required.

5. FINDING: The proposed project is consistent with the General Plan and the Garberville Redway Alderpoint Benbow Community Plan 1987 (GRBAP).

EVIDENCE: a) The project involves improvement and replacement of old, undersized and failing water system infrastructure. The District was formed in 1932 for the purpose of providing sanitary sewer services. After purchasing the privately held Garberville Water Company in 2004, the District began providing drinking water to customers in the district. The Public Facilities (PF) designation is utilized to classify land appropriate for use by a

governmental agency or public agency, which has the purpose of serving the public health, safety, convenience, or welfare. The Public (P) designation is applied to land owned by or under the jurisdiction of the Federal, State, County or any other district authority or public corporation, or agency thereof. The Residential Agriculture (RA) designations are typically applied to large lot residential uses that typically rely upon on-site water and wastewater systems. The Residential Estates (RE) designations are generally applied to lands adjacent to urban areas or rural communities with limited public services but suitable for single-family residential use. This designation is commonly used in water-only service areas. The Residential Low Density (RL) designations are intended to be applied in urban areas of the County where topography, access, utilities, and public services make the area suitable for such development. Lastly, the Commercial General (CG) designation is intended to classify lands that because of their location, access, and availability of services are suitable for commercial development. The project is to upgrade and maintain existing community water system infrastructure and associated ancillary development. The proposed project supports the use within the land use designations. The replacement of the current water storage tanks will not expand the District's service area, water withdraws or customer entitlements, but will replace two undersized water tanks and associated infrastructure to ensure the water system is properly functioning. The proposed use is consistent with the provision of public services for the Garberville community. This project will supplement GSD's existing water storage capabilities, increasing existing storage from 400,000 gallons by an additional 427,000 gallons to meet increase water storage for use during the low flow times of year and meet fire protection requirements. The proposed uses conform to the primary or compatible uses described in the affected land use designations.

b) All applicable policies of the General Plan and GRBAP remain in full force.

c) The applicant will be responsible for obtaining all necessary Federal, State and Local permits, including Building Permits from the County of Humboldt Building Division to facilitate demolition and construction.

d) The proposed project includes conveyance of the Hurlbutt Tank site (APN: 032-211-011) to the current property owner of APN:

032-211-035, which would be merged with APN: 032-211-035. Conditions of approval require the recording of a Notice of Merger and Certificate of Compliance. to complete the conveyance. The current property owner of APN: 032-211-021 would convey the proposed 550,000-gallon tank site to GSD. The project also includes conveyance of an easement on APN: 223-183-003 to GSD for construction and maintenance of the new Alderpoint Pump Station, associated waterlines, and ingress/egress to the site. Pursuant to Government Code Section 66428(a)(2), a parcel map shall not be required for land conveyed to a governmental agency unless there is substantial evidence that public policy necessitates a parcel map. For conveyances such as these, they have been addressed as a conveyance by Deed. As conditioned, Planning staff supports the proposed land conveyances.

e) The Garberville Sanitary District, as the lead agency under CEQA, prepared an Initial Study/Mitigated Negative Declaration pursuant to the California Environmental Quality Act (CEQA) Statute (Public Resources Code 21000–21189) and Guidelines (California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000–15387). As Lead Agency, the Garberville Sanitary District found the project would have a Less Than Significant Effect on the Environment with Mitigation Incorporated (State Clearinghouse #2023100664).

6. FINDING: The Project and the conditions under which it may be operated or maintained will not be detrimental to the public health, safety, or welfare or materially injurious to properties or improvements in the vicinity.

EVIDENCE: a) The objective of the project is to improve and replace old, undersized, and failing water system infrastructure, which is in the interest of public health, safety, and welfare. The proposed project complies with all development standards of the zoning districts which are intended to protect public health, safety and welfare. There is no evidence the work would be detrimental to the public health, safety, or welfare.

7. FINDING: Development permits shall be issued only for a lot that was created in compliance with all applicable state and local subdivision regulations.

EVIDENCE: a) APN 032-211-021 (associated with the Special Permit) is one legal parcel per Notice of Lot Line Adjustment and Certificate of Subdivision Compliance (Record Number PLN-2020-16841) recorded February 24, 2022, Humboldt County Recorder.

8. FINDING: The proposed development does not reduce the residential density for any parcel below that utilized by the Department of Housing and Community Development in determining compliance with housing element law.

EVIDENCE: a) The parcels were not included in the housing inventory of Humboldt County's 2019 Housing Element.

DECISION

NOW, THEREFORE, based on the above findings and evidence, the Humboldt County Planning Commission does hereby:

- Adopt the findings set forth in this resolution; and
- Conditionally approves the General Plan Conformance Review and Special Permit for Garberville Sanitary District subject to the conditions of approval attached hereto as Attachment 1A.

Adopted after review and consideration of all the evidence **April 4, 2024.**

The motion was made by COMMISSIONER Sarah West and second by COMMISSIONER Thomas Mulder and the following vote:

AYES: COMMISSIONERS: Iver Skavdal, Thomas Mulder, Noah Levy, Jerome Qiriazi, Peggy O'Neill, Sarah West, Lorna McFarlane

NOES: COMMISSIONERS:

ABSENT: COMMISSIONERS:

ABSTAIN: COMMISSIONERS:

DECISION: Motion carried 7/0

I, John Ford, Secretary to the Planning Commission of the County of Humboldt, do hereby certify the foregoing to be a true and correct record of the action taken on the above-entitled matter by said Commission at a meeting held on the date noted above.

John Ford, Director
Planning and Building Department

CONDITIONS OF APPROVAL

APPROVAL OF THE GENERAL PLAN CONFORMANCE REVIEW AND SPECIAL PERMIT IS CONDITIONED ON THE FOLLOWING TERMS AND REQUIREMENTS:

A. General Conditions

1. The project shall be conducted in accordance with the Site Plans and Construction Plans. Minor deviations shall be permitted as provided by Humboldt County Code Section 312-11; however, all other changes shall require modification of this permit.

2. The applicant shall comply with recommendations from the Humboldt County Department of Public Works in their comments dated December 13, 2023, as follows:

    a. **Encroachment Permit:** The applicant must apply for and obtain an encroachment permit for all work performed within the County road right of way including but not limited to removal and replacement of water mains within the County maintained road right of ways of Alderpoint Road and Redwood Drive. In addition, an encroachment permit is required to provide an ADA compliant urban driveway apron and surfaced driveway to County standards [reference: County Code §411-11 (a)(b)].

    b. **Traffic Control Plan:** The applicant shall be responsible for all traffic control and safety at all work locations in a manner satisfactory to the Department of Public Works. Traffic control operations shall conform to California Manual on Uniform Traffic Control Devices for Streets and Highways (FHWA's MUTCD 2009 Edition, as amended for use in California), March 30, 2021, or latest edition, and to the satisfaction of the Department of Public Works. Warning and flagging of motorists at work locations shall be conducted AT ALL TIMES by properly trained personnel.

    The applicant shall use Caltrans 2022 Standard Plan T13 with T9 for a traffic control plan, when applicable, for closing one traffic lane. Permittee shall use CAMUTCD Figure 6H-6, Titled "Shoulder Work with Minor Encroachment (TA-6)", when applicable, for working outside of the travelway and not affecting normal vehicle traffic.

    Conditions requiring a traffic control plan other than Caltrans T13 with T9 or Fig 6H-6 will require submittal and Public Works approval of a traffic control plan prepared by a Registered Civil Engineer (or Traffic Engineer). Traffic control shall be conducted in a manner that provides the least inconvenience to motorists as possible. Emergency vehicles shall be allowed to pass through the controlled areas at all times. One travel lane shall be available for through traffic at all times. Permittee shall notify the

Department of Public Works 48 hours prior to conducting any traffic control that requires closures of both travel lanes for longer than 5 minutes. Closure of both travel lanes for longer than 5 minutes requires prior written approval by the Director of Public Works. The California Highway Patrol and the Humboldt County Sheriff's Office shall also be notified of any traffic control that requires closure of both travel lanes at least 48 hours in advance.

c. **Construction plans:** Unless otherwise approved in writing by the Department all watermains and waterlines not in use shall be removed from the public right of way. Construction plans shall state whether the existing water main is to be removed or abandoned in place (if approved by the Department). If the line is to be abandoned in place, the line shall be slurry filled and the construction plans shall clearly show the location of the line.

d. **Access Roads:** Intersections of utility access roads with the County maintained road shall be surfaced to County standards. Intersections of abandoned utility access roads shall be blocked and returned to natural conditions.

e. Site visibility must be maintained at all construction entrances and utility access locations with County maintained roads.

f. The applicant shall be responsible to correct any involved drainage problems on the County road as a direct result of the project to the satisfaction of this Department. The applicant shall minimize the transport of sediment to drainage courses during construction. The County Inspector shall be notified by applicant for review and approval of installed erosion control measures within County right of way.

g. During construction, roadways shall be periodically cleaned of mud, soil, rock, and debris. California Storm Water Quality Association (CASQA) BMPs shall be used to prevent the tracking of material onto County roads. The following BMPs shall be used at a minimum: stone wash pad; rumble racks; sweeping roads on a daily basis.

h. No construction materials or debris shall be placed within the County road right of way during the project, unless permitted through an encroachment permit. All fueling, equipment maintenance, staging, and construction management shall be located outside the County road right of way.

3. The applicant will be responsible for obtaining all necessary Federal, State and Local permits, as applicable.

4. The applicant shall apply for and record a Notice of Merger and Certificate of Subdivision Compliance for APNs: 032-211-011 and APN: 032-211-035 with the Humboldt County Planning Department for the conveyance associated with the Hurlbutt Tank site.

5. The applicant is required to pay for permit processing on a time and material basis as set forth in the schedule of fees and charges as adopted by ordinance of the Humboldt County Board of Supervisors. The Department will provide a bill to the applicant after the decision. Any and all outstanding Planning fees to cover the processing of the application to decision by the Hearing Officer shall be paid to the Humboldt County Planning Division, 3015 "H" Street, Eureka.

B. Ongoing Requirements/Development Restrictions Which Must be Satisfied for the Life of the Project:

1. Before any digging or excavation occurs, the applicant shall contact Underground Service Alert (USA) by dialing 811 a minimum of two working days prior to commencing any work to ensure that all existing underground utilities are identified and marked on-site.

Informational Notes:

1. This permit shall expire and become null and void at the expiration of two (2) years after all appeal periods have lapsed (see "Effective Date") except where construction under a valid building permit or use in reliance on the permit has commenced prior to such anniversary date. The period within which construction or use must commence may be extended as provided by Section 312-11.3 of the Humboldt County Code.

2. Under California Health and Safety Code, Section 25404 et seq., any business that contains on-site more than 55 gallons, 500 pounds, or 200 cubic feet of a hazardous material, or generates hazardous waste as part of their business activity, must report these activities and be inspected. Contact Humboldt County Environmental Health's Hazardous Materials Unit at 707-268-2220 or mswoveland@co.humboldt.ca.us if there will be hazardous materials stored above these quantities or if hazardous waste is generated.

3. If cultural resources are encountered during construction activities, the contractor on site shall cease all work in the immediate area and within a 50-foot buffer of the discovery location. A qualified archaeologist as well as the appropriate Tribal Historic Preservation Officer(s) are to be contacted to evaluate the discovery and, in consultation with the applicant and lead agency, develop a treatment plan in any instance where significant impacts cannot be avoided.

   The Native American Heritage Commission (NAHC) can provide information regarding the appropriate Tribal point(s) of contact for a specific area; the NAHC can

be reached at 916-653-4082. Prehistoric materials may include obsidian or chert flakes, tools, locally darkened midden soils, groundstone artifacts, shellfish or faunal remains, and human burials. If human remains are found, California Health and Safety Code 7050.5 requires that the County Coroner be contacted immediately at 707-445-7242. If the Coroner determines the remains to be Native American, the NAHC will then be contacted by the Coroner to determine appropriate treatment of the remains pursuant to PRC 5097.98. Violators shall be prosecuted in accordance with PRC Section 5097.99

The applicant is ultimately responsible for ensuring compliance with this condition.

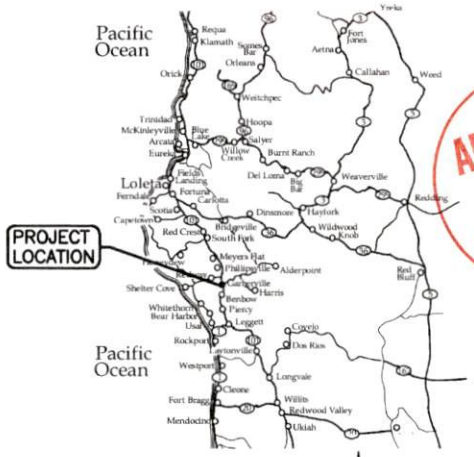
GARBERVILLE SANITARY DISTRICT

ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT PROJECT

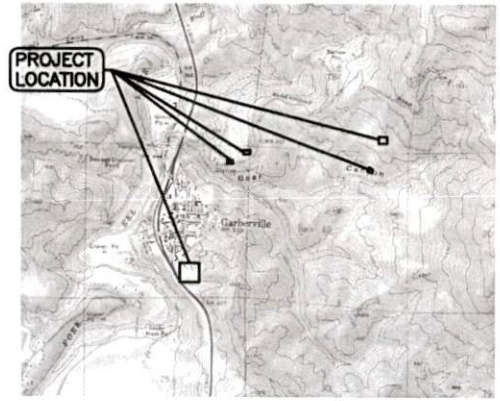
GARBERVILLE, CALIFORNIA

PREPARED BY:

SEPTEMBER 2023



LOCATION MAP
NTS



VICINITY MAP
NTS

APPROVED
APR 4 2024
Humboldt County
PLANNING

RECEIVED
NOV. 9, 2023
Humboldt County
PLANNING

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6	C1.1	MAIN TANK SITE PREPARATION AND DEMOLITION PLAN
7	C1.2	ENLARGED DEMOLITON AND RESTORATION PLAN
8	C1.3	MAIN TANK CONSTRUCTION EXCAVATION PLAN
9	C1.4	MAIN TANK FINISH GRADING PLAN
10	C1.5	MAIN TANK FINISH SURFACE MATERIALS
11	C1.6	MAIN TANK SITE PLAN & YARD PIPING
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13	C1.8	UPPER MAPLE LANE PUMP STATION MECHANICAL PLAN
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18	C2.4	MAIN TANK WATER MAIN PLAN AND PROFILE
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24	C3.2	WALLAN TANK SITE PLAN & YARD PIPING
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27	C4.1	WALLAN PUMP STATION MECHANICAL PLAN
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61	S-005	MISCELLANEOUS APPURTENANCES

* NOT INCLUDED IN 60% SUBMITTAL

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1
IF NOT ONE INCH, ADJUST SCALES ACCORDINGLY

SHN
812 W. WABASH AVE.
EUREKA, CA. 95501
WWW.SHN-ENGR.COM
707-441-8855

NO.	DATE	REVISION	BY

DSGN -
DR CDN/JMT
CHK JRO
APVD

GARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

COVER

SHEET G1.0
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 9/28/2023 5:11 PM CNEWELL PLOTTED: 10/4/2023 8:13 AM NEWELL, CHRIS
P:\Eureka\2022\022067-GSD-Winter\Dwgs\022067-COVER.dwg

ABBREVIATIONS

A
AGGR — AGGREGATE
APPROX — APPROXIMATELY
@ — AT

B
BLDG — BUILDING

C
CAV — COMBINATION AIR VALVE
CLR — CLEAR
℄ — CENTERLINE
CO — CLEANOUT
CONC — CONCRETE
CONT — CONTINUOUS OR CONTINUED
CTR — CENTER

D
° — DEGREE (ANGLE)
DI — DROP INLET OR DUCTILE IRON
DIA — DIAMETER
DIM — DIMENSION
DET — DETAIL
DWG — DRAWING

E
(E) — EXISTING
EG — EXISTING GRADE/GROUND
EL — ELBOW
ELEC — ELECTRIC OR ELECTRICAL
ELEV — ELEVATION
EQ — EQUAL
EW — EACH WAY
EXST — EXISTING

F
FDN — FOUNDATION
FG — FINISHED GRADE
FH — FIRE HYDRANT
FL — FLOW LINE
FLR — FLOOR
FT — FOOT OR FEET

G
GA — GAGE
GAL — GALLON
GPM — GALLONS PER MINUTE
GRD — GRADE OR GROUND
GV — GATE VALVE

H
HDPE — HIGH DENSITY POLYETHYLENE
HOR — HORIZONTAL
HT — HEIGHT

I
ID — INSIDE DIAMETER
INV — INVERT

L
LB — POUND
LF — LINEAR FEET
LT — LEFT

M
MATL — MATERIAL
MAX — MAXIMUM
MECH — MECHANICAL
MFR — MANUFACTURER
MIN — MINIMUM OR MINUTE
MJ — MECHANICAL JOINT

N
(N) — NEW
NO — NUMBER OR NORMALLY OPEN
NTS — NOT TO SCALE
— NUMBER

O
OC — ON CENTER
OD — OUTSIDE DIAMETER
OH — OVERHEAD

P
PERF — PERFORATED
PRV — PRESSURE RELIEF VALVE
PSI — POUNDS PER SQUARE INCH
PVC — POLYVINYL CHLORIDE PLASTIC

Q
QTY — QUANTITY

R
R — RADIUS
RC — RELATIVE COMPACTION
RD — ROAD
RFGA — RESTRAINED FLANGE COUPLING ADAPTER
RSP — ROCK SLOPE PROTECTION
RT — RIGHT OR RING TIGHT
R/W — RIGHT OF WAY

S
SL — SLOPE
SCHED — SCHEDULE
SD — STORM DRAIN
SF — SQUARE FOOT/FEET
SHT — SHEET
SIM — SIMILAR
STA — STATION

T
TDH — TOTAL DYNAMIC HEAD
TYP — TYPICAL

U
UTIL — UTILITY

V
VAR — VARIES
VERT — VERTICAL
VG — VALLEY GUTTER

W
W — WATER OR WIDE FLANGE
w/ — WITH

UTILITIES LEGEND

PROPOSED

- GATE VALVE
- CHECK VALVE
- DROP INLET
- —SD— STORM DRAIN LINE
- —W— WATER LINE

TOPOGRAPHIC LEGEND

PROPOSED

- 47.55 — FINISH GRADE ELEVATON
- TOP OF CUT
- TOP OF FILL
- 200 — CONTOUR LINE
- FENCE

DETAIL AND SECTION DESIGNATION

SECTION (LETTER) OR DETAIL (NUMERAL) DESIGNATION — A

INDICATES SECTION OR DETAIL TAKEN AND SHOWN ON SAME SHEET — C-5

ON DRAWING WHERE SECTION OR DETAIL IS TAKEN:
SHEET NUMBER WHERE SHOWN

ON DRAWING WHERE SECTION OR DETAIL IS SHOWN:
SHEET NUMBER WHERE TAKEN

CURVE DATA

R (RADIUS)
L (LENGTH)
Δ (DELTA)
T (TANGENT)

NOTES

1. CONTACT THE ENGINEER FOR SYMBOLS NOT LISTED.
2. THIS IS A STANDARD SHEET, THEREFORE, SOME SYMBOLS OR ABBREVIATIONS MAY APPEAR ON THIS SHEET WHICH DO NOT APPEAR ON THE PLANS.
3. SITE AND UTILITY SYMBOLS SHOWN ON THIS SHEET ARE NOT INTENDED TO REPRESENT THE PHYSICAL SCALE OR SHAPE OF ANY ITEMS. WHERE LARGE-SCALE PLANS ARE PRESENTED, THE SYMBOLS SHOWN HEREON MAY BE REPLACED BY DETAILS MORE SUITED TO THE DRAWING SCALE.

APPROVED
APR 4 2024
Humboldt County
PLANNING

GENERAL NOTES:

1. ALL WORK SHALL CONFORM TO CURRENT CALIFORNIA BUILDING CODE.
2. THE WORKING DRAWINGS ARE GENERALLY DIAGRAMMATIC. THEY DO NOT SHOW EVERY OFFSET, BEND OR ELBOW REQUIRED FOR INSTALLATION IN THE SPACE PROVIDED. THEY DO NOT SHOW EVERY DIMENSION, COMPONENT PIECE, SECTION, JOINT OR FITTING REQUIRED TO COMPLETE THE PROJECT. ALL LOCATIONS FOR WORK SHALL BE CHECKED AND COORDINATED WITH EXISTING CONDITIONS IN THE FIELD BEFORE BEGINNING CONSTRUCTION. EXISTING UNDERGROUND UTILITIES WITHIN THE LIMITS OF EXCAVATION SHALL BE VERIFIED AS TO CONDITION, SIZE AND LOCATION BY UNCOVERING, PROVIDED SUCH IS PERMITTED BY LOCAL PUBLIC AUTHORITIES WITH JURISDICTION, BEFORE BEGINNING CONSTRUCTION. CONTRACTOR SHALL NOTIFY ENGINEER OF ANY DISCREPANCIES.
3. THE CONTRACTOR SHALL SECURE NECESSARY PERMITS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
4. CONTRACTOR SHALL PERFORM TRENCH WORK IN CONFORMANCE WITH CAL/OSHA REQUIREMENTS.
5. CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, GENERAL CONTRACTOR WILL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY. ALL WORK AND EQUIPMENT SHALL COMPLY WITH CAL/OSHA REQUIREMENTS. THIS REQUIREMENT SHALL BE MADE TO APPLY CONTINUOUSLY, AND NOT BE LIMITED TO NORMAL WORKING HOURS.
6. THE CONTRACTOR SHALL INDEPENDENTLY REVIEW GROUND, TOPOGRAPHY AND TREE CONDITIONS THROUGHOUT THE SITE, AND ASSUME THE RISK OF COMPLETING THE WORK SET OUT ON THESE PLANS, REGARDLESS OF ROCK, WATER TABLE OR OTHER CONDITIONS WHICH MAY BE ENCOUNTERED IN THE COURSE OF THE WORK.
7. ANY DISCREPANCY DISCOVERED BY THE CONTRACTOR IN THESE PLANS, OR ANY FIELD CONDITIONS DISCOVERED BY THE CONTRACTOR THAT MAY DELAY OR OBSTRUCT THE PROPER COMPLETION OF THE WORK SHOWN HEREIN SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER AND THE ENGINEER IMMEDIATELY UPON DISCOVERY. SAID NOTIFICATION SHALL BE IN WRITING.
8. ALL UNDERGROUND IMPROVEMENTS SHALL BE INSTALLED TESTED AND APPROVED PRIOR TO PAVING.
9. THE CONTRACTOR SHALL NOT BEGIN EXCAVATING UNTIL ALL EXISTING UTILITIES HAVE BEEN MARKED IN THE FIELD. THE CONTRACTOR SHALL NOTIFY EACH APPLICABLE ENTITY AT LEAST 48 HOURS PRIOR TO COMMENCING WORK. CALL UNDERGROUND SERVICE ALERT (USA) TWO WORKING DAYS BEFORE DIGGING AT (800) 227-2600 FOR LOCATES.
10. GRADING AND CONSTRUCTION CONTRACTORS SHALL STOP WORK AND NOTIFY THE OWNER AND THE ENGINEER IF CULTURAL RESOURCES ARE DISCOVERED DURING CONSTRUCTION.
13. THE CONTRACTOR SHALL GIVE THE INSPECTOR 48 HOURS ADVANCE NOTICE OF ANY CONSTRUCTION OR REQUIRED TESTING.
14. SHOULD THE CONTRACTOR OR ANY OF HIS AGENTS OR EMPLOYEES ENCOUNTER OR DISCOVER MATERIALS WHICH APPEAR TO BE HAZARDOUS DURING THE PERFORMANCE OF THE WORK, THE CONTRACTOR SHALL INFORM THE ENGINEER IMMEDIATELY AND SUSPEND WORK IN THE AFFECTED AREA UNTIL THE ENGINEER HAS INSPECTED THE LOCATION AND MATERIALS IN QUESTION. SHOULD IT BE NECESSARY TO UNDERTAKE REMEDIATION, THE ENGINEER WILL GIVE WRITTEN NOTICE TO SUSPEND WORK IN THE AFFECTED AREA UNTIL THE PROPER COURSE OF ACTION HAS BEEN DETERMINED. OPERATIONS IN THE AFFECTED AREA SHALL BE RESUMED ONLY UPON WRITTEN NOTICE BY THE ENGINEER.
15. ALL SITE GRADING WILL BE INSPECTED BY THE ENGINEER. COMPACTION TESTING WILL BE CONDUCTED AFTER SUFFICIENT DENSITIES HAVE BEEN ACHIEVED IN THE CONTRACTOR'S OPINION. THE CONTRACTOR SHALL MAKE ALL REQUESTS FOR MATERIALS TESTING AT LEAST 48 HOURS IN ADVANCE. ANY SOILS THAT FAIL TO MEET THE REQUIRED COMPACTION LEVELS SHALL BE REMOVED, AND RECOMPACTED. ALL COSTS ASSOCIATED WITH ACHIEVING COMPACTION STANDARDS SHALL BE INCLUDED IN THE CONTRACTOR'S ORIGINAL BID.
16. THE TOPSOIL SHALL BE REMOVED FROM CUT AND FILL AREAS AND SHALL NOT BE USED FOR ENGINEERED FILL. TOPSOIL SHALL BE STOCKPILED SEPARATELY AND REPLACED OVER AREAS OF EXPOSED SUBGRADE TO A MINIMUM DEPTH OF 6 INCHES.
17. NO CHANGES OR MODIFICATIONS SHALL BE MADE TO THESE PLANS WITHOUT WRITTEN APPROVAL BY THE ENGINEER.

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY

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EUREKA, CA. 95501
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707-441-8855

NO.	DATE	REVISION	BY

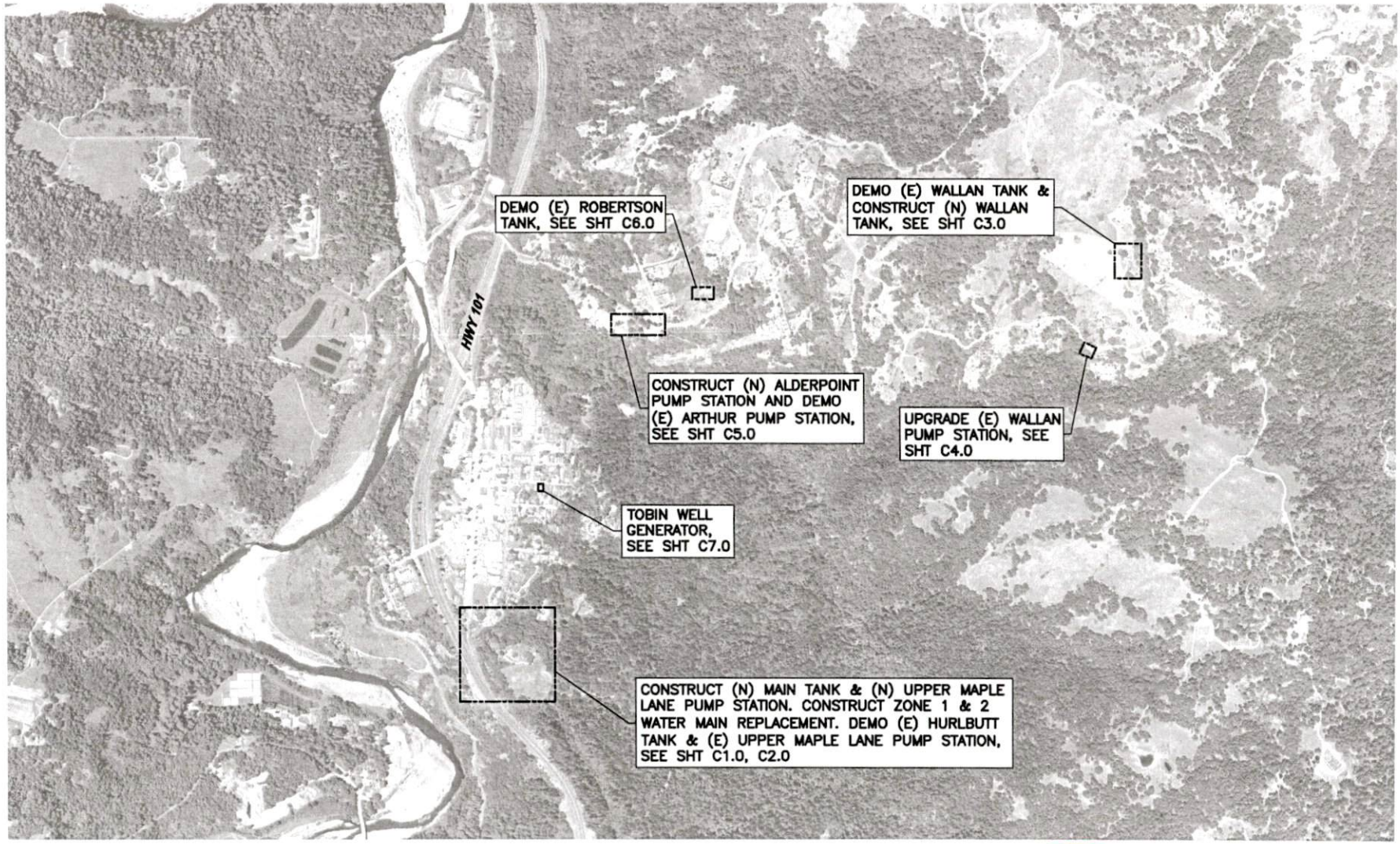
DESIGN 1
DR CDN/JMF
CHK JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/FAIRBUTT TANKS REPLACEMENT
CARBERVILLE, CALIFORNIA

GENERAL NOTES

SHEET G2.0
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 9/29/2023 4:24 PM JFOSTER, PLOTTED: 10/4/2023 8:14 AM NEWELL, CHRIS
G:\Eureka\2022\022067-CSD-Water\Dwgs\022067-NOTES.dwg



APPROVED
APR 4 2024
Humboldt County
PLANNING

1"=500'

60% DESIGN

VERIFY SCALES
BAR IS 1ME INCH ON ORIGINAL DRAWING
0 1"
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SHY
812 W. WABASH AVE.
EUREKA, CA. 95501
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707-441-8855

NO.	DATE	REVISION	BY

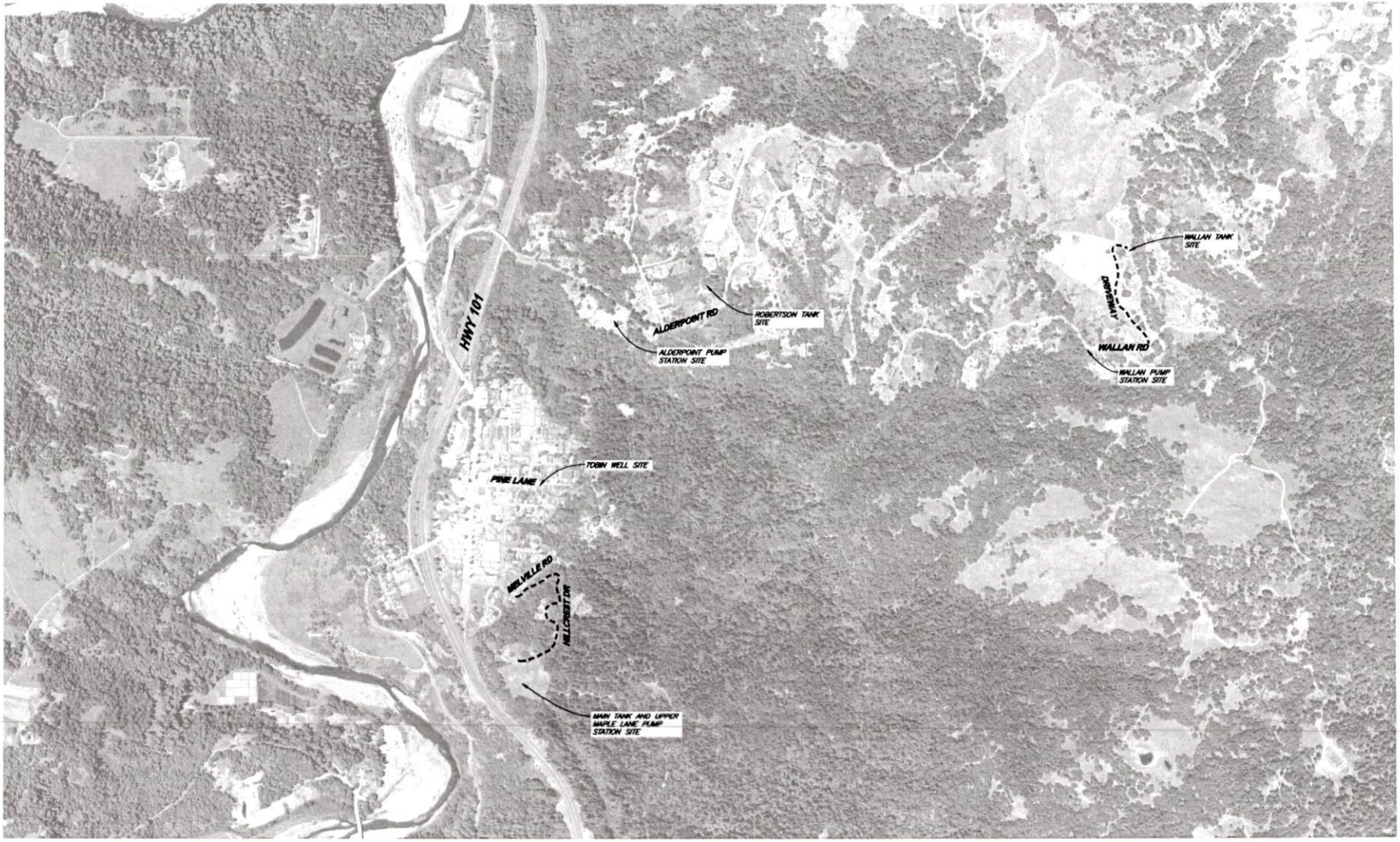
DESIGN -
DR CDN/JWF
CHK JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
CARBERVILLE, CALIFORNIA

PROJECT OVERVIEW

SHEET G3.0
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 9/28/2023 11:46 AM JFOSTER, PLOTTED: 10/4/2023 8:14 AM NEWELL, CHRIS
P:\Canada\2022\022067-CSD-Water\Dwg\022067-PROJ-OVER.dwg



1"=500'

60% DESIGN

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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707-441-8855

NO.	DATE	REVISION	BY

DESIGN
DR CDN/JWF
CHK JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/ALDERPOINT TANKS REPLACEMENT
CARBERVILLE, CALIFORNIA

SITE ACCESS PLAN

SHEET G4.0
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 9/28/2023 4:22 PM CNEWELL, PLOTTED: 10/4/2023 8:14 AM NEWELL, CHRIS
A:\Eureka\2022\022067-CSD-Wallan\Dwgs\022067-SITE-ACCS.dwg

APPROVED
APR 4 2024
Humboldt County
PLANNING

PLAN
NTS

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
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IF NOT ONE INCH, ADJUST THE SHEET AND/OR SCALES ACCORDINGLY

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NO.	DATE	REVISION	BY

DSGN -
DR CDW/JWF
CHK JSO
APVD

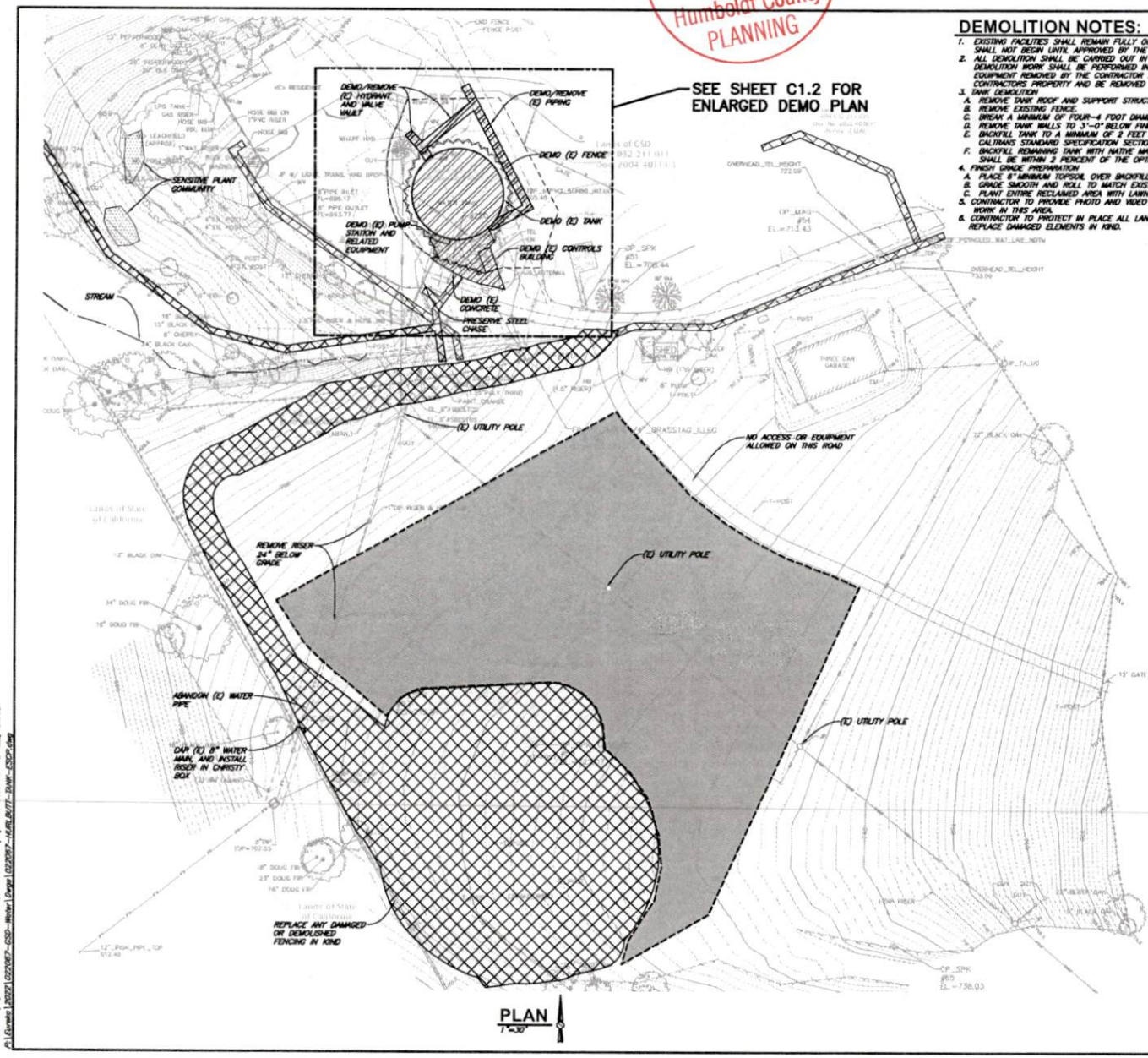
GARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

MAIN TANK OVERVIEW

SHEET C1.0
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 9/26/2023 4:29 PM CNEWELL PLOTTED: 10/4/2023 8:14 AM NEWELL, CHRIS
P:\Eureka\2022\022067-GSD-Water\Dwgs\022067-MAIN-TANK-OVER.dwg

APPROVED
APR 4 2024
Humboldt County
PLANNING



DEMOLITION NOTES:

1. EXISTING FACILITIES SHALL REMAIN FULLY OPERATIONAL UNTIL NEW FACILITIES ARE FULLY OPERATIONAL. DEMOLITION OF EXISTING FACILITIES SHALL NOT BEGIN UNTIL APPROVED BY THE OWNER AND THE ENGINEER.
2. ALL DEMOLITION SHALL BE CARRIED OUT IN A MANNER WHICH WILL PREVENT INJURY TO WORKERS AND DAMAGE TO ADJACENT FACILITIES. DEMOLITION WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE LAWS AND ORDINANCES. EXISTING MATERIALS AND EQUIPMENT REMOVED BY THE CONTRACTOR SHALL NOT BE REUSED IN THE WORK UNLESS OTHERWISE SPECIFIED, AND BECOME THE CONTRACTORS PROPERTY AND BE REMOVED FROM THE JOB SITE AND PROPERLY DISPOSED OF, EXCEPT AS NOTED BELOW.
3. TANK DEMOLITION
   A. REMOVE TANK ROOF AND SUPPORT STRUCTURE.
   B. REMOVE EXISTING FENCE.
   C. BREAK A MINIMUM OF FOUR-4 FOOT DIAMETER HOLES THROUGH TANK FLOOR TO PROVIDE DRAINAGE THROUGH TANK.
   D. REMOVE TANK WALLS TO 3'-0" BELOW FINISHED GRADE. CONCRETE RUBBLE TO BE PACED EVENLY ACROSS TANK BOTTOM.
   E. BACKFILL TANK TO A MINIMUM OF 2 FEET OVER TOP OF CONCRETE RUBBLE WITH CLASS 2 PERMEABLE MATERIAL IN ACCORDANCE WITH CALTRANS STANDARD SPECIFICATION SECTION 68-1.025.
   F. BACKFILL REMAINING TANK WITH NATIVE MATERIAL TO 6" BELOW FINISHED GRADE. NATIVE MATERIAL TO BE PLACED IN 8-INCH LIFTS AND SHALL BE WITHIN 2 PERCENT OF THE OPTIMUM MOISTURE CONTENT. COMPACT NATIVE MATERIAL TO 90% RELATIVE COMPACTION.
4. FINISH GRADE PREPARATION
   A. PLACE 6" MINIMUM TOPSOIL OVER BACKFILL.
   B. GRADE SMOOTH AND ROLL TO MATCH EXISTING CONTOURS.
   C. PLANT ENTIRE RECLAIMED AREA WITH LAWN GRASS AND APPLY FERTILIZER AT MANUFACTURERS RECOMMENDED RATES.
5. CONTRACTOR TO PROVIDE PHOTO AND VIDEO SURVEY OF PROPERTY TO DOCUMENT EXISTING CONDITIONS PRIOR TO COMMENCEMENT OF WORK IN THIS AREA.
6. CONTRACTOR TO PROTECT IN PLACE ALL LANDSCAPING AND ARCHITECTURAL ELEMENTS. IF DAMAGE OCCURS, THE CONTRACTOR IS TO REPLACE DAMAGED ELEMENTS IN KIND.

LEGEND

- STAGING & STOCKPILING AREA
- CLEARING AND GRUBBING
- DEMOLITION
- SENSITIVE PLANT COMMUNITY

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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NO.	DATE	REVISION	BY

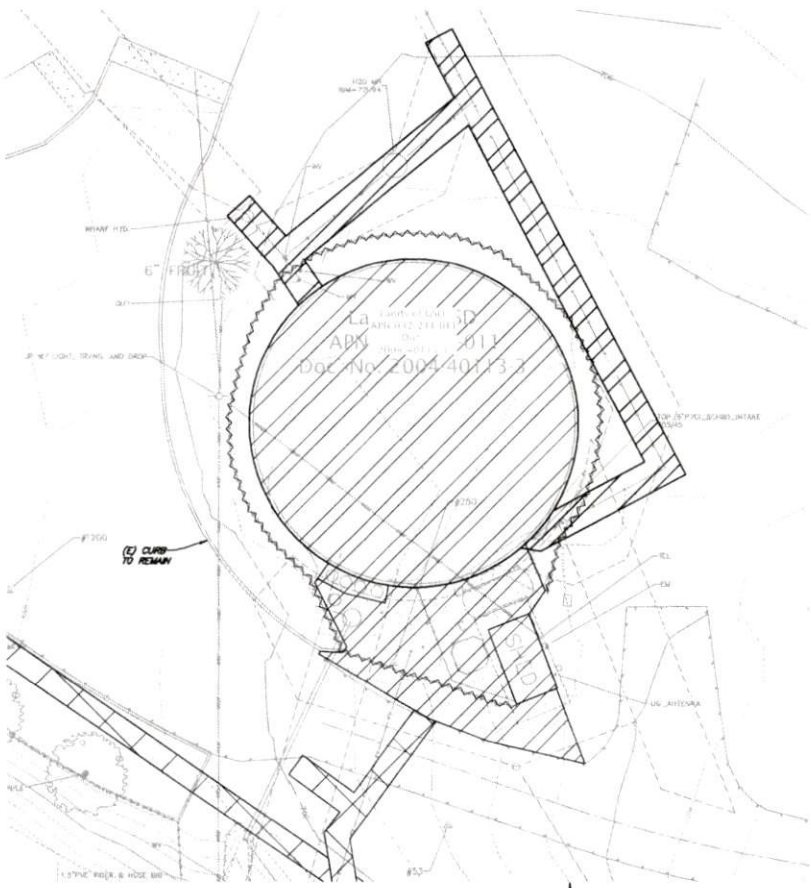
DESIGN MM
DR JMF/CDM
CHK JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLACE/HURLBUTT TANKS REPLACEMENT
CARBERVILLE, CALIFORNIA

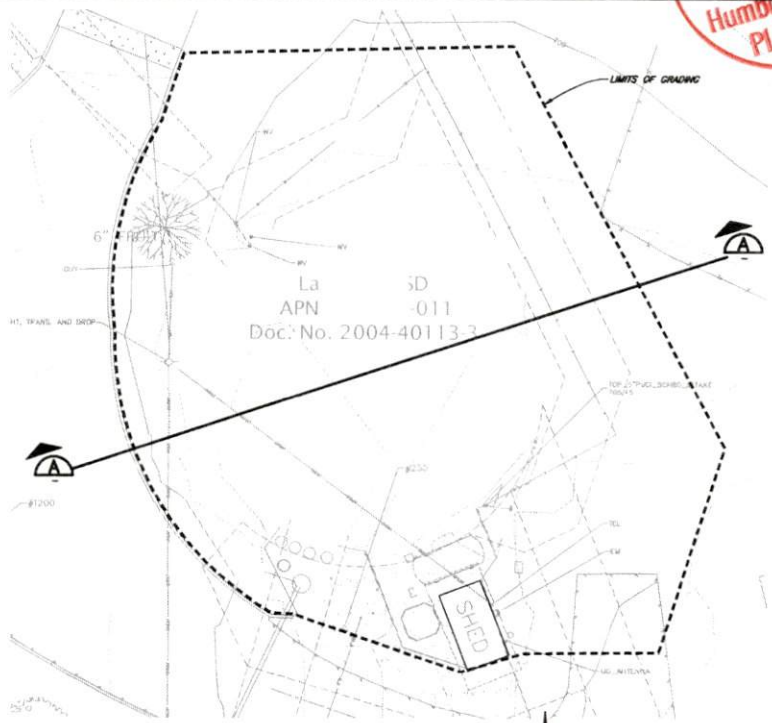
MAIN TANK SITE PREPERATION AND DEMOLITON PLAN

SHEET C1.1
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 10/4/2023 8:34 AM CNEWELL, PLOTTED: 10/4/2023 8:35 AM NEWELL, CARS
P:\Civil\2022\022067-CSD-Water\Dwgs\022067-HURLBUTT-TANK-CSCP.dwg



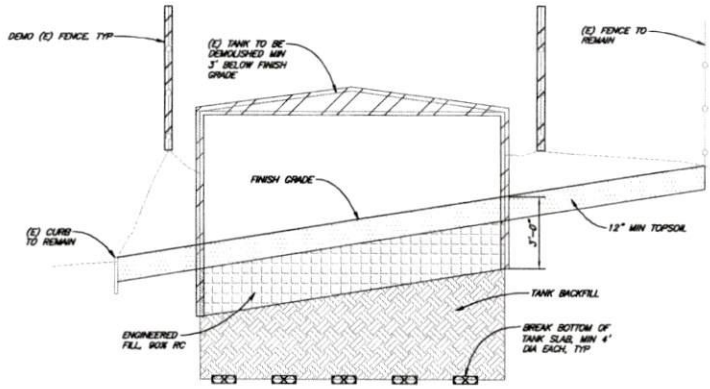
ENLARGED DEMOLITION PLAN
1"=10'



SITE RESTORATION PLAN
1"=20'

LEGEND

- CLEARING AND GRUBBING
- DEMOLITION



SECITON A
NTS

60% DESIGN

APPROVED
APR 4 2024
Humboldt County
PLANNING

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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EUREKA, CA 95501
707-441-8855
EMAIL@SHN-ENG.COM

NO.	DATE	REVISION	BY

DESIGN AM
DR JWF/CDN
CHK JSO
APVD

GARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

ENLARGED DEMOLITION AND RESTORATION PLAN

SHEET C1.2
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 10/4/2023 9:34 AM CNEWELL, PLOTTED: 10/4/2023 9:36 AM NEWELL, CHRIS
P:\Eureka\2022\022067-GSD-Water\Dwgs\022067-HURLBUTT-TANK-DSGN.dwg

SAVED: 8/29/2023 4:30 PM CNEWELL, PLOTTED: 10/4/2023 8:15 AM NEWELL, CHRIS
P:\Eureka\2022\022067-GSD-Water\Dwgs\022067-HURLBUTT-TANK-INT-GRDG.dwg

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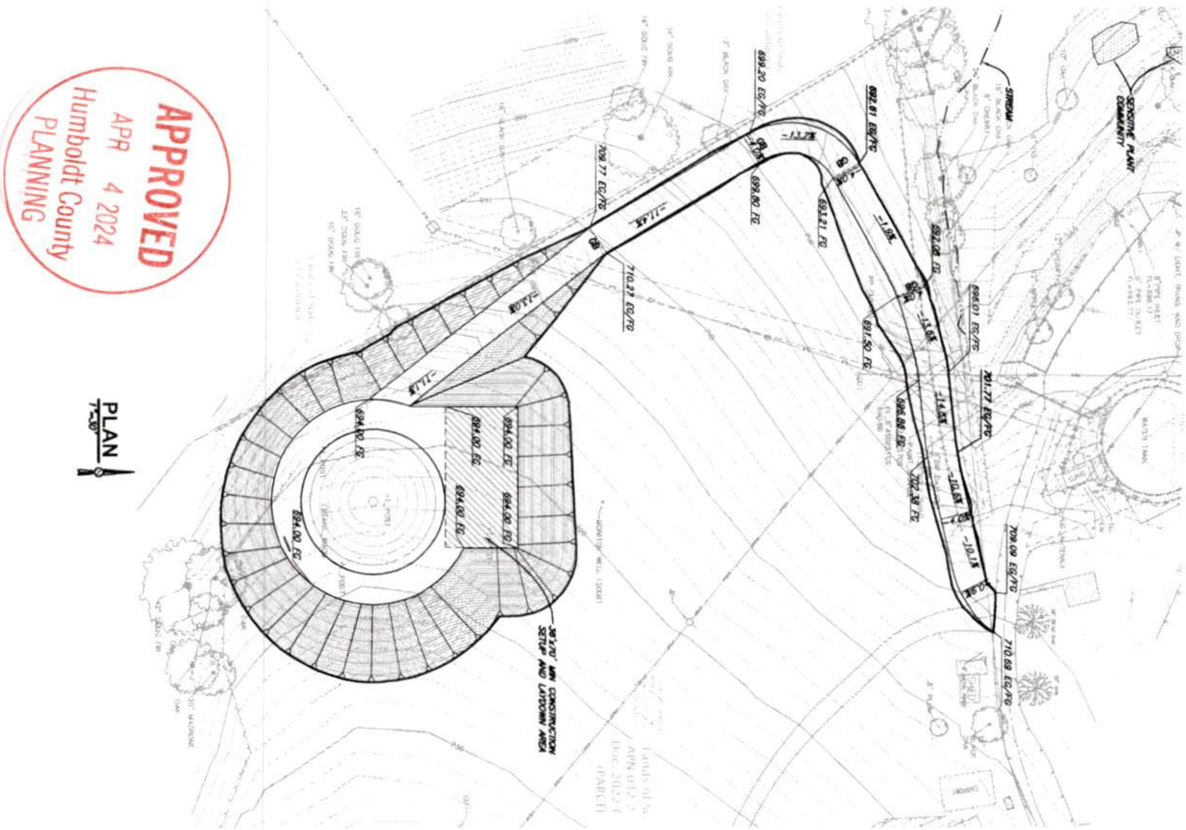
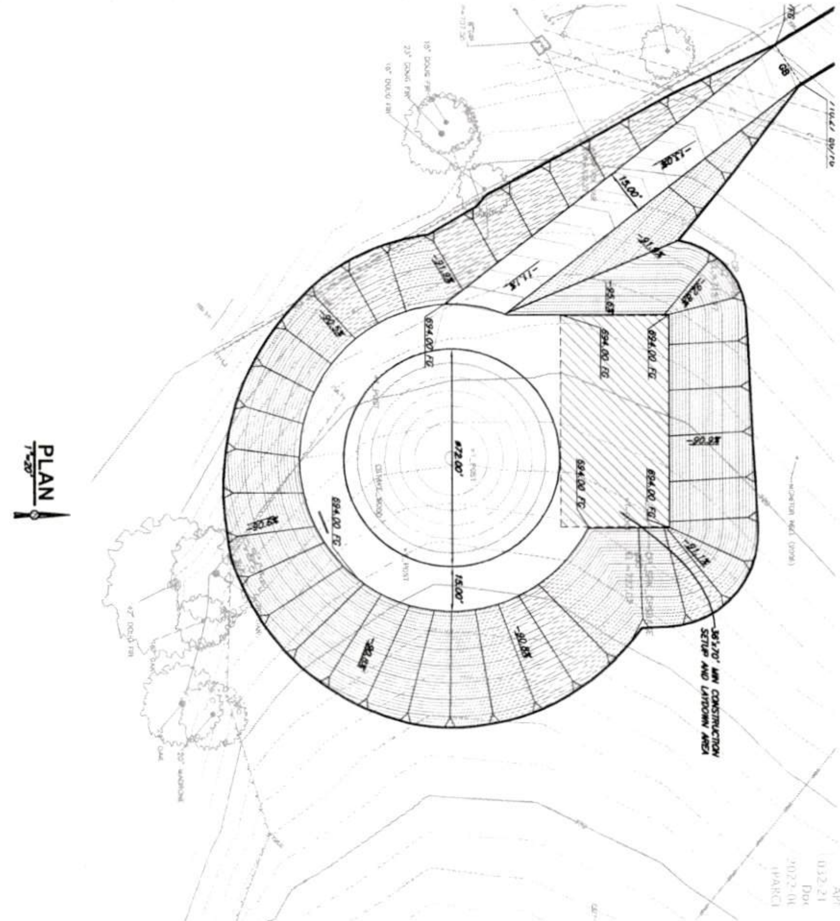
APR 4 2024
Humboldt County
PLANNING



PLAN
1"=20'



PLAN
1"=20'

NOTES:

1. EXCAVATION GRADING DOES NOT SHOW EXCAVATION FOR TANK FOOTINGS, PIPING, ETC.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE STABILITY OF ALL TEMPORARY EXCAVATIONS. REFER TO SHN GEOTECH REPORT FOR TEMPORARY SHORING PRECAUTIONS.

60% DESIGN

PROJ. NO. 022067	DATE 09/2023	SEQ	SHEET C1.3	GARBERVILLE SANITARY DISTRICT ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT GARBERVILLE, CALIFORNIA MAIN TANK CONSTRUCTION EXCAVATION PLAN

DSGN	MM
DR	JWF/CDN
CHK	JSO
APVD	

NO.	DATE	REVISION	BY

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VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
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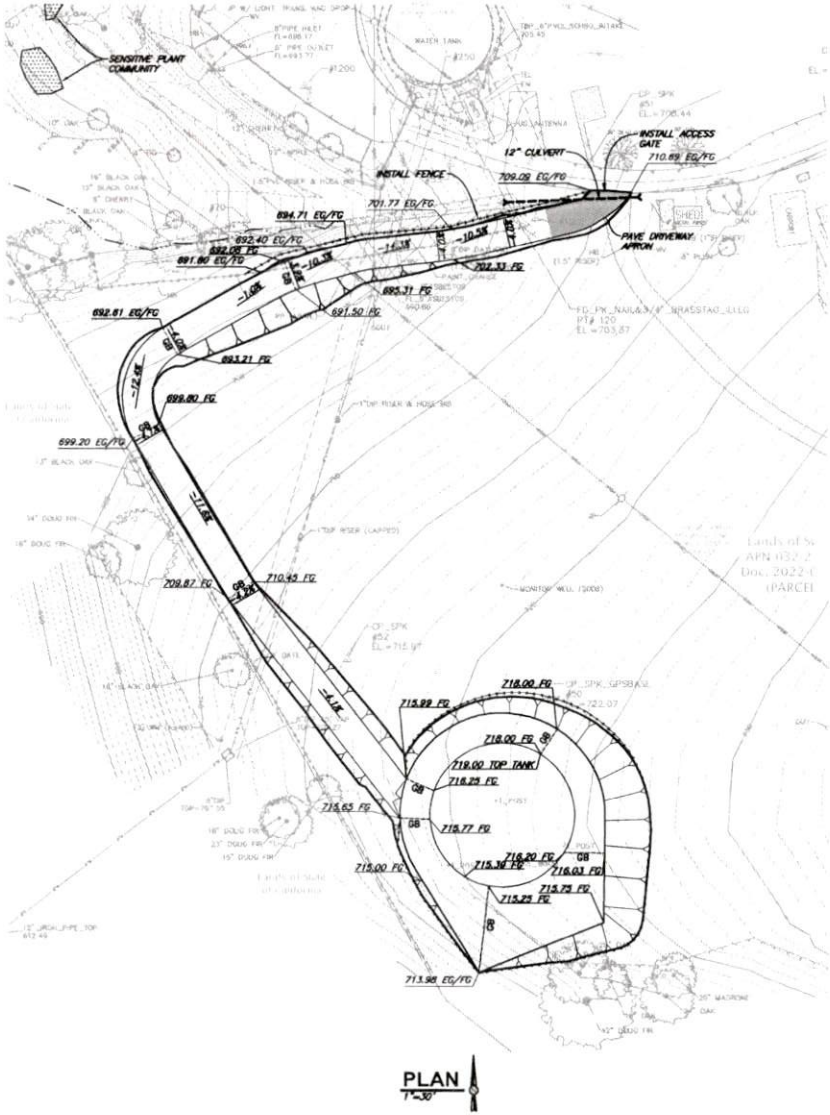

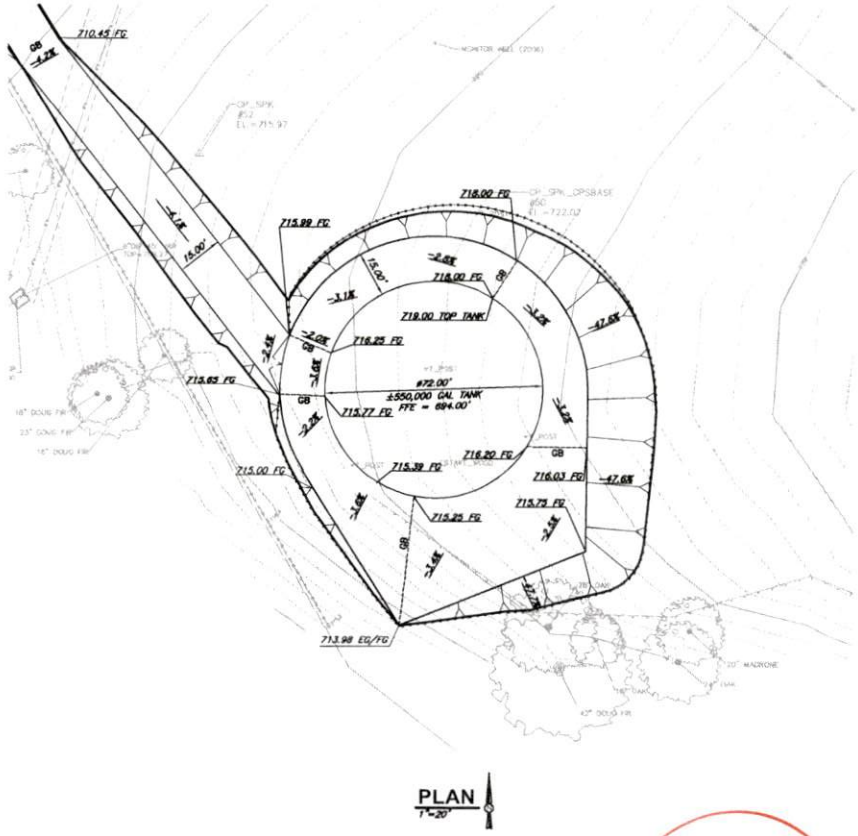

APPROVED
9 4 2024
Humboldt County
PLANNING

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VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH, ADJUST SCALES ACCORDINGLY

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NO.	DATE	REVISION	BY

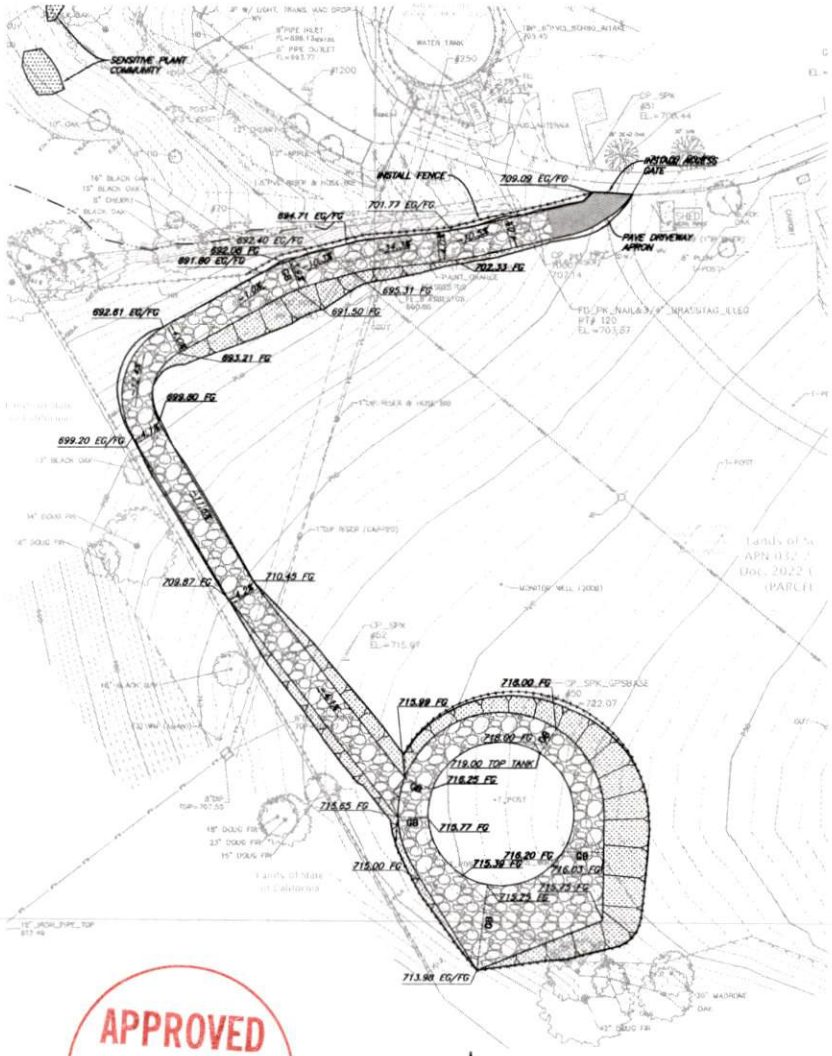
DESIGN MM
DR JWF/CDN
CHK JSO
APVD

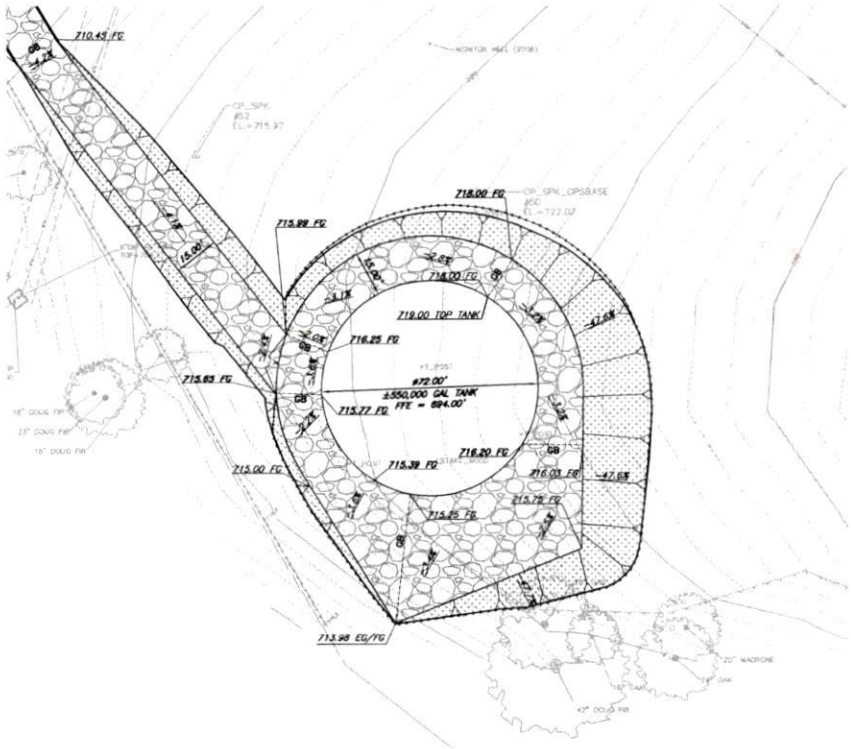
CARBERVILLE SANITARY DISTRICT
ROBERTSON/WILLIAM/HUBBUTT TANKS REPLACEMENT
CARBERVILLE, CALIFORNIA

MAIN TANK FINISH GRADING PLAN

SHEET C1.4
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 9/26/2023 4:34 PM CNEWELL PLOTTED: 10/4/2023 8:15 AM NEWELL, CHRIS
P:\Eureka\2022\022067-CSD-Water\Dwgs\022067-HUBBUTT-TANK-FIN-GRDG.dwg





LEGEND

- CLASS 2 AB AT 95% RC
- AC PAVEMENT
- EROSION CONTROL SEEDING/PLANTING

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

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0 1"
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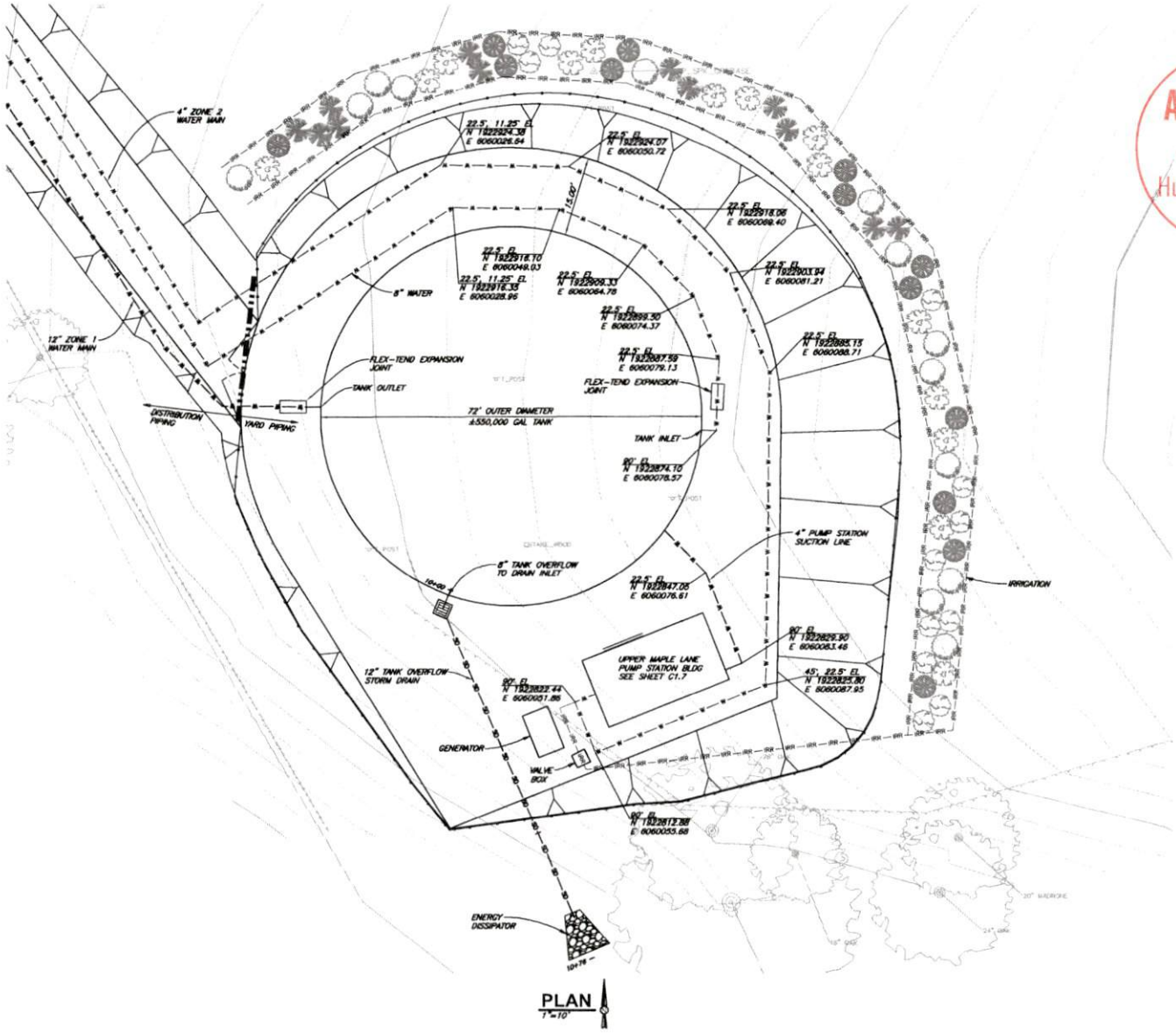
DESIGN MM
DR JRF/CDM
CHK JSO
APVD

GARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

MAIN TANK FINISH SURFACE MATERIALS

SHEET C1.5
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 9/26/2023 4:34 PM CNEWELL, PLOTTED: 10/4/2023 8:16 AM NEWELL, CHRIS
P:\Eureka\2022\022067-GSD-Water\Dwgs\022067-HURLBUTT-SNR-PN-C005.dwg



PLAN
1"=10'

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1/2" 1"
IF NOT ONE INCH, ADJUST SCALES ACCORDINGLY

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812 W. WABASH AVE.
EUREKA, CA. 95501
707-443-8326 FAX 707-444-8676
EUREKA@SHN-ENG.COM

NO.	DATE	REVISION	BY

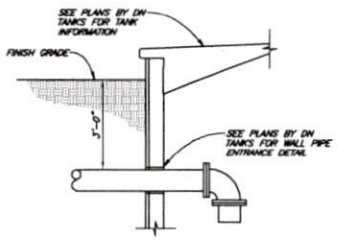
DESIGN MM
DR MR/CDN
CHK JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLACE/HUBBUTT TANKS REPLACEMENT
CARBERVILLE, CALIFORNIA

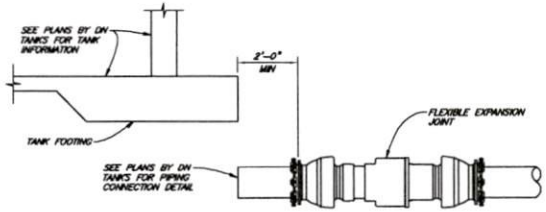
MAIN TANK SITE PLAN & YARD PIPING

SHEET C1.6
SEQ
DATE 09/2023
PROJ. NO. 022067

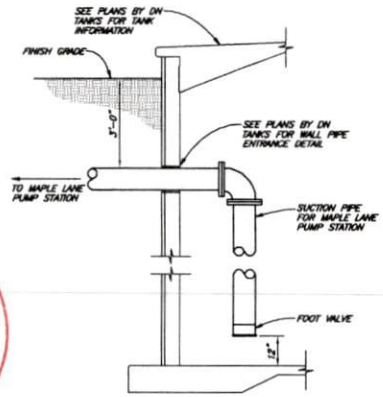
SAVED: 9/29/2023 5:07 PM CNEWELL PLOTTED: 10/4/2023 8:16 AM NEWELL, CHRIS
A:\Eureka\2022\022067-CSD-Water\Dwgs\022067-HUBBUTT-TANK-YARD-PIPE.dwg



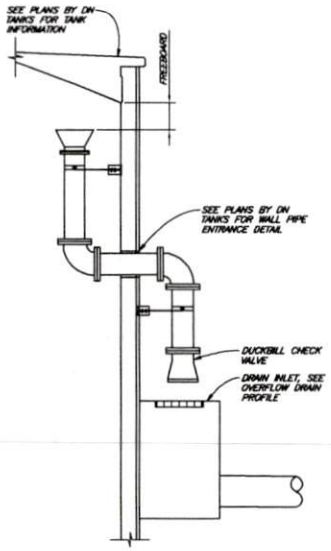
TANK INLET
NTS



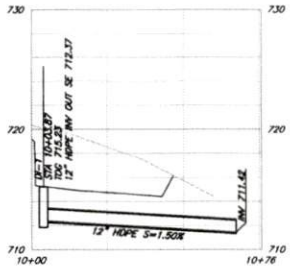
TANK OUTLET
NTS



UPPER MAPLE LANE PS CONNECTION
NTS



TANK OVERFLOW
NTS



OVERFLOW DRAIN PROFILE
SCALE: 1"=20' H
1"=5' H

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

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NO.	DATE	REVISION	BY

DESIGN MM
DR JHF/CDM
CHK JSO
APVD

GARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

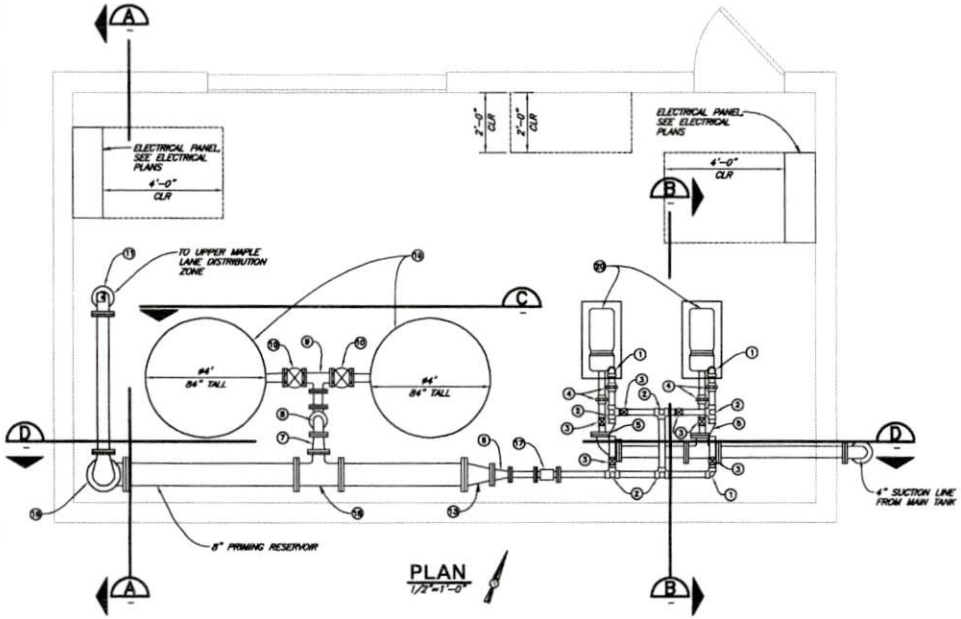
MAIN TANK CONNECTIONS

SHEET C1.7
SEQ
DATE 09/2023
PROJ. NO. 022067

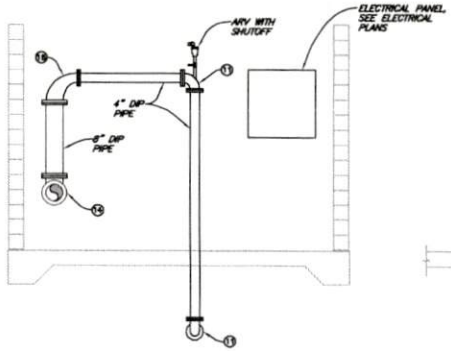
SAVED: 9/29/2023 5:07 PM CHENELL PLOTTED: 10/4/2023 8:16 AM NEWELL, CHRIS
P:\Eureka\2022\022067-GSD-Water\Dwgs\022067-HURLBUTT-TANK-VARD-PIPE.dwg

KEY NOTES:

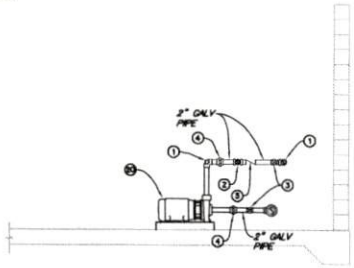
1. 2" GALV EL
2. 2" GALV TEE
3. 2" BALL VALVE
4. 2" GALV UNION
5. 2" CHECK VALVE
6. 4"x2" DIP RDCR
7. 4"x3" DIP RDCR
8. 3" DIP EL
9. 3" DIP TEE
10. 3" GATE VALVE
11. 4" DIP EL
12. 4" DIP TEE
13. 8"x4" DIP RDCR
14. 8" DIP EL
15. 8"x4" DIP RDCR TEE
16. 8"x4" RDCR EL
17. 2" MAG FLOW METER
18. 8"x4"x8" DIP TEE
19. 422 GAL PRESSURE TANK, FULL ACCEPTANCE REPLACEABLE BLADDER
20. 2" END SUCTION PUMP, SEE SPECIFICATIONS
21. PRESSURE GAUGE ASSEMBLY 0-100PSI
22. PRESSURE TRANSMITTER



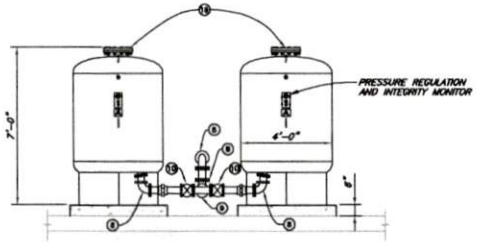
PLAN
1/2"=1'-0"



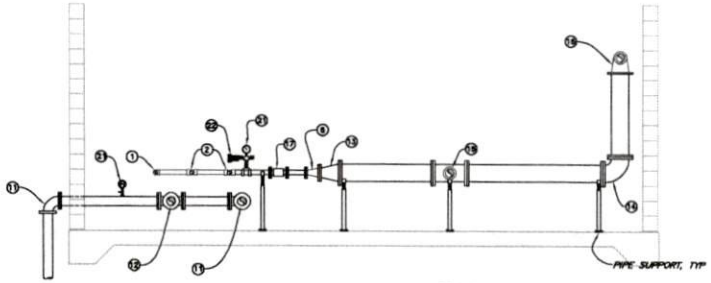
SECTION A
3/8"=1'-0"



SECTION B
3/8"=1'-0"



SECTION C
3/8"=1'-0"



SECTION D
3/8"=1'-0"

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1" 2"
IF NOT ONE INCH, ADJUST SCALES ACCORDINGLY

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707-441-8855

NO.	DATE	REVISION	BY

DESIGN PEG
DR JMF/CDM
CHK JSG
APV'D

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
CARBERVILLE, CALIFORNIA

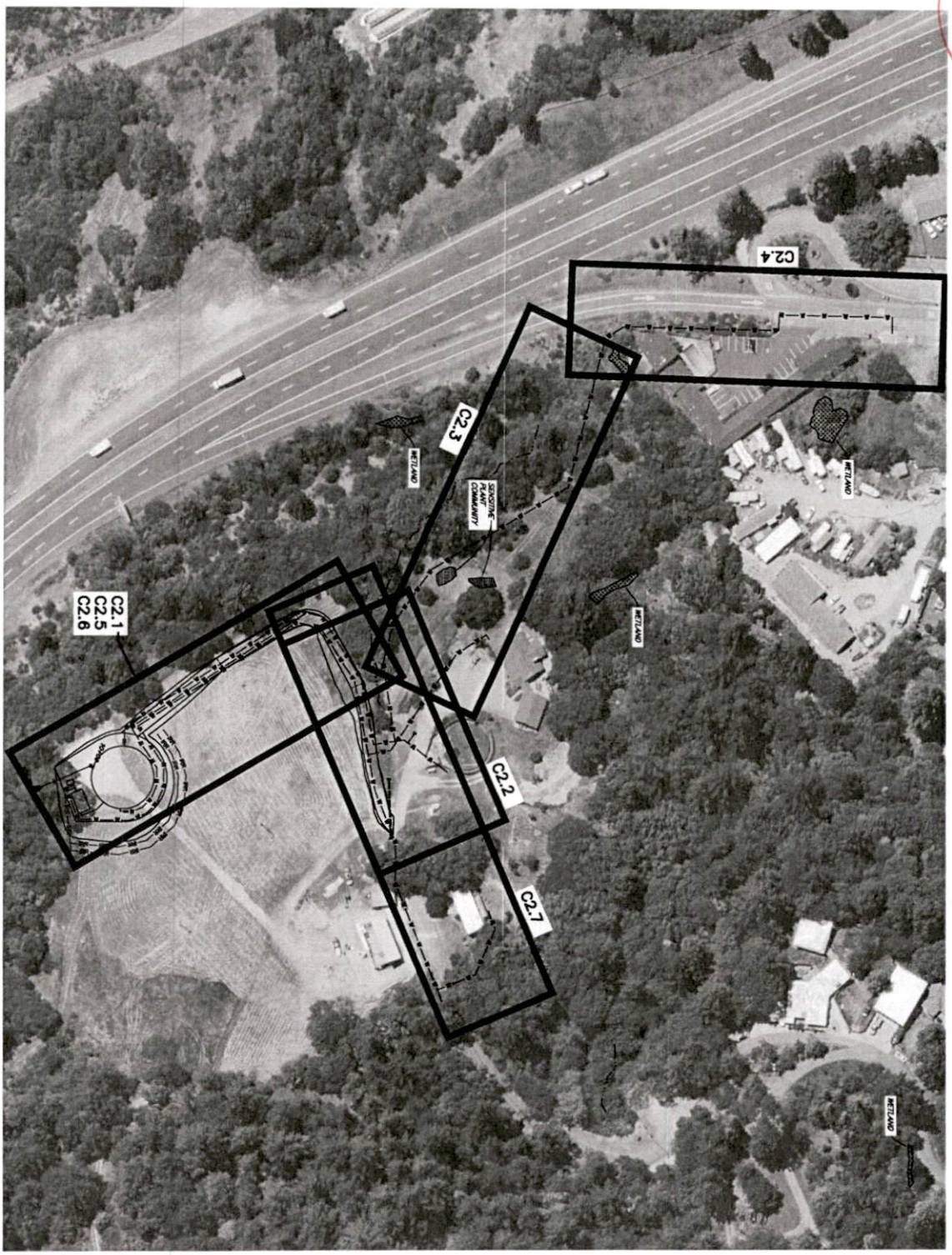
UPPER MAPLE LANE PUMP STATION MECHANICAL PLAN

SHEET C1.8
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 9/26/2023 5:09 PM JFOSTER, PLOTTED: 10/4/2023 8:17 AM NEWELL, CHRIS
P:\Eureka\2022\022067-CSD-Water\Dwgs\022067-HURLBUTT-PUMP-STA-MECH.dwg

SAVED: 9/29/2023 4:35 PM CNEWELL, PLOTTED: 10/4/2023 8:17 AM NEWELL, CHRIS
P:\Eureka\2022\022067-CSD-Water\Dwgs\022067-HURLBUTT-TANK-WATR-MAIN-OVER.dwg

APPROVED
APR 4 2024
Humboldt County
PLANNING

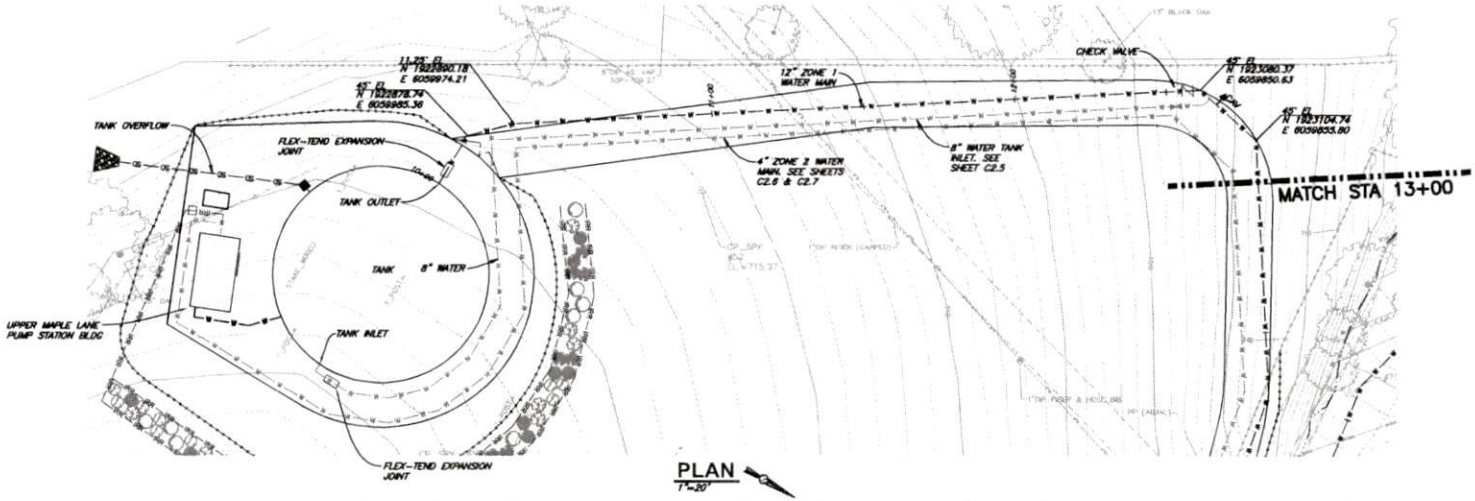


PLAN
NTS

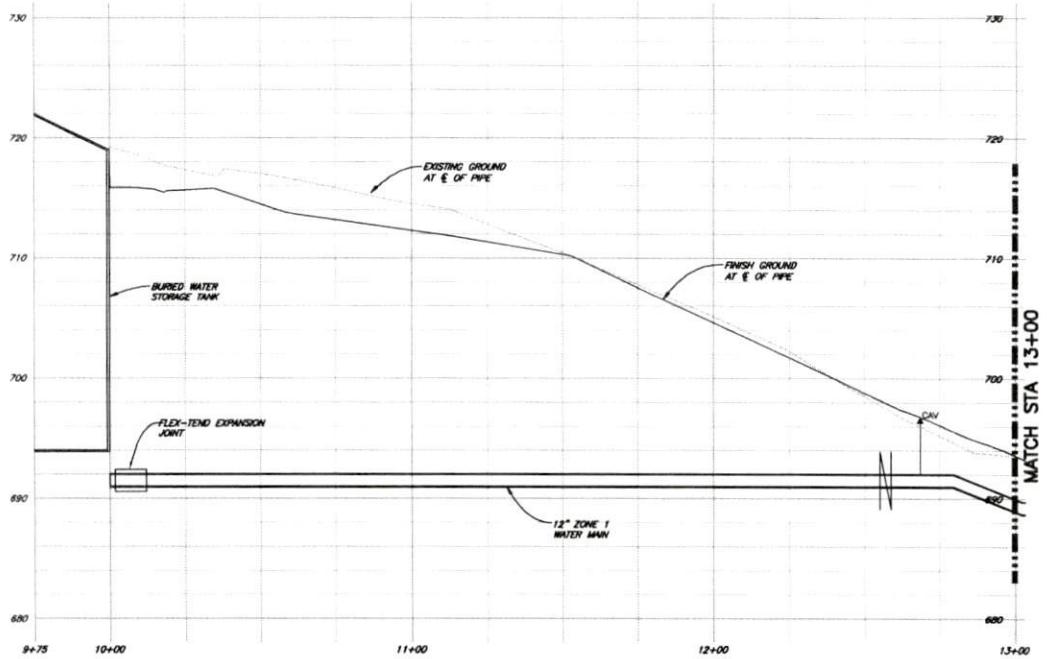
60% DESIGN

PROJ. NO. 022067	DATE 09/2023	SIZE	SHEET C2.0	GARBERVILLE SANITARY DISTRICT ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT GARBERVILLE, CALIFORNIA MAIN TANK WATER MAIN OVERVIEW	DSGN – DR CDN/JWF CHK JSO APVD	NO. / DATE / REVISION / BY	SHN 812 W. WABASH AVE. EUREKA, CA. 95501 WWW.SHN-ENGR.COM 707-441-8855

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY



PLAN
1"=20'



12" ZONE 1 WATER MAIN PROFILE
SCALE: 1"=20' H
1"=5' V

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING 1"
0 1 IF NOT ONE INCH, THEN SCALE REQUIRED SCALES ACCORDINGLY

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NO.	DATE	REVISION	BY

DESIGN -
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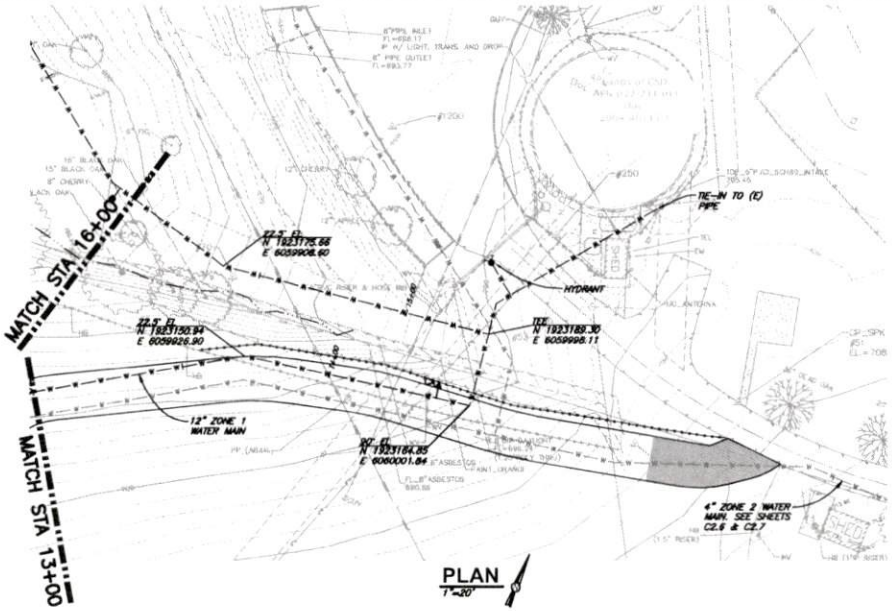
CHK JRO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

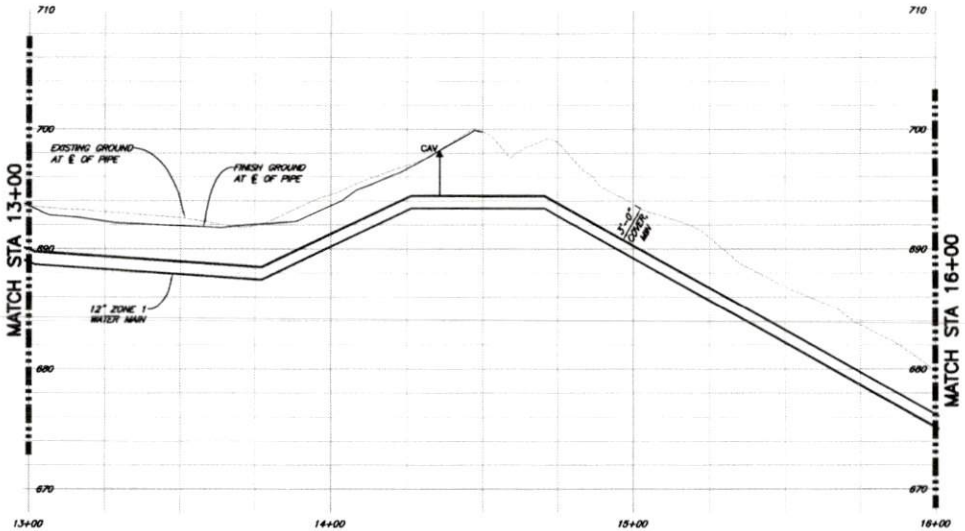
MAIN TANK WATER MAIN
PLAN AND PROFILE

SHEET C2.1
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 9/26/2023 3:33 PM CNEWELL PLOTTED: 10/4/2023 8:17 AM NEWELL, CHRIS
P:\Eureka\2022\022067-CSD-Water\Dwgs\022067-HURLBUTT-TANK-WATER-MAIN-PNP.dwg



PLAN
1"=20'



12" ZONE 1 WATER MAIN PROFILE
SCALE 1"=20' H
1"=5' V

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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NO.	DATE	REVISION	BY

DESIGN -
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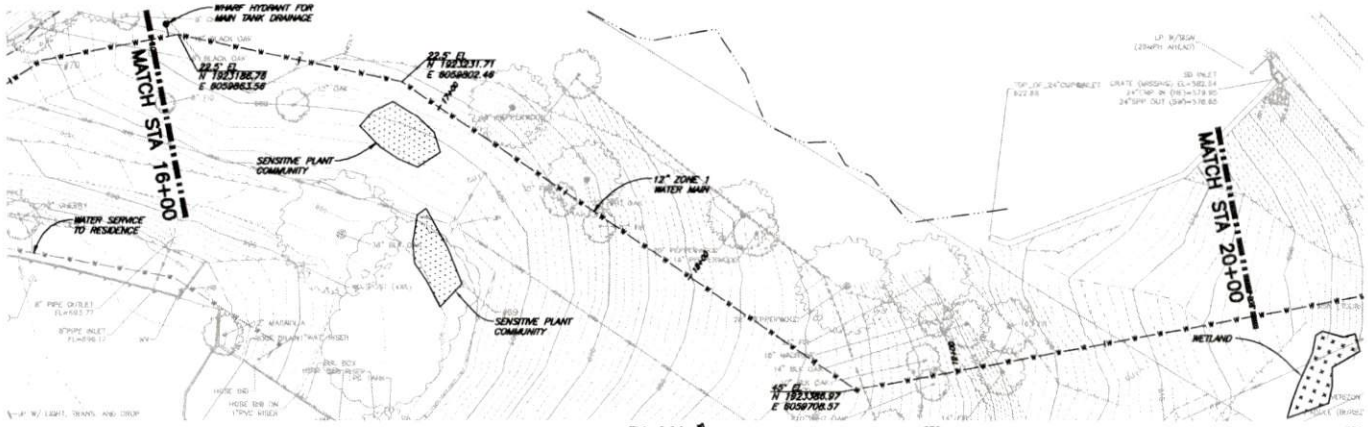
CHK JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLWORK/BRITT TANK REPLACEMENT
CARBERVILLE, CALIFORNIA

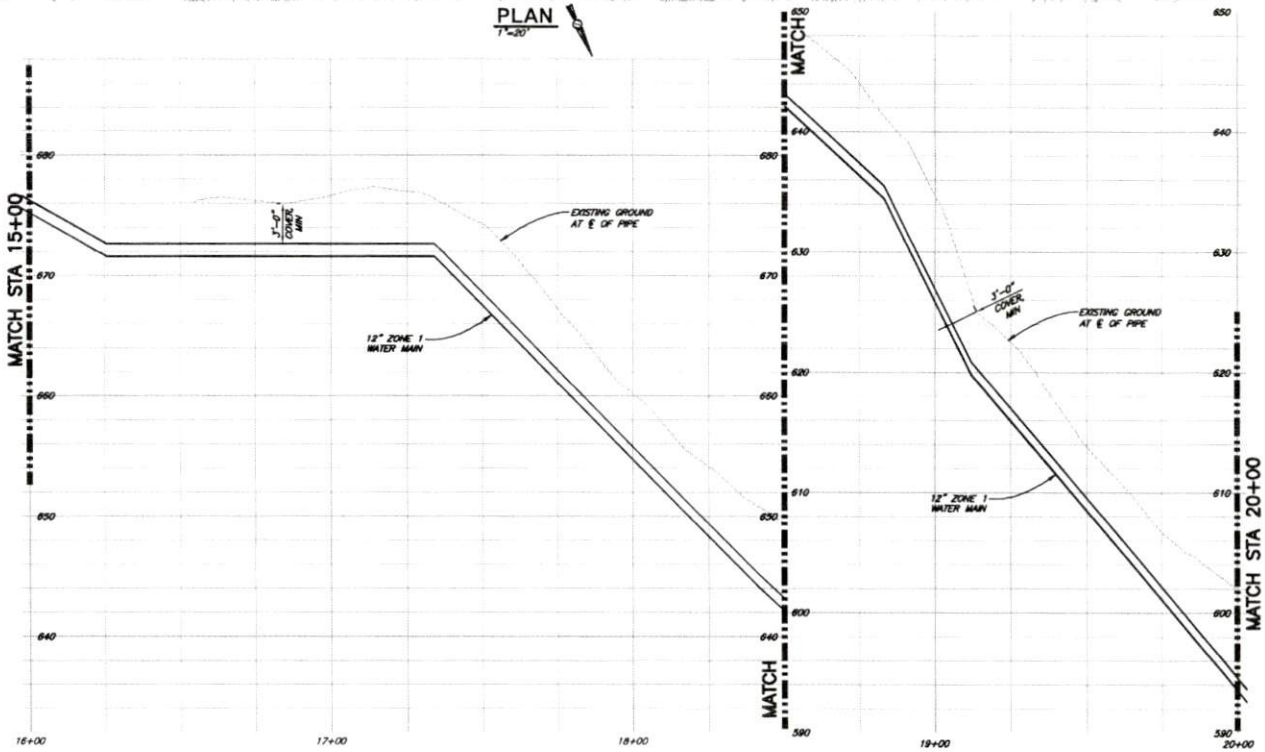
MAIN TANK WATER MAIN PLAN AND PROFILE

SHEET C2.2
SEQ
DATE 08/2023
PROJ. NO. 022067

SAVED: 9/26/2023 3:33 PM CNEWELL PLOTTED: 10/4/2023 8:17 AM NEWELL CHRIS
A:\Eureka\2022\022067-CSD-Weber\Dwgs\022067-HUB,BUTT-TANK-WATR-MAIN-PNP.dwg



PLAN
1"=20'



12" ZONE 1 WATER MAIN PROFILE
SCALE: 1"=20' H
1"=5' V

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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NO.	DATE	REVISION	BY

DESIGN -
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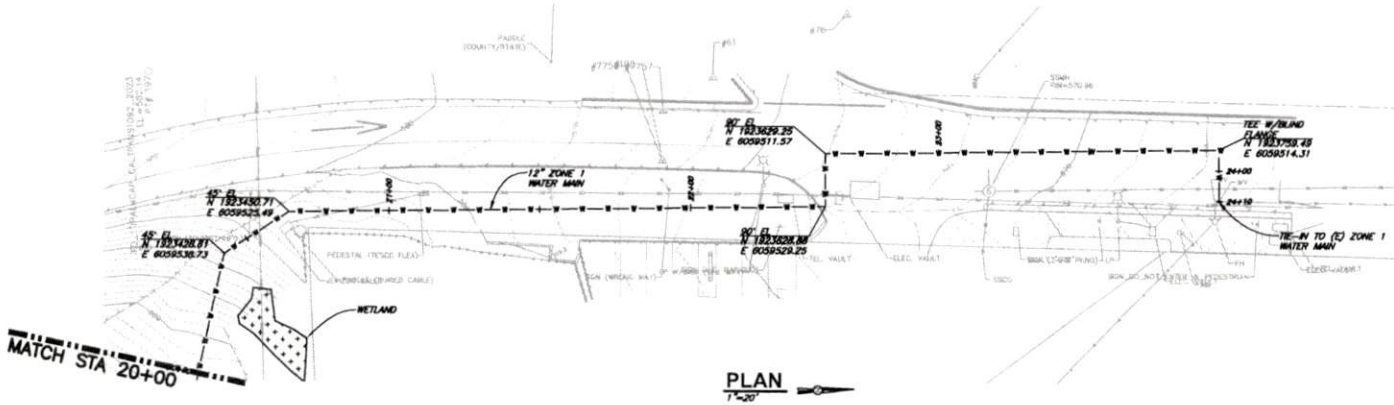
CHK JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLACE/HURLBUTT TANKS REPLACEMENT
CARBERVILLE CALIFORNIA

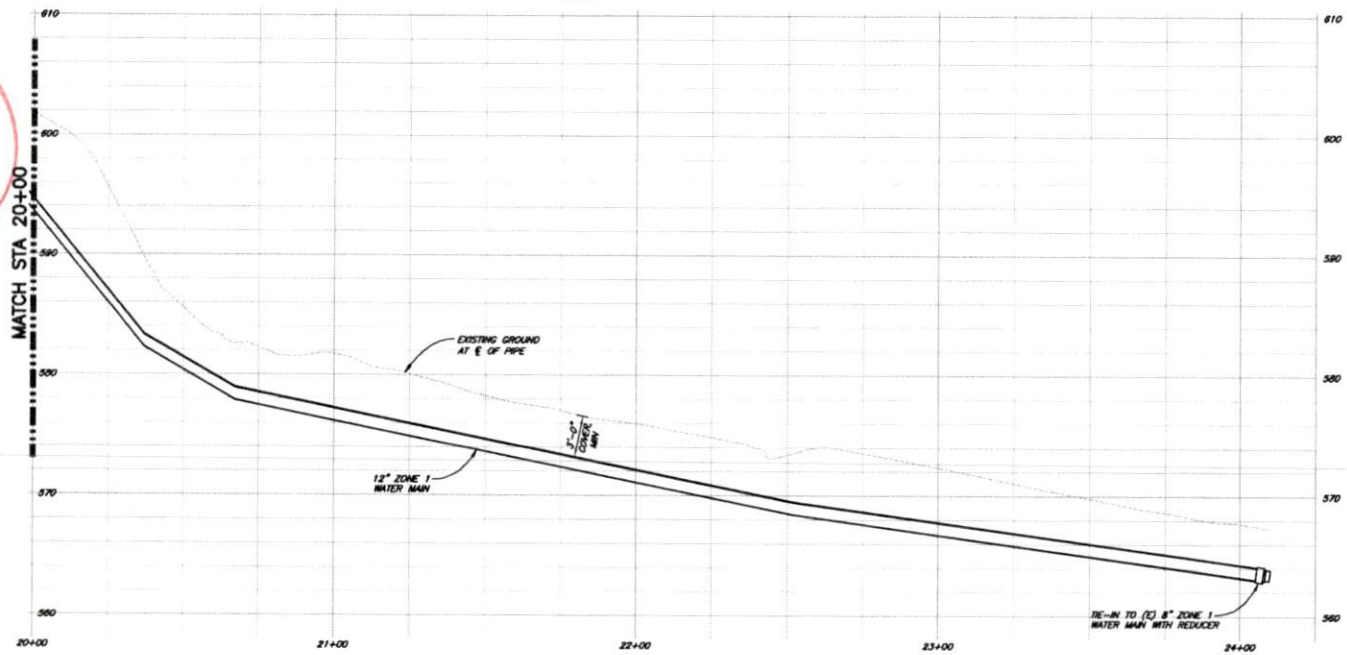
MAIN TANK WATER MAIN
PLAN AND PROFILE

SHEET C2.3
SEQ
DATE 08/2023
PROJ. NO. 022067

SAVED: 8/28/2023 3:33 PM CNEWELL PLOTTED: 10/4/2023 8:18 AM NEWELL, CHRIS
P:\Eureka\2022\022067-CSD-Water\Dwgs\022067-HURLBUTT-TANK-WATER-MAIN-PNP.dwg



PLAN
1"=20'



12" ZONE 1 WATER MAIN PROFILE
SCALE: 1"=20' H
1"=5' V

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING 1"
0 1 IF NOT ONE INCH, THE SHEET IS NOT FULL SCALE, ADJUST SCALES ACCORDINGLY

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NO.	DATE	REVISION	BY

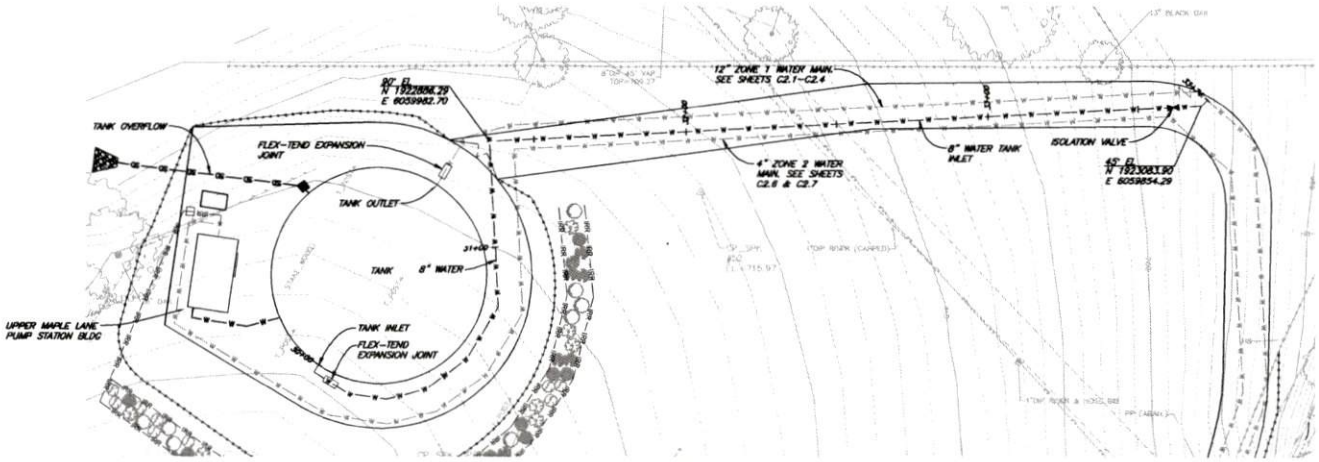
DESIGN -
DR JWF/CDN
CHK JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
CARBERVILLE, CALIFORNIA

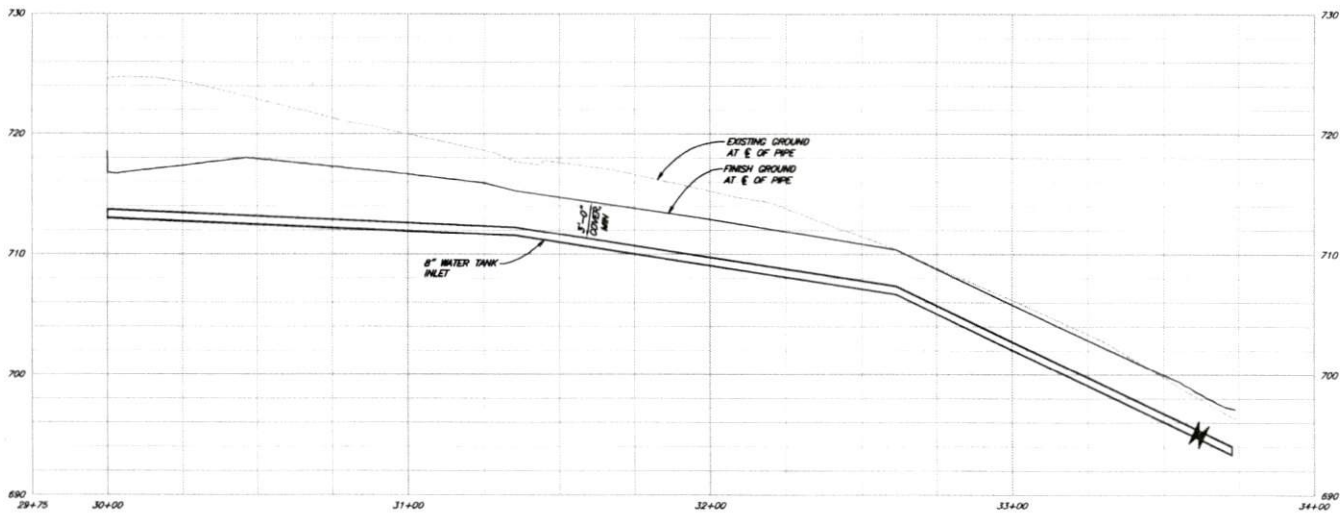
MAIN TANK WATER MAIN PLAN AND PROFILE

SHEET C2.4
SEQ
DATE 08/2023
PROJ. NO. 022067

SAVED: 8/29/2023 3:33 PM CNEWELL, PLOTTED: 10/4/2023 8:18 AM NEWELL, CHRIS
P:\Eureka\2022\022067-CSD-Water\Dwgs\022067-HURLBUTT-TANK-WSTR-MAIN-PNP.dwg



PLAN
1"=20'



PROFILE
SCALE: 1"=20' H
1"=3' V

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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NO.	DATE	REVISION	BY

DESIGN -
DR JWT/CDN
CHK JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
CARBERVILLE, CALIFORNIA

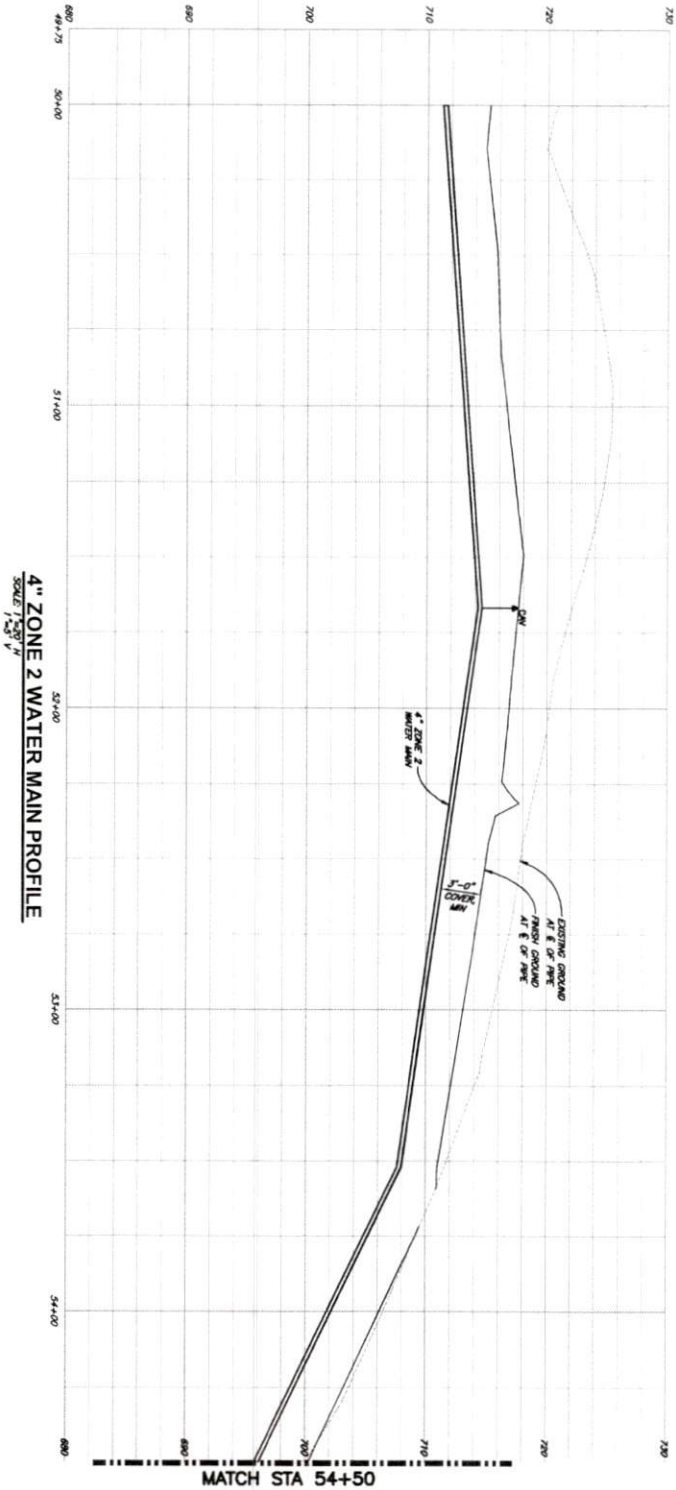
MAIN TANK WATER INLET
PLAN AND PROFILE

SHEET C2.5
SEQ
DATE 09/2023
PROJ. NO. 022067

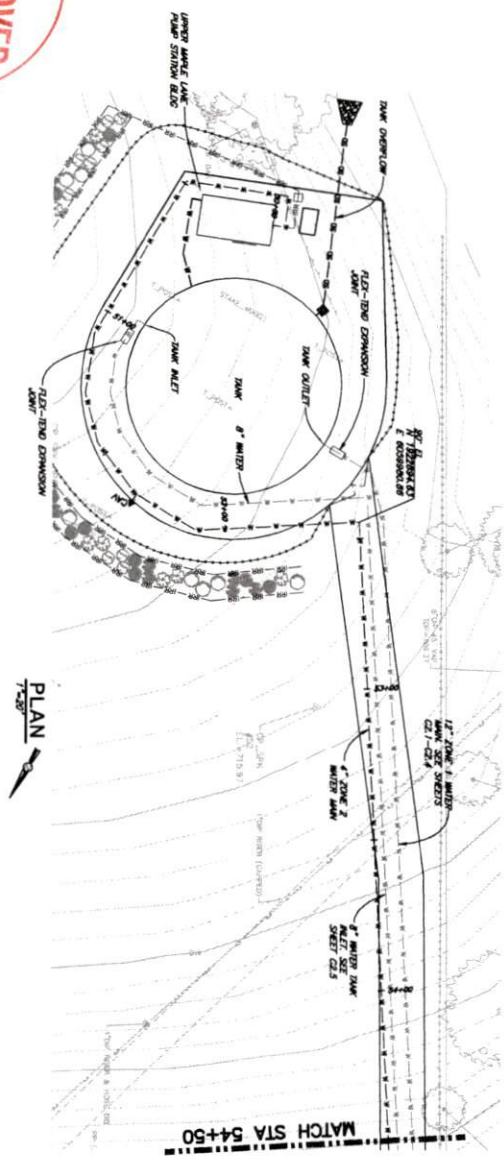
SAVED: 9/26/2023 5:09 PM CNEWELL, PLOTTED: 10/4/2023 8:18 AM NEWELL, CHRIS
A:\Eureka\2022\022067-CSD-Water\Dwgs\022067-HURLBUTT-TANK-WATER-INLET-PNP.dwg

SAVED: 9/29/2023 3:32 PM CNEWELL, PLOTTED: 10/4/2023 8:18 AM NEWELL, CHRIS
P:\Eureka\2022\022067-CSD-Water\Dwgs\022067-HURLBUTT-TANK-WATR-MAPLE-PNP.dwg

APPROVED
APR 4 2024
Humboldt County
PLANNING



4" ZONE 2 WATER MAIN PROFILE
SCALE: 1"=50' H, 1"=5' V

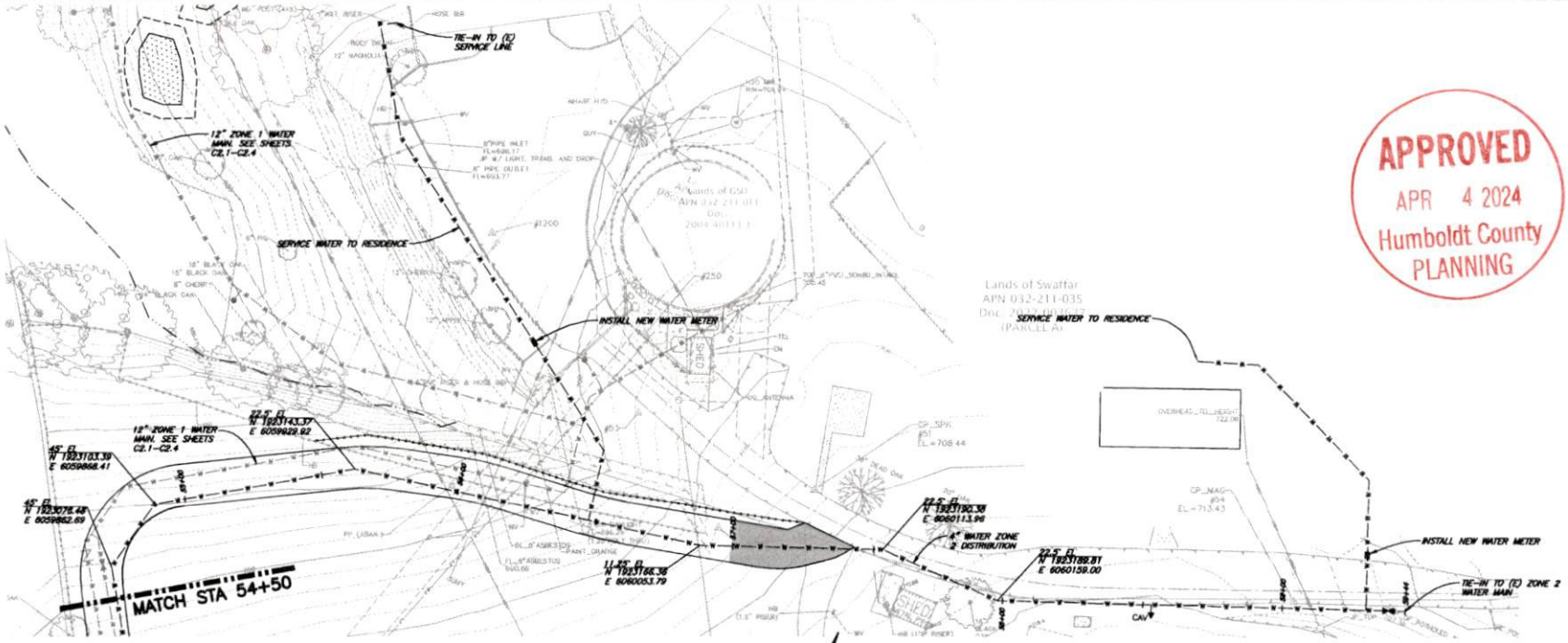


PLAN
1"=20'

60% DESIGN

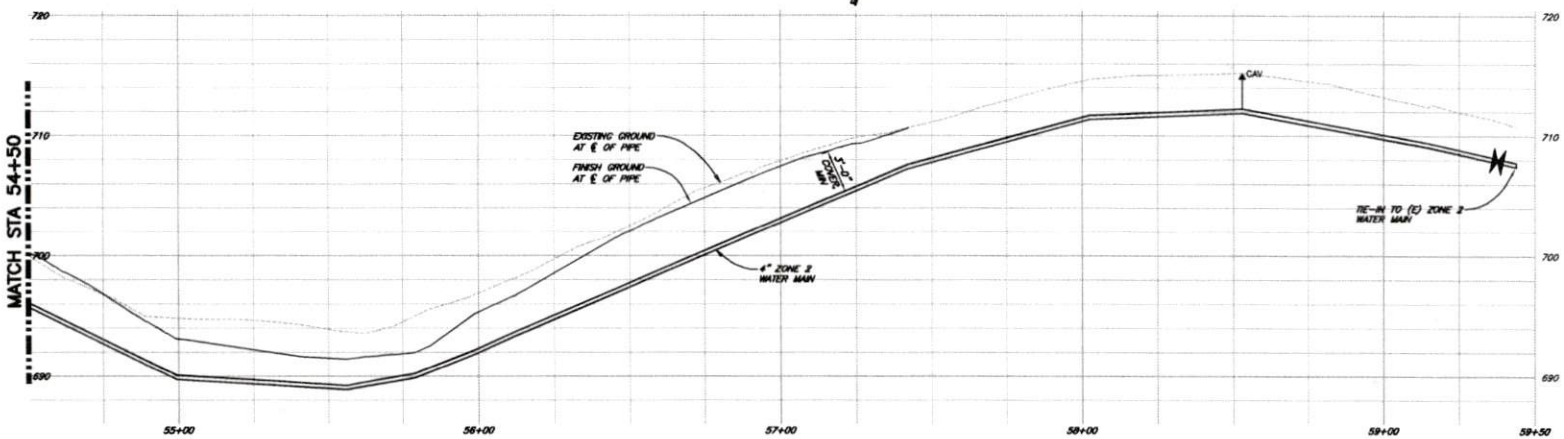
PROJ. NO. 022067	DATE 09/2023	SEQ	SHEET C2.6	GARBERVILLE SANITARY DISTRICT ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT GARBERVILLE, CALIFORNIA MAIN TANK 4INCH WATER DISTRIBUTION PLAN AND PROFILE	DSGN – DR JWF/CDH CHK JSO APVD	NO. / DATE / REVISION / BY	SHN 812 W. WABASH AVE. EUREKA, CA. 95501 WWW.SHN-ENGR.COM 707-441-8855

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY



APPROVED
APR 4 2024
Humboldt County
PLANNING

PLAN
1"=20'



4" ZONE 2 WATER MAIN PROFILE
SCALE: 1"=20' H
1"=5' V

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1" IF NOT ONE INCH, ADJUST SCALES ACCORDINGLY

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FAX 707-441-8805
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NO.	DATE	REVISION	BY

DESIGN -
DR INF/CDN
CHK JBO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WILLIAMS/HURLBUTT TANK REPLACEMENT
CARBERVILLE, CALIFORNIA

MAIN TANK 4INCH WATER DISTRIBUTION PLAN AND PROFILE

SHEET C2.7
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 9/29/2023 3:32 PM CNEWELL PLOTTED: 10/4/2023 8:19 AM NEWELL, CHRIS
A:\Eureka\2022\022067-CSD-Water\Dwgs\022067-HURLBUTT-SWR-WTR-MAYPLE-PNP.dwg

SAVED: 9/28/2023 11:49 AM CNEWELL, PLOTTED: 10/4/2023 8:19 AM NEWELL, CHRIS
P:\Eureka\2022\022067-CSD-Water\Dwgs\022067-WALL-TANK-OVER.dwg

PLAN
1"=30'

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

PROJ. NO. 022067	DATE 09/2023	ISS.	SHEET C3.0	GARBERVILLE SANITARY DISTRICT ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT GARBERVILLE, CALIFORNIA WALLAN TANK AND PUMP STATION OVERVIEW	DSGN –				
					DR CDN/JWF				
					CHK JSO				
					APVD	NO.	DATE	REVISION	BY

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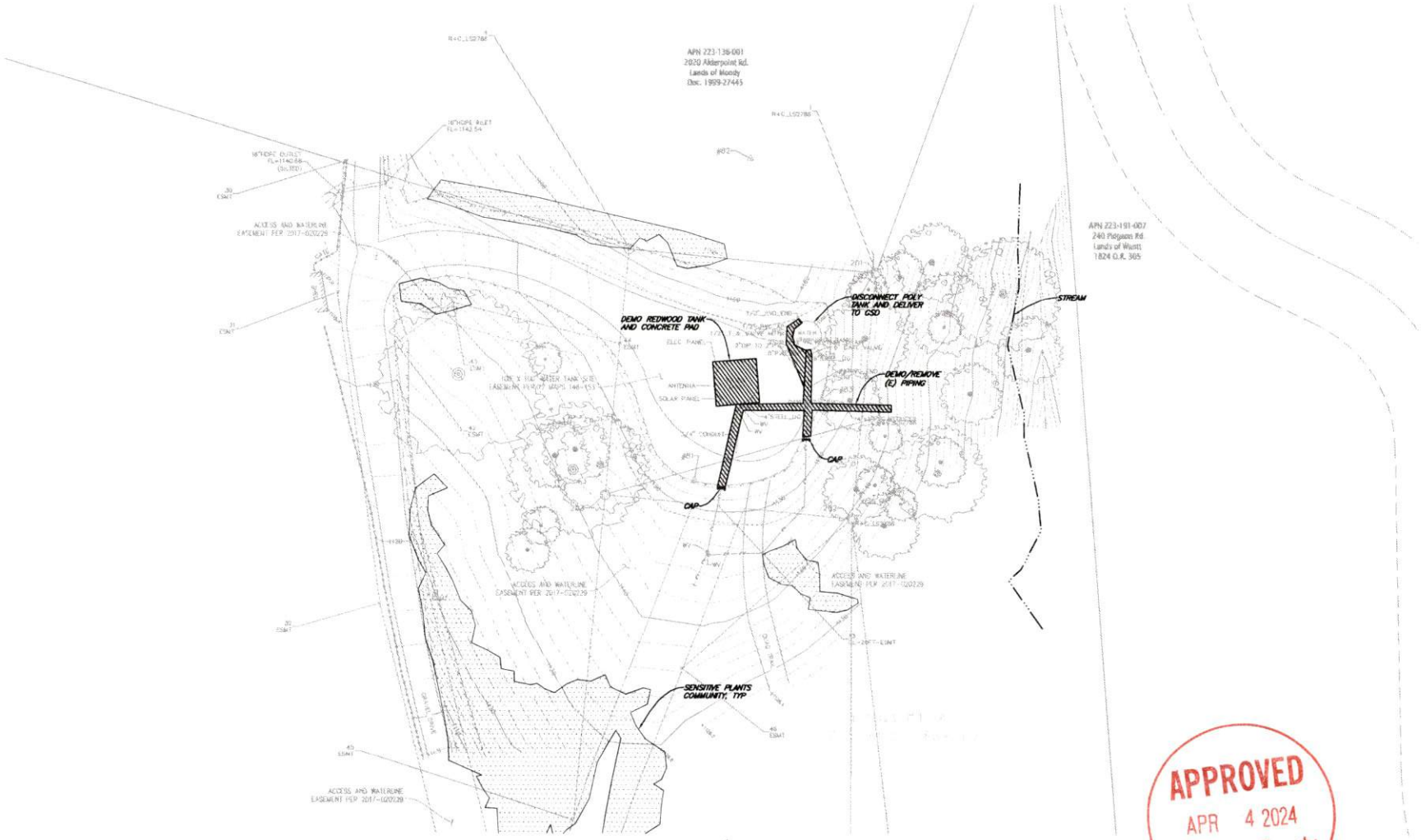
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY



DEMOLITION NOTES:

1. EXISTING POLY TANK SHALL REMAIN FULLY OPERATIONAL UNTIL NEW TANK IS CONSTRUCTED AND APPROVED FOR USE BY THE OWNER AND ENGINEER.
2. CONTRACTOR SHALL DEMOLISH AND PROPERLY DISPOSE OF ALL ITEMS SHOWN TO BE DEMOLISHED.

PLAN
1"=20'

LEGEND

- DEMOLITION/REMOVE
- SENSITIVE PLANTS COMMUNITY

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

SAVED: 8/28/2023 11:52 AM CNEWELL, PLOTTED: 10/4/2023 8:19 AM NEWELL, CHRIS
P:\Eureka\2022\022067-GSD-Water\Dwgs\022067-WALL-TNK-CSP.dwg

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1/2 1
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY

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EUREKA, CA. 95501
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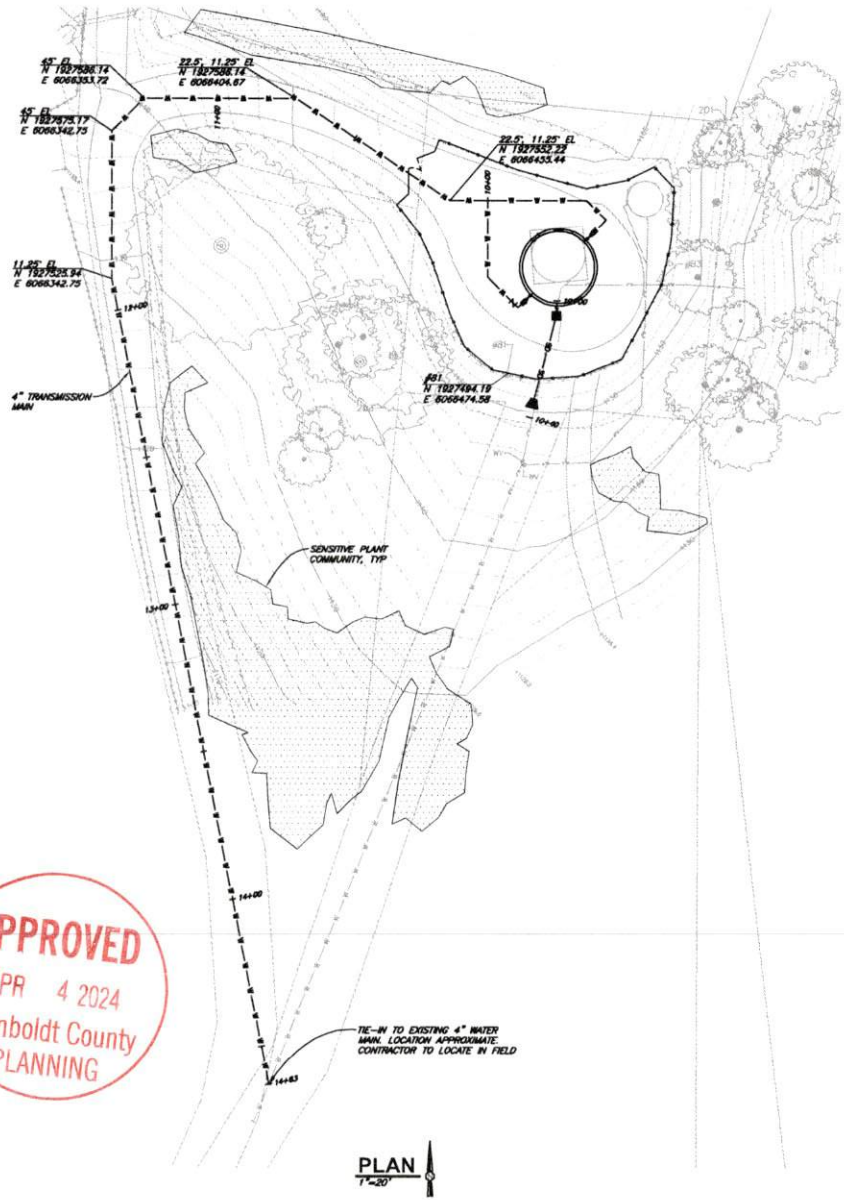
NO.	DATE	REVISION	BY

DESIGN -
DR CDM/JMF
CHK JSO
APVD

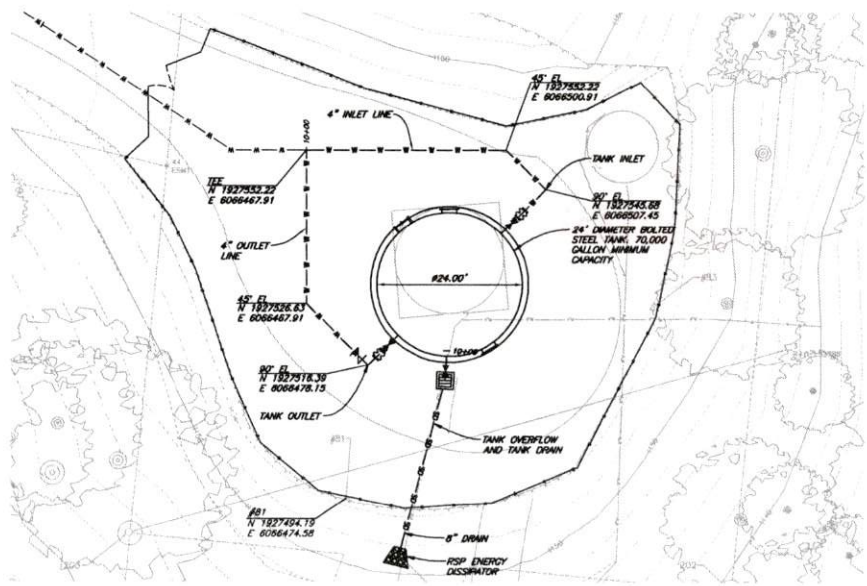
GARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

WALLAN TANK CLEARING, GRUBBING, AND DEMOLITION PLAN

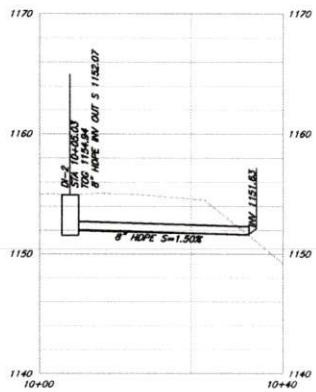
SHEET C3.1
SEQ
DATE 09/2023
PROJ. NO. 022067



PLAN
1"=20'



PLAN
1"=10'



TANK DRAIN PROFILE
SCALE: 1"=10' H
1"=5' H

60% DESIGN

APPROVED
APR 4 2024
Humboldt County
PLANNING

SAVED: 9/29/2023 3:53 PM CNEWELL, PLOTTED: 10/4/2023 8:20 AM NEWELL, CHRIS
P:\Eureka\2022\022067-GSD-Water\Dwgs\022067-WALL-TNK-SITE.dwg

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SHN
812 W. WABASH AVE.
EUREKA, CA 95501
707-441-8855

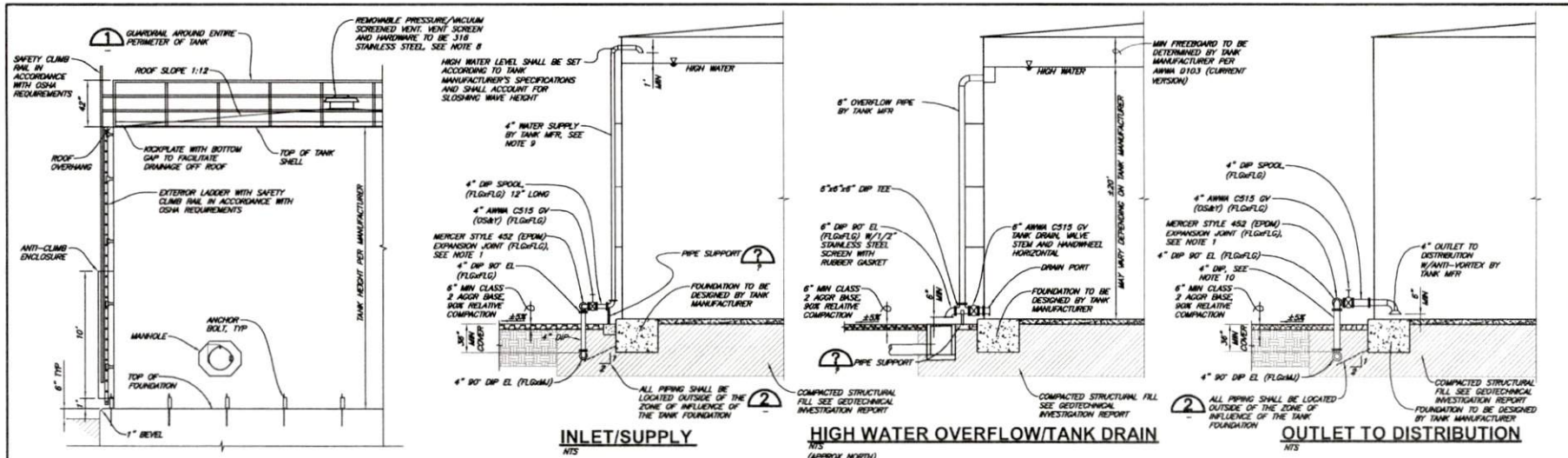
NO.	DATE	REVISION	BY

DESIGN -
DR CDN/JMT
CHK JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

WALLAN TANK SITE PLAN & YARD PIPING

SHEET C3.2
SEQ
DATE 09/2023
PROJ. NO. 022067

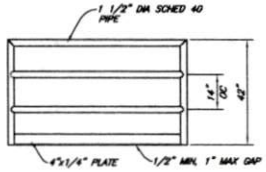


TANK ELEVATION
NTS

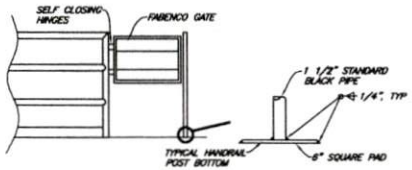
INLET/SUPPLY
NTS

HIGH WATER OVERFLOW/TANK DRAIN
NTS

OUTLET TO DISTRIBUTION
NTS

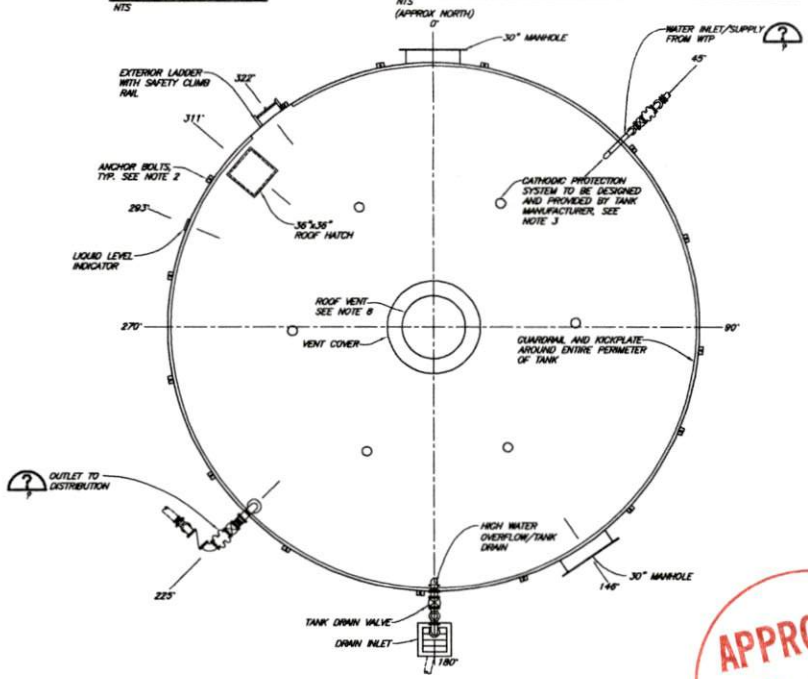


RAIL ELEVATION



GATE ELEVATION
DETAIL

DETAIL 1
NTS
(GUARDRAILING)



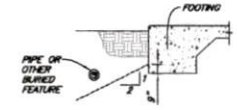
TANK PLAN
NTS

NOTES:

1. ALL PIPING CONNECTIONS SHALL HAVE ADEQUATE CAPACITY TO ACCOMODATE CALCULATED DISPLACEMENTS DUE TO SEISMIC LOADS, IN ACCORDANCE WITH AWWA D100 OR D103 AS APPROPRIATE (CURRENT VERSION). PIPING CONNECTIONS SHOWN ON THESE PLANS REPRESENT MINIMUM REQUIREMENTS AND SHOULD BE MODIFIED IN COORDINATION WITH THE ENGINEER IF IT IS DETERMINED BY THE TANK MANUFACTURER THAT ADDITIONAL DISPLACEMENT CAPACITY IS NEEDED.
2. THE SIZE AND NUMBER OF ANCHOR BOLTS SHALL BE DETERMINED BY TANK MANUFACTURER'S ENGINEER.
3. TANK MANUFACTURER SHALL COORDINATE THE DESIGN AND INSTALLATION OF THE CATHODIC PROTECTION SYSTEM.
4. FINAL LOCATION OF TANK APPURTENANCES AND PIPING CONNECTIONS TO BE DETERMINED IN COORDINATION WITH THE OWNER IN THE FIELD. PROVIDE AS CLOSE TO 180° SEPARATION BETWEEN TANK INLET AND OUTLET AS POSSIBLE.
5. ALL EXTERIOR PIPES AND PIPE SUPPORTS SHALL BE COATED WITH TANK EXTERIOR COATING SYSTEM.
6. TANK BOTTOM, AND TANK SHELL TO BOTTOM CONNECTION SHALL ALL BE VACUUM OR AIR-PRESSURE TESTED FOR WATER-TIGHTNESS.
7. ALL SAFETY RELATED COMPONENTS SHALL COMPLY WITH OSHA REQUIREMENTS.
8. TANK VENTS SHALL PREVENT ENTRY OF RAIN WATER OR RUNOFF, BIRDS, INSECTS, RODENTS, AND OTHER ANIMALS. PROVIDE SUFFICIENT AIRFLOW IF 50% BLOCKED, AND COVERED BY STAINLESS STEEL #24 MESH.
9. PROVIDE 1" THICK RIGID INSULATION, UV RESISTANT AND RATED FOR EXTERIOR USE ON ALL EXPOSED PIPING AND VALVES.

FLANGE NOTE:

DIELECTRIC ISOLATION KITS SHALL BE USED WITH ALL STAINLESS STEEL HARDWARE AND FASTENERS.



DETAIL 2
NTS

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
BAR IS 0.5" HIGH ON ORIGINAL DRAWING
0 1 2 3 4 5
IF NOT THE INCH BAR ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SHN
812 W. WABASH AVE.
EUREKA, CA. 95501
TEL. 707-443-8326
FAX. 707-444-8330
EMAIL: EUR@SHN-ENG.COM

NO.	DATE	REVISION	BY

DESIGN -
DR JWF/TCM
CHK JSO
APVD

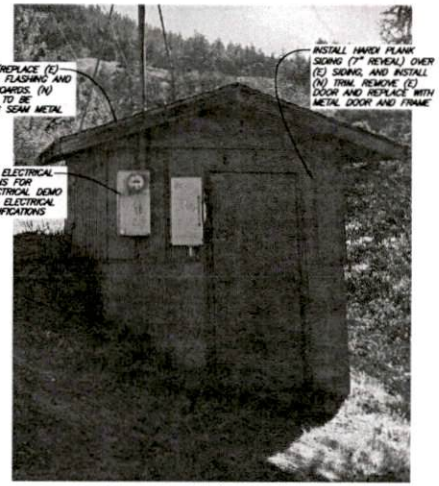
GARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

WALLAN TANK LAYOUT

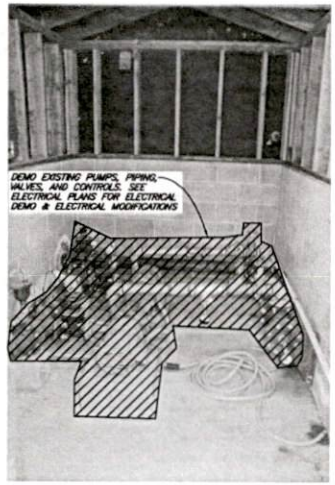
SHEET C3.3
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 9/29/2023 3:45 PM CNEWELL PLOTTED: 10/4/2023 8:30 AM NEWELL, CHRIS
A:\Eureka\2022\022067-GSD-Water\Dwgs\022067-WALL-TANK-LAYOUT.dwg

PLAN
1"=20'



PUMP STATION EXTERIOR



PUMP STATION INTERIOR

LEGEND

- DEMOLITION/REMOVE
- SENSITIVE PLANTS COMMUNITY

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY

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707-441-8855

NO.	DATE	REVISION	BY

DESIGN -
DR CDW/JWF
CHK JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HILBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

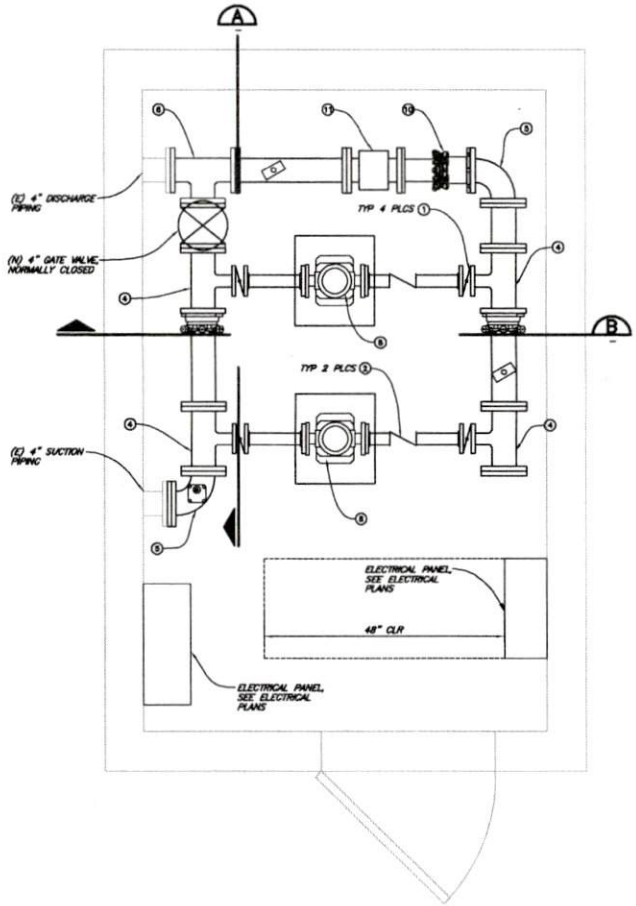
WALLAN PUMP STATION UPGRADES

SHEET C4.0
SEQ
DATE 09/2023
PROJ. NO. 022067

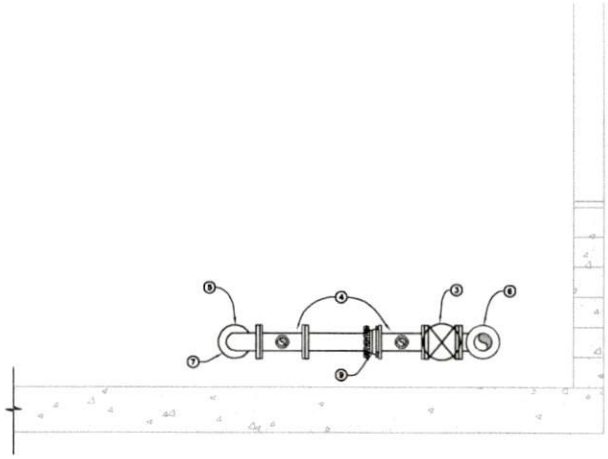
SAVED: 9/29/2023 3:18 PM JFOSTER, PLOTTED: 10/4/2023 8:20 AM NEWELL, CHRIS
P:\Drawings\2022\022067-SSD-Water\Dwgs\022067-WALL-PUMP-STAT-DIST-COND.dwg

KEY NOTES:

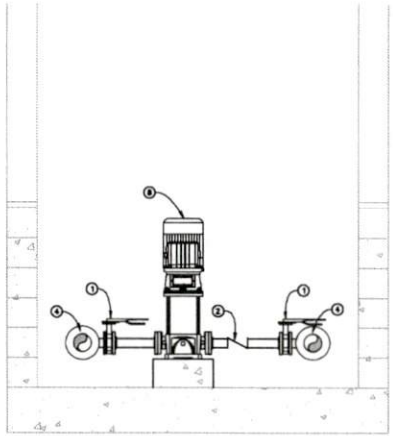
① 2" BFV, LUG	⑦ CONNECT TO EXISTING PIPE	⑬ ------	⑲ ------
② 2" CHECK VALVE	⑧ BOOSTER PUMP 35GPM @ 306', 7.5 HP	⑭ ------	⑳ ------
③ 4" DIP GV	⑨ 4" RCFA	⑮ ------	㉑ ------
④ 4"x4"x2" DIP TEE	⑩ 4" DISMANTLING JOINT	⑯ ------	㉒ ------
⑤ 4" DIP EL	⑪ 4" MAGNETIC FLOW METER	⑰ ------	㉓ ------
⑥ 4" DIP TEE			



PLAN
1"=1'-0"



SECTION A
NTS



SECTION B
NTS

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

SAVED: 9/26/2023 3:17 PM JFOSTER, PLOTTED: 10/4/2023 8:21 AM NEWELL, CHRIS
P:\Eureka\2022\022067-GSD-Winter\Dwgs\022067-WALL-PUMP-STAT-MECH.dwg

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1/2 1
IF NOT ONE INCH, ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SHN
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707-441-8855
www.shn-inc.com

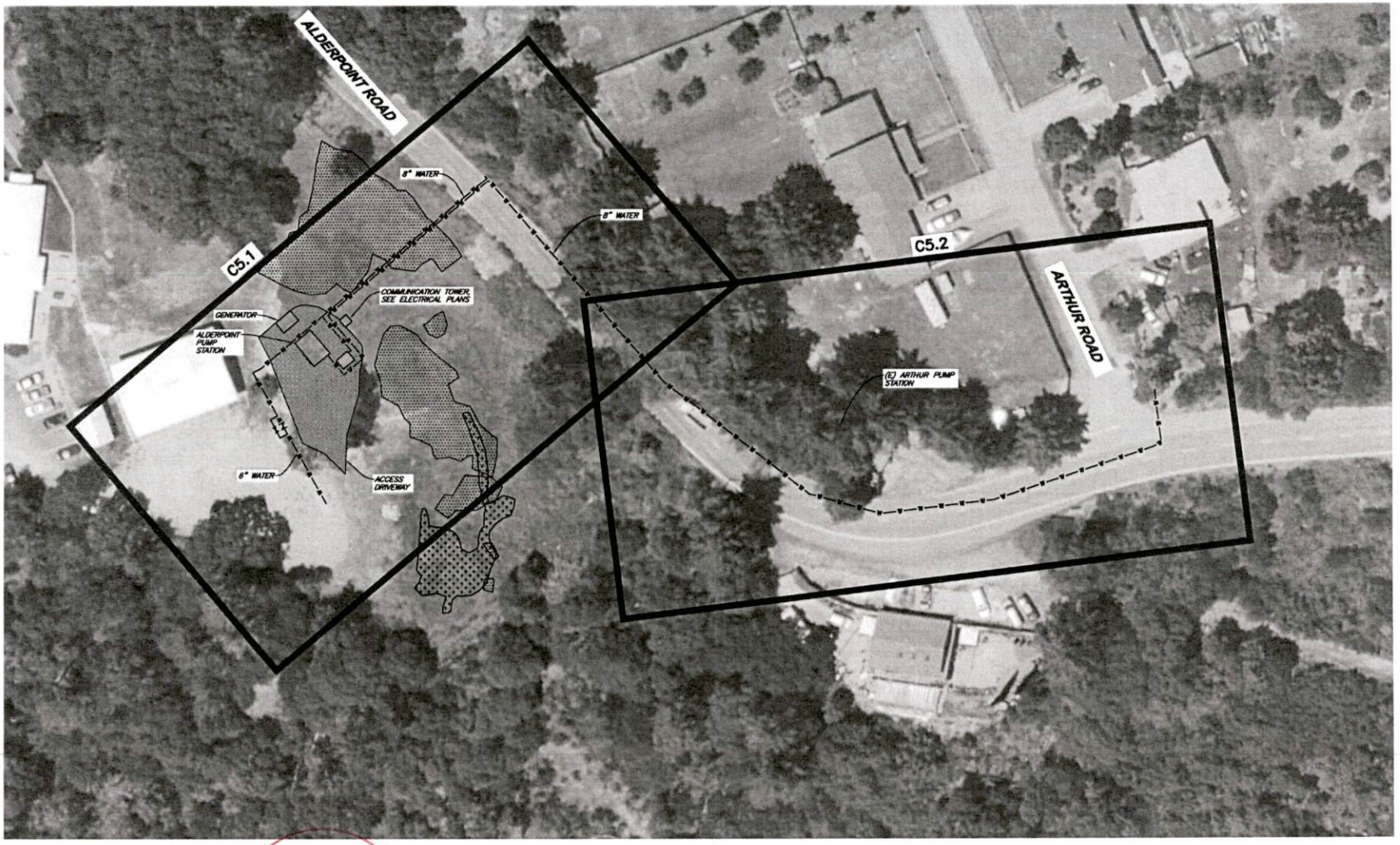
NO.	DATE	REVISION	BY

DESIGN -
DR CDM/JWF
CHK JSO
APVD

GARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

WALLAN PUMP STATION MECHANICAL PLAN

SHEET C4.1
SEQ.
DATE 09/2023
PROJ. NO. 022067



PLAN
1"=30'

LEGEND

WETLAND AREA

SENSITIVE PLANTS COMMUNITY

60% DESIGN

APPROVED
APR 4 2024
Humboldt County
PLANNING

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SHN
812 W. WABASH AVE.
EUREKA, CA 95501
EUREKA@SHN-ENG.COM
707-441-8855

NO.	DATE	REVISION	BY

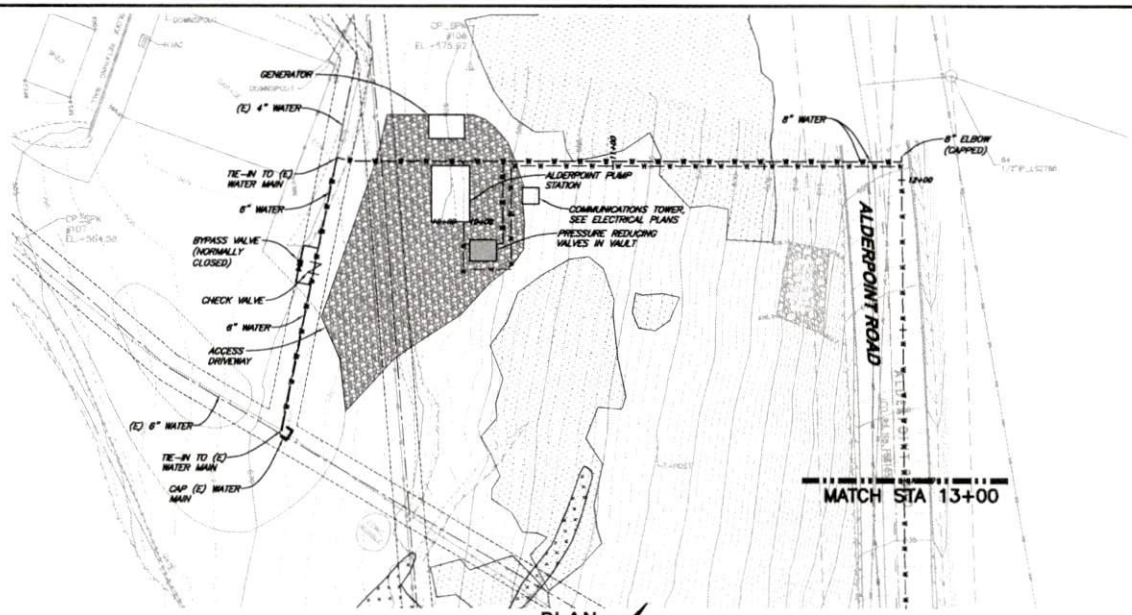
DESIGN -
DR CDN/JWF
CHK JSO
APVD

GARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

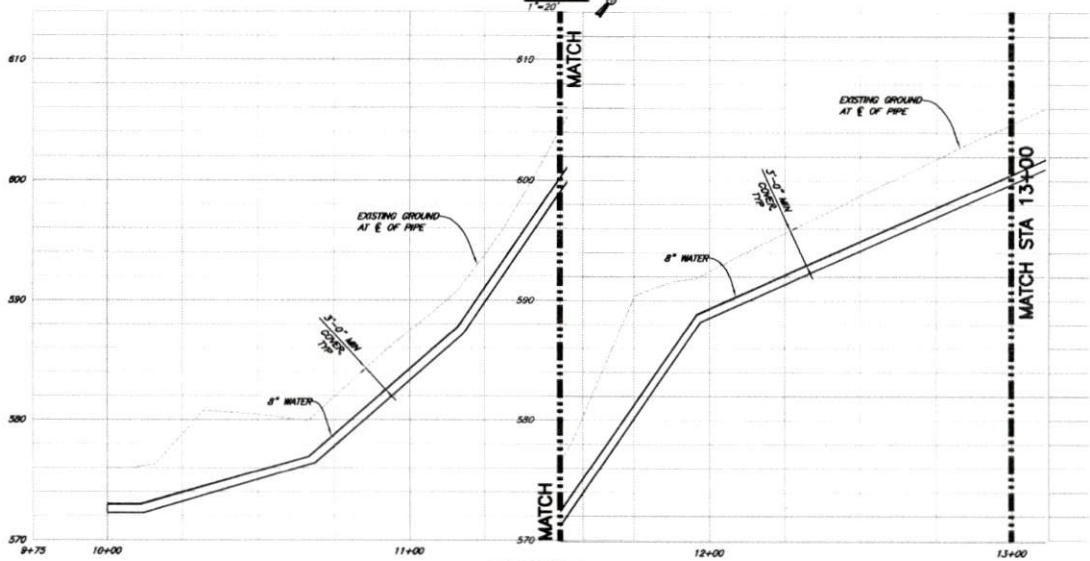
ALDERPOINT PUMP STATION AND WATER MAIN OVERVIEW

SHEET C5.0
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 10/11/2023 10:09 AM JFOSTER, PLOTTED: 10/11/2023 10:13 AM JOHN FOSTER
P:\Eureka\2022\022067-ISD-Water\Dwgs\022067-ALDERPNT-WATER-MAIN-OVER.dwg



PLAN
1"=20'



PROFILE
SCALE: 1"=20' H
1"=5' V

LEGEND

- WETLAND AREA
- SENSITIVE PLANTS COMMUNITY

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
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NO.	DATE	REVISION	BY

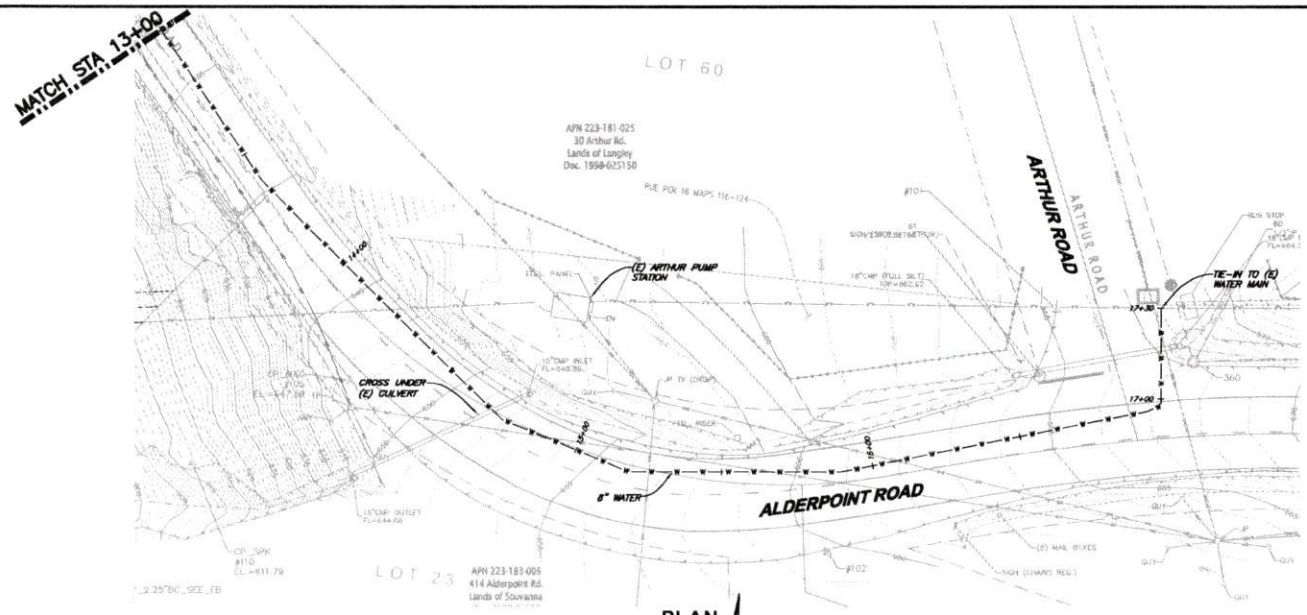
DESIGN -
DR CDN/JMF
CHK JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
CARBERVILLE, CALIFORNIA

ALDERPOINT PUMP STATION AND WATER MAIN PLAN AND PROFILE

SHEET C5.1
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 10/11/2023 9:54 AM JFOSTER, PLOTTED: 10/11/2023 10:16 AM JOHN FOSTER
P:\Eureka\2022\022067-CSD-Water\Dwg\022067-ALDRPNT-WATER-PNP.dwg

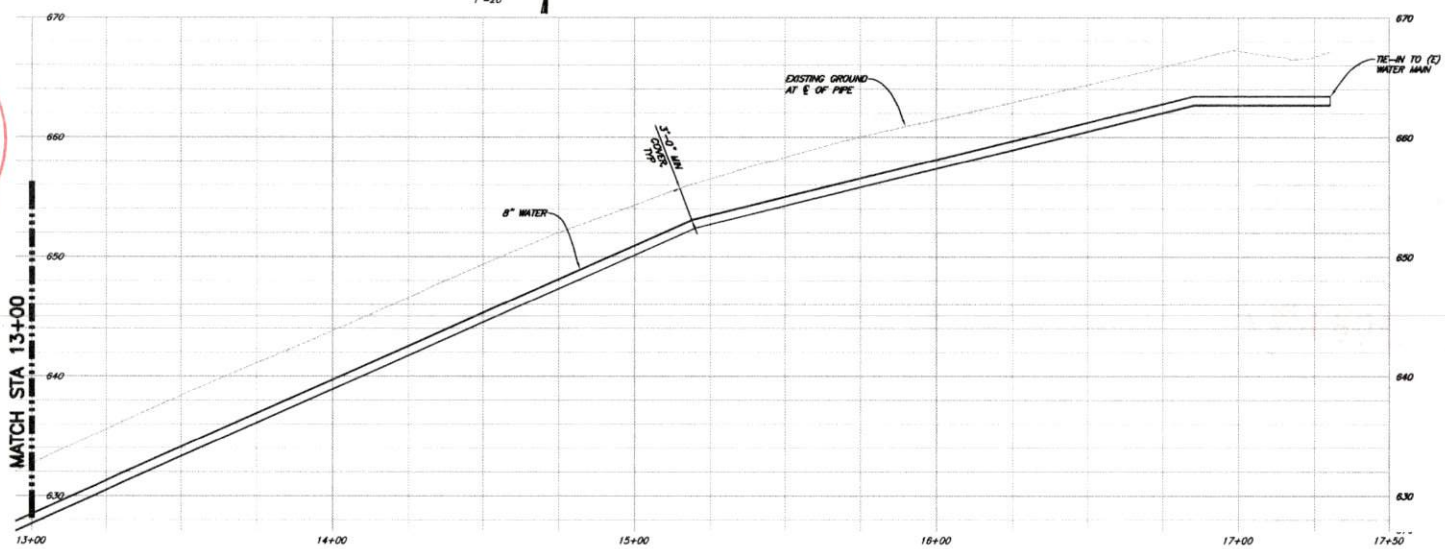


LEGEND

- WETLAND AREA
- SENSITIVE PLANTS COMMUNITY

PLAN

1"=20'



PROFILE

SCALE: 1"=20' H
1"=5' V

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
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NO.	DATE	REVISION	BY

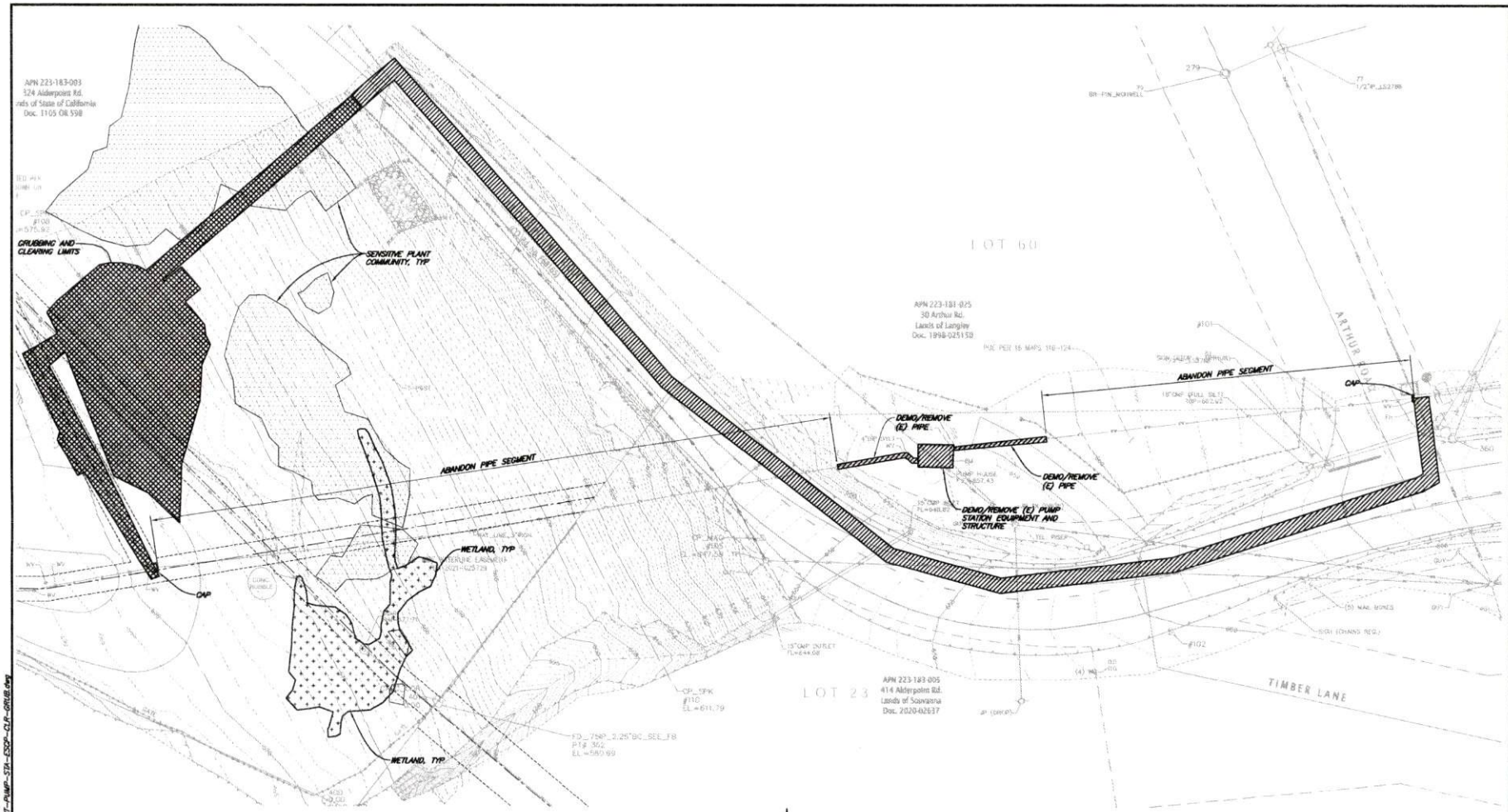
DESIGN 1
DR CDN/JWF
CHK JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
CARBERVILLE, CALIFORNIA

ALDERPOINT PUMP STATION AND WATER MAIN PLAN AND PROFILE

SHEET C5.2
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 10/11/2023 8:54 AM JFOSTER, PLOTTED: 10/11/2023 10:17 AM JOHN FOSTER
P:\Eureka\2022\022067-CSD-Water\Dwgs\022067-ALDRPNT-WATER-PWP.dwg



PLAN
1"=20'

LEGEND

- WETLAND AREA
- SENSITIVE PLANTS COMMUNITY
- CLEARING AND GRUBBING
- DEMO

DEMOLITION NOTE:

EXISTING FACILITIES SHALL REMAIN FULLY OPERATIONAL UNTIL NEW FACILITIES ARE FULLY OPERATIONAL. DEMOLITION OF EXISTING FACILITIES SHALL NOT BEGIN UNTIL APPROVED BY THE OWNER AND THE ENGINEER.

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

SHED: 10/11/2023 9:54 AM JFOSTER, PLOTTED: 10/11/2023 10:17 AM JOHN FOSTER
P:\Eureka\2022\022067-GSD-Winter\Dwgs\022067-ART-PUMP-STA-ESCP-CLR-GRUB.dwg

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING 1"
0 1 IF NOT ONE INCH, ADJUST THIS SHEET ACCORDINGLY SCALES ACCORDINGLY

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EUREKA, CA. 95501
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707-441-8855

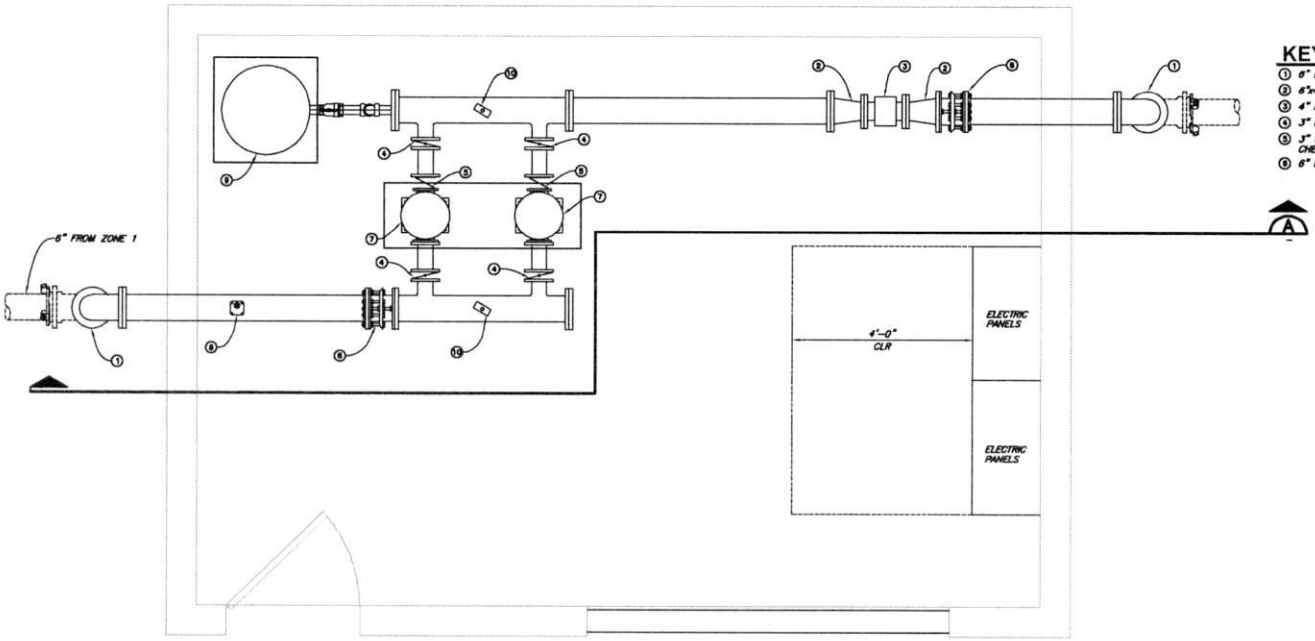
NO.	DATE	REVISION	BY

DESIGN -
DR CDN/JWF
CHK JSO
APVD

GARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

ALDERPOINT PUMP STATION SITE PREPARATION AND DEMOLITION

SHEET C5.3
SEQ
DATE 09/2023
PROJ. NO. 022067

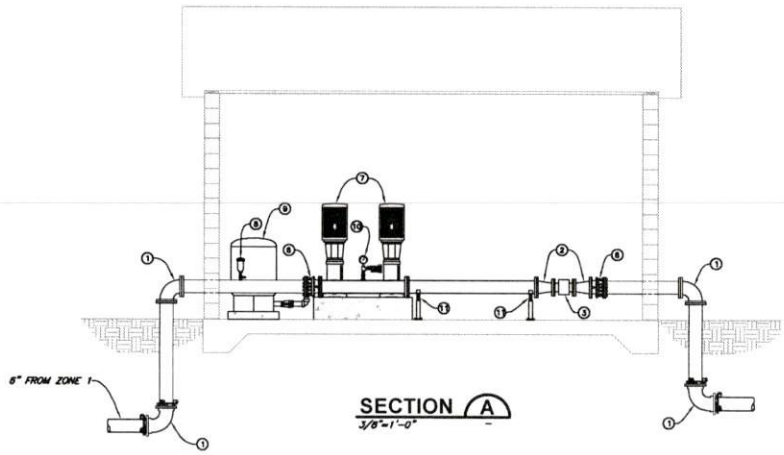


PLAN
3/8"=1'-0"

KEY NOTES:

1. 6" DIP EL
2. 6"x4" DIP REDUCER
3. 4" MAG FLOW METER
4. 3" BUTTERFLY VALVE, LUG
5. 3" WAFER SILENT CHECK VALVE
6. 6" DISMANTLING JOINT
7. VERTICAL MULTI-STAGE PUMP, 200 GPM @ ~379' TDH, 30 HP
8. 1" CORP, W/CORP STOP & PIPE NIPPLE
9. 80 GAL PRESSURE TANK
10. PRESSURE GAUGE AND TRANSDUCER, SEE DETL X SHT X
11. SST PIPE SUPPORT
12. ------
13. ------
14. ------
15. ------
16. ------

APPROVED
APR 4 2024
Humboldt County
PLANNING



SECTION A
3/8"=1'-0"

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY

SWA
812 W. WABASH AVE.
EUREKA, CA 95501
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707-441-8855

NO.	DATE	REVISION	BY

DESIGN -
DR CDM/MHF
CHK JSD
APVD

GARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

ALDERPOINT PUMP STATION MECHANICAL PLAN

SHEET C5.4
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 10/11/2023 8:48 AM JFOSTER, PLOTTED: 10/11/2023 10:17 AM JOHN FOSTER
P:\Eureka\2022\022067-GSD-Water\Dwgs\022067-ART-PUMP-STA-MECH.dwg

PLAN
1"=20'

LEGEND

WETLAND AREA

SENSITIVE PLANTS COMMUNITY

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING 1"
0 1 2 3 4 5
IF NOT ONE INCH, ADJUST THIS SHEET ACCORDINGLY SCALES ACCORDINGLY

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707-441-8855

NO.	DATE	REVISION	BY

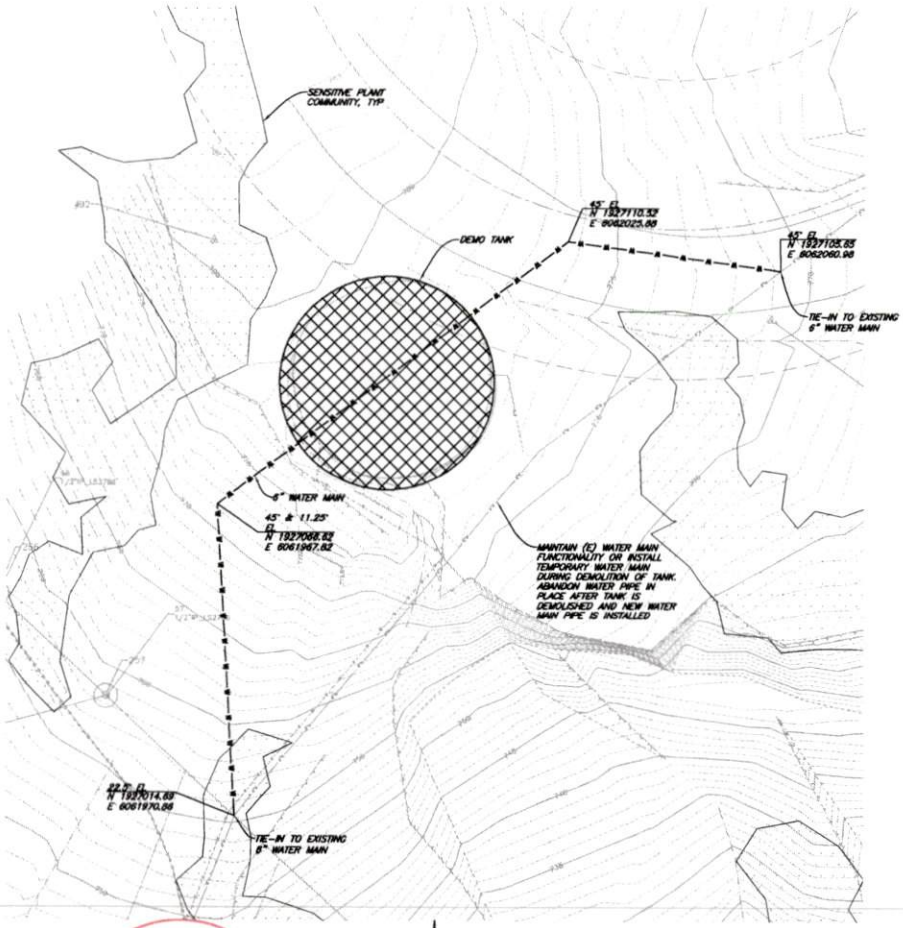
DESIGN -
DR CDN/JWP
CHK JRO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
CARBERVILLE, CALIFORNIA

ROBERTSON TANK OVERVIEW

SHEET C6.0
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 9/28/2023 10:27 AM JFOSTER, PLOTTED: 10/4/2023 8:23 AM NEWELL, CHRIS
A:\Eureka\2022\022067-CSD-Winter\Dwgs\022067-RCB-TANK-CXST-CONO.dwg



PLAN
1"=10'

NOTES:

1. ALL DEMOLITION SHALL BE CARRIED OUT IN A MANNER WHICH WILL PREVENT INJURY TO WORKERS AND DAMAGE TO ADJACENT FACILITIES. DEMOLITION WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE LAWS AND ORDINANCES. EXISTING MATERIALS AND EQUIPMENT REMOVED BY THE CONTRACTOR SHALL NOT BE REUSED IN THE WORK UNLESS OTHERWISE SPECIFIED, AND BECOME THE CONTRACTORS PROPERTY AND BE REMOVED FROM THE JOB SITE, EXCEPT AS NOTED BELOW.
2. TANK DEMOLITION
   A. REMOVE TANK ROOF AND SUPPORT STRUCTURE.
   B. BREAK A MINIMUM OF FOUR-4 FOOT DIAMETER HOLES THROUGH TANK FLOOR TO PROVIDE DRAINAGE THROUGH TANK.
   C. REMOVE TANK WALLS TO 3'-0" BELOW FINISHED GRADE. CONCRETE RUBBLE TO BE PACED EVENLY ACROSS TANK BOTTOM.
   D. BACKFILL TANK TO A MINIMUM OF 2 FEET OVER TOP OF CONCRETE RUBBLE WITH CLASS 2 PERMEABLE MATERIAL IN ACCORDANCE WITH CALTRANS STANDARD SPECIFICATION SECTION 68-1.025.
   E. BACKFILL REMAINING TANK WITH NATIVE MATERIAL TO 6" BELOW FINISHED GRADE. NATIVE MATERIAL TO BE PLACED IN 8-INCH LIFTS AND SHALL BE WITHIN 2 PERCENT OF THE OPTIMUM MOISTURE CONTENT. COMPACT NATIVE MATERIAL TO 90% RELATIVE COMPACTION.
3. FINISH GRADE PREPARATION
   A. PLACE 6" MINIMUM TOPSOIL OVER BACKFILL.
   B. GRADE SMOOTH AND ROLL TO MATCH EXISTING CONTOURS.
   C. PLANT ENTIRE RECLAIMED AREA WITH LAWN GRASS AND APPLY FERTILIZER AT MANUFACTURERS RECOMMENDED RATES.
4. CONTRACTOR TO PROVIDE PHOTO AND VIDEO SURVEY OF PROPERTY TO DOCUMENT EXISTING CONDITIONS PRIOR TO COMMENCEMENT OF WORK IN THIS AREA.
5. CONTRACTOR TO PROTECT IN PLACE ALL LANDSCAPING AND ARCHITECTURAL ELEMENTS. IF DAMAGE OCCURS, THE CONTRACTOR IS TO REPLACE DAMAGED ELEMENTS IN KIND.

LEGEND

SENSITIVE PLANTS COMMUNITY

DEMO

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING 1"
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EUREKA, CA 95501
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NO.	DATE	REVISION	BY

DESIGN -
DR CDN/JNF
CK JSO
APVD

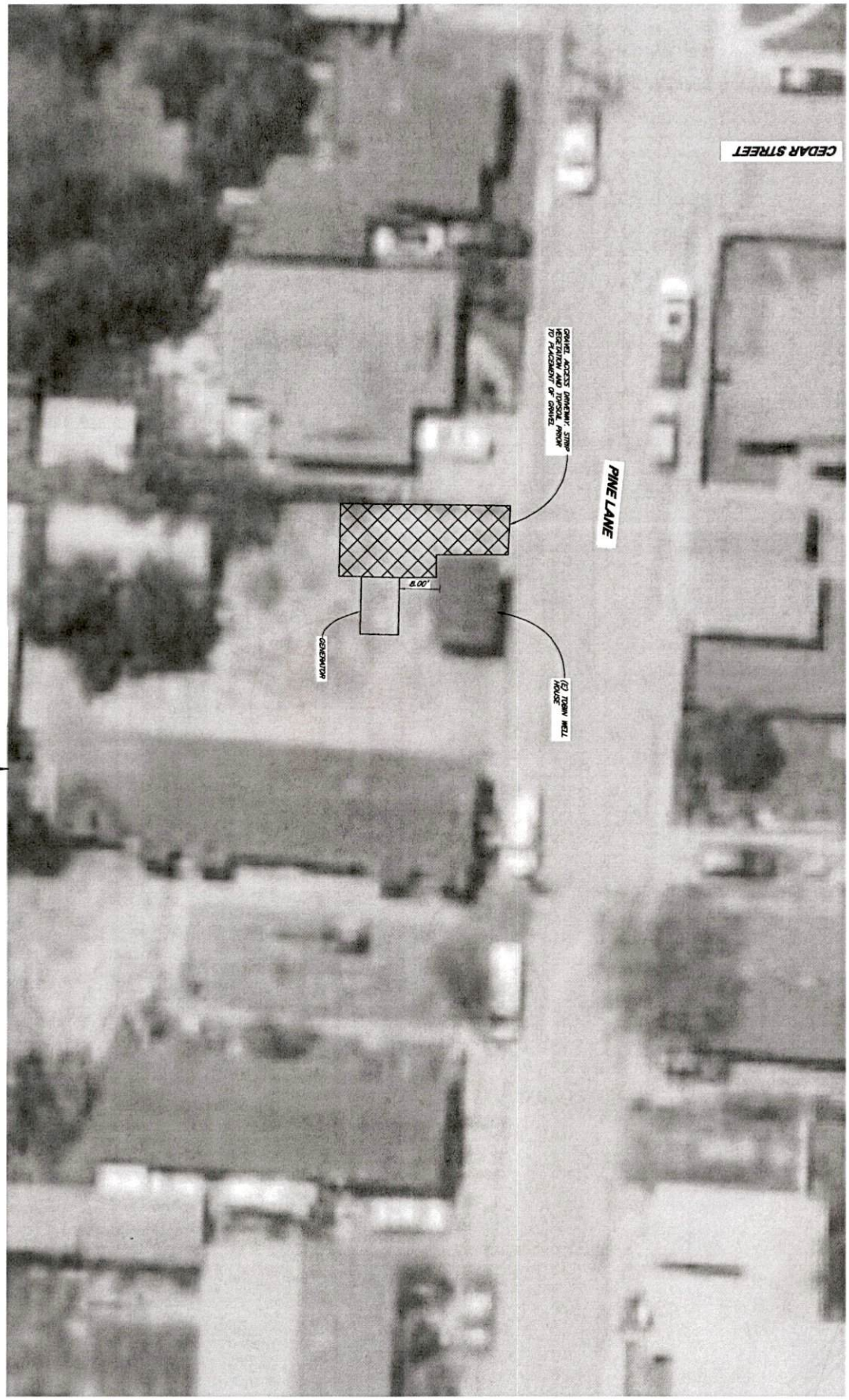
CARBERVILLE SANITARY DISTRICT
ROBERTSON/WILLOW HILL LIFT STATIONS REPLACEMENT
CARBERVILLE, CALIFORNIA

ROBERTSON TANK DEMOLITION PLAN AND WATER MAIN REPLACEMENT

SHEET C6.1
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 9/26/2023 3:38 PM JFOSTER, PLOTTED: 10/4/2023 8:23 AM NEWELL, CHRIS
P:\Clients\2022\022067-CSD-Water\Dwgs\022067-ROB-TANK-DEMO.dwg

SAVED: 9/28/2023 10:32 AM JFOSTER, PLOTTED: 10/4/2023 8:24 AM NEWELL, CHRIS
P:\Eureka\2022\022067-GSD-Water\Dwgs\022067-TOB-WELL-GEN-SITE.dwg



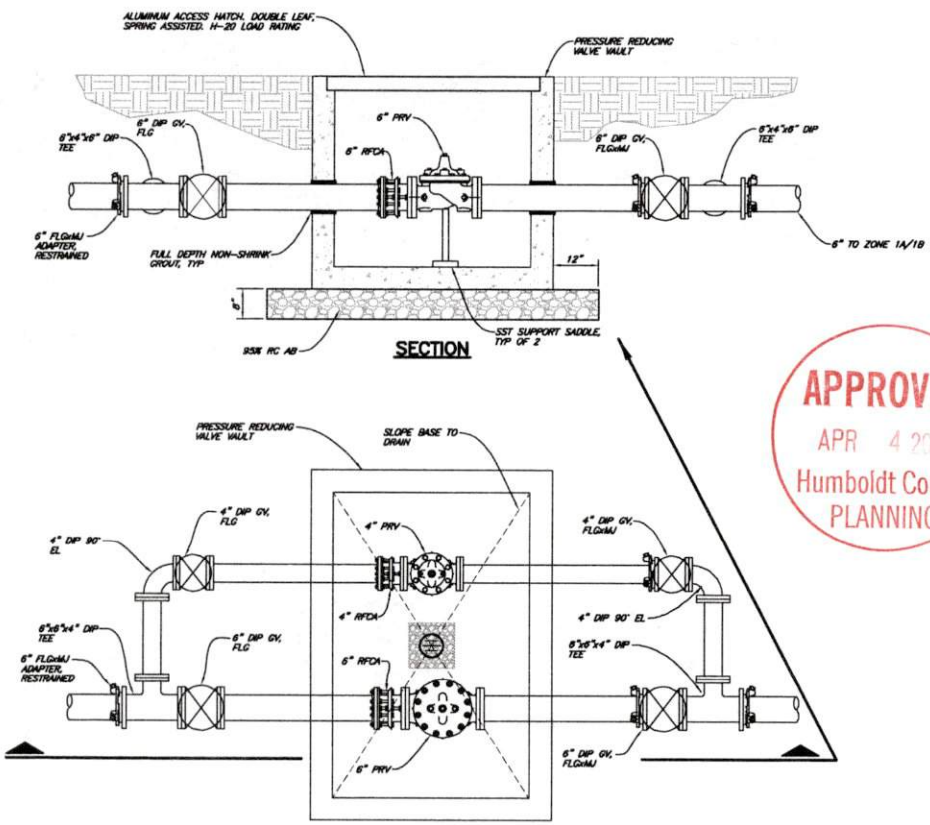
PLAN
7x10

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

PROJ. NO. 022067	DATE 09/2023	SEQ	SHEET C7.0	GARBERVILLE SANITARY DISTRICT ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT GARBERVILLE, CALIFORNIA TOBIN WELL GENERATOR SITE PLAN	DSGN – DR CDM/JWF CHK JSO APVD	NO. / DATE / REVISION / BY	SHN 812 W. WABASH AVE. EUREKA, CA. 95501 WWW.SHN-ENGR.COM 707-441-8855

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY



DETAIL 1
NTS
(PRESSURE REDUCING VALVE VAULT)

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

SAVED: 9/29/2023 12:22 PM JFOSTER, PLOTTED: 10/4/2023 8:24 AM NEWELL, CHRIS
P:\Eureka\2022\022067-SSD-Water\Dwgs\022067-DETAILS.dwg

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING A
0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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EUREKA, CA. 95501
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707-441-8855

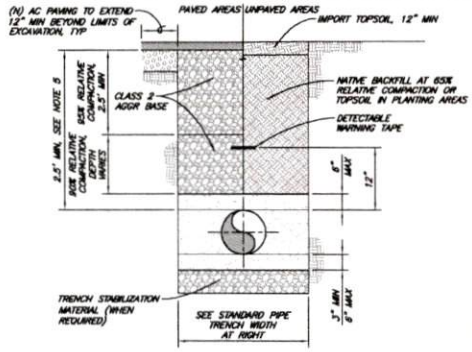
NO.	DATE	REVISION	BY

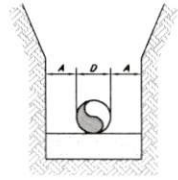
DSGN -
DR JWF/CDN
CHK JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

CIVIL DETAILS

SHEET C8.0
SEQ
DATE 09/2023
PROJ. NO. 022067



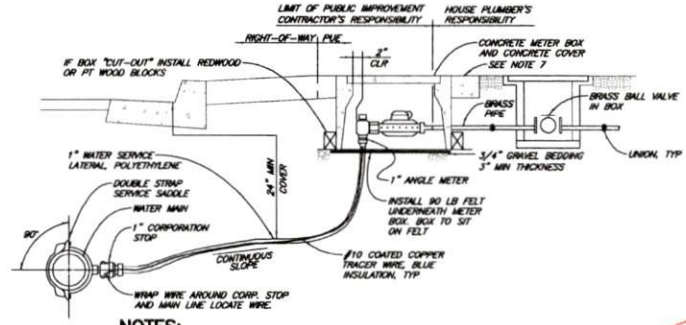


PIPE DIA "D"	MINIMUM "A"	MAXIMUM "A"
<4"	3"	6"
4" TO 6"	6"	12"
8" TO 15"	8"	14"
16" TO 21"	10"	16"
24" TO 30"	12"	18"
33" TO 42"	15"	21"
48" & LARGER	18"	24"

NOTES:

1. WIDER TRENCHES MAY REQUIRE HIGHER STRENGTH PIPE AND/OR SPECIAL BEDDING.
2. DIFFERING TRENCH WIDTHS REQUIRE PRIOR APPROVAL OF ENGINEER.
3. IN MAKING EXCAVATIONS FOR THIS PROJECT, THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR PROVIDING AND INSTALLING ADEQUATE SHEETING, SHORING AND BRACING AS MAY BE NECESSARY AS A PRECAUTION AGAINST SLIDES OR CAVE-INS, AND TO PROTECT ALL EXISTING IMPROVEMENTS OF ANY KIND, EITHER ON PUBLIC OR PRIVATE PROPERTY, FULLY FROM DAMAGE.
4. SATISFACTORY NATIVE BACKFILL MATERIAL USED AS UTILITY TRENCH BACKFILL BELOW UNPAVED AREAS SHALL BE APPROVED BY THE ENGINEER PRIOR TO USE.
5. 2-SACK SLURRY BACKFILL MAY BE USED IN TRENCH WHEN MINIMUM PIPE COVER NOT POSSIBLE, WHEN APPROVED BY OWNER'S REPRESENTATIVE.
6. CLASS 2 AGGREGATE BASE SHALL BE COMPACTED TO 95% RELATIVE COMPACTION.
7. DETECTABLE WARNING TAPE SHALL BE BRIGHT COLORED, CONTINUOUSLY PRINTED, MINIMUM 6" WIDE BY 4 MIL THICK, MANUFACTURED FOR DIRECT BURIAL.
8. DETECTABLE WARNING TAPE NOT REQUIRED FOR IRRIGATION LINES.
9. GRAVEL ROADS SHALL USE PAVED AREA TRENCH SECTION BUT WITH AGGREGATE BASE TO SURFACE, UNLESS NOTED OTHERWISE.

DETAIL 1
NTS
(TYPICAL TRENCH)



NOTES:

1. ALL WATER SERVICE MATERIALS SHALL BE AS SPECIFIED IN THE DESIGN SPECIFICATIONS (OR APPROVED EQUAL).
2. FACTORY MANUFACTURED FITTINGS SHALL BE USED EXCLUSIVELY.
3. #10 COPPER TRACER WIRE WITH BLUE INSULATION SHALL BE TAPED TO ALL WATER MAINS, SERVICES, AND FITTINGS. TRACER WIRE SHALL BE SECURELY CONNECTED TO THE WATER MAIN TRACE WIRE AT ONE END, AND SHALL TERMINATE IN A LOOP JUST BELOW THE LID IN THE METER BOX AT THE OTHER END.
4. ALL WATER SERVICE SADDLES SHALL HAVE ALL EXPOSED NUTS AND BOLTS COMPLETELY COVERED WITH SPRAY-ON RUBBERIZED UNDERCOATING.
5. CONNECTIONS BETWEEN FITTINGS AND WATER SERVICE PIPING SHALL BE MADE WITH PACK JOINTS, AND STAINLESS STEEL INSERT STIFFENERS SHALL BE USED AS NEEDED WHEN CONNECTING WATER SERVICE PIPING TO PACK JOINTS.
6. NEW WATER SERVICES SHALL BE PUSHED OR BORED UNDER EXISTING SIDEWALK UNLESS NOTED OTHERWISE.
7. WHERE NO SIDEWALK EXISTS, CONSTRUCT A 4" THICK BY 6" CLEAR WIDTH CONCRETE COLLAR PAD FOR METER BOX SET.
8. PRIOR TO METER SET, ADDRESS TO BE CLEARLY MARKED ON UNDERSIDE BOX LID WITH PERMANENT FELT MARKER.

DETAIL 2
NTS
(WATER SERVICE)

APPROVED
APR 4 2024
Humboldt County
PLANNING

STEM EXTENTION FABRICATION NOTES

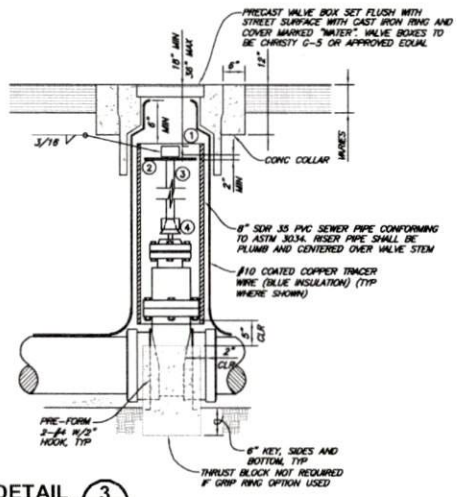
1. ALL WELDS TO RISER SHAFT SHALL BE FILLET WELD ALL AROUND, AS SPECIFIED BELOW.
2. ALL STEEL REQUIRED FOR RISER FABRICATION SHALL BE STRUCTURAL STEEL PER ASTM A36.

VALVE STEM EXTENTION PARTS LIST

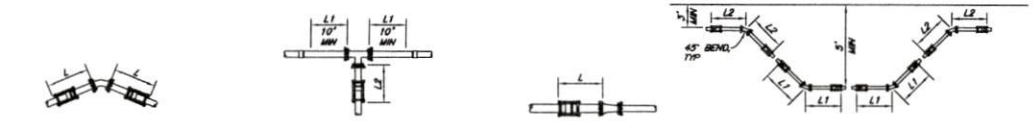
1. VALVE OPERATING NUT OR 1-7/8"x 1-7/8"x2" HIGH, SOLID STEEL WELDED TO RISER SHAFT.
2. 1/8" THKx7-1/2" DIA GUIDE PLATE WELDED TO RISER SHAFT.
3. 1-1/2"x3/16" SQUARE STEEL TUBING, LENGTH AS REQUIRED. EDGE WELD OPERATING NUT AT BOTH ENDS.
4. 2-1/2"x3/16" SQUARE STEEL TUBING 2-1/2" IN LENGTH WELDED TO RISER SHAFT.

NOTES:

1. IF VALVE IS INSTALLED SO THAT THE TOP OF THE OPERATING NUT IS LESS THAN 36" BELOW FINISHED GRADE, THE STEM RISER IS NOT REQUIRED.
2. ALL EXTERNAL BOLTS AND NUTS ON VALVES SHALL BE 304 STAINLESS STEEL OR VALVE ASSEMBLY SHALL BE POLY WRAPPED.
3. IF ENGLINE VALVE, THEN PROVIDE ADEQUATE THRUST BLOCKING & RESTRAINT OR FLANGED/MJ CONNECTION.
4. PROVIDE CLOW, WATEROUS, OR AVK VALVE.



DETAIL 3
NTS
(GATE VALVE INSTALLATION)



HORIZONTAL BENDS, DEAD ENDS, AND INLINE VALVES

Pipe Diam	11.25° Bend	22.5° Bend	45° Bend	90° Bend	Dead End & Valve, Tees
4"	3'	6'	13'	26'	53'
6"	4'	8'	17'	34'	68'
8"	5'	10'	21'	42'	85'
10"	6'	12'	26'	52'	104'
12"	7'	14'	30'	60'	122'
14"	8'	16'	34'	68'	138'
16"	9'	18'	38'	77'	156'
18"	10'	20'	43'	86'	174'

REQUIRED LENGTH (L) OF RESTRAINED PIPE FOR EACH SIDE OF BEND OR VALVE

REQUIRED LENGTH (L1) OF RESTRAINED PIPE FOR EACH SIDE OF DEAD END OR VALVE

TEES

Pipe Diam	4"	6"	8"	10"	12"	14"	16"	18"
4"	5'	5'	5'	5'	5'	5'	5'	5'
6"	5'	5'	5'	5'	5'	5'	5'	5'
8"	5'	5'	5'	5'	5'	5'	5'	5'
10"	5'	5'	5'	5'	5'	5'	5'	5'
12"	5'	5'	5'	5'	5'	5'	5'	5'
14"	5'	5'	5'	5'	5'	5'	5'	5'
16"	5'	5'	5'	5'	5'	5'	5'	5'
18"	5'	5'	5'	5'	5'	5'	5'	5'

BRANCH SIZE

REQUIRED LENGTH (L1) OF RESTRAINED PIPE

REQUIRED LENGTH (L) OF RESTRAINED PIPE

NOTE: ALL TEE RUNS SHALL HAVE 10' MINIMUM RESTRAINED RUN LENGTH ON EACH SIDE OF TEE.

REDUCERS

Pipe Diam	3"	4"	6"	8"	10"	12"	14"	16"	18"
3"	—	3'	6'	8'	10'	12'	13'	15'	16'
4"	3'	—	8'	11'	13'	15'	17'	19'	21'
6"	6'	8'	—	17'	20'	23'	26'	28'	31'
8"	8'	11'	17'	—	26'	31'	35'	38'	42'
10"	10'	13'	20'	26'	—	39'	44'	49'	53'
12"	12'	15'	23'	31'	39'	—	52'	58'	63'
14"	13'	17'	26'	35'	44'	52'	—	65'	71'
16"	15'	19'	28'	38'	49'	58'	65'	—	78'
18"	16'	21'	31'	42'	53'	63'	71'	78'	—

REQUIRED LENGTH (L) OF RESTRAINED PIPE (FOR LARGE SIDE OF REDUCER)

REQUIRED LENGTH (L) OF RESTRAINED PIPE

VERTICAL OFFSET

Pipe Diam	L1	L2
4"	4'	3'
6"	6'	4'
8"	7'	5'
10"	8'	6'
12"	9'	6'
14"	11'	8'
16"	12'	8'
18"	13'	9'

REQUIRED LENGTH OF RESTRAINED PIPE

NOTE: RESTRAINED JOINT LENGTHS BASED ON 45° FITTINGS.

NOTES:

1. JOINT RESTRAINT DEVICES SHALL BE USED IN LIEU OF THRUST BLOCKING FOR ALL PRESSURE MAIN AND APPURTENANCE INSTALLATIONS UNLESS PROJECT PLANS OR DESIGN CONDITIONS SPECIFICALLY REQUIRE THRUST BLOCKING.
2. THE RESTRAINED LENGTHS LISTED IN THE ABOVE TABLES ARE VALID FOR THE FOLLOWING INSTALLATION CONDITIONS:
   SOIL CLASSIFICATION: GW (ASTM STD. D2487); INCLUDES CLASS 2 AGGREGATE BASE BACKFILL
   TRENCH TYPE: TYPE 3 (AWWA C605)
   TEST PRESSURE: 150 PSI
   SAFETY FACTOR: 2 TO 1
   DEPTH OF BURY: 36" FROM SURFACE TO TOP OF PIPE
   PIPE TYPE: PVC C900
   WHERE INSTALLATION CONDITIONS DO NOT MATCH THOSE LISTED ABOVE, THE RESTRAINED LENGTHS SHALL BE REDALCULATED TO SUIT THE ACTUAL SITE CONDITIONS. ALL REVISED CALCULATIONS SHALL BE MADE WITH A TEST PRESSURE OF 150 PSI MINIMUM AND A SAFETY FACTOR OF 2. REVISED RESTRAINED LENGTHS SHALL BE APPROVED BY THE ENGINEER PRIOR TO PIPE INSTALLATION.
3. ALL RESTRAINT FITTINGS SHALL BE FACTORY MANUFACTURED AND APPROVED FOR USE BY THE ENGINEER PRIOR TO PIPE INSTALLATION. THE FOLLOWING RESTRAINT FITTINGS HAVE BEEN PREQUALIFIED FOR USE:
   MECHANICAL JOINT GLANDS: ROMAC "GRIPRING" PIPE RESTRAINER
   EBBA IRON SERIES 2000 PV
   BELL AND SPIGOT JOINTS: ROMAC MODEL 611 (4" THROUGH 8")
   EBBA IRON SERIES 1600 (4" THROUGH 12")
   EBBA IRON SERIES 2800 (14" THROUGH 36")
4. ALL MECHANICAL JOINT CONNECTIONS AT FITTINGS SHALL BE RESTRAINED.

DETAIL 4
NTS
(RESTRAINED JOINTS)

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

812 W. WABASH AVE.
EUREKA, CA 95501
707-441-8855

NO.	DATE	REVISION	BY

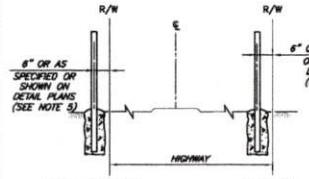
DESIGN -
DR JMF/CDM
CHK JSG
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
CARBERVILLE, CALIFORNIA

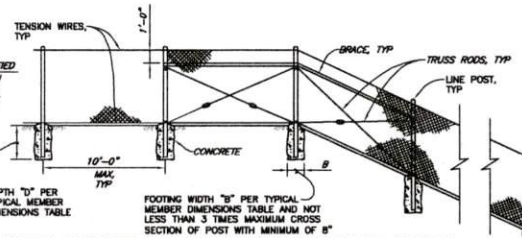
CIVIL DETAILS

SHEET C8.1
SEQ
DATE 09/2023
PROJ. NO. 022067

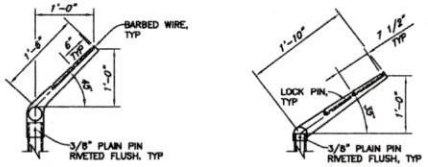
SAVED: 9/26/2023 12:22 PM JFOSTER PLOTTED: 10/4/2023 8:24 AM NEWELL, CHRIS
A:\Eureka\2022\022067-CSD-Water\Dwgs\022067-DETAILS.dwg



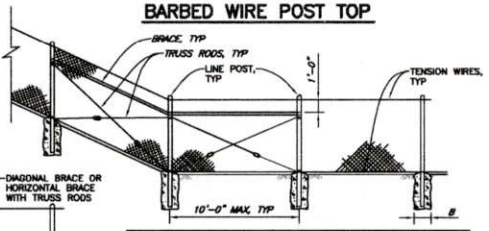
FENCE LOCATION

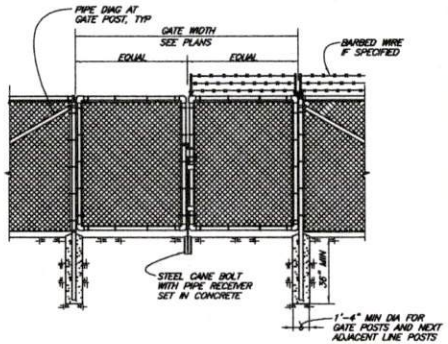


CHAIN LINK FENCE ON SHARP BREAK IN GRADE



BARBED WIRE POST TOP





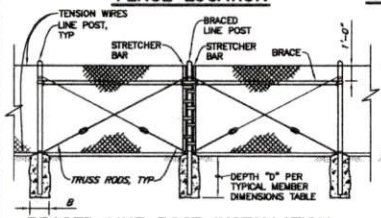
NOTE:

1. LATCH MECHANISM SHALL BE LOCKABLE. FREE END OF GATES SHALL BE EQUIPPED WITH DEVICES TO HOLD BOTH GATES IN THE OPEN POSITION.
2. FENCE AND DOUBLE LEAF SWING GATE PER CALTRANS STANDARD DETAIL A-85.

DETAIL 2

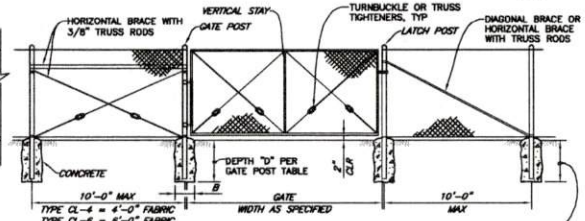
NTS

(CHAIN LINK DOUBLE-SWING GATE)



BRACED LINE POST INSTALLATION

BRACED LINE POST AT INTERVALS NOT EXCEEDING 1000'



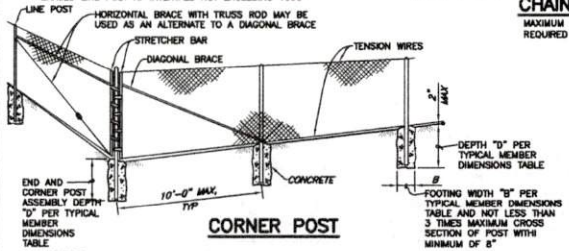
CHAIN LINK GATE INSTALLATION

MAXIMUM GATE WIDTH IS 12'-0" VERTICAL STAY IS REQUIRED IN MIDDLE OF GATE GREATER THAN 8'-0" WIDTH

GATE POST

FENCE HEIGHT (MAX)	SLATTED	B (IN)	D (FT)	ROUND PIPE SECTION	ROUND PIPE ROUND OD PIPE	ROUND PIPE WEIGHT (LB/FT)
5'-0"	NO	12"	2'-6"	3 Std	3.50"	7.58
6'-0"	NO	12"	2'-6"	3 Std	3.50"	7.58
8'-0"	NO	12"	3'-0"	3 Std	3.50"	7.58
10'-0"	NO	14"	3'-6"	3 Std	3.50"	7.58
5'-0"	YES	12"	3'-0"	3½ Std	4.00"	9.12
6'-0"	YES	14"	3'-6"	4 Std	4.50"	10.80
8'-0"	YES	18"	3'-6"	5 Std	5.56"	14.60
10'-0"	YES	20"	4'-0"	6 Std	6.63"	19.00

ABOVE POST DIMENSIONS AND WEIGHTS ARE MINIMUMS. LARGER SIZES MAY BE USED UPON APPROVAL.



CORNER POST

TYPICAL MEMBER DIMENSIONS (SEE NOTES)

FENCE HEIGHT (MAX)	SLATTED	B (IN)	D (FT)	LINE POSTS ROUND PIPE SECTION	LINE POSTS ROUND PIPE ROUND OD PIPE	LINE POSTS ROUND PIPE WEIGHT (LB/FT)	LINE POSTS ROLL FORMED SECTION	LINE POSTS ROLL FORMED WEIGHT (LB/FT)	BRACES ROUND PIPE SECTION	BRACES ROUND PIPE ROUND OD PIPE	BRACES ROUND PIPE WEIGHT (LB/FT)	BRACES ROLL FORMED SECTION	BRACES ROLL FORMED WEIGHT (LB/FT)
5'-0"	NO	8"	2'-6"	1½ Std	1.90"	2.72	1.875" x 1.625"	1.85	1½" Std	1.90"	2.72	1.625" x 1.250"	1.35
6'-0"	NO	10"	2'-6"	2 Std	2.38"	3.66	1.875" x 1.625"	2.40	2 Std	2.38"	3.66	1.625" x 1.250"	1.35
8'-0"	NO	12"	3'-0"	2½ Std	2.88"	5.80	3.250" x 2.500"	4.50	2 Std	2.38"	3.66	1.625" x 1.250"	1.35
10'-0"	NO	14"	3'-6"	3 Std	3.50"	7.58	3.250" x 2.500"	4.50	2½ Std	2.88"	5.80	1.625" x 1.250"	1.35
5'-0"	YES	12"	3'-0"	3½ Std	4.00"	9.12	N/A	-	2 Std	2.38"	3.66	N/A	-
6'-0"	YES	14"	3'-0"	4 Std	4.50"	10.80	N/A	-	2 Std	2.38"	3.66	N/A	-
8'-0"	YES	18"	3'-6"	5 Std	5.56"	14.60	N/A	-	2 Std	2.38"	3.66	N/A	-
10'-0"	YES	20"	4'-0"	6 Std	6.63"	19.00	N/A	-	2½ Std	2.88"	5.80	N/A	-

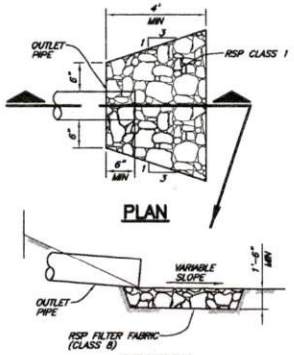
NOTES:

1. THE TABLE TO THE RIGHT SHOWS MINIMUM SIZED POSTS AND BRACES COMPLYING WITH THE SPECIFICATIONS. LARGER OR HEAVIER POST AND BRACE SIZES MAY BE USED UPON APPROVAL.
2. SECTIONS SHOWN IN THE TABLES MUST ALSO COMPLY WITH STRENGTH REQUIREMENTS AND OTHER PROVISIONS OF THE SPECIFICATIONS.
3. OTHER SECTIONS WHICH COMPLY WITH THE STRENGTH REQUIREMENTS AND OTHER PROVISIONS OF THE SPECIFICATIONS MAY BE USED UPON APPROVAL.
4. OPTIONS EXERCISED SHALL BE UNIFORM ON ANY ONE PROJECT.
5. OFFSET TO BE 2'-0" AT MONUMENT LOCATIONS, MEASURED AT RIGHT ANGLES TO R/W LINES. TAPER TO ACHIEVE OFFSET TO BE AT LEAST 20'-0" LONG.
6. SEE STANDARD PLAN A88B FOR BRACE, STRETCHER BAR, AND TRUSS TIGHTENER DETAILS.

DETAIL 1

NTS

(SECURITY FENCE)



SECTION

DETAIL 3

NTS

(RSP ENERGY DISSIPATOR)

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

812 W. WABASH AVE.
EUREKA, CA. 95501
FAX 707-441-8166
707-441-8855

NO.	DATE	REVISION	BY

DESIGN -
DR WF/DN
CHK JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WILLIAMS LIFT STATIONS REPLACEMENT
CARBERVILLE, CALIFORNIA

CIVIL DETAILS

SHEET C8.2
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 9/26/2023 12:22 PM JFOSTER, PLOTTED: 10/4/2023 8:24 AM NEWELL, CHRIS
A:\Eureka\2022\022067-CSD-Winter\Dwgs\022067-DETAILS.dwg

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
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812 W. WABASH AVE.
EUREKA, CA. 95501
WWW.SHN-ENG.COM
707-441-8855

NO.	DATE	REVISION	BY

DESIGN PEG
DR JWF/CDM
CHK JSO
APVD

GARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

STRUCTURAL NOTES AND LEGEND

SHEET S0.1
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 9/28/2023 12:02 PM JFOSTER, PLOTTED: 10/4/2023 8:24 AM NEWELL, CHRIS
P:\Curves\2022\022067-GSD-Water\Dwgs\022067-STRCT-NOTES-LEGEND.dwg

SAVED: 9/26/2023 12:02 PM JFOSTER, PLOTTED: 10/4/2023 8:24 AM NEWELL, CHRIS
P:\Eureka\2022\022067-GSD-Water\Dwgs\022067-STRCT-SPCL-INSPCT.dwg

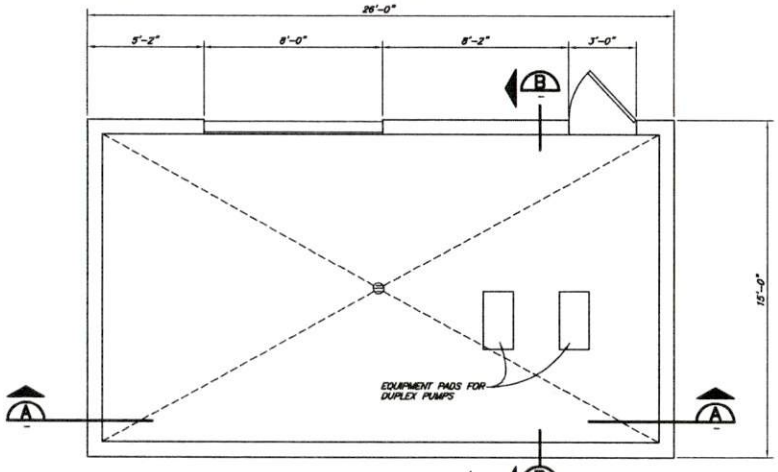
APPROVED
Humboldt County
PLANNING

60% DESIGN

PROJ. NO. 022067	DATE 09/2023	SEQ	SHEET S0.2	GARBERVILLE SANITARY DISTRICT ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT GARBERVILLE, CALIFORNIA STRUCTURAL SPECIAL INSPECTIONS	DSGN PEG DR JWF/CDN CHK JSO APVD	NO.	DATE	REVISION	BY

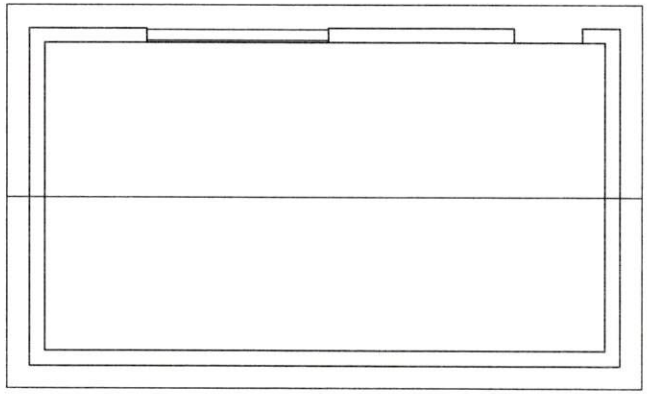
SHN
812 W. WABASH AVE.
EUREKA, CA. 95501
WWW.SHN-ENGR.COM
707-441-8855

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

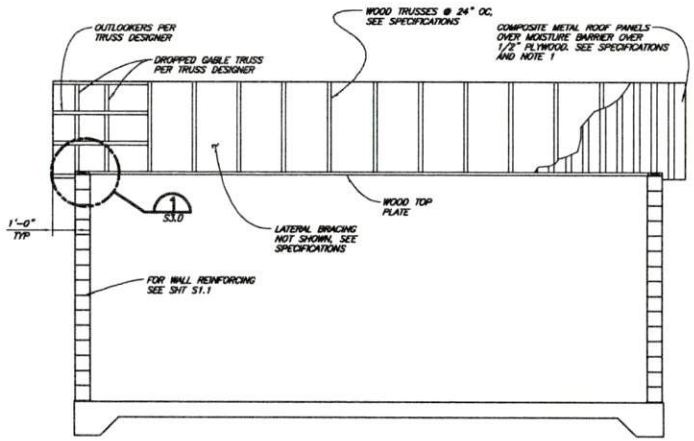


NOTE:
f =4,000 PSI
f =60,000 PSI

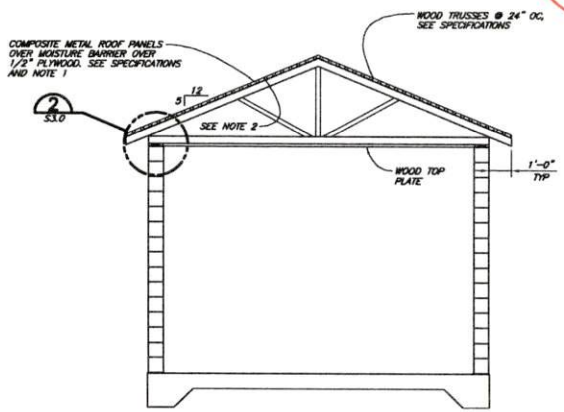
FLOOR PLAN
3/8"=1'-0"



ROOF PLAN
3/8"=1'-0"



SECTION A
3/8"=1'-0"



SECTION B
3/8"=1'-0"

NOTES:

1. PLYWOOD SHALL HAVE PANEL SPAN RATING ROOF/FLOOR OF 24/16. PROVIDE EDGE SUPPORT.
2. PAINT INTERIOR FACE OF PLYWOOD WITH ONE COAT OF PRIMER AND TWO COATS OF ENAMEL. COLOR TO BE APPROVED BY OWNER.
3. ALL DIMENSIONS FOR OPENINGS IN CMU ARE NOMINAL. CONTRACTOR TO ADJUST PER BLOCK CONSTRUCTION.

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING 1"
IF NOT ONE INCH, ADJUST THIS SHEET ACCORDINGLY SCALES ACCORDINGLY

812 W. WABASH AVE.
EUREKA, CA. 95501
WWW.SHN-ENGR.COM
707-441-8855

NO.	DATE	REVISION	BY

DESIGN PEG
DR. JWF/CDN
CHK. JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

UPPER MAPLE LANE PUMP STATION PLAN AND SECTIONS

SHEET S1.0
SEQ
DATE 09/2023
PROJ. NO. 022067

SAVED: 9/29/2023 12:40 PM JFOSTER, PLOTTED: 10/4/2023 8:24 AM NEWELL, CHRIS
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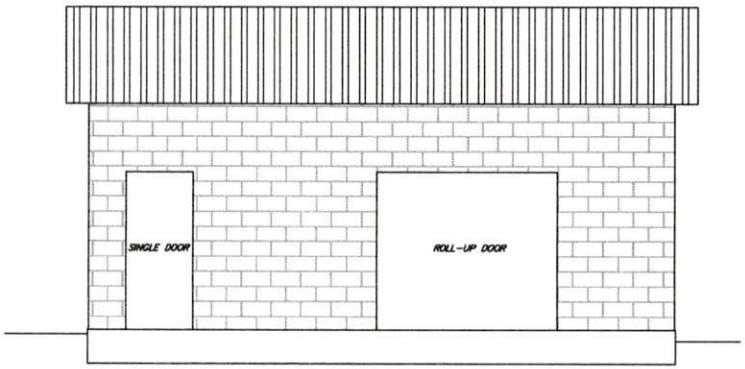
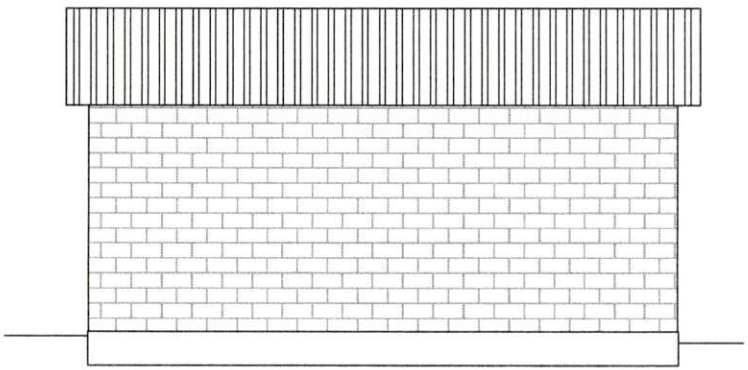


NORTH ELEVATION
3/8"=1'-0"



SOUTH ELEVATION
3/8"=1'-0"

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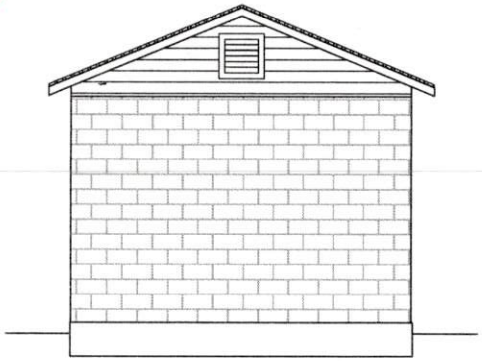
Humboldt County
PLANNING



EAST ELEVATION
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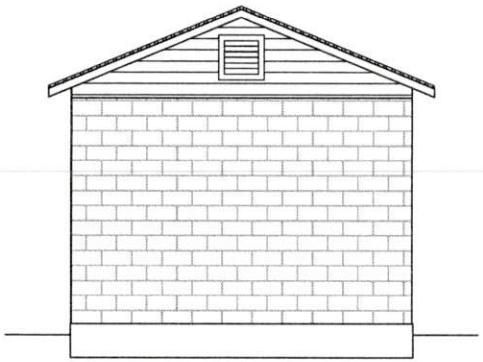

WEST ELEVATION
3/8"=1'-0"

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SWA
812 W. WABASH AVE.
EUREKA, CA 95501
707-441-8855

NO.	DATE	REVISION	BY

DESIGN PEG
DR JWF/CDN
CHK JSO
APVD

GARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

UPPER MAPLE LANE PUMP STATION REINFORCING DETAILS

SHEET S1.1
SEQ
DATE 09/2023
PROJ. NO. 022067

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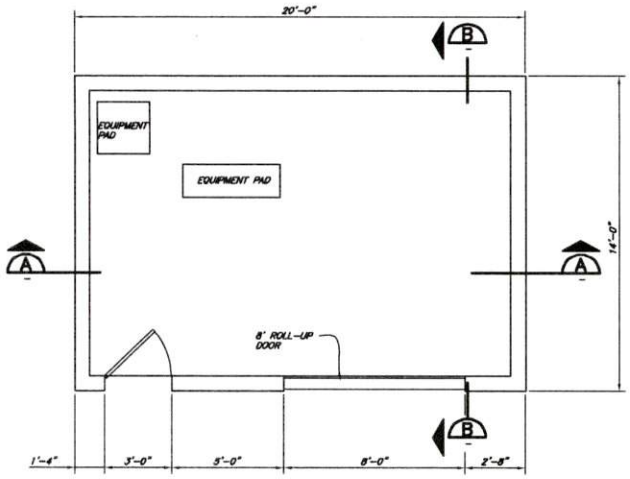
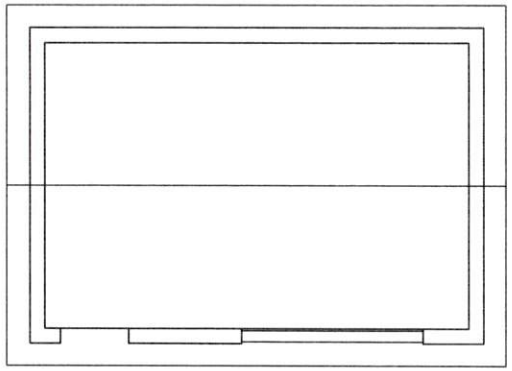
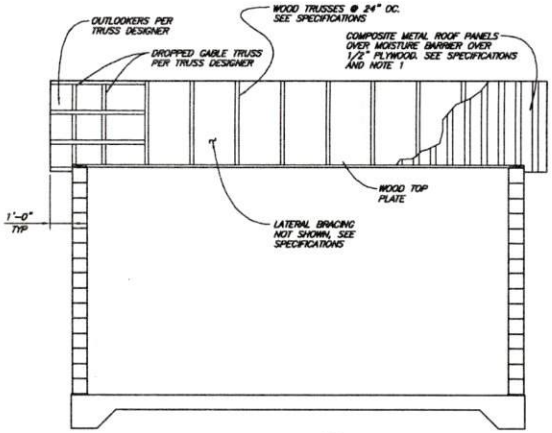


NOTE:
f' =4,000 PSI
f' =60,000 PSI

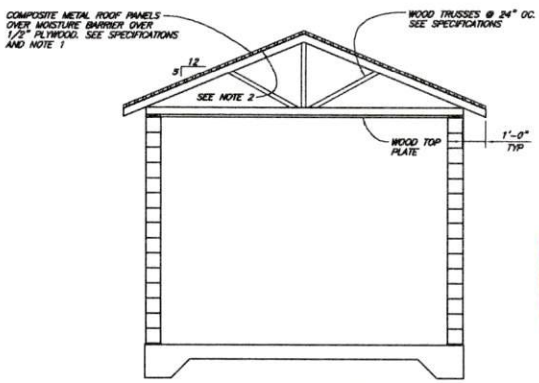
FLOOR PLAN
3/8"=1'-0"



ROOF PLAN
3/8"=1'-0"



SECTION A
3/8"=1'-0"



SECTION B
3/8"=1'-0"

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Humboldt County
PLANNING

NOTES:
1. PLYWOOD SHALL HAVE PANEL SPAN RATING ROOF/FLOOR OF 24/16. PROVIDE EDGE SUPPORT.
2. PAINT INTERIOR FACE OF PLYWOOD WITH ONE COAT OF PRIMER AND TWO COATS OF ENAMEL. COLOR TO BE APPROVED BY OWNER.
3. ALL DIMENSIONS FOR OPENINGS IN CMU ARE NOMINAL, CONTRACTOR TO ADJUST PER BLOCK CONSTRUCTION.

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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812 W. WABASH AVE.
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DESIGN -
DR CDN/JWF
CHK JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
CARBERVILLE, CALIFORNIA

ALDERPOINT PUMP STATION PLAN AND SECTIONS

SHEET S2.0
SEQ
DATE 09/2023
PROJ. NO. 022067

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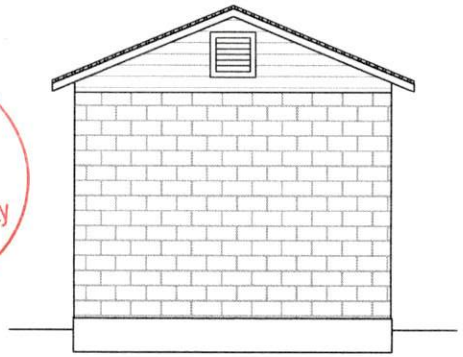
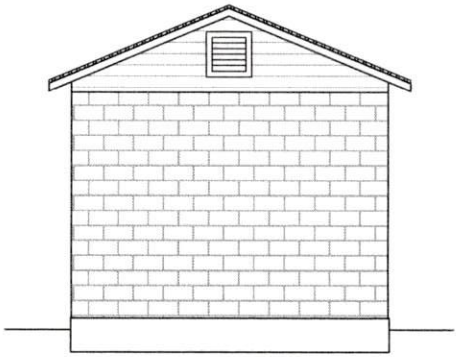
APPROVED
APR 4 2024
Humboldt County
PLANNING



NORTH ELEVATION
3/8"=1'-0"



SOUTH ELEVATION
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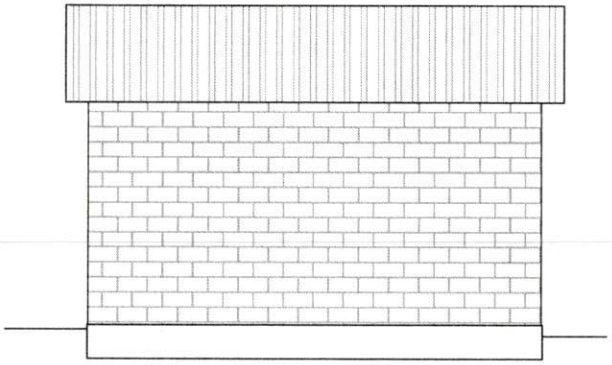
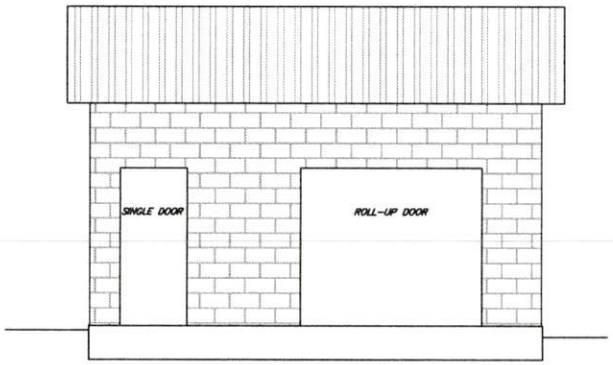


EAST ELEVATION
3/8"=1'-0"



WEST ELEVATION
3/8"=1'-0"

60% DESIGN

VERIFY SCALES
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0 1"
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707-441-8855

NO.	DATE	REVISION	BY

DESIGN -
DR CDN/JWT
CHK JSO
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

ALDERPOINT PUMP STATION REINFORCING DETAILS

SHEET S2.1
SEQ
DATE 09/2023
PROJ. NO. 022067

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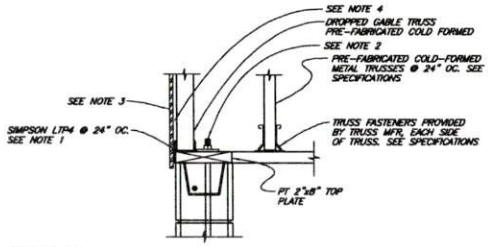
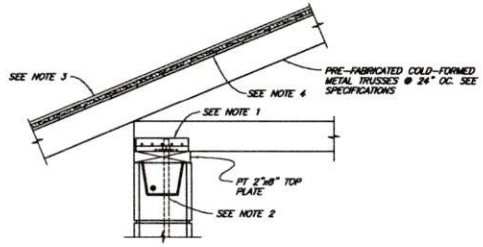


NOTES:

1. NAIL LTP4 TO TOP PLATE PER SIMPSON INSTRUCTIONS. SCREW TO TRUSS W/6-#10 SELF-DRILLING SCREWS.
2. 5/8" DIA ANCHOR BOLTS W/15" MIN EMBEDMENT. PLACE IN GROUTED CELLS. DO NOT EXCEED 48" OC SPACING. INSTALL W/1/4"x3"x3" WASHER.
3. COMPOSITE METAL WALL PANELS TO MATCH ROOFING OVER MOISTURE BARRIER OVER 1/2" PLYWOOD SHEETING. SEE SPECIFICATIONS.
4. PAINT INTERIOR FACE OF PLYWOOD WITH ONE COAT OF PRIMER AND TWO COATS OF ENAMEL. COLOR TO BE APPROVED BY OWNER.

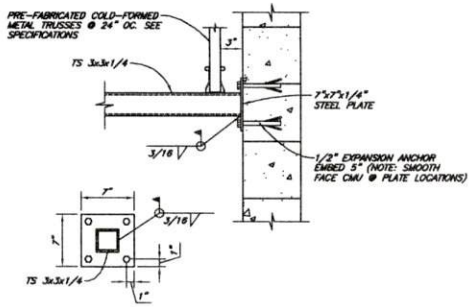
DETAIL 1 (S1.0,S2.0)
NTS
(CORNER CONNECTION)



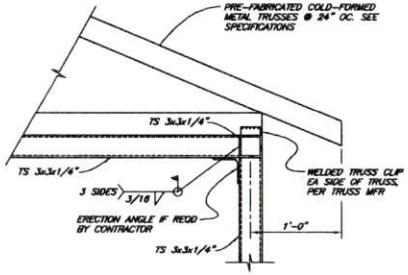
NOTES:

1. TRUSS FASTENERS EACH SIDE OF TRUSS. PROVIDED BY TRUSS MFR.
2. 5/8" DIA ANCHOR BOLTS W/15" MIN EMBEDMENT. PLACE IN GROUTED CELLS. DO NOT EXCEED 48" OC SPACING. INSTALL W/ 1/4"x3"x3" WASHER.
3. COMPOSITE METAL ROOF PANELS OVER MOISTURE BARRIER OVER 1/2" PLYWOOD. SEE SPECIFICATIONS.
4. PAINT INTERIOR FACE OF PLYWOOD WITH ONE COAT OF PRIMER AND TWO COATS OF ENAMEL. COLOR TO BE APPROVED BY OWNER.

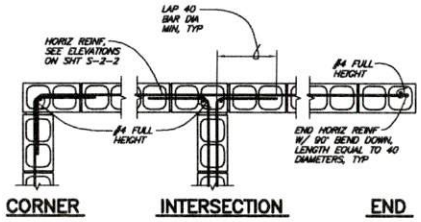
DETAIL 2 (S1.0,S2.0)
NTS
(CORNER CONNECTION)



DETAIL 3 (–)
NTS
(ROOF SUPPORT CONNECTION)



DETAIL 4 (S1.0,S2.0)
NTS
(CORNER CONNECTION)



TYPICAL CMU WALL REINFORCING
NTS

APPROVED
APR 4 2024
Humboldt County
PLANNING

60% DESIGN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING 1"
0 1 2 3 4 5
IF NOT ONE INCH, THEN SCALE REQUIRED SCALES ACCORDINGLY

SHN
812 W. WABASH AVE.
EUREKA, CA. 95501
707-441-8855
707-441-8822
EUREKA@SHN-ENG.COM

NO.	DATE	REVISION	BY

DESIGN –
DR CDW/JWF
CHK JSO
APVD

GARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

STRUCTURAL DETAILS

SHEET S3.0
SEQ
DATE 09/2023
PROJ. NO. 022067

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APPEALS OF PLANNING COMMISSION ACTIONS

WHO MAY APPEAL?

County Ordinance and State Law provides the opportunity for the applicant or any other person who disagrees with the Planning Commission's decision to approve, conditionally approve, or deny a project, to appeal that decision to the Board of Supervisors.

WHAT CONSTITUTES A FORMAL APPEAL?

All appeals must be submitted in writing and must be accompanied by the fee established for appeals by the Board of Supervisors. The person filing the appeal shall state specifically why the decision of the Planning Commission is not in accord with the standards and regulations of the zoning ordinances, or why it is believed that there was an error or an abuse of discretion by the Planning Commission. A copy of the receipt can be used as proof of payment when filing with the Clerk of the Board.

WHAT IS THE FEE FOR FILING AN APPEAL?

The County's adopted schedule of fees and charges establishes fees for appeals of Planning Commission actions. Appeal fees include charges by other County departments (e.g., Division of Environmental Health or Public Works Land Use). If the appeal does not involve issues within the jurisdiction of a particular County department, it may be possible to reduce the appeal fee by the amount normally collected. This can be done by providing a written fee waiver authorization from that department with the appeal request. Please contact the Planning Division for updated fee information.

WHERE IS AN APPEAL FILED?

The appeal must be filed with the Planning Division at the Clark Complex, 3015 H Street, Eureka, CA 95501. However, for subdivisions and subdivision map extensions not involving property in the Coastal Zone, a copy of the appeal and proof of payment of the appeal fees must also be filed with the Clerk of the Board of Supervisors, in Room #111 of the Humboldt County Courthouse, 825 Fifth Street, Eureka, CA 95501.

HOW LONG DO I HAVE TO FILE AN APPEAL?

Subdivisions, discretionary permits and variances have different appeal filing periods and procedures under the law. Please refer to the back of this sheet for the specific ordinance requirements. The following information may be used for guidance.

Permit Type	Appeal Filing Period	Where To File
Subdivisions	10 calendar days	Planning Division and Clerk of the Board
Subdivision Map Extensions	15 calendar days (Appealable only if denied)	Planning Division and Clerk of the Board
Subdivisions in the Coastal Zone	10 calendar days	Planning Division only
Lot Line Adjustments	10 calendar days	Planning Division only
Permits and Variances In the Coastal Zone	10 working days	Planning Division only
Permits and Variances outside of the Coastal Zone (Inland Zoning)	10 working days	Planning Division

"Working Day" appeal periods begin the very next business day after the decision is made and end at 5:00 p.m. on the tenth (10th) business day counting sequentially (weekends and County-recognized holiday days are excluded as they are not normal working days).
"Calendar Day" appeal periods begin the very next day after the decision is made and end at 5:00 p.m. on the final appeal day by counting sequentially, unless the last day is a weekend or County-recognized holiday, then the appeal period would end on 5:00 p.m. the next business day following the weekend or County-recognized holiday.

WHAT IF THE "PROJECT" INVOLVES MULTIPLE PERMIT TYPES?

Different permit types have different appeal periods. If you wish to appeal a project as a whole, the most restrictive (i.e., shortest time period) appeal period must be used. If you wish to appeal a specific permit involved in the project, the appeal period for that specific permit must be followed. Failing to file an appeal in the correct timeframe can invalidate the appeal.

QUESTIONS?

For more information or if you have questions regarding the appeal process, contact the Planning Division at (707)445-7541.

REGULATIONS GOVERNING APPEALS OF DECISIONS
BY THE HEARING OFFICER

COASTAL ZONING REGULATIONS

Section 312-13. Appeal Procedures.

Appeals to the Board of Supervisors. Any person, as defined in Chapter 2, aggrieved by an action or the Hearing Officer may appeal such action to the Board of Supervisors by filing a notice of appeal with the Planning Division of the Planning and Building Department within ten (10) working days of said action. Upon receipt of the notice of appeal, the Planning Division shall transmit to the Clerk of the Board a copy of the notice of appeal. An appeal fee as set by resolution of the Board of Supervisors shall be paid when the appeal is filed.

Grounds for Appeals. The Planning Division shall provide a standard form on which the appellant shall state specifically why the decision of the Hearing Officer is not in accord with the standards and regulations of the zoning ordinance, or why it is believed that there was an error or an abuse of discretion by the Hearing Officer.

INLAND (NON-COASTAL) ZONING REGULATIONS

Section 312-13. Appeals to the Board of Supervisors

Except as otherwise stated in this Code, any person, as defined in this Code, aggrieved by an action taken by the Hearing Officer on any completed application, may appeal such action to the Board of Supervisors by filing a notice of appeal with the Department within ten (10) working days of said action. Appeals on Coastal Development Permits for subdivisions shall be filed within ten (10) calendar days of the decision of the Hearing Officer. Upon receipt of the notice of appeal, the Planning Division of the Planning and Building Department shall transmit to the Clerk of the Board a copy of the notice of appeal. An appeal fee as set by resolution of the Board of Supervisors shall be paid when the appeal is filed. This section does not apply to a rezoning or an amendment to this division.

SUBDIVISION REGULATIONS AND STATE SUBDIVISION MAP ACT

325-8. APPEALS (Subdivision Projects)

The subdivider, any interested person or any public entity may appeal any action of the Advisory Agency to the Board of Supervisors. (Note: Appeals are processed in accordance with the following sections of the California Government Code: §66451.3, 66452.5, 66452.6(e) and 66474.7.)

325.5-10. APPEALS (Lot Line Adjustments)

Any person aggrieved by an action of the Planning Director or Planning Commission may take an appeal to the Board of Supervisors by filing a notice of appeal with the Planning Division of the Planning and Building Department and with the clerk of the Board of Supervisors within ten (10) days of said action. The notice of appeal filed with the Planning Division shall be accompanied by a fee set by resolution of the Board of Supervisors sufficient to cover the cost of processing the application for appeal. Upon receipt of the notice of appeal, the Planning Division shall forthwith transmit to the Board of Supervisors all the papers constituting the record upon which the action appealed from was taken.

COUNTY OF HUMBOLDT

JOHN BARTHOLOMEW
TREASURER—TAX COLLECTOR
825 Fifth Street Room 125
Eureka, California 95501

Phone: 707-476-2450
Fax: 707-445-7608
Toll Free: 877-897-5692
email: taxinfo@co.humboldt.ca.us

TAX COLLECTION INFORMATION
Important: all taxes and assessments must be paid in full before any parcel changes are recorded.

SUBDIVISION OR COMBINING LAND PARCELS
To complete the recording of any map change (subdivision or any combinations), the Treasurer-Tax Collector's office should be contacted to determine (1) if any taxes or assessments need payment and (2) if a tax performance bond is necessary. There is an application fee of $140.00 to provide this information.

If the map is recorded between:

January 1 and October 31:

A. All delinquent property taxes (secured and unsecured) must be paid in full.
B. Bonded assessments usually must be paid in full.
C. Current fiscal year taxes must be paid in full.
D. A deposit in the estimated amount of the tax for the next fiscal year, which becomes a lien on January 1, must be posted with the Treasurer.

November 1 and December 31:

A. All delinquent property taxes (secured and unsecured) must be paid in full.
B. Bonded assessments usually must be paid in full.
C. Current fiscal year taxes must be paid in full.

LOT LINE ADJUSTMENTS
It is to your benefit to make sure all taxes through the current tax year are paid before completing a lot line adjustment. Unpaid taxes could "cloud" title to all involved properties and could prevent combining property to simplify tax assessment. The Treasurer-Tax Collector's office should be contacted to determine if any taxes are unpaid.

FOR MORE INFORMATION
Please contact the Humboldt County Tax Collector's office at 707-476-2450, from 8:30 am to noon, and 1:00 pm to 5:00 pm, Monday through Friday.

Geotechnical Investigation Report

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Engineering Geologic and Geotechnical Investigation Report—Revision 1

Proposed Water System Improvements for the Garberville Sanitary District, Humboldt County, California

Prepared for:

Garberville Sanitary District

October 2023

022067

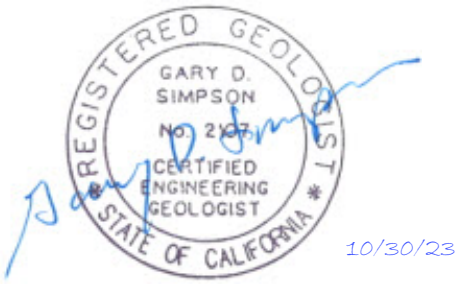
Phone: (707) 441-8855 **Email:** info@shn-engr.com
Web: shn-engr.com • 812 W. Wabash Avenue, Eureka, CA 95501-2138

Engineering Geologic and Geotechnical Investigation Report—Revision 1

Proposed Water System Improvements for Garberville Sanitary District, Humboldt County, California

Prepared for:

Garberville Sanitary District



Gary Simpson, CEG 2107
Sr. Engineering Geologist

Prepared by:

812 W. Wabash Ave.
Eureka, CA 95501-2138
(707) 441-8855

John H. Dailey, GE 256
Sr. Geotechnical Engineer

October 2023

QA/QC: GDS GDS
Reference: 022067

Table of Contents

Appendices

List of Illustrations

Figures **Follows Page**

Tables **Page**

Abbreviations and Acronyms

Units of Measure

Term	Definition
µm	micrometers
H	height of the wall
H:V	horizontal to vertical
mg/kg	milligrams per kilogram
mm	millimeters
mV	millivolts
ohms-cm	ohms-centimeter
pcf	pounds per cubic foot
pci	pounds per cubic inch
ppm	parts per million
psf	pounds per square foot
psi	pounds per square inch

Additional Terms

Term	Definition
AB	aggregate base
APN	Assessor's parcel number
ASCE	American Society of Civil Engineers
ASTM	ASTM-International
BGS	below ground surface
CBC	California Building Code
CEQA	California Environmental Quality Act
CGS	California Geologic Survey
GSD	Garberville Sanitary District
I.D.	internal diameter
MTJ	Mendocino Triple Junction
NAVD88	North American vertical datum, 1988
OSHA	Occupational Safety and Health Administration
PGA_M	Site modified peak ground acceleration
redox	reduction and oxidation potential
SE	sand equivalent
SPT	standard penetration test

Introduction

This report presents the results of SHN's investigation of geologic and geotechnical site conditions for proposed water distribution system improvements for the Garberville Sanitary District (GSD), in Garberville, Humboldt County, California. Improvements to the water distribution system are proposed to improve stability and reliability of the existing piping. Proposed new water storage tanks are intended to increase the water storage capacity for potable water and fire suppression for the community of Garberville.

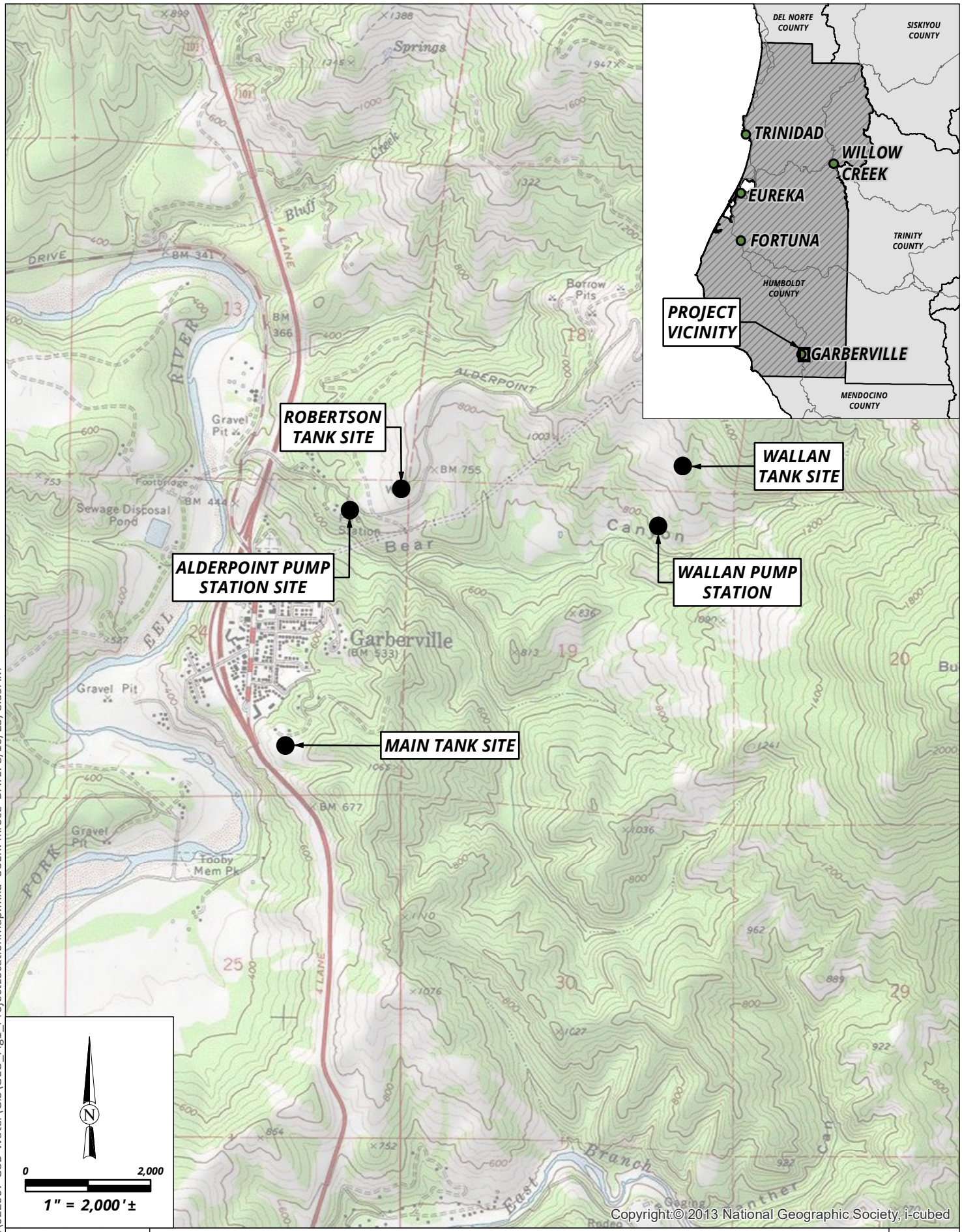
Our geotechnical investigation was completed to inform the project design team and to provide the necessary background information for Humboldt County and California Environmental Quality Act (CEQA) permitting. Our assessment focuses on characterization of the geologic conditions (geohazards) at the proposed water tanks, water lines, and pump station sites, and development of geotechnical recommendations relative to the construction of new water storage tanks and associated infrastructure. This report is intended to address all the items on the "Soils Engineering/Engineering Geology Report Checklist" provided on the Humboldt County Planning and Building Department's website (Humboldt County, 2008).

Project Location and Description

Garberville Sanitary District serves the unincorporated town of Garberville and surrounding area with sewer, wastewater, and water services. GSD owns, operates, maintains, and manages the public drinking water system, which includes two drinking water sources, water treatment facilities, three finished water storage tanks currently in service, multiple pumping stations, and a distribution piping network. GSD's service area covers 581 acres, and the water system serves approximately 1,200 people in the Garberville community. The area is topographically rugged, and the water system crosses a variety of terrain. The project elements requiring geotechnical consideration occur at five locations in the Garberville vicinity referred to as "Main Tank," "Wallan Tank," "Alderpoint Pump Station," "Robertson Tank," and "Wallan Pump Station" (Figure 1).

Specifically, elements of the project requiring geotechnical consideration include the following:

- Construction of a partially buried, approximately 550,000-gallon water storage tank (Main Tank), pump station (Maple Lane Pump Station), generator, and waterlines
- Installation of a buried waterline at the Main Tank site
- Replacement of the Wallan Tank with an aboveground steel tank
- Construction of a new pump station (Alderpoint Pump Station) across Alderpoint Road from the existing Arthur Road Pump Station. The new Alderpoint Pump Station will replace the existing Arthur Road Pump Station
- Visual evaluation of the stability of the Wallan Pump Station
- Demolition of the Robertson Tank



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Garberville Sanitary District
Garberville Water System Improvements
Garberville, California

Project Location Map

August 2023 - 022067

Figure

1

Scope of Work

The scope of SHN's services included reviewing available geologic and subsurface information; field reconnaissance; overseeing the advancement of geotechnical borings; performing laboratory testing on selected soil samples; and providing engineering geologic and geotechnical recommendations to aid in project planning, design, and construction.

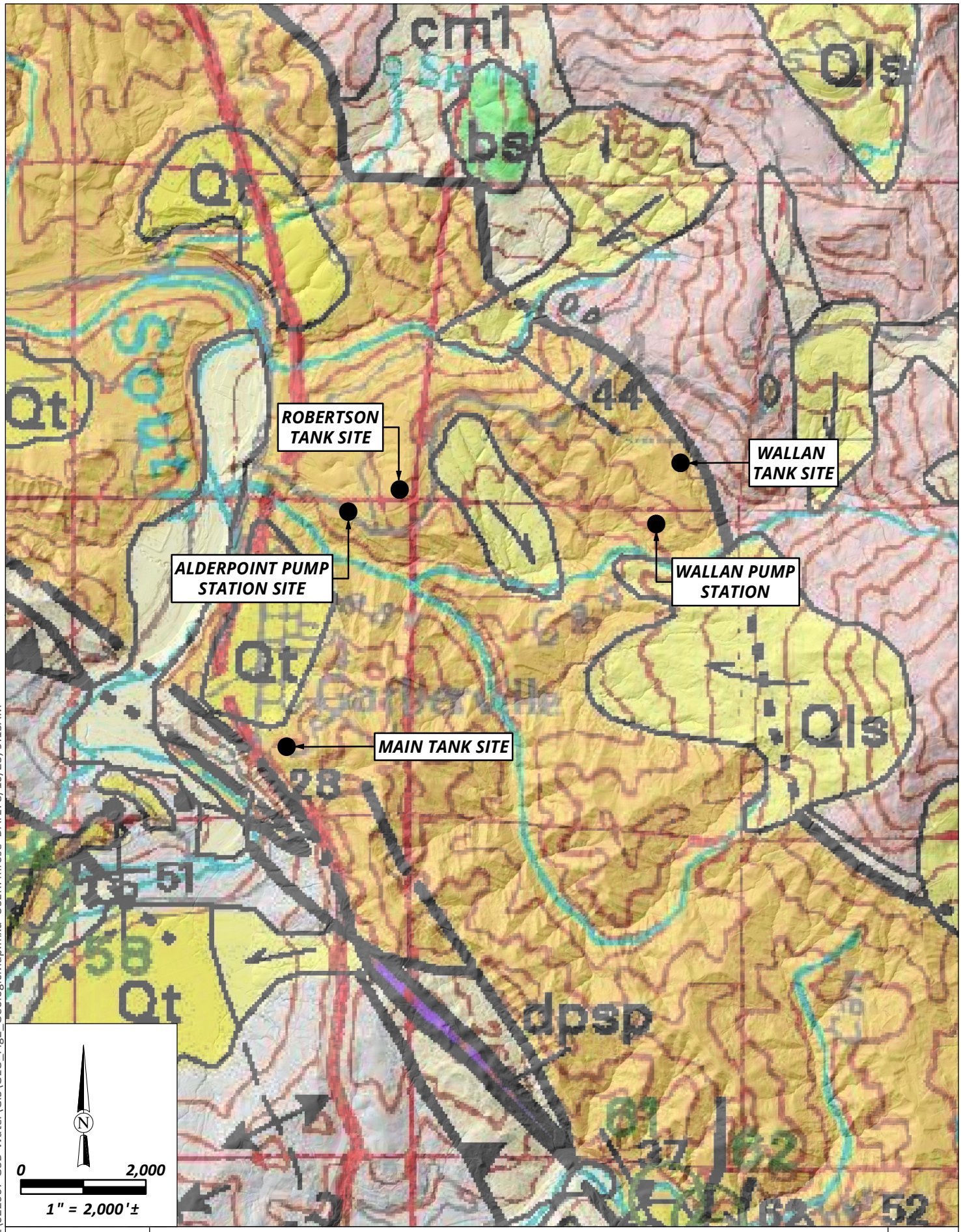
Specifically, the following information, recommendations, and design criteria are presented in this report:

- description of site terrain and local geology;
- engineering geologic assessment of sites where there are stability concerns;
- description of soil and groundwater conditions at the proposed water tank and pump station sites, based on our field exploration, laboratory testing, and review of existing geotechnical information;
- logs of the exploratory geotechnical borings at the proposed water tank and pump station sites (Appendix 1) and the results of laboratory tests conducted for this investigation (Appendix 2);
- assessment of potential earthquake-related geologic/geotechnical hazards (for example, strong earthquake ground shaking, surface fault rupture, liquefaction, settlement);
- seismic design parameters in accordance with the applicable portions of the 2022 California Building Code (CBC) and American Society of Civil Engineers (ASCE) 7-16 Standard, including site soil classification, seismic design category, and spectral response accelerations;
- recommendations for site improvements, including site and subgrade preparation, fill material, placement, and compaction requirements;
- recommendations for foundation type and design criteria, including bearing capacity, along with provisions to mitigate the effects of adverse soil conditions, as appropriate;
- expected total and differential settlement; and
- recommendations for observation of foundation installation, materials testing and inspection, and other construction considerations.

Geologic Setting

The project area is located within the western portion of the Coast Range Geomorphic Province in southern Humboldt County, California. The site is located in a complex and dynamic geologic environment, approximately 40 miles southeast of Cape Mendocino. Cape Mendocino marks the intersection of three crustal plates known as the Mendocino Triple Junction (MTJ) and is characterized by active tectonic deformation and high rates of seismicity.

Geologic mapping of the area (Figure 2) shows that the water system is underlain by bedrock associated with the Quaternary-Tertiary-aged undifferentiated Wildcat Group (Spittler, 1984). Bedrock associated with the Broken Formation of the Cretaceous-Jurassic aged Franciscan Complex is located directly east of the Wallan Tank in the northeastern part of the project area. The two geologic units are separated along a northwest-trending contact, which is interpreted as a relict bedrock fault. Portions of the project vicinity are underlain by alluvial terrace deposits associated with the ancestral Eel River (shown by Qt on the Figure 3). These alluvial terraces typically consist of an abrasion platform cut across Wildcat



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Garberville Sanitary District
Garberville Water System Improvements
Garberville, California

Geologic Map
McLaughlin, 2000
August 2023 - 022067

Figure
2

QUATERNARY AND TERTIARY OVERLAP DEPOSITS

Qt

Undifferentiated nonmarine terrace deposits (Holocene and Pleistocene)- Dissected and (or) uplifted gravel, sand, silt, and clay, deposited in fluvial settings. In western Eureka quadrangle (Sheet 1) unit includes minor shallow marine intertongues and warped and tilted beds of late Pleistocene Hookton and Rohnerville Formations of Ogle (1953), in addition to younger late Pleistocene and Holocene fluvial terrace units a few feet to a few tens of feet higher than normal modern high-water level

Qls

Landslide deposits (Holocene and Pleistocene)-Unsorted clay- to boulder-size debris and broken rock masses that have moved downslope in debris flows, earth flows, and as more-or-less intact rotational or translational blocks, largely from Pleistocene to present. Only large landslides, occupying tens to hundreds of acres, are depicted here.

QTw

Marine and nonmarine overlap deposits (late Pleistocene to middle Miocene)-Thin-bedded to massive, weakly lithified siltstone, fine- to medium-grained sandstone, silty to diatomaceous mudstone and locally soft, scaly mudstone. Locally includes lenses of pebble to boulder conglomerate, carbonate concretions, abundant molluscan fossils, woody debris, and horizons of rhyolitic volcanic ash that are greater than 1 meter thick in some areas. Includes the Wildcat Group (Ogle, 1953), the Bear River beds (Haller, 1980), and related outlier Neogene deposits isolated along faults near Briceland, Garberville, Benbow, Piercy, Bridgeville and northeast of Weott. Unit also includes minor fault-bounded blocks along or near the coast between Bear River and the Mattole River that are incorporated into melange of the Coastal terrane; the Neogene Falor Formation northeast of Eureka (Manning and Ogle, 1950); and equivalent deposits in the offshore area deposited in shelf, slope, and slope basin settings. A few poorly exposed erosional remnants of shallow marine to brackish water strata mapped along high ridge crests overlying the Franciscan Complex in the 1:24,000 Zenia quadrangle are tentatively assigned to this unit. South of this map, unit correlates with valley-fill, perched gravel and shallow marine to nonmarine coal-bearing sedimentary rocks of Quaternary and Tertiary age in the Round Valley area of Covelo 1:100,000 quadrangle (Jayko and others, 1989)

COAST RANGES PROVINCE

FRANCISCAN COMPLEX

Coastal Belt

Yager terrane (Eocene to Paleocene?)

Sedimnetary rocks of the Yager terrane (Eocene to Paleocene?)-Argillite and arkosic sandstone rhythmically interbedded, thin to medium bedded; massive to thickly bedded arkosic sandstone with minor interbeds of argillite; and minor lenses of polymict boulder to pebble conglomerate. Southwest of Garberville, unit highly folded, but locally may be penetratively sheared or broken. Argillite and interbedded fine-grained sandstone is commonly calcareous and may have abundant plant debris in places. Sandstone characteristically contains prominent detrital muscovite. Based on fossil dinoflagellates and on spores and pollen from carbonate concretions in argillite, age of terrane is late to middle Eocene. Locally the lower beds of the terrane may be as old as Paleocene (McLaughlin and others, 1994). The Yager terrane is divided into 3 subunits based principally on topographic expression in aerial photographs and outcrop data:

y1

Sheared and highly folded mudstone-Includes minor rhythmically interbedded sandstone, locally with lenses of conglomerate. Exhibits irregular topography lacking a well-incised system of sidehill drainages

Central belt

Melange of the Central belt (early Tertiary to Late Cretaceous)- Consists of a matrix of clayey, penetratively sheared argillite and fine-grained sandstone, locally with intercalated green tuff and hard elliptical carbonate concretions armored with scaly black argillite. Includes blocks up to several kilometers across, of diverse lithologies and ages. Age range of the Central belt is based on the paleontologic and isotopic age range of rocks in the melange and on inferred range in age of penetrative shearing, boudinage, and related deformation that occurred during melange formation. Components of the Central belt melange include:

Unnamed Metasandstone and meta-argillite (Late Cretaceous to Late Jurassic)-Arkosic lithic metasandstone and meta-argillite, reconstituted to textural zones 1 to 2A (Jayko and others, 1989) and metamorphosed to pumpellyite and lawsonite grade, with less than 1/2 percent K-feldspar (fig. 5). Unit locally includes cobble- to pebble-size polymict conglomerate or monomict chert-pebble conglomerate. Locally, the metasandstone and meta-argillite depositionally overlie radiolarian chert in composite melange blocks. In some places in blocks metasandstone is imbricated or structurally interleaved with chert and basalt. Fossils from unnamed metasandstone and meta-argillite range in age from Late Cretaceous to Late Jurassic. Carbonate concretions and local, thin, silty, hemipelagic chert beds and lenses in melange matrix contain radiolaria and dinoflagellates ranging in age from Late Jurassic to Early Cretaceous (Tithonian to Aptian or Albian). Some metasandstone and conglomerate in composite blocks depositionally overlie chert with a Late Cretaceous (Cenomanian) radiolarian assemblage. The unnamed metasandstone and meta-argillite is divided into subunits of melange and broken formation based principally on topographic expression in aerial photographs and outcrop data:

cm1

Melange-Predominantly penetratively sheared, locally tuffaceous, scaly meta-argillite and less abundant blocks of metasandstone. Exhibits rounded, poorly incised, lumpy and irregular topography

cb1

Broken formation-Consists of bedded to massive, locally folded, rarely conglomeratic metasandstone and meta-argillite, with only minor amounts of highly sheared rocks. Exhibits sharp-crested topography with regular, well-incised sidehill drainages

bs

Basaltic rocks (Cretaceous and Jurassic)-Includes pillowed and non-pillowed flows, flow breccias, submarine tuff, and diabase. Basalt commonly is alkalic (high TiO2 content). Basalt may be overlain by radiolarian chert or foraminiferal limestone. Age of locally overlying limestone indicates some basalt to be as young as Middle Cretaceous (Aptian); where overlain by radiolarian chert, basalt is no younger than Early Jurassic. Basalt is metamorphosed to low greenschist grade

dpsp

Serpentinite melange (Jurassic?)-Partially to completely serpentinized ultramafic rocks (harzburgite, dunite), locally highly sheared, and includes minor masses of cumulate gabbro, diabase or basalt. Present beneath diabase and (or) basalt of the Benbow and Bear Buttes areas (Sheet 3). Contact with overlying ophiolitic rocks probably is an attenuation fault. Unit is partially equivalent to some serpentinite interspersed with and assigned to Central belt of Franciscan Complex

sediments, with terrace sediments consisting of alluvial deposits (sand, silt, and gravel; Spittler, 1984). The Main Tank site is underlain by one such terrace more than 400 feet above the modern Eel River.

Bedrock of the undifferentiated Wildcat group is described as mudstone, shale, sandstone, siltstone, and minor amounts of conglomerate with highly variable degrees of consolidation. Specific descriptions of the geologic units within the project vicinity are presented on Figure 2a.

Geologic mapping by McLaughlin and others (2000) and Spittler (1984) show areas of landsliding (Qls on Figure 2; McLaughlin and others, 2000) in the project vicinity; these occur as translational/rotational and earthflow slides. Spittler (1984) shows areas of "disrupted ground," throughout the project vicinity, which is described as:

> "Irregular ground surface caused by complex landsliding processes resulting in features that are indistinguishable or too small to delineate individually at the map scale; also may include areas affected by downslope creep, expansive soils, and/or gully erosion; boundaries are usually indistinguishable."

The water distribution system is within the Garberville-Briceland fault zone. According to Kelsey and Carver (1988), the Garberville-Briceland fault zone is a discontinuous series of north-northwest trending lineaments that extend south-southeast from Bull Creek, through Garberville, to just north of Laytonville. There is no documented recent (Holocene) activity on the Garberville fault, nor are there mapped faults crossing the water system. The Garberville-Briceland fault zone is not zoned as active by the State of California (CGS, 2018).

Geologic Hazards

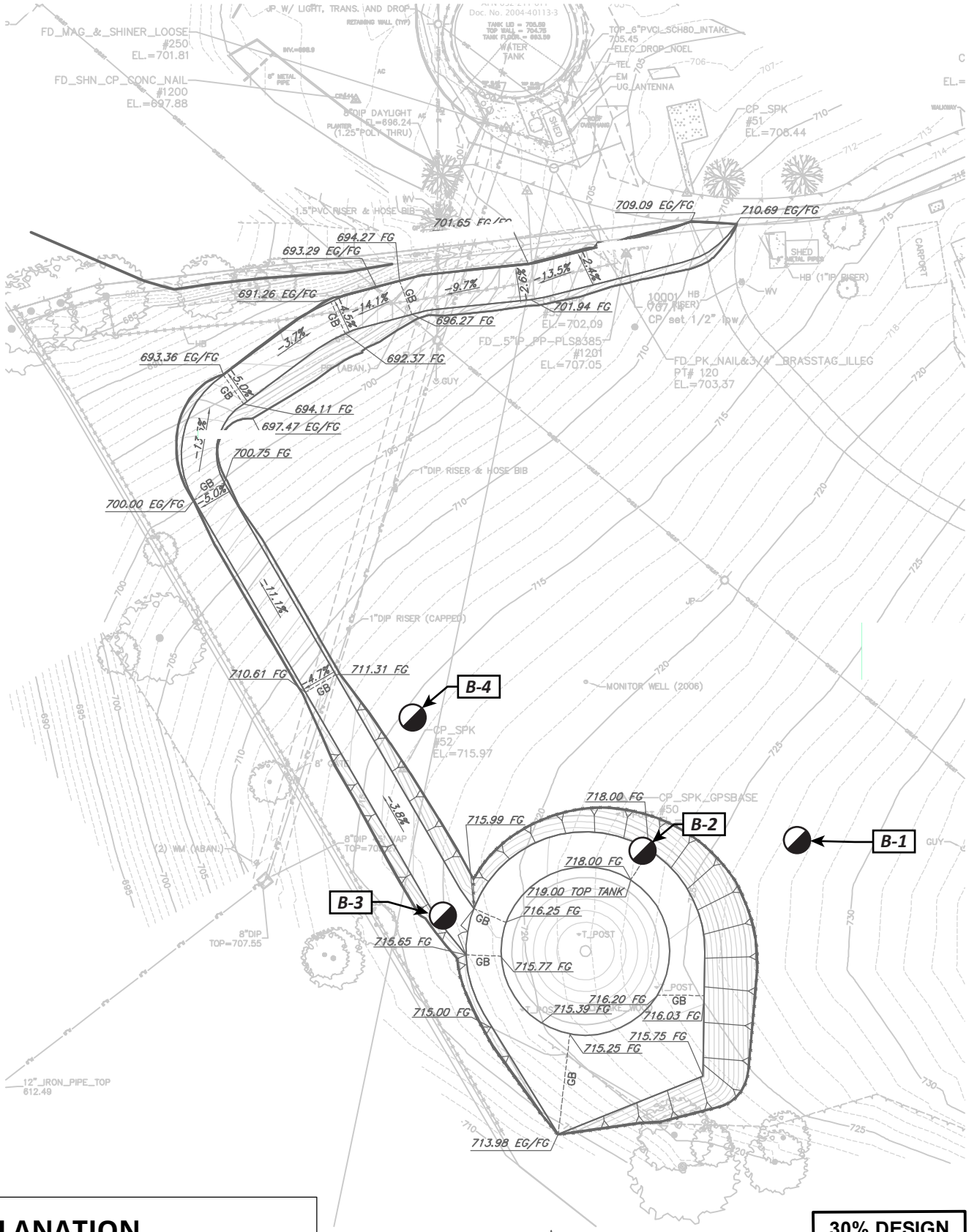
Potential geologic/geotechnical hazards common to the local area include seismic ground shaking, surface fault rupture, and slope instability. The assessment of these potential hazards is presented below.

Seismic Ground Shaking

The project site is in a seismically active area with the potential for strong earthquakes and strong ground shaking. As stated above, the water distribution system is within the Garberville-Briceland fault zone. This fault zone is not considered active by the State of California (CGS, 2018). The site is located approximately 15 miles northeast of the northern most extent of the San Andreas fault. Strong seismic ground shaking should be expected during the lifespan of the proposed water storage tanks and associated infrastructure.

Surface Fault Rupture

The project site is not located in a state-mandated Earthquake Fault Zone (CGS, 2018). The nearest known active fault is the San Andreas fault, which is approximately 15 miles southwest of the project site. The San Andreas fault is a northwest-trending strike-slip fault. Surface ruptures associated with 1906 San Francisco earthquake were identified at Shelter Cove (Lawson, 1908). During our field visit, we did not observe any geomorphic evidence suggesting recent surface rupture in the project area.



EXPLANATION

GEOTECHNICAL BORING

Garberville Sanitary District
Garberville Water System Improvements
Garberville California

Geotechnical Boring Locations
Main Tank Site
August 2023 - 022067

Figure
3

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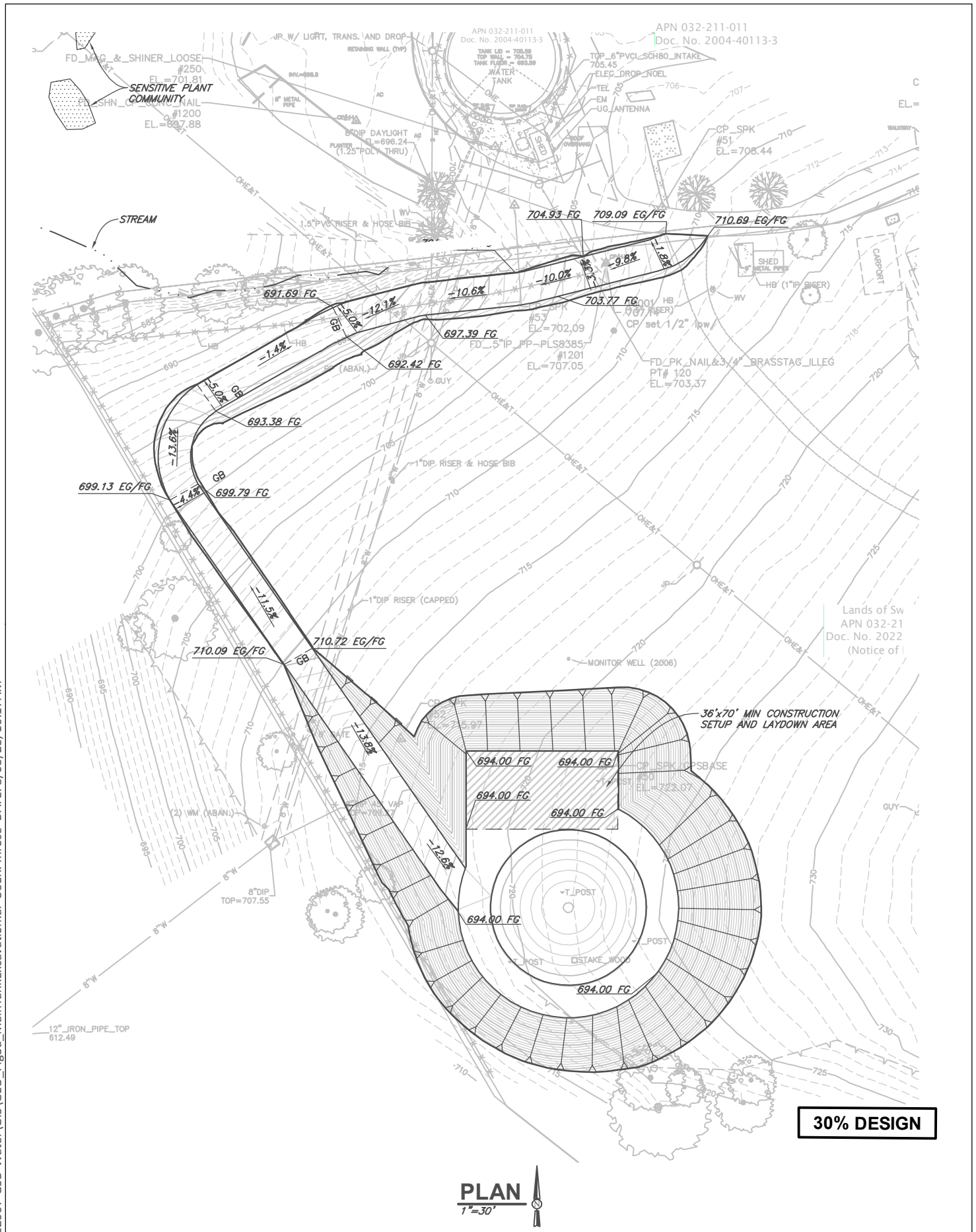

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Garberville Sanitary District
Garberville Water System Improvements
Garberville, California

Main Tank Excavation Plan

August 2023 - 022067

Figure 3A

Liquefaction

Liquefaction is a soil behavior phenomenon in which soil located below the groundwater table temporarily loses strength during and immediately after a seismic event because of strong earthquake ground motions. Recently deposited and geologically young Holocene age sediments consisting of relatively loose, saturated, non-cemented granular soil are most susceptible.

As all the sites discussed in this report are located in upland settings on bedrock or older alluvial soils, there is a negligible potential for soil liquefaction to impact improvements related to this project.

Slope Stability

Numerous landslides and areas of unstable ground are shown on available geologic maps (Spittler, 1983; McLaughlin, 2000). The type and concentration of landsliding is relative to the underlying bedrock; more slides are mapped in areas underlain by Broken Formation bedrock, which does not underlie the improvement sites. Relatively few are mapped (or observed) in areas underlain by Wildcat Group sediments. We did not observe any features related to recent landsliding (tension cracks, seeps, springs, rills, or gullies) at the proposed new infrastructure sites, although unstable ground is mapped in the site vicinity. Localized landsliding adjacent to the Robertson Tank demolition site is noted below. Failures occur along roads within the service area (Alderpoint Road, for example), but these appear related to construction methods (unsupported sidecast fills on steep slopes) rather than underlying slope instability in the native soils.

Due to the site location in a seismically active area and the potential for strong seismic ground shaking to occur at the site, there is an ongoing potential for localized co-seismic landsliding to occur along steep slopes throughout the project area.

Field Investigation and Laboratory Testing

An engineering geologist from SHN conducted site reconnaissance on May 25, 2023, prior to each subsurface investigation to observe existing site conditions. A project geologist visited the Main Tank and Alderpoint Pump Station sites on June 8, 2023, and the Wallan Tank site on June 21, 2023, to oversee the advancement of geotechnical exploratory borings. The borings at each site were drilled and sampled by Taber Drilling of Sacramento, California, using a CME 75 track-mounted drill rig with solid-flight augers. Upon completion of drilling, the borings were backfilled with cement grout and soil cuttings. Field sampling and observation, and laboratory testing methods are described in the following paragraphs. Subsurface investigations specific to each site are described in the following sections.

Representative samples were obtained during drilling using standard penetration test (SPT; 1.375-inch internal diameter [I.D.]) and modified California (2.5-inch I.D.) split-spoon samplers. The samplers were driven 18 inches into the soil/rock using a 140-pound auto-hammer with a 30-inch drop. The number of “blows,” or hammer drops, required for each 6-inch increment of sampler drive was recorded. The blow counts for each 6-inch drive and the sampler types are noted on the boring logs (Appendix 1).

Visual classifications of the earth materials encountered were made in the field in general accordance with the Manual-Visual Classification Method (ASTM-International [ASTM] D 2488). The final boring logs, presented in Appendix 1, were prepared based on the field logging, examination of samples in the laboratory, and the results of laboratory testing.

Selected soil samples were tested in SHN's certified soils-testing laboratory in Eureka, California, to determine selected index properties of the subsurface materials. Samples were tested for in-place moisture content and dry density, percent fines (passing the number 200 sieve), and plasticity index (Atterberg Limits). Results of the laboratory tests are provided at the corresponding sample locations on the geotechnical boring logs (Appendix 1) and included as Appendix 2.

Main Tank Site

At the main tank site, four exploratory geotechnical borings (B-1-LH through B-4-LH) were advanced to depths of 51.5 feet (B-1-LH and B-2-LH), 26.5 feet (B-3-LH), and 16.5 feet (B-4-LH). Three of the four borings were drilled in the planned vicinity of the partially buried water tank (based on an early conceptual tank footprint) and one boring (B-4-LH) was drilled in the planned location of the buried water line. Boring locations are shown on Figure 3.

Wallan Tank Replacement

At the Wallan Tank site, two exploratory geotechnical borings (B-1-W and B-2-W) were advanced to depths of 16.5 feet below grade. The geotechnical borings were placed on opposite sides of the existing Wallan Tank. Boring locations are shown on the site plan on Figure 4.

Wallan Pump Station

Field reconnaissance of the site and vicinity was completed on May 25, 2023. Geotechnical conditions at the site were determined based on surface geological exposures. Subsurface investigation at the site is not relevant to this effort and was not part of the work scope.

Alderpoint Pump Station

At the new Alderpoint Pump Station site, one exploratory geotechnical boring (B-1-APS) was advanced to 16.5 feet below grade. The geotechnical boring was placed near the edge of the proposed building footprint, at the bottom of the vegetated slope. The boring location is shown on the site plan on Figure 5.

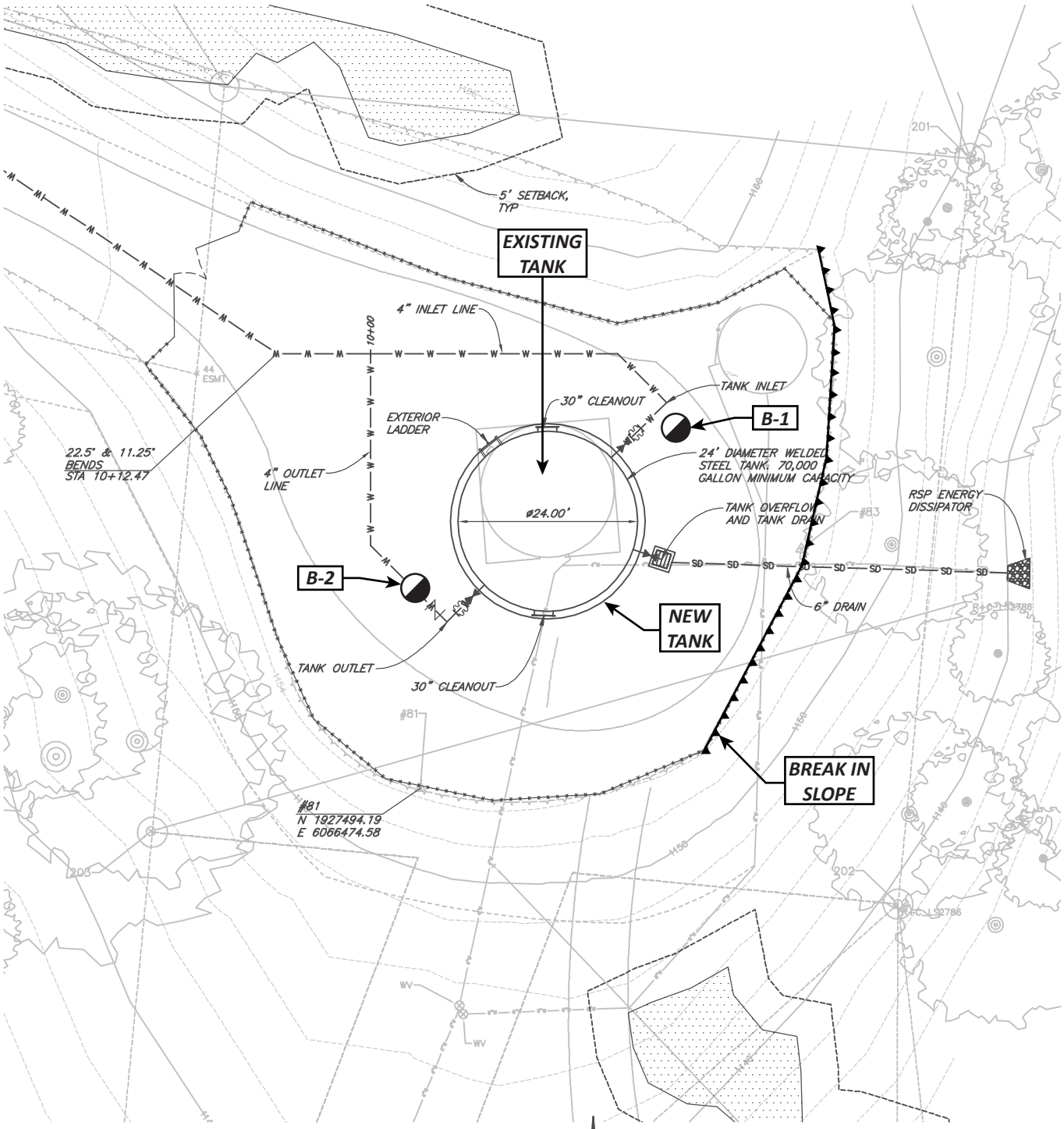
Robertson Tank Demolition

SHN Geosciences staff visited the site on May 25, 2023, and completed field reconnaissance of the site and vicinity. Geotechnical conditions at the site were determined based on surface geological exposures. Subsurface investigation at the site is not relevant to this effort and was not part of the work scope.

Project Location and Description

Main Tank Site

The Main Tank site is located southeast of the town of Garberville on Humboldt County Assessor's parcel number (APN) 032-211-021. Improvements at this site requiring geotechnical consideration consist of the construction of a partially buried, approximately 550,000-gallon concrete water tank, a pump station and generator adjacent to the tank (Maple Lane Pump Station), and a buried water line. We understand that the pump station and generator will be constructed on the engineered fill-pad surrounding the



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30% DESIGN

EXPLANATION

GEOTECHNICAL BORING

Garberville Sanitary District
Garberville Water System Improvements
Garberville, California

Geotechnical Boring Locations
Wallan Tank Site
August 2023 - 022067

Figure
4

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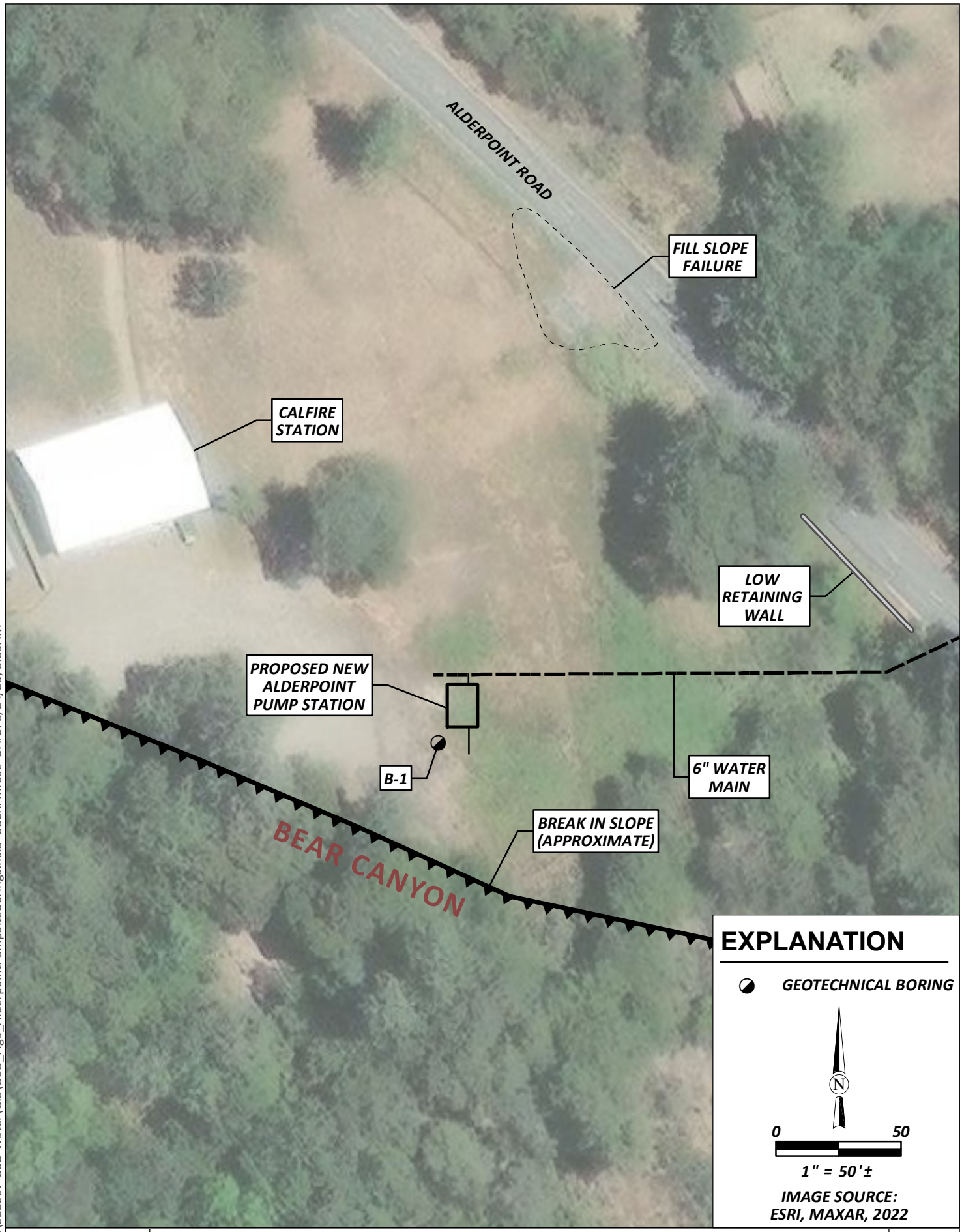

Garberville Sanitary District
Garberville Water System Improvements
Garberville, California

Geotechnical Boring Location
Proposed New Alderpoint Pump Station
August 2023 - 022067

Figure
5

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partially buried tank, and the water main will exit at the bottom elevation of the buried tank and be routed across the field and to the northwest in a trench up to 25 feet deep. The finished site configuration shown on the 30% site plan with geotechnical boring locations is shown on Figure 3.

The site is situated on a gently to moderately sloping ancient alluvial terrace surface, with elevations ranging from approximately 690 to 740 feet (North American vertical datum, 1988 [NAVD88]). The partially buried tank is to be sited in the southern portion of the property, in the southwestern corner of the terrace remnant. Gentle slopes at the tank site slope toward the west and southwest. The site is vegetated by grasses; there are no trees or large plants within the area of proposed improvements (although the site is adjacent to the tree line). The southwestern border of the property at the tank site is marked by a wire fence near the top of a southwest-facing cut slope leading to Highway 101 that is densely vegetated with dense shrubs and mature hardwood trees. The slope south of the site is a forested valley wall slope associated with a natural, west-flowing stream.

The partially buried, 72-foot-wide concrete tank is to be installed at a depth 30+ feet below existing grade. The excavation will be up to 180 feet wide and will include a construction setup and laydown area, surrounded by temporary cut slopes up to about 34 feet high (see Figure 3a). After the tank is installed, the excavation will be backfilled with 20+ feet of engineered fill (varying thickness around the perimeter of the tank). The large temporary construction excavation will be filled upward from the bottom (it will become shallower) and inward from the edges (it will become narrower). The finished excavation would be up to about 150 feet wide. The engineered fill pad surrounding the tank will support the new Maple Lane Pump Station, a generator, and a service road. The Maple Lane Pump Station has a planned footprint of 20 by 15 feet and is to be sited on the southeast side of the buried tank.

Permanent slopes surrounding the tank and service road area will be fill slopes up to about 10 feet tall. The tank overflow pipe will consist of a subdrain to exit the tank on the south side that will daylight on the slope southeast of the tank area. Finished configuration will result in a service road within the partially filled water-main excavation and extending around the partially buried tank (refer to the site plan on Figure 3). The proposed service road surfaces are planned with gentle cross-slopes; the access road to the northwest will drain to the northwest, and the service road surrounding the tank will drain to the slope south of the tank area.

The water main exiting near the tank base elevation on the west will be routed to the northwest. The line will be installed up to about 25 feet below grade near the tank, and shallow to the northwest. The method of installation for the deepest section of the line is not yet determined, but could either consist of a temporary shored trench, or horizontally drilled directional bore.

Wallan Tank Replacement

The Wallan Tank site is located approximately 1 mile northeast from the town of Garberville, on Humboldt County APN 223-191-006. The site is situated at an approximate elevation of 1,100 feet (NAVD88) on an east facing ridge that divides two tributary drainages to the Eel River. From Wallan Road, access to the site is by a narrow, unpaved, steep road in a rural residential area. Improvements at this site requiring geotechnical consideration consist of the demolition of the existing aboveground redwood water tank and construction of a new aboveground steel water tank in approximately the same position. The new tank is expected to have an approximate capacity of 70,000 gallons. A site plan with geotechnical boring locations is shown on Figure 4.

The existing tank to be replaced occupies a relatively level, unpaved pad cut into a moderate gradient southwest-facing slope. The site is bordered by an 8- to 10-foot-high cut bank along its northern side and a steep, forested slope to the east; the site is accessed from the west by an unpaved driveway.

Wallan Pump Station

The Wallan Pump Station is located along the outboard edge of Wallan Road along the approach to the Wallan Tank. A small facility with a limited footprint, the pump station structure is inset into the road shoulder on a narrow sidehill bench several feet below the grade of Wallan Road. We understand that improvements at this site are limited to minor infrastructure upgrades that will not require structural modifications to the existing building or its foundation.

Alderpoint Pump Station

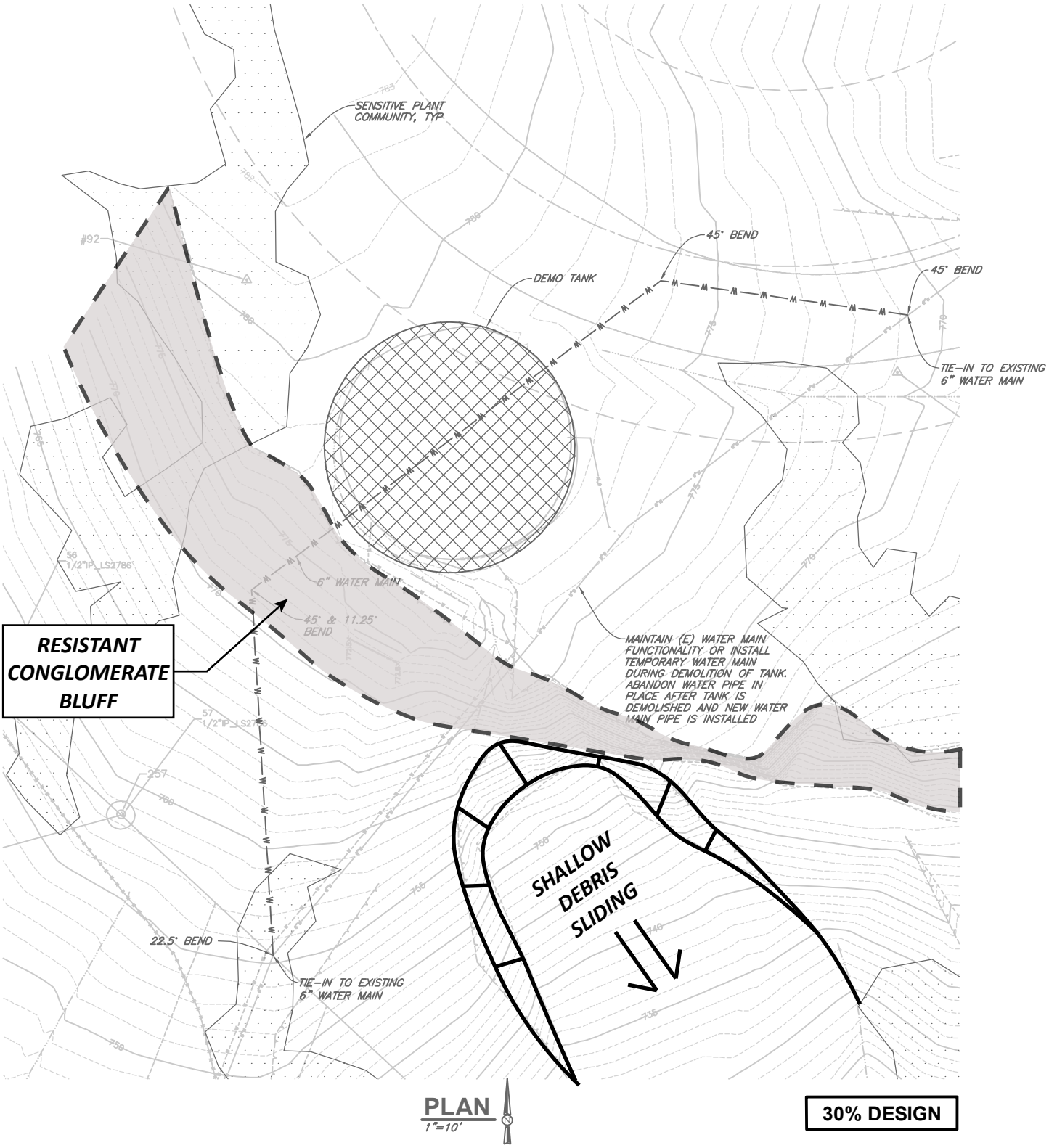
The proposed new Alderpoint Pump Station site is located approximately 1 mile from the town center of Garberville, adjacent to Alderpoint Road (to the north), at the east end of Humboldt County APN 223-183-003, which is currently partially occupied by a California Department of Forestry and Fire Protection (CAL FIRE) station. The new pump station is planned to replace the existing Arthur Road Pump Station that is located just to the east, across Alderpoint Road. The new pump station has a planned footprint of approximately 20 feet by 13 feet and includes two 8-inch water lines that will connect to the existing system. A site plan with geotechnical boring locations is shown on Figure 5.

The site is situated at an approximate elevation of 550 feet (Google Earth), on a gentle to moderate slope. The proposed new pump station footprint is sited approximately 50 feet from the edge of Bear Canyon, which occurs as a very steep slope, densely forested by oak and other hardwood trees. The footprint is generally located in an area that has been partially graded to provide a gravel-surfaced turnaround for CAL FIRE Station vehicles.

Isolated unstable areas occur along the outboard edge of Alderpoint Road adjacent to the site. These shallow failures appear related to unstable fill soils rather than instability of the underlying native soils.

Robertson Tank Demolition

The Robertson Tank is an existing structure located north of Garberville, along the north side of Alderpoint Road, about 650 feet northeast of the Arthur Road Pump Station (Figure 6). The existing tank lies mostly below grade along the water main connecting the existing Arthur and Wallan pump stations. The Robertson Tank is underlain by Wildcat Group bedrock. The site is located at the crest of a steep, linear, south-facing slope that exposes cemented cobble conglomerate. Slopes (bluffs) of this type are relatively common features associated with resistant areas within the Wildcat Group, several of which occur near the site. The bluff is by nature, a resistant landform with low erosion and mass wasting potential. Debris shed from the bluff through minor, periodic rockfall accumulates at the base of the slope and forms a shallow debris slide slope south of the bluff.



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SHN	Garberville Sanitary District Garberville Water System Improvements Garberville, California	**Robertson Tank Demolition** August 2023 - 022067	**Figure** **6**

Subsurface Conditions

Main Tank Site

The native materials encountered in the geotechnical borings are consistent with the known geologic conditions identified in previous geologic mapping (Spittler, 1984; Pleistocene age river terrace sediments and/or the older Wildcat Group). The soil profile generally consists of stiff to hard/medium dense to dense interbedded sandy lean clay and clayey sand observed to the maximum depth explored (51.5 feet in B-1-LH and B-2-LH). An interval of hard sandy lean clay with gravel was observed at a depth of 10 feet in B-2-LH, and an interval of loose clayey sand was observed at a depth of 5 feet in B-3-LH. Specific descriptions of the soils encountered are shown on the boring logs included in Appendix 1.

Groundwater was encountered below 35 feet in boring B-1-LH. In borings B-2-LH through B-4-LH, soils were dry in the upper 15 feet of the borings, with increased moisture observed near 15 feet below ground surface (BGS). Groundwater levels at the time of our investigation (early June) in this region would be approaching a seasonal low, which we would expect to occur in late summer or early fall.

Mottling was observed as shallow as 5 to 10 feet deep in the geotechnical borings, which we interpret to be related to seasonally perched water. Groundwater levels fluctuate seasonally and can be expected to be higher during periods of intense precipitation. The topographic position of the proposed tank at the edge of an elevated terrace surface, however, suggests the potential for high groundwater is limited. Groundwater seepage may occur during grading and construction for the proposed new partially buried water tanks and related infrastructure, especially if sandy materials are encountered.

Wallan Tank Replacement

Published geologic mapping indicates the site is located immediately west of a significant geologic contact between the older Franciscan Bedrock (to the east) and younger Wildcat Group bedrock (to the west; McLaughlin et. al., 2000). Based on our subsurface observations, we interpret the materials in the geotechnical borings to be Wildcat Group, which is consistent with the mapping. To a depth of 5 feet beneath the site, we encountered deeply weathered conglomerate, which occurs as stiff silty clay with varying amounts of fine sand and gravels. Below 5 feet, we encountered highly weathered bedrock, consisting of highly fractured, moderately soft fine sandstone to siltstone. Specific descriptions of the materials encountered are shown on the boring logs provided in Appendix 1.

Groundwater was not encountered in the geotechnical borings during the time of our investigation (in late June). Groundwater levels can be expected to be higher during periods of intense precipitation, however, based on localized topography and the underlying soil conditions. We do not anticipate that groundwater will be a significant factor during construction of shallow improvements.

Alderpoint Pump Station

The native materials encountered in our geotechnical boring are consistent with previous geologic mapping (Wildcat Group). We encountered medium dense silty and clayey fine sand to a depth of 10 feet, with a layer of loose silty sand approximately 3 feet BGS. Between 10 and 15 feet below grade, we encountered stiff sandy lean clay overlying clayey sand with gravel to the maximum depth explored (16.5 feet).

Groundwater was not encountered in the geotechnical boring at the time of our investigation (in early June). Groundwater levels can be expected to be higher during periods of intense precipitation,

however, based on localized topography and the underlying soil conditions. We don't anticipate groundwater will be a factor during construction of shallow improvements, provided construction occurs during the dry season.

Seismic Design Parameters

Based on the subsurface conditions encountered at our exploration locations, laboratory test results, and our interpretation of soil conditions within 100 feet of the ground surface, we classify the Main Tank site as a Site Class C consisting of "Very Dense Soil and Soft Rock" and the Wallen Tank and Alderpoint Pump Station sites as a Site Class D consisting of a "Stiff Soil" in accordance with Chapter 20 of ASCE 7-16. On this basis, the mapped and design spectral response accelerations were determined using the ASCE 7 Hazard Tool (ASCE, 2022) in conjunction with the site class and site coordinates 40.094667 º, -123.793008º (Main Tank Site); 40.107731º, -123.770436º (Wallan Tank Replacement); and 40.105182º, -123.789514º (Alderpoint Pump Station) at the location of the proposed tanks and structures. Calculated values for ASCE 7-16 are presented in the tables below.

Table 1a. ASCE/SEI 7-16 Spectral Acceleration Parameters (Main Tank Site)

Parameter	0.2 Second	1 Second
Maximum Considered Earthquake Spectral Acceleration (MCE_R)	S_S = 1.773	S_1 = 0.845
Site Class	C	
Site amplification factor	F_a = 1.2	F_v = 1.4
Site-modified spectral acceleration	S_{MS} = 2.128	S_{M1} = 1.184
Numeric seismic design value	S_{DS} = 1.418	S_{D1} = 0.789
MCE_G peak ground acceleration (PGA)	0.74	
Site amplification factor at PGA (F_{PGA})	1.2	
Site modified peak ground acceleration (PGA_M)	0.888	

Table 1b. ASCE/SEI 7-16 Spectral Acceleration Parameters (Wallan Tank Replacement)

Parameter	0.2 Second	1 Second
Maximum Considered Earthquake Spectral Acceleration (MCE_R)	S_S = 1.662	S_1 = 0.849
Site Class	D	
Site amplification factor	F_a = 1	F_v = N/A
Site-modified spectral acceleration	S_{MS} = 1.662	S_{M1} = N/A
Numeric seismic design value	S_{DS} = 1.108	S_{D1} = N/A
MCE_G peak ground acceleration (PGA)	0.749	
Site amplification factor at PGA (F_{PGA})	1.1	
Site modified peak ground acceleration (PGA_M)	0.824	

Table 1c. ASCE/SEI 7-16 Spectral Acceleration Parameters (Alderpoint Pump Station)

Parameter	0.2 Second	1 Second
Maximum Considered Earthquake Spectral Acceleration (MCE_R)	S_S = 1.709	S_1 = 0.854
Site Class	D	
Site amplification factor	F_a = 1	F_v = N/A
Site-modified spectral acceleration	S_{MS} = 1.709	S_{M1} = N/A
Numeric seismic design value	S_{DS} = 1.139	S_{D1} = N/A
MCE_G peak ground acceleration (PGA)	0.749	
Site amplification factor at PGA (F_{PGA})	1.1	
Site modified peak ground acceleration (PGA_M)	0.824	

Geotechnical Conclusions and Recommendations

Based on the results of our field and laboratory investigation, it is our opinion that construction of the water storage tanks and pump stations at the project sites are feasible from a geohazard and geotechnical standpoint, if our recommendations are implemented during design and construction. The major geotechnical considerations for development of the proposed water storage tanks and pump stations are the potential for strong seismic ground shaking and the proximity to steep, locally unstable slopes.

The sites are likely to experience strong seismic ground shaking resulting from earthquakes on active faults in the region during the design life of the proposed water tanks and associated infrastructure. The intensity of ground shaking from earthquakes will depend on several factors, including the distance from the site to the earthquake focus, the magnitude and duration of the earthquake, and the response of the underlying soil. At a minimum, it will be necessary to design and construct the proposed structures in accordance with the earthquake-resistant provisions of the governing code.

All geotechnical-related work should be performed in accordance with the recommendations of the Geotechnical Engineer-of-Record during construction. Where the recommendations of this report and the cited sections of Title 24 are in conflict, the Owner or Engineer should request clarification from the Geotechnical Engineer-of-Record. The recommendations in this report should not be waived without the consent of the Geotechnical Engineer-of-Record for the project. The following subsections present recommendations for the geotechnical-related work.

Below we provide site-specific discussion and recommendations for each site, followed by general geotechnical recommendations for site preparation, grading, wet weather considerations, engineered fills, soil corrosivity, foundations, and so on.

Main Tank Site

The development of the main tank will require excavation of a large semi-circular area up to about 30 feet deep to accommodate the buried tank (Figures 3 and 3a). The water main will extend northwestward from the tank, exiting the tank bottom (25 feet below grade) and following an increasingly shallow alignment. The current plans show the water main constructed via trench, although we understand the final construction method will be determined by the contractor.

The tank excavation, as currently planned, will be 180 feet wide during construction; it is acceptable to use 1:1 temporary construction slopes for this excavation, although the contractor is responsible for the stability of the final excavation configuration based on the materials and conditions encountered at the time of excavation. Following construction, the excavation will be partially backfilled, supporting the pump station and a service road around the tank. The finished configuration will entail a smaller circular area, as the construction excavation is filled both upward and inward; finished fill slopes surrounding the finished configuration should be associated with a 2:1 slope gradient.

Following construction of the concrete tank, backfill placed in the excavation to achieve final grade around the tank and along the water main should be placed following the recommendations provided below in the "Site Preparation and Grading" and "Select Engineered Fill" sections. Fill placed against the native soils along the outside of the temporary tank excavation or along the service road should be benched, as prescribed below. Finished grade will result in the partial burial of the water tank; the water main excavation will be partially filled and retained as a service road.

The finished configuration will result in surface drainage around the partially buried water tank flowing toward an outlet at the south edge that flows onto the native hillside, while drainage along the service road (which will be a through cut) will be directed toward the northwest. Drainage from the area surrounding the tank will discharge at a single point above the adjacent hillslope and appropriate energy dissipation will be required.

We recommend that trenches for water lines into and drainage lines out of the partially buried tank have a plug placed within the trench backfill to minimize the normally granular backfill from acting as a conduit for water to enter beneath the main water tank. The plug should be constructed using a sand cement slurry (minimum 28-day compressive strength of 500 pounds per square inch [psi]) or relatively impermeable native clay soil.

Based on the results of our subsurface investigation, we believe that the proposed main tank can be supported on a continuous footing foundation around the perimeter of the tank. Recommendations for this foundation type are provided in subsequent sections below in "Foundations." Note that the walls of the buried tank are considered below-grade retaining walls and attention is directed to the "Below Grade Tank Walls and Retaining Walls" section.

Wallan Tank Replacement

The removal and replacement of the Wallan tank is to occur on a pre-existing graded pad with no change to the existing condition. The proposed replacement tank will occupy much of the footprint of the existing tank. Following demolition of the existing tank, treat the disturbed areas per the recommendations in the "Site Preparation and Grading" and "Select Engineered Fill" discussions below. We assume the replacement tank will be developed on a ring-wall foundation, discussed below in "Foundations."

Based on the results of our site investigation, we did not encounter fill materials in either boring location. We interpret that the enlarged tank footprint will remain in the native cut surface. However, if any fill or other unsuitable materials are encountered during excavation/preparation of the site, they should be removed and our recommendations for general site and subgrade preparation should be adhered to.

Drainage onto the steep slope east of the site should include a significant energy dissipation feature.

Wallan Pump Station

We understand that the proposed improvements at the Wallan Pump Station are minor and will not require soil disturbance surrounding the facility. In its current condition, the pump station is within about 5 feet of a steep slope. The current site condition exhibits no evidence of slope instability or erosion that is affecting the small buffer strip adjacent to the pump station. Relative to the proposed infrastructure upgrades at the site, the primary objective is to maintain existing conditions without disturbing soils or vegetation surrounding the facility. Concentrated runoff should not be directed towards the steep slope outboard of the pump station.

Alderpoint Pump Station

Construction of the Alderpoint pump station is to occur on an undeveloped site with a slab-on-grade foundation. The geotechnical recommendations below regarding "Site Preparation and Grading," "Select Engineered Fill," and "Concrete Structural Slabs-on-Grade" are relevant.

The Alderpoint pump station and associated infrastructure will be located adjacent to the crest of the high valley wall slope of Bear Canyon. Although no recent landsliding is apparent on the slope adjacent to the site, it is prudent to maintain a reasonable setback to accommodate future potential geologic change. We recommend a minimum setback from the crest of the slope of 30 feet.

Robertson Tank Site

As the Robertson Tank demolition occurs atop a resistant bluff comprised of cemented cobble conglomerate, there is a low potential for impacts related to demolition and backfilling of the tank. The ground should be resistant to disturbance and have low erosion potential. Care should be taken during the demolition of the tank to avoid disturbance of the soil between the tank footprint and the top of the bluff directly south.

Once the aboveground portions of the tank have been removed, the side walls should be demolished to a minimum of 4 feet below grade and the debris removed from the excavation. Break a minimum of four 4-foot diameter holes through the tank floor to provide drainage through the tank; the debris from creating these holes may be retained in the holes. Any remaining voids in the holes in the tank floor should be filled with drain rock and the remainder of the excavation should be backfilled following the recommendations for "Select Engineered Fill" below. Treat the ground surface, as appropriate, to receive vegetation or other erosion control, as appropriate to meet project goals.

We understand the realigned water line will be routed through the footprint of the demolished Robertson Tank, in order to increase its setback from the bluff crest, which we agree is appropriate. We expect the depth of burial to be shallower than 4 feet (the depth of the remaining tank walls). The existing water line should be abandoned in place.

General Geotechnical Recommendations

Site Preparation and Grading

Following demolition of any remaining concrete and asphalt (where required), areas to be graded should be cleared of any rubbish or debris, organics, organic topsoil, loose soil and/or soft bedrock, and any other unsuitable material. Site preparation operations should extend at least 5 feet beyond the limits of improvements. We anticipate that stripping to a depth of less than 1 foot will be required to remove the organics and topsoil, where encountered. Deeper stripping may be locally required to remove concentrations of vegetation, such as brush and tree roots. Where the removal of large trees is required, it will be necessary to remove all major root systems, then fill the excavations with properly placed engineered fill compacted to at least 90 percent relative compaction[1].

Any vegetation and organic topsoil with more than 2 percent organic material by dry weight should be removed. The Geotechnical Engineer should observe and approve the prepared site prior to any excavation, subgrade preparation, and placement of fill or improvements.

All areas to receive engineered fill should be stripped of loose and/or soft surface soils and vegetation and benched into firm soil/rock. If zones of weak or saturated soils are encountered during site preparation, they should be removed by further excavation to expose firm natural soil/rock and replaced with engineered fill.

Fill placed in swales and drainage channels should be benched into firm soils along the bottom and sides to provide a firm level surface on which to place new engineered fill. In areas where proposed structures will be supported on spread footings and are located partially on cut and partially on fill, the cut portion should be over-excavated and replaced as engineered fill in order to provide at least 12 inches of engineered fill below all of the footings to provide uniform support for the entire foundation.

Non-engineered fill that may be present within the limits of grading should be identified and excavated to expose firm natural ground. In areas intended to support new water storage tanks and engineered fill, and for a distance of at least 5 feet beyond the limits of these improvements, topsoil and loose native soils should be excavated to expose firm, undisturbed native soil. The resulting surface created by removal of non-engineered fill and loose soils should be checked by the Geotechnical Engineer or qualified representative to determine whether further excavation is required to remove any loose or unsuitable materials. The approved surface may then be brought to pad grade with placement of engineered fill.

Permanent cut and fill slopes up to 5 feet in height should be placed no steeper than 1.5H:1V and 2H:1V (horizontal to vertical), respectively. Higher or steeper slopes should be reviewed by the Geotechnical Engineer or qualified representative for stability during construction. We understand that temporary construction slopes related to the development of the Main Tank may be as steep as 1H:1V. It is the contractor's responsibility to monitor the stability of temporary cut slopes. Additional recommendations are provided below in the "Excavations and Temporary Shoring" section.

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[1] Relative compaction refers to the in-place dry density of a soil expressed as a percentage of the maximum dry density of the same soil, as determined by the ASTM D1557 compaction test procedure. Optimum moisture is the water content (percentage by dry weight) corresponding to the maximum dry density.

Site grading during and shortly after the wet season is typically difficult and/or uneconomical. Onsite soils will have moisture contents well above optimum and will require greater than normal spreading, mixing, and/or aeration to achieve a near-optimum moisture content suitable for required compaction.

Engineered fill placed on slopes that are steeper than 5H:1V should be keyed and benched into supportive material to provide a firm, stable surface on which to support the fill. Prior to fill placement on slopes steeper than 5H:1V, a construction keyway should be excavated at the toe of the fill. The keyway should be a minimum of 8 feet wide or of a width equal to half the height of the fill slope, whichever is greater. The keyway should be excavated a minimum of 2 feet into bedrock or competent support material, as measured on the downhill side of the excavation. The depth to supportive material should be determined by this office in the field during construction. The base of the keyway excavation should have a nominal slope of approximately 2 percent dipping toward the back (uphill side) of the key. Subsequent construction benches should be excavated at least 4 feet horizontally into firm undisturbed soil to remove any non-supportive surficial soil and should also have a nominal slope of approximately 2 percent dipping in the uphill direction. Our representative should observe the completed keyway and bench excavations to confirm they are founded in materials with sufficient supporting capacity.

Engineered fill placed as backfill, following construction of the main tank, should be benched into the surrounding temporary cutslope. Construction benches should be excavated at least 4 feet horizontally into firm undisturbed soil to remove any non-supportive surficial soil as the engineered fill is brought up in layers and should also have a nominal slope of approximately 2 percent dipping in the uphill direction. Backfill material should be brought up uniformly around the below-grade structure (that is, backfill should be at the same elevation all around the structure as the backfill is placed and compacted). The elevation difference of the backfill surface around the structure should not be greater than 2 feet.

The area at both the top and toe of fill slopes should be graded or provided with a lined berm or V-ditch, to provide good surface drainage away from the slope to protect against erosion. All slope surfaces should be planted with fast-growing, erosion-resistant vegetation immediately after grading. Should erosion channels develop, they should be repaired immediately to prevent progressive undermining or sloughing of the slope surface.

Wet Weather Subgrade Protection

The near-surface soils consist of loose, non-cohesive, fine-grained granular materials and/or soft fine-grained silts. We expect that both light and heavy construction equipment will have difficulty operating on the near-surface soils if grading commences during and/or immediately following the wet season. Contractors should expect high soil moisture conditions in the near-surface soils throughout the wet season and into the late spring months following a typical winter wet season. The wet season in coastal northern California generally begins in the month of November and continues through May. Heavy rains are also not uncommon during the months of October and June. Beginning construction activities and earthwork immediately prior to the onset of the wet season is not advised and will likely lead to delays if measures are not taken to stabilize and protect the exposed subgrade.

Soils that have been disturbed during site preparation activities, or unsuitable areas identified during proof-rolling or probing, should be removed to firm ground and replaced with stabilization material and compacted structural fill.

Protection of the subgrade is the responsibility of the contractor. Track-mounted excavating equipment may be required during and following wet weather. The contractor will be responsible for constructing an all-weather access road and staging area. The thickness of the haul road to access the currently undeveloped portions of the site for construction and staging areas will depend on the amount and type of construction traffic. The materials used for haul roads or site access drives should be stabilization material consisting of pit or quarry run rock that is well-graded, angular, crushed rock consisting of 4- to 6-inch minus material with less than 5 percent passing the U.S. Standard No. 4 Sieve. The material should be free of organic matter and other deleterious material. A minimum 6- to 12-inch-thick mat of stabilization material should be used for light staging areas. The stabilization material for haul roads and areas with repeated heavy construction traffic will likely need to be increased to between 12 to 18 inches. The actual thickness of haul roads and staging areas should be based on the contractor's approach to site work and the amount and type of construction traffic and is the contractor's responsibility. The stabilization material should be placed in one lift over the prepared, undisturbed subgrade and compacted using a smooth-drum, non-vibratory roller. Additionally, a geotextile fabric should be placed as a barrier between the subgrade and stabilization material. The geotextile should meet specifications for soil separation and stabilization, such as Mirafi 600X or equivalent.

Select Engineered Fill

Fill placed in areas to support proposed water tank and pump station foundations should meet the requirements for select engineered fill. Select engineered fill should have less than 2 percent by dry weight of vegetation and deleterious material and should meet the gradation requirements presented in Table 2.

Table 2. Fill Gradation Criteria

Sieve Designation	Percent Passing by Dry Weight
3-inch (50 mm)[i]	100
2½-inch (37.5 mm)	85 minimum
¾-inch (19 mm)	70 minimum
No. 4 (4.75 mm)	60 minimum
No. 200 (75 µm) [ii]	5 minimum, 30 maximum

[i] mm: millimeters
[ii] µm: micrometers

We anticipate that onsite soils will be suitable for reuse as select engineered fill following removal of debris, organics, and any other unsuitable material. Fine-grained soil with a liquid limit greater than 40 and a plasticity index greater than 15 should not be used as select engineered fill. If clayey soils do not meet the plasticity requirements, mixing of the clayey soils with sandier soils may be required. Crushing and/or removal of rock particles greater than 3 inches in size will be required. Select engineered fill should have a low corrosion potential, which is defined as a minimum resistivity of 2,000 ohms per centimeter and maximum sulfate and chloride concentrations of 250 parts per million (ppm).

In addition, we do not recommend using river-run material as select engineered fill; crushed, angular material should have at least 50 percent of the material (as determined by the material's dry weight) containing a minimum of two fractured faces.

Engineered fill should be placed in loose lifts not exceeding 8 inches in thickness and compacted to a

minimum of 90 percent relative compaction. The Geotechnical Engineer should approve all fill prior to placement.

A qualified field technician should be present to observe fill placement and perform field density tests in accordance with ASTM D 6938 at random locations throughout each lift to verify that the specified compaction is being achieved.

Samples of proposed import fill materials should be submitted to SHN for approval at least three business days prior to use at the site.

Excavations and Temporary Shoring

The contractor shall be responsible for the stability of all temporary excavations. Excavations should be made in accordance with and should comply with applicable Occupational Safety and Health Administration (OSHA) specifications and regulations. The contractor should periodically monitor all open cuts for evidence of incipient stability failures.

Excavations deeper than 4 feet below ground surface (or shallower if excavations appear unsafe) should be laid back to a safe slope inclination or supported by an appropriate shoring system. It should be noted the contractor is solely responsible for site safety and safe working conditions during construction. A temporary or permanent shoring system should be installed in a configuration that will allow vertical side slopes for deep excavations where laying back the excavation is impractical. Recommendations are presented below for the design and construction of a soldier pile wall for permanent shoring.

Excavated soils should be placed a minimum of 10 feet away from the edge of the below-grade excavation to reduce surcharge loads on the temporary cut slopes. If shoring systems are used, the effects of the soil stockpile on the shoring system should be taken into account during design if the soils are placed in the area between the top of the excavation and a 1H:1V (horizontal to vertical) projection from the toe of the excavation, to reduce the potential of a shoring failure.

Similarly, heavy equipment should be operated in a safe manner and should be kept an adequate distance from unshored or unbraced excavation sidewalls to prevent a cut slope stability hazard. If shoring is used, surcharge loads from heavy equipment should be considered in the design calculations to prevent a surcharge failure during construction. For an unshored excavation, a heavy equipment exclusionary zone should be established based on soil type, depth of excavation, presence of groundwater, and configuration of the open cut. As a general guideline, heavy equipment should be excluded from a zone located between the top of the excavation and a 1H:1V projection from the bottom toe of the adjacent excavation sidewall.

Utility Trench Backfill

New utility trenches excavated parallel to spread footing foundations should be set back from the footings such that the trench bottoms lie outside a projected hypothetical 1.5H:1V (horizontal to vertical) line extending downward from the footing bottom.

Unless concrete bedding is required around utilities, bedding should consist of sand having a sand equivalent (SE) of at least 30. The bedding should extend from 6 inches below to 1 foot above the

conduit or pipe. Sand bedding should not be jetted or ponded into place and should be mechanically compacted to a minimum of 90 percent relative compaction.

In areas to support improvements (such as new slabs) and adjacent to structure foundations, backfill placed above the bedding in utility trenches should be properly placed and adequately compacted to minimize settlement and provide a stable subgrade.

In areas to support improvements such as slabs and pavements and adjacent to structure foundations, backfill placed above the bedding in utility trenches should be properly placed and adequately compacted to minimize settlement and provide a stable subgrade. If possible, the trench backfill should be compacted following rough grading but prior to final grading and compaction. Onsite inorganic soils meeting the requirements for engineered fill may be used as trench backfill. Backfill consisting of onsite soils should be placed in layers not exceeding 8 inches in loose thickness, water-conditioned, and compacted to at least 90 percent relative compaction as described for engineered fill. Trench backfill need only be compacted to 85 percent relative compaction in landscape areas or in areas more than 5 feet beyond the limits of buildings, pavements, concrete slabs-on-grade, sidewalks, or other flatwork. The upper 6 inches of trench backfill under pavements should be surface compacted to at least 95 percent relative compaction.

Where utility trenches cross underneath buildings, we recommend that a plug be placed within the trench backfill to minimize the normally granular backfill from acting as a conduit for water to enter beneath the building. The plug should be constructed using a sand cement slurry (minimum 28-day compressive strength of 500 psi) or relatively impermeable native soil for pipe bedding or backfill. We recommend the plug extend a distance of at least 3 feet in each direction from the point where the utility enters the building perimeter.

Soil Corrosion Potential

As part of the investigation at the proposed partially buried concrete tank (Main Tank), laboratory corrosivity tests were performed on composited soil samples collected from boring B-1-LH at 25.5 to 26 feet BGS and from B-2-LH at 15 to 16.5 feet BGS. Tests were performed to evaluate the reduction and oxidation potential (redox), pH, resistivity, and concentrations of chloride and sulfate, of/in the soil that would be in contact with the Main Tank foundation elements and underground piping. The results of the soil corrosivity tests are included in Appendix 3 and are summarized in Table 3.

Table 3. Soil Corrosivity Test Results

Parameter	Composite Sample
Redox (mV)[a,b]	340
pH	6.72
Resistivity (100% Saturation) (ohms-cm)[c]	8,800
Chloride (mg/kg)[d]	<15
Sulfate (mg/kg)	<15

[a] Redox: oxidation-reduction potential
[b] mV: millivolts
[c] ohms-cm: ohms-centimeter
[d] mg/kg: milligrams per kilogram

- The redox potential is indicative of potentially slightly corrosive soils resulting from anaerobic soil conditions.
- The pH of the soil reportedly does not present corrosion problems for buried iron, steel, mortar-coated steel, and reinforced concrete structures.
- Based upon the resistivity measurement, the soil samples are classified as mildly corrosive. All buried iron, steel, cast iron, ductile iron, galvanized steel, and dielectric-coated steel or iron should be properly protected against corrosion. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.
- The chloride ion and sulfate ion concentrations are below the detection limits of 15 milligrams per kilogram (mg/kg).

Foundations

Based on our geotechnical investigation, we conclude that the proposed new water storage tanks and pump station structures may be supported by concrete spread footings embedded at least 18 inches below the lowest adjacent grade in firm native soil/rock or properly compacted engineered fill. SHN defines lowest adjacent grade as the tank bottom, or exterior soil subgrades, whichever results in a deeper footing. Footing thicknesses and widths should meet the minimum requirements in the 2022 CBC. Footings founded in firm native soil/rock or properly compacted engineered fill should be designed using a maximum allowable bearing capacity of 2,500 pounds per square foot (psf) for dead plus normal duration live loads. The foundation for the partially buried main water tank (Main Tank) should be designed using an allowable bearing capacity of 4,500 psf for dead plus long-term live loads. These allowable bearing capacities may be increased by one-third for total load conditions, including wind and seismic.

Base friction resistance may be calculated using an ultimate friction coefficient of 0.35 for firm native soil/rock. If crushed aggregate base (AB) is used as engineered fill beneath the new water tanks, an ultimate base friction coefficient of 0.45 may be used. Passive resistance may be calculated using an equivalent fluid unit weight of 300 pounds per cubic foot (pcf). The recommended passive resistance is reduced by a factor of about 1.5 from the ultimate value to reduce deflections to tolerable amounts. The recommended passive pressure and friction coefficients may be combined, without reduction, for calculating total lateral resistance. The passive resistance contributed by soils within 1 foot of the ground surface should be neglected unless these soils are protected and confined by a slab-on-grade or pavement. Gaps between the footing and adjacent ground should be completely backfilled using engineered fill, concrete, or lean cement slurry with a 28-day unconfined compressive strength of at least 100 psi.

The ring-wall footing should be reinforced to resist hoop stresses within the wall. Hoop stresses may be calculated by assuming outward lateral pressure acting on the foundation equal to 0.45 times the vertical pressure imposed on the subgrade within the ring-wall. Lateral soil pressures acting on buried vaults that may be constructed adjacent to the tank should likewise be calculated using a lateral soil pressure equal to 0.45 times the vertical pressure acting on the adjacent subgrade.

Steel tank bottoms are typically domed upward from the perimeter to the center to allow differential settlement to occur without overstressing the tank bottom in tension. The settlement is anticipated to be greater at the center than at the perimeter. The imposed loads under full hydrostatic pressure may

result in some settlement of the underlying engineered fill. Post-construction vertical settlement due to full hydrostatic loading is estimated at ½ inch near the center of the tank.

We recommend that a representative of the Geotechnical Engineer observe all foundation excavations prior to the placing of reinforcing steel. This inspection should be conducted to ensure that the bottoms and sides of all foundation excavations are level or suitably benched and are free of loose or soft soil, ponded water, and debris. If any loose pockets are encountered in the bottom of the foundation excavations, they should be over-excavated, and the base of the excavation should be backfilled with lean concrete. It is important that foundation excavations be clean and free of loose or soft soils, water, or other debris at the time concrete is placed.

Concrete Structural Slabs-on-Grade

Concrete slabs-on-grade should be supported by engineered fill prepared in accordance with our recommendations for earthwork.

A minimum of 4 inches of Class 2 Aggregate Base rock, compacted to a minimum of 90 percent relative compaction, should be provided beneath exterior flatwork and other slabs-on-grade.

It is important that the subgrade be moist and free of desiccation cracks at the time the slab is cast. Recommendations for slab reinforcement, strength, thickness, control and construction joints, etc., should be provided by others. Although cracks in concrete slabs are common and should be expected, the following measures may help to reduce cracking of slabs.

- Slabs should be cast using concrete with a maximum slump of 4 inches or less.
- Add a water reducing agent or plasticizer to the concrete to increase slump while maintaining a low water-cement ratio to reduce concrete shrinkage. (Concrete having a high water-cement ratio is a major cause of concrete cracking.)
- Control joints should be provided at appropriate intervals to control the location of shrinkage cracks.

Below Grade Tank Walls and Retaining Walls

Below-grade walls (including the tank walls) should be designed to resist both static lateral earth pressures and lateral pressures caused by earthquakes. We recommend permanent below-grade walls be designed for the more critical of either at-rest pressures or assumed static active pressure and a dynamic component. Although not anticipated, a design groundwater level of 1 foot above the bottom of the main tank should be assumed in design.

For restrained backfill conditions, use an at-rest equivalent fluid pressure of 60 pcf above the design groundwater level and 95 pcf below, plus a traffic surcharge where the wall is adjacent to access roads or streets. Active earth pressures may be used for design of unrestrained retaining walls, if required, where the top of the wall is free to translate or rotate. To develop active earth pressures, the walls should be capable of deflecting by at least 0.004H (where H is the height of the wall). Cantilever walls retaining level engineered fill may be designed for active lateral earth pressures of 36 pcf, plus a traffic surcharge where the wall is adjacent to access roads.

If retaining wall (or tank wall) backfill will be subject to passenger vehicle or light truck traffic loading within a distance of H/2 from the top of the wall (where H is the wall height), the wall should be designed to resist an additional uniform lateral pressure of 72 psf applied to the back of yielding walls (active conditions), or 124 psf applied to the back of non-yielding walls (at-rest conditions). Surcharge loads imposed by greater loads or unusual loads within a distance of H of the back of the wall should be considered on a case-by-case basis.

In addition to the active or at-rest lateral soil pressures, retaining walls should be designed to resist additional dynamic earth pressures during earthquake loading. The additional dynamic pressure increment may be calculated using an additional equivalent fluid pressure of 16 pcf. The dynamic pressure increment should be applied to the wall as a triangular distribution so the resultant force acts at a distance of 0.33H above the base of the wall (where H is the height of the wall). Under the combined effects of static and dynamic loading, a safety factor of 1.1 against sliding or overturning is acceptable.

The dynamic component of the lateral earth pressure was calculated using the Mononabe-Okabe equation and, therefore, assumes that sufficient deformation of the wall will occur during seismic loading to develop active soil conditions. As previously discussed, we recommend permanent below-grade walls be designed for the more critical of either at-rest pressures or assumed static active pressure and a dynamic component.

Closure

The analyses, conclusions, and recommendations contained in this report are based on site conditions that we observed at the time of our investigation, data from our subsurface explorations, our current understanding of proposed project elements, and on our experience with similar projects in similar geotechnical environments. We have assumed that the information obtained from our subsurface explorations is representative of subsurface conditions throughout the areas of proposed improvements addressed in this report.

We have assumed, in preparing our recommendations, that SHN will be retained to review those portions of the plans and specifications that pertain to soil-related work. The purpose of this review is to confirm that our earthwork recommendations have been properly interpreted and implemented during design. If we are not provided with this opportunity for review of the plans and specifications, our recommendations could be misinterpreted.

We recommend a representative of our firm confirm site conditions during the construction phase. If subsurface conditions differ significantly from those disclosed by our investigation, we should be given the opportunity to re-evaluate the applicability of our conclusions and recommendations. Some alteration of recommendations may be appropriate. If the scope of the proposed construction changes from that described in this report, our recommendations should also be reviewed.

Limitations

The recommendations provided in this report are based on the assumption that we will be retained to provide the construction monitoring described above in order to evaluate compliance with our recommendations. If we are not retained for these services, SHN cannot assume any responsibility for any potential claims that may arise during or after construction as a result of misuse or

misinterpretation of this report by others. Furthermore, if another geotechnical consultant is retained for follow-up service to this report, SHN will at that time cease to be the Geotechnical Engineer-of-Record.

The opinions presented in this report are valid as of the present date for the property evaluated. Changes in the condition of a property can occur with the passage of time, whether due to natural processes or the works of man, on this or adjacent properties. In addition, changes in applicable standards of practice can occur, whether from legislation or the broadening of knowledge. Accordingly, the opinions presented in this report may be invalidated, wholly or partially, by changes outside of our control. Therefore, this report is subject to review and should not be relied upon after a period of 2 years. In addition, this report should not be used and is not applicable for any property other than that evaluated.

Our conclusions and interpretations are also based on conditions at the time of our work. We cannot preclude changes that may occur in the future that could alter site conditions. This is especially true in Humboldt County, which is located in a dynamic geologic environment subject to large scale, catastrophic events (such as great earthquakes and large storms).

Lastly, this report applies only to the site described above. Because of the high degree of variability in geology in this region, it is not possible to extrapolate the results described herein to any other site. This report is to be considered in its entirety. No part, section, paragraph, sentence, or phrase is to be quoted, evaluated, or otherwise used without considering its context and relationship to the entire report.

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Geotechnical Boring Logs

1

BORING NUMBER B-1-LH

CLIENT Garberville Sanitary District
PROJECT NAME Main Tank
PROJECT NUMBER 022067.400
PROJECT LOCATION APN 032-211-021, Humboldt County
DATE STARTED 6/8/23 **COMPLETED** 6/8/23
GROUND ELEVATION **HOLE SIZE** 4"
DRILLING CONTRACTOR Taber Drilling
GROUNDWATER DEPTH
DRILLING METHOD Solid Flight Augers
▽ **AT TIME OF DRILLING** ---
LOGGED BY A. Troia **CHECKED BY** G. Simpson
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(CL-ML) SILT-CLAY, dry, brown, trace very fine sand, organics.										
		(CL-ML) SILTY LEAN CLAY, stiff to very stiff, dry, strong brown, low to medium plasticity, strong cementation, difficult to break samples; trace very fine sand.	SPT S1	100	5-7-8 (15)	>4.5						
		UC Test Undrained shear strength = 3613 psf	MCS S2, S3	100	8-12-13 (25)	>4.5	103	19				
5		(CL) Grades to SANDY LEAN CLAY, very stiff, dry to moist, strong brown/olive mottling; medium plasticity; very fine sand.	SPT S4	100	4-7-9 (16)				36	21	15	
		(SC) CLAYEY SAND-SANDY LEAN CLAY, medium dense/very stiff, dry to moist, strong brown, medium plasticity fines, strong cementation; occasional fine to coarse well-rounded silicious gravel, (WILDCAT FM?). **UC Test** Undrained shear strength = 1591 psf	MCS S5, S6	100	7-11-15 (26)	>4.5	107	20				
10		(SC) CLAYEY SAND, medium dense, dry to moist, strong brown; very fine sand; strong cementation; weak mottling and iron-oxide staining.	SPT S7	100	4-7-9 (16)							
15		Fine, cemented root casts at ~15'. Layer or lense of strong cementation. **UC Test** Undrained shear strength = 1191 psf	MCS S8, S9	100	6-10-11 (21)	3.5	104	22				
		(CL) Grades to SANDY LEAN CLAY, medium dense, moist, light brown to olive; medium plasticity; very fine sand; iron-oxide staining.										
20												

(Continued Next Page)

CLIENT Garberville Sanitary District **PROJECT NAME** Main Tank
PROJECT NUMBER 022067.400 **PROJECT LOCATION** APN 032-211-021, Humboldt County

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
20		(SC) CLAYEY SAND, medium dense, moist, dark yellowish-brown and tan (mottled); moderate to strong cementation, medium plasticity fines; thin clayey interbeds, thinly bedded sand with alternationg oxidized beds.	SPT S10	100	6-8-9 (17)							49
25		(SP-SC) POORLY GRADED SAND with CLAY, dense, moist, strong brown; strong cementation; fine sand with occasional coarse well-rounded sand; mottled.	MCS S11, S12	100	11-13-27 (40)	3.5						
30		No sample recovery; driller notes possible groundwater.										
35		(SC) CLAYEY SAND; dense, wet, olive; strong cementation; fine sand with interbedded medium to coarse subangular sand.	SPT S13	100	9-16-16 (32)							46
40												

(Continued Next Page)

BORING NUMBER B-1-LH

CLIENT Garberville Sanitary District **PROJECT NAME** Main Tank

PROJECT NUMBER 022067.400 **PROJECT LOCATION** APN 032-211-021, Humboldt County

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
		(SC) CLAYEY SAND; dense, wet, olive; strong cementation; fine sand with interbedded medium to coarse subangular sand. *(continued)*										
45		Becomes gray, medium dense, moist; very fine to find sand with trace medium sand; strong cementation, strong cohesion with medium plasticity fines; no dilatency.	SPT S14	100	6-9-10 (19)							
50		(CL) SANDY LEAN CLAY; very stiff, moist, gray to dark gray; very fine to fine sand; strong cementation with moderate toughness; sand is interbedded.	SPT S15	100	7-9-13 (22)							

Bottom of borehole at 51.5 feet.

BORING NUMBER B-2-LH

CLIENT Garberville Sanitary District
PROJECT NAME Main Tank
PROJECT NUMBER 022067.400
PROJECT LOCATION APN 032-211-021, Humboldt County
DATE STARTED 6/8/23 **COMPLETED** 6/8/23
GROUND ELEVATION **HOLE SIZE** 4"
DRILLING CONTRACTOR Taber Drilling
GROUNDWATER DEPTH
DRILLING METHOD Solid Flight Augers
▽ **AT TIME OF DRILLING** ---
LOGGED BY A. Troia **CHECKED BY** G. Simpson
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(CL-ML) SILT-CLAY, stiff, dry, strong brown, moderate cementation, low plasticity fines, very fine sand, very fine roots/organics.	SPT S1	100	5-6-7 (13)							
		(CL-ML) SILTY LEAN CLAY, stiff, dry, strong brown; low to medium plasticity, moderate to strong cementation; slight mottling; <10% very fine sand, (WILDCAT FM.) **UC Test** Undrained shear strength = 1475 psf	MCS S2, S3	100	6-7-7 (14)	4.25	99	19				
5		(CL) SANDY LEAN CLAY, very stiff, dry, strong brown; very fine sand with occasional coarse sand.	SPT S4	100	4-6-11 (17)							66
10		(CL) SANDY LEAN CLAY with GRAVEL, hard, dry, strong brown; mottling/iron oxide staining; medium plasticity fines; fine well-rounded gravel and coarse sand.	MCS S5, S6	100	13-17-26 (43)	>4.5	103	23				
15		(SC) CLAYEY SAND, dense, moist, strong brown; strong cementation, weakly stratified, no dilatency; fine sand.	SPT S7	100	8-11-13 (24)							
20												

(Continued Next Page)

CLIENT Garberville Sanitary District **PROJECT NAME** Main Tank
PROJECT NUMBER 022067.400 **PROJECT LOCATION** APN 032-211-021, Humboldt County

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
20		(SC) CLAYEY SAND, dense, moist, strong brown; strong cementation, weakly stratified, no dilatency; fine sand. *(continued)*	SPT S8	100	9-10-12 (22)							40
25												
30		Becomes medium dense, moist, strong cementation and cohesion; iron-oxide staining.	MCS S9, S10	100	7-10-12 (22)		109	20				
35												
40		(CL) SANDY LEAN CLAY; very stiff, gray to bluish gray, low to medium plasticity, fine sand.	MCS S11, S12	100	6-11-15 (26)	2.75	111	20				70

(Continued Next Page)

BORING NUMBER B-2-LH

CLIENT Garberville Sanitary District **PROJECT NAME** Main Tank

PROJECT NUMBER 022067.400 **PROJECT LOCATION** APN 032-211-021, Humboldt County

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
45		(SC) CLAYEY SAND, dense, moist, strong brown; strong cementation, weakly stratified, no dilatency; fine sand. *(continued)*										
50		(CL) LEAN CLAY, very stiff, dry, gray to dark gray; strong cementation, difficult to break with knife; low plasticity; occasional completely weathered, rounded, medium gravels.	MCS S13, S14	100	13-18-23 (41)	>4.5						

Bottom of borehole at 51.5 feet.

BORING NUMBER B-3-LH

CLIENT Garberville Sanitary District
PROJECT NUMBER 022067.400
DATE STARTED 6/8/23 **COMPLETED** 6/8/23
DRILLING CONTRACTOR Taber Drilling
DRILLING METHOD Solid Flight Augers
LOGGED BY A. Troia **CHECKED BY** G. Simpson
NOTES

PROJECT NAME Main Tank
PROJECT LOCATION APN 032-211-021, Humboldt County
GROUND ELEVATION **HOLE SIZE** 4"
GROUNDWATER DEPTH
▽ **AT TIME OF DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(SC) CLAYEY SAND to SANDY CLAY, loose/stiff, moist, strong brown; very fine to fine sand; low to medium plasticity fines; moderate cementation; slightly mottled, fine roots/organics in upper 6" and occasional to 10'.										
5			SPT S1	100	2-4-5 (9)							
10		(CL) SANDY CLAY, hard, dry, strong brown; mostly fine sand with medium to coarse sand; strong cementation; occasional rounded fine to medium gravels, (WILDCAT FM.) **UC Test** Undrained shear strength = 1605 psf	MCS S2, S3	100	10-21-21 (42)	4.0	103	22				
15			SPT S4	100	4-7-8 (15)							
20												

(Continued Next Page)

BORING NUMBER B-3-LH

CLIENT Garberville Sanitary District **PROJECT NAME** Main Tank

PROJECT NUMBER 022067.400 **PROJECT LOCATION** APN 032-211-021, Humboldt County

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
20		(CL) SANDY CLAY, hard, dry, strong brown; mostly fine sand with medium to coarse sand; strong cementation; occasional rounded fine to medium gravels, (WILDCAT FM.) *(continued)*	MCS S5, S6	100	10-21-24 (45)		101	20				54
25		Becomes moist.	SPT S7	100	12-12-16 (28)							

Bottom of borehole at 26.5 feet.

BORING NUMBER B-4-LH

CLIENT Garberville Sanitary District
PROJECT NAME Main Tank
PROJECT NUMBER 022067.400
PROJECT LOCATION APN 032-211-021, Humboldt County
DATE STARTED 6/8/23 **COMPLETED** 6/8/23
GROUND ELEVATION **HOLE SIZE** 4"
DRILLING CONTRACTOR Taber Drilling
GROUNDWATER DEPTH
DRILLING METHOD Solid Flight Augers
▽ **AT TIME OF DRILLING** ---
LOGGED BY A. Troia **CHECKED BY** G. Simpson
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(CL) SANDY LEAN CLAY, stiff, dry to moist, strong brown; moderate cementation, low plasticity; very fine sand with occasional coarse sand; organics in upper ~6".										
5			SPT S1	100	3-4-5 (9)							66
10		Becomes very stiff; mottled.	SPT S2	100	3-7-10 (17)				31	24	7	
15		(SC) CLAYEY SAND, medium dense, moist, brown; fine to medium sand.	SPT S3	100	5-10-13 (23)							42

Bottom of borehole at 16.5 feet.

BORING NUMBER B-1-APS

CLIENT Garberville Sanitary District
PROJECT NAME Alderpoint Pump Station
PROJECT NUMBER 022067.400
PROJECT LOCATION APN 223-183-003, Humboldt County
DATE STARTED 6/21/23 **COMPLETED** 6/21/23
GROUND ELEVATION 550 ft (approx.) **HOLE SIZE** 4"
DRILLING CONTRACTOR Taber Drilling
GROUNDWATER DEPTH
DRILLING METHOD Solid Flight Augers
AT TIME OF DRILLING --- Not encountered.
LOGGED BY A. Troia **CHECKED BY** G. Simpson
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(ML) SILT with GRAVELS, dry, dark brown, mottled at base; subrounded, fine to medium gravels, (TOPSOIL/WILDCAT FM.)										
		(SM) SILTY SAND, medium dense, moist, strong brown and gray (mottled); very fine to fine sand, (WILDCAT FM.)	MCS		7-10-11 (21)		116	13				44
		Becomes loose; same as above with occasional fine to medium gravels.	MCS		3-4-5 (9)		112	16				
5		Becomes medium dense with moderate cementation; increased gravel content.	MCS		6-8-10 (18)		112	16				
		(SC) CLAYEY SAND, medium dense, dry to moist, strong brown; strong cementation; very fine to fine sand, occasional rounded fine to medium gravel; moderately cohesive, low to medium plasticity fines; mottled.	SPT		4-6-11 (17)							
10		(CL) SANDY LEAN CLAY, very stiff, dry to moist, strong brown; strong cementation; medium plasticity fines; very fine to fine sand, mottled.	SPT		5-8-10 (18)							
15		(SC) CLAYEY SAND with GRAVEL, dense, dry to moist, strong brown; strong cementation, fine to medium subrounded gravels, fine sand.	SPT		15-19-30 (49)							

Bottom of borehole at 16.5 feet.

BORING NUMBER B-1-W

CLIENT Garberville Sanitary District
PROJECT NUMBER 022067.400
DATE STARTED 6/21/23 **COMPLETED** 6/21/23
DRILLING CONTRACTOR Taber Drilling
DRILLING METHOD Solid Flight Augers
LOGGED BY A. Troia **CHECKED BY** G. Simpson
NOTES

PROJECT NAME Wallan Tank
PROJECT LOCATION APN 223-191-006, Humboldt County
GROUND ELEVATION 1153 ft NAVD88 **HOLE SIZE** 4"
GROUNDWATER DEPTH
▽ **AT TIME OF DRILLING** --- Not Encountered.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(ML) SILT with GRAVEL, dry, brown, fine to medium subrounded gravel.										
		SANDSTONE BOULDER, dry, strong brown; fine sand; highly fractured, requires light effort to break sample with knife.	MCS	100	10-15-34 (49)		120	22				
		(CL) LEAN CLAY, stiff, dry, brown, moderate cementation, medium plasticity; trace fine micaceous sand; occasional angular, well-graded gravels.	SPT	100	10-7-6 (13)				33	19	14	
5		SANDSTONE BEDROCK; highly weathered, moderately soft, highly fractured, fine sand; oxidized; zones of silty-clay throughout.	MCS	100	10-16-27 (43)		106	19				
		Becomes dark brown.	SPT	100	14-15-15 (30)							
10			MCS	100	16-13-18 (31)							
15		Same as above.	SPT	100	12-12-15 (27)							

Bottom of borehole at 16.5 feet.

BORING NUMBER B-2-W

CLIENT Garberville Sanitary District
PROJECT NAME Wallan Tank
PROJECT NUMBER 022067.400
PROJECT LOCATION APN 223-191-006, Humboldt County
DATE STARTED 6/21/23 **COMPLETED** 6/21/23
GROUND ELEVATION 1153 ft NAVD88 **HOLE SIZE** 4"
DRILLING CONTRACTOR Taber Drilling
GROUNDWATER DEPTH
DRILLING METHOD Solid Flight Augers
AT TIME OF DRILLING --- Not Encountered.
LOGGED BY A. Troia **CHECKED BY** G. Simpson
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(ML) SILT with GRAVEL, dry, brown, fine to medium subrounded gravels.										
		(CL-ML) SILTY CLAY with SAND, stiff, dry, brown; very fine sand, medium angular gravels, moderate cementation. **UC Test** Undrained shear strength = 1498 psf	MCS	100	10-9-11 (20)							
		(GW-GM) SILTY GRAVEL with SAND, medium dense, dry, brown; angular, well-graded gravels.	MCS	100	10-11-16 (27)		104	16				
5		SILTY SANDSTONE, moderately soft, dry, strong brown and gray, highly fractured.	SPT	100	8-7-13 (20)		117	11				
			SPT	44	7-12-10 (22)							
10		Slightly increased cementation.	MCS	100	11-13-14 (27)							
15		Same as above.	MCS	100	17-16-15 (31)							

Bottom of borehole at 16.5 feet.

Laboratory Results 2

Phone: (707) 441-8855 Email: info@shn-engr.com Web: shn-engr.com
812 W. Wabash Avenue, Eureka, CA 95501-2138

DENSITY BY DRIVE- CYLINDER METHOD (ASTM D2937)

Project Name:	**GSD-APS**	**Project Number:**	**022067.400**
Performed By:	**JMA**	**Date:**	**7/12/2023**
Checked By:	**KEW**	**Date:**	**7/18/2023**
Project Manager:	**JSO**		

Lab Sample Number	23-671	23-673	23-675		
Boring Label	B-1-APS	B-1-APS	B-1-APS		
Sample Depth (ft)	2-2.5'	4-4.5'	6-6.5'		
Diameter of Cylinder, in	2.42	2.42	2.42		
Total Length of Cylinder, in.	6.00	6.00	6.00		
Length of Empty Cylinder A, in.	0.00	0.00	0.00		
Length of Empty Cylinder B, in.	0.90	0.80	0.52		
Length of Cylinder Filled, in	5.10	5.20	5.48		
Volume of Sample, in^3	23.46	23.92	25.21		
Volume of Sample, cc.	384.41	391.94	413.05		

Pan #	SS8	SS3	SS12		
Weight of Wet Soil and Pan	1000.0	1013.0	1051.1		
Weight of Dry Soil and Pan	904.8	898.3	934.7		
Weight of Water	95.2	114.7	116.4		
Weight of Pan	192.9	197.0	194.2		
Weight of Dry Soil	711.9	701.3	740.5		
Percent Moisture	13.4	16.4	15.7		
Dry Density, g/cc	1.85	1.79	1.79		
Dry Density, lb/ft^3	115.6	111.7	111.9		

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812 W. Wabash Avenue, Eureka, CA 95501-2138

PERCENT PASSING # 200 SIEVE (ASTM - D1140)

Project Name:	**GSD-APS**	**Project Number:**	**022067.400**
Performed By:	**JMA**	**Date:**	**7/14/2023**
Checked By:	**KH**	**Date:**	**7/18/2023**
Project Manager:	**JSO**		

Lab Sample Number	23-670				
Boring Label	B-1-APS				
Sample Depth	1.5-2.0'				
Pan Number	ss8				
Dry Weight of Soil & Pan	569.8				
Pan Weight	193.5				
Weight of Dry Soil	376.3				
Soil Weight Retained on #200&Pan	402.5				
Soil Weight Passing #200	167.3				
Percent Passing #200	**44**				

Lab Sample Number					
Boring Label					
Sample Depth					
Pan Number					
Dry Weight of Soil & Pan					
Pan Weight					
Weight of Dry Soil					
Soil Weight Retained on #200&Pan					
Soil Weight Passing #200					
Percent Passing #200					

Garberville Sanitary District Water Improvements – Geotech
Lower Hurlbutt site (one of three sites)

p 1 of 3

Phone: (707) 441-8855 Email: info@shn-engr.com Web: shn-engr.com
812 W. Wabash Avenue, Eureka, CA 95501-2138

MATERIALS TESTING LABORATORY RECEIVING AND SCHEDULING OF TESTS

PROJECT NAME GSD WATER LH — Date Sampled 6/07/2023 — Sampled by ART

JOB NUMBER 022067.400 — Date Received — Results to ART

PROJECT MANAGER ART (J.O'BARR AM) ← TASK MANAGER FOR GEOTECH — Date Recorded — ☐ Lab Billing Program Submitted

TOTAL NUMBER OF SAMPLES — BAGS ____ BUCKETS ____ SHELBY TUBES ____ BRASS LINERS ____

SAMPLE CONDITION: INTACT ☐ DAMAGED ☐ COMPOSITE ☐ UNDISTURBED ☐

Client Information:

SAMPLE NO. & DEPTH	MOISTURE DENSITY	UNCONFINED COMPRESSION	USDA TEXTURAL ANALYSIS	COARSE SIEVE ANALYSIS 3" to No.4	FINE SIEVE ANALYSIS No.4 to No. 200	% PASSING 200	SAND EQUIVALENT	SPECIFIC GRAVITY	PLASTICITY INDEX	COMPACTION CURVE (ASTM-1557)	CAL TRANS CURVE (CT-216)	COMPACTION CHECK POINT	% ORGANICS	LA RATTLER	DURABILITY	SULFATE SOUNDNESS	RICE SPECIFIC GRAVITY	R VALUE	CONSOLIDATION *		DIRECT SHEAR **	TRIAXIAL SHEAR **	LAB SAMPLE NUMBER
B-1-LH 1-2.5																							
3.5-4																							
4-4.5		■																					
5-6.5									■														
7.5-8																							
8-8.5		■																					
10-11.5																							
15.5-16																							
16-16.5		■																					
20-21.5'						■																	
25.5-26																							
26-26.5																							
35-36.5'						■																	
45-46.5'																							
50-51.5'																							
B-2-LH 1-2.5																							
3.5-4																							
TOTAL																							

COMMENTS:

Samples will be retained for 90 days after completion of the testing program. If samples need to bre retained beyond 90 days, indicate how long to retain this sample program ____

* Indicate The Following: Consolidation Loads: ____ Consolidated Drained: ☐ Consolidated Undrained: ☐ Unconsolidated Undrained: ☐ note all points to be saturated Residual Cycles ____

** Indicate The Following: Confining loads: ____

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MATERIALS TESTING LABORATORY RECEIVING AND SCHEDULING OF TESTS

PROJECT NAME GSD Water LH | Date Sampled 6/7/23 | Sampled by ART

JOB NUMBER 022067.406 | Date Received | Results to ART

PROJECT MANAGER ART NSO | Date Recorded | ☐ Lab Billing Program Submitted

TOTAL NUMBER OF SAMPLES: BAGS ____ BUCKETS ____ SHELBY TUBES ____ BRASS LINERS ____

SAMPLE CONDITION: INTACT ☐ DAMAGED ☐ COMPOSITE ☐ UNDISTURBED ☐

Client Information:

SAMPLE NO. & DEPTH	MOISTURE DENSITY	UNCONFINED COMPRESSION	USDA TEXTURAL ANALYSIS	COARSE SIEVE ANALYSIS 3" to No.4	FINE SIEVE ANALYSIS No.4 to No. 200	% PASSING 200	SAND EQUIVALENT	SPECIFIC GRAVITY	PLASTICITY INDEX	COMPACTION CURVE (ASTM-1557)	CAL TRANS CURVE (CT-216)	COMPACTION CHECK POINT	% ORGANICS	LA RATTLER	DURABILITY	SULFATE SOUNDNESS	RICE SPECIFIC GRAVITY	R VALUE	CONSOLIDATION *		DIRECT SHEAR **	TRIAXIAL SHEAR **	LAB SAMPLE NUMBER
B-2-LH 4-4.5		■																					
5-6.5'						■																	
10.5-11																							
11-11.5	■																						
15-16.5																							
20-21.5						■																	
30.5-31																							
31-31.5	■																						
40.5-41						■																	
41-41.5	■																						
50.5-51																							
51-51.5																							
B-3-LH 5-6.5									■														
10.5-11																							
11-11.5		■																					
15-16.5																							
20.5-21						■																	
TOTAL																							

COMMENTS:

Samples will be retained for 90 days after completion of the testing program. If samples need to bre retained beyond 90 days, indicate how long to retain this sample program ____

* Indicate The Following: Consolidation Loads: ____ Consolidated Drained: ☐ Consolidated Undrained: ☐ Unconsolidated Undrained: ☐ note all points to be saturated Residual Cycles ____

** indicate The Following: Confining loads: ____

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MATERIALS TESTING LABORATORY RECEIVING AND SCHEDULING OF TESTS

PROJECT NAME GSD WATER LH | Date Sampled 6/7/23 | Sampled by ART

JOB NUMBER 022067.400 | Date Received | Results to ART

PROJECT MANAGER ART / JSO | Date Recorded | ☐ Lab Billing Program Submitted

TOTAL NUMBER OF SAMPLES: BAGS ____ BUCKETS ____ SHELBY TUBES ____ BRASS LINERS ____

SAMPLE CONDITION: INTACT ☐ DAMAGED ☐ COMPOSITE ☐ UNDISTURBED ☐

Client Information:

SAMPLE NO. & DEPTH	MOISTURE DENSITY	UNCONFINED COMPRESSION	USDA TEXTURAL ANALYSIS	COARSE SIEVE ANALYSIS 3" to No.4	FINE SIEVE ANALYSIS No.4 to No. 200	% PASSING 200	SAND EQUIVALENT	SPECIFIC GRAVITY	PLASTICITY INDEX	COMPACTION CURVE (ASTM-1557)	CAL TRANS CURVE (CT-216)	COMPACTION CHECK POINT	% ORGANICS	LA RATTLER	DURABILITY	SULFATE SOUNDNESS	RICE SPECIFIC GRAVITY	R VALUE	CONSOLIDATION *		DIRECT SHEAR **	TRIAXIAL SHEAR **	LAB SAMPLE NUMBER
B-3-LH 21-21.5	■																						
25-26.5'																							
B-4-LH 5-6.5'						■																	
10-11.5'									■														
15-16.5'						■																	
TOTAL																							

COMMENTS:

Please indicate the total quantity of brass linners to be cleaned, a unit fee of $3 per sample will be applied ____

Samples will be retained for 90 days after completion of the testing program. If samples need to bre retained beyond 90 days, indicate how long to retain this sample program ____

* Indicate The Following: Consolidation Loads: ____ Consolidated Drained: ☐ Consolidated Undrained: ☐ Unconsolidated Undrained: ☐ note all points to be saturated Residual Cycles ____

** Indicate The Following: Confining loads: ____

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DENSITY BY DRIVE- CYLINDER METHOD (ASTM D2937)

Project Name:	**GSD Water- Main Tank**	**Project Number:**	**022067.400**
Performed By:	**KEW**	**Date:**	**6/28/2023**
Checked By:	**KEW**	**Date:**	**7/10/2023**
Project Manager:	**JOB**		

Lab Sample Number	23-598	23-602	23-604	23-612	
Boring Label	B-2-LH	B-2-LH	B-2-LH	B-3-LH	
Sample Depth (ft)	11-11.5'	31-31.5'	41-41.5'	21-21.5'	
Diameter of Cylinder, in	2.40	2.40	2.40	2.40	
Total Length of Cylinder, in.	6.00	6.00	6.00	6.00	
Length of Empty Cylinder A, in.	0.00	0.00	0.00	0.00	
Length of Empty Cylinder B, in.	0.60	0.65	0.80	1.00	
Length of Cylinder Filled, in	5.40	5.35	5.20	5.00	
Volume of Sample, in^3	24.43	24.20	23.52	22.62	
Volume of Sample, cc.	400.32	396.61	385.49	370.67	

Pan #	SS14	SS2	SS6	SS1	
Weight of Wet Soil and Pan	1000.6	1025.3	1015.7	915.9	
Weight of Dry Soil and Pan	850.6	886.9	882.2	795.2	
Weight of Water	150.0	138.4	133.5	120.7	
Weight of Pan	192.7	193.4	195.9	195.1	
Weight of Dry Soil	657.9	693.5	686.3	600.1	
Percent Moisture	22.8	20.0	19.5	20.1	
Dry Density, g/cc	1.64	1.75	1.78	1.62	
Dry Density, lb/ft^3	102.6	109.2	111.1	101.1	

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PERCENT PASSING # 200 SIEVE (ASTM - D1140)

Project Name:	**GSD Water-Main Tank**	**Project Number:**	**022067.400**
Performed By:	**KEW**	**Date:**	**6/28/2023**
Checked By:	**KEW**	**Date:**	**7/10/2023**
Project Manager:	**JOB**		

Lab Sample Number	23-587	23-590	23-596	23-600	23-603
Boring Label	B-1-LH	B-1-LH	B-2-LH	B-2-LH	B-2-LH
Sample Depth	20-21.5'	35-36.5'	5-6.5'	20-21.5'	40.5-41'
Pan Number	SS8	SS10	SS15	SS3	SS12
Dry Weight of Soil & Pan	362.1	366.1	359.6	365.3	360.1
Pan Weight	192.9	195.3	194.3	197.0	193.9
Weight of Dry Soil	169.2	170.8	165.3	168.3	166.2
Soil Weight Retained on #200&Pan	279.6	287.5	250.7	297.8	243.5
Soil Weight Passing #200	82.5	78.6	108.9	67.5	116.6
Percent Passing #200	**49**	**46**	**66**	**40**	**70**

Lab Sample Number	23-611	23-614	23-616		
Boring Label	B-3-LH	B-4-LH	B-4-LH		
Sample Depth	20.5-21'	5-6.5'	15-16.5'		
Pan Number	SS5	SS7	S8		
Dry Weight of Soil & Pan	367.5	360.9	319.5		
Pan Weight	196.0	193.6	158.8		
Weight of Dry Soil	171.5	167.3	160.7		
Soil Weight Retained on #200&Pan	275.4	250.5	252.5		
Soil Weight Passing #200	92.1	110.4	67.0		
Percent Passing #200	**54**	**66**	**42**		

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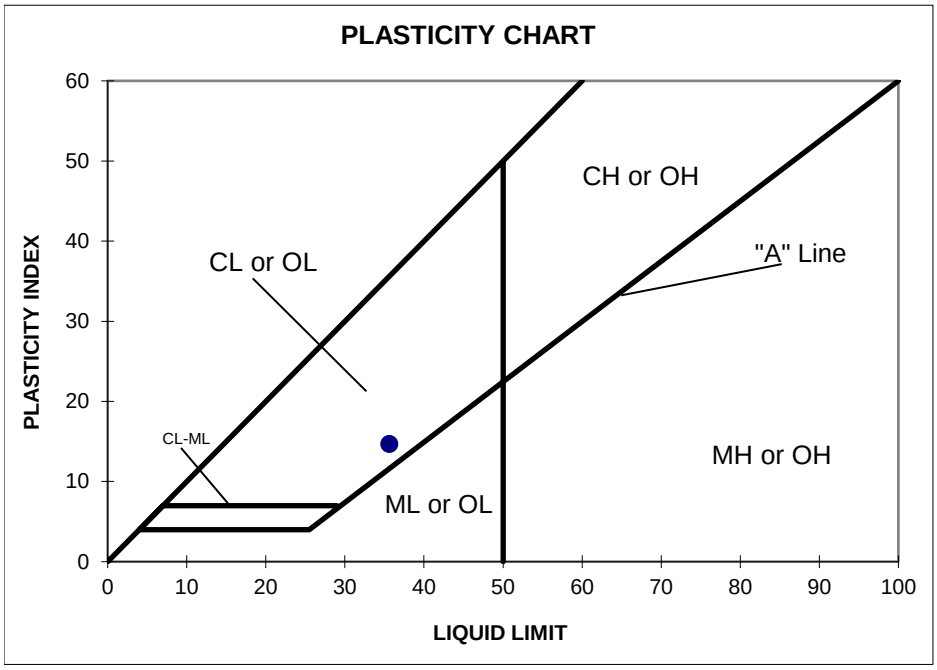
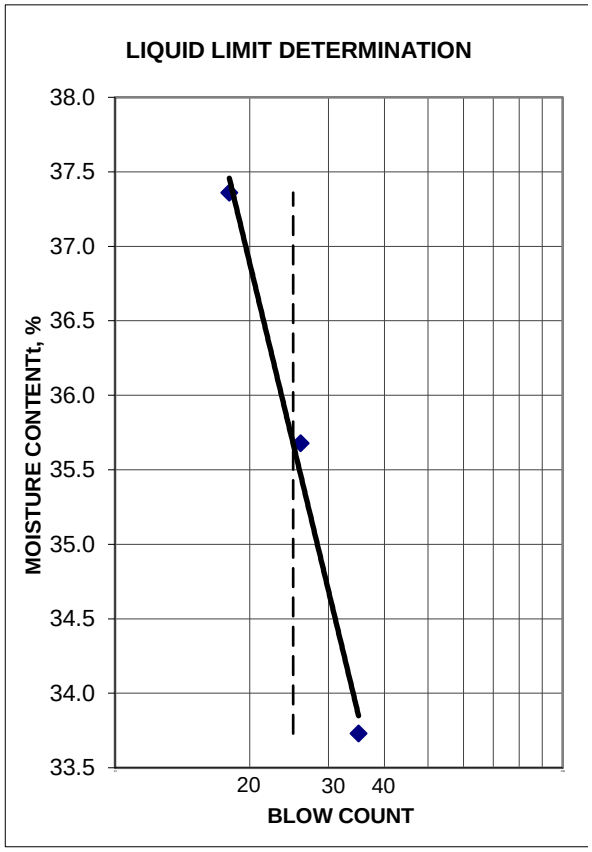
LIQUID LIMIT, PLASTIC LIMIT, and PLASTICITY INDEX (ASTM-D4318)

JOB NAME:	**GSD Water-Main Tank**	JOB #:	**022067.400**	LAB SAMPLE #:	**23-581**
SAMPLE ID:	**B-1 5-6.5**	PERFORMED BY:	**KEW**	DATE:	**7/7/2023**
PROJECT MANAGER:	**JOB**	CHECKED BY:	**KEW**	DATE:	**7/10/2023**

LINE NO.		TRIAL NO. 1	TRIAL NO. 2	TRIAL NO. 1	TRIAL NO. 2	TRIAL NO. 3
A	PAN #	17	18	7	8	9
B	PAN WT. (g)	20.260	20.170	28.900	29.040	28.610
C	WT. WET SOIL & PAN (g)	28.060	28.330	34.530	34.440	34.750
D	WT. DRY SOIL & PAN (g)	26.710	26.920	33.110	33.020	33.080
E	WT. WATER (C-D)	1.350	1.410	1.420	1.420	1.670
F	WT. DRY SOIL (D-B)	6.450	6.750	4.210	3.980	4.470
G	BLOW COUNT	--	--	35	26	18
H	MOISTURE CONTENT (E/F*100)	20.9	20.9	33.7	35.7	37.4

LIQUID LIMIT	**PLASTIC INDEX**	PLASTIC LIMIT
36	**15**	21





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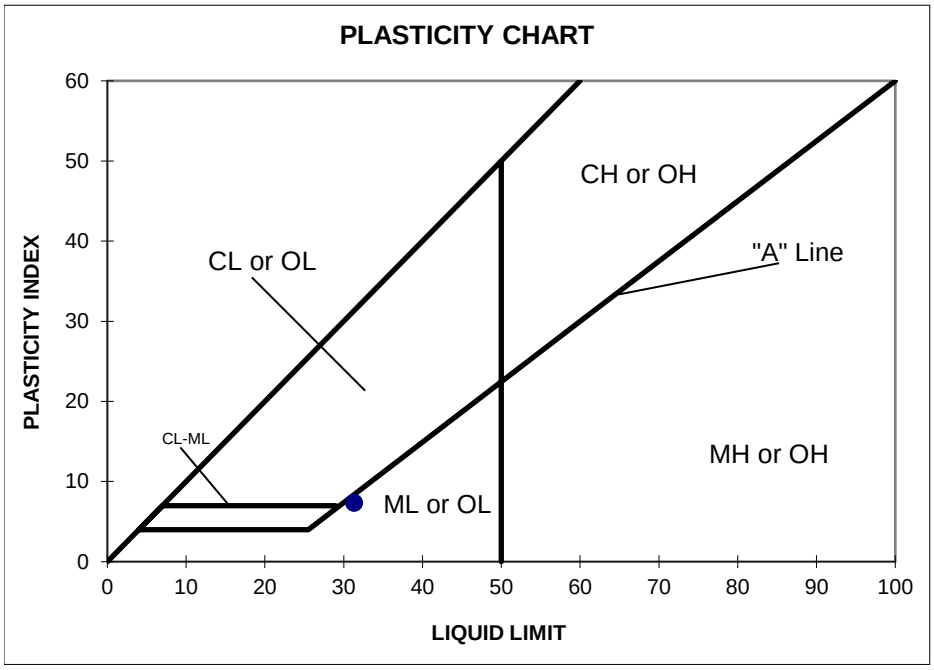
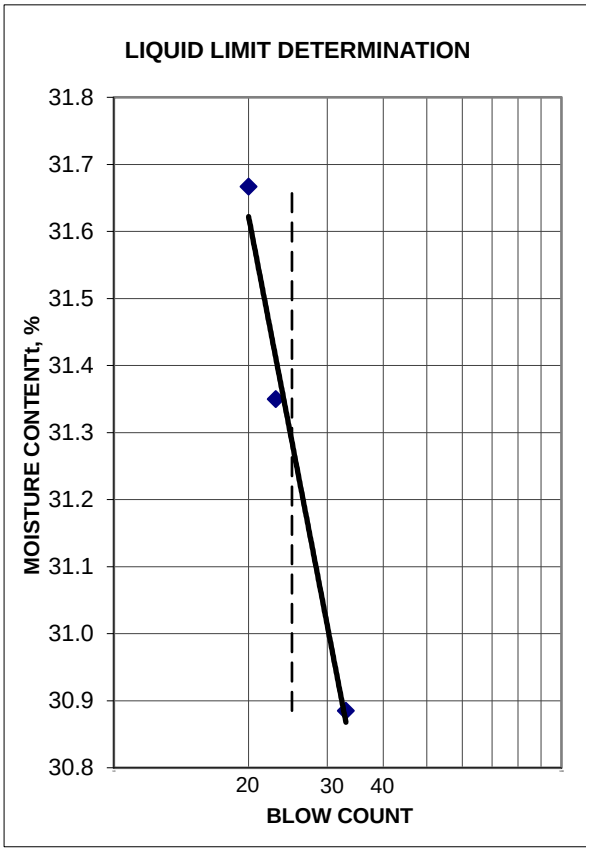
LIQUID LIMIT, PLASTIC LIMIT, and PLASTICITY INDEX (ASTM-D4318)

JOB NAME:	**GSD Water-Main Tank**	JOB #:	**022067.400**	LAB SAMPLE #:	**23-615**
SAMPLE ID:	**B-4 10-11.5'**	PERFORMED BY:	**KEW**	DATE:	**7/7/2023**
PROJECT MANAGER:	**JOB**	CHECKED BY:	**KEW**	DATE:	**7/10/2023**

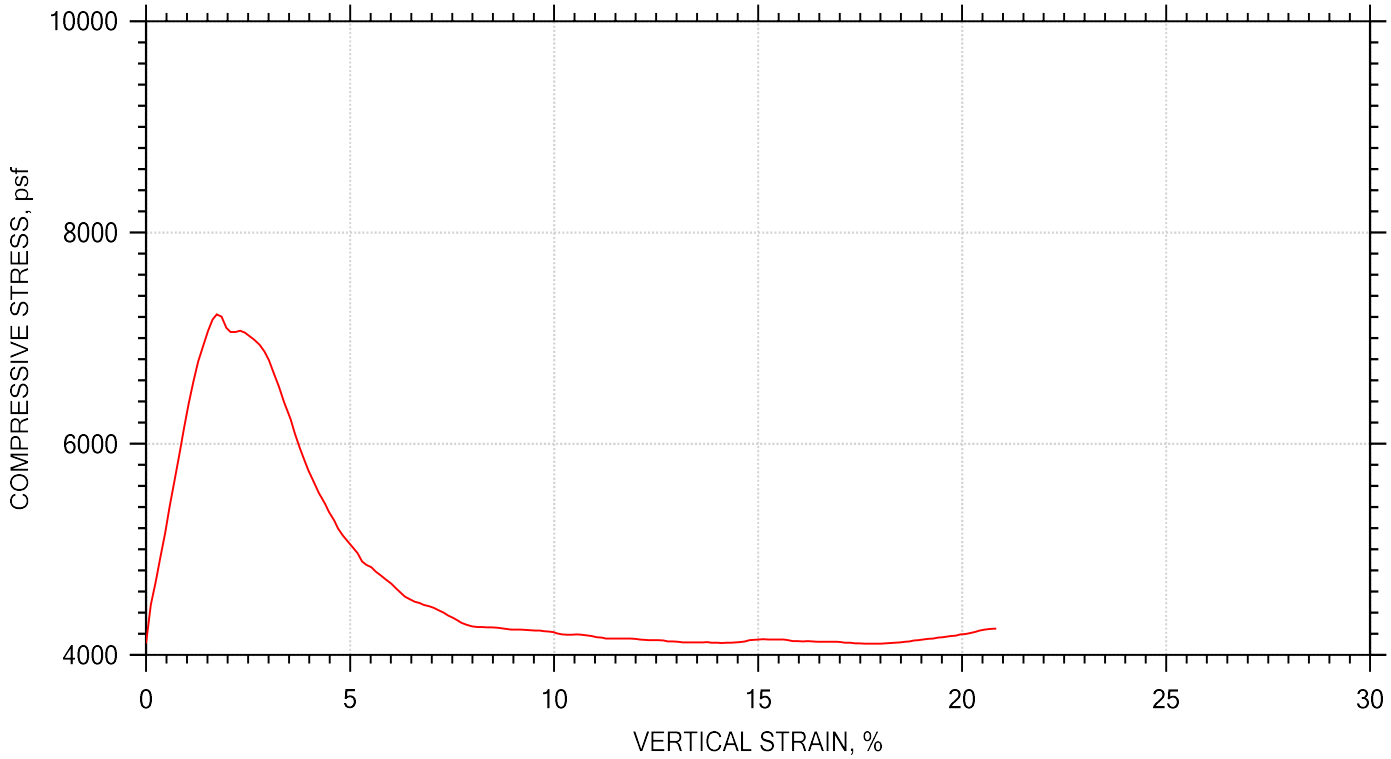
LINE NO.		TRIAL NO. 1	TRIAL NO. 2	TRIAL NO. 1	TRIAL NO. 2	TRIAL NO. 3
A	PAN #	13	14	1	2	3
B	PAN WT. (g)	21.940	20.130	29.580	28.940	28.970
C	WT. WET SOIL & PAN (g)	30.530	28.510	36.530	37.990	35.290
D	WT. DRY SOIL & PAN (g)	28.870	26.890	34.890	35.830	33.770
E	WT. WATER (C-D)	1.660	1.620	1.640	2.160	1.520
F	WT. DRY SOIL (D-B)	6.930	6.760	5.310	6.890	4.800
G	BLOW COUNT	--	--	33	23	20
H	MOISTURE CONTENT (E/F*100)	24.0	24.0	30.9	31.3	31.7

LIQUID LIMIT	**PLASTIC INDEX**	PLASTIC LIMIT
31	**7**	24





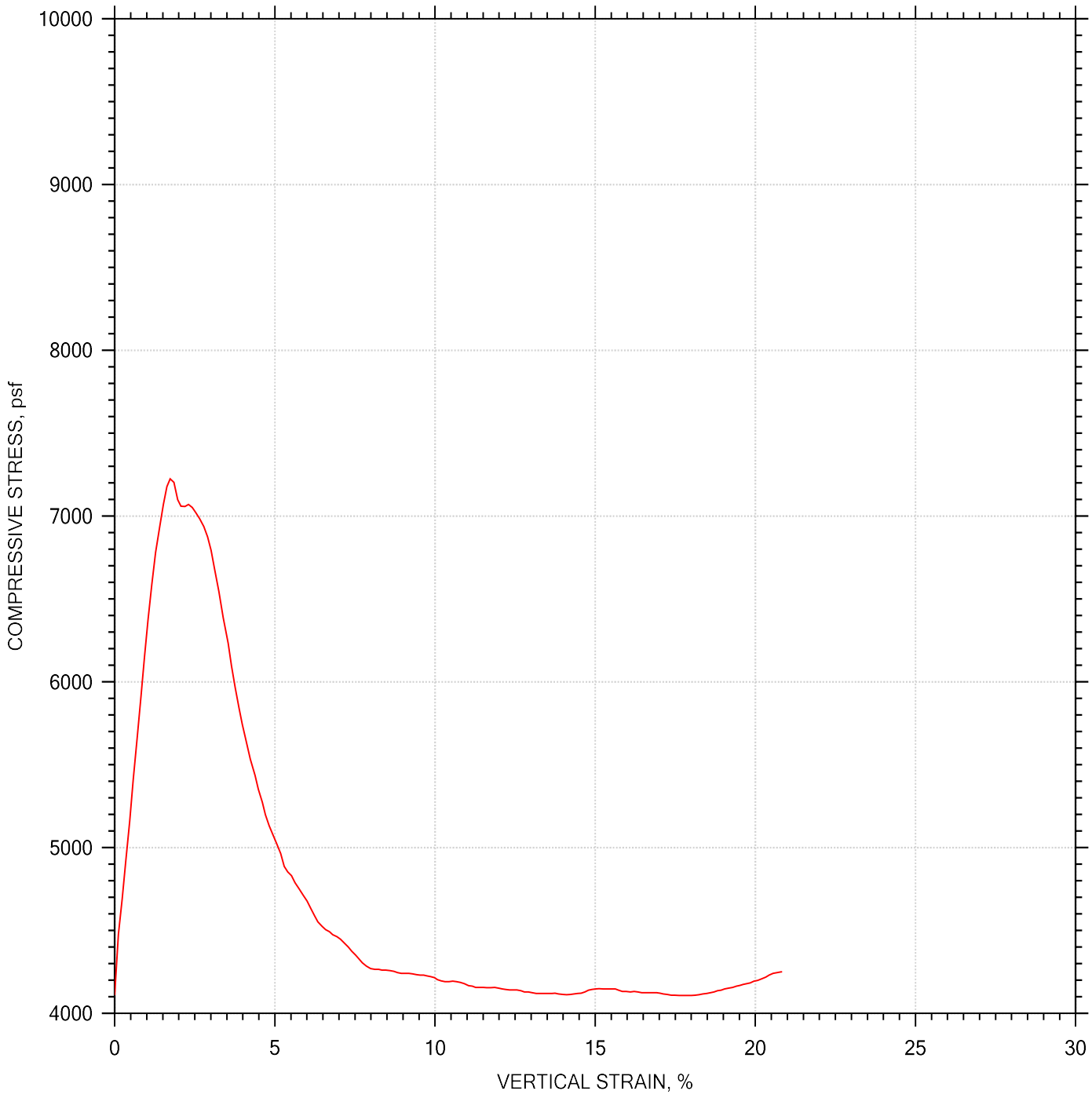
UNCONFINED COMPRESSION TEST REPORT



Symbol					
Test No.		23-580			
Initial	Diameter, in	2.4			
	Height, in	4.8			
	Water Content, %	19.19			
	Dry Density, pcf	103.1			
	Saturation, %	84.16			
	Void Ratio	0.604			
Unconfined Compressive Strength, psf		7225			
Undrained Shear Strength, psf		3613			
Time to Failure, min		1.5025			
Strain Rate, %/min		0.01			
Estimated Specific Gravity		2.65			
Liquid Limit		---			
Plastic Limit		---			
Plasticity Index		---			
Failure Sketch					

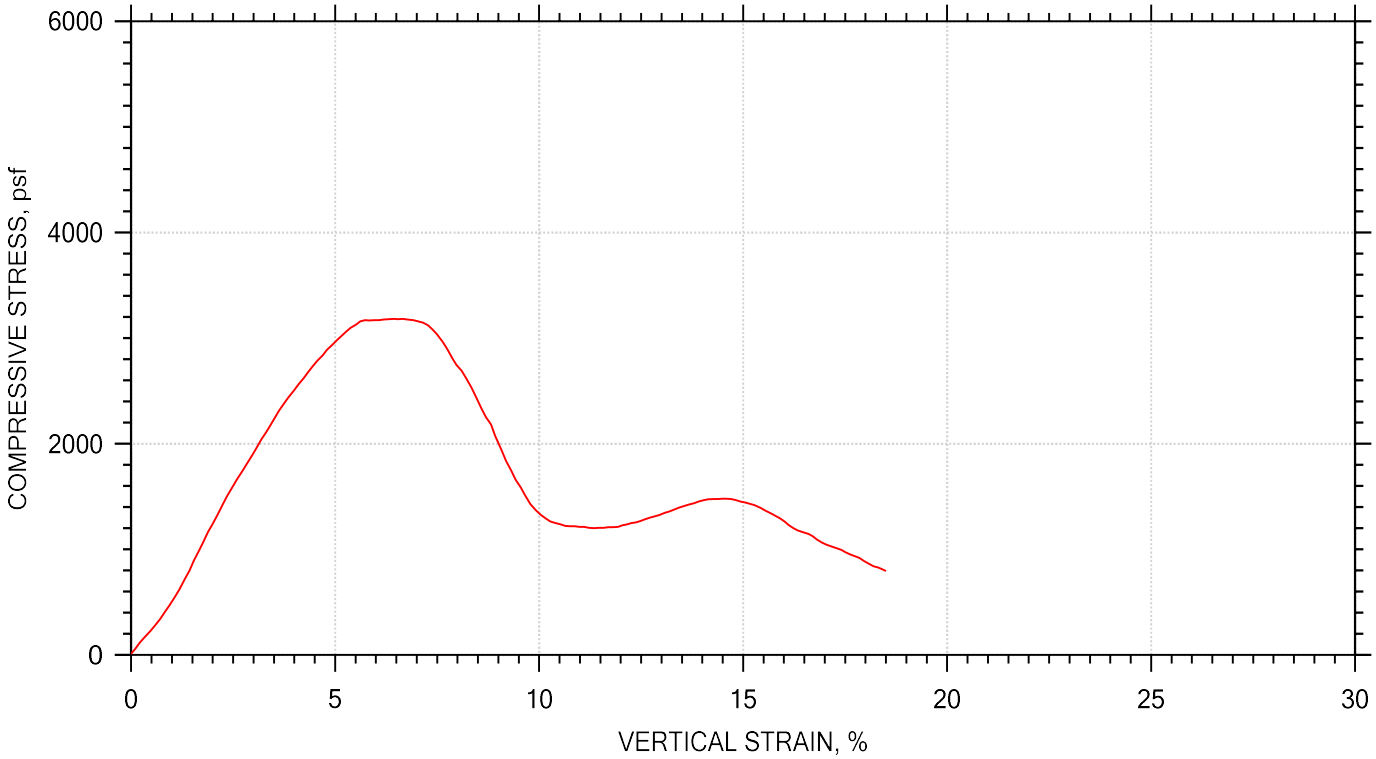
	Project: GSD Water	Location: Garberville	Project No.: 022067.400
	Boring No.: B-1-LH	Tested By: KEW	Checked By:
	Sample No.: 3	Test Date: 6/29/23	Elevation:
	Test No.: 23-580	Preparation: Undisturbed	Depth: 4-4.5'
	Description:		
	Remarks:		

UNCONFINED COMPRESSION TEST REPORT



	Project: GSD Water	Location: Garberville	Project No.: 022067.400
	Boring No.: B-1-LH	Tested By: KEW	Checked By:
	Sample No.: 3	Test Date: 6/29/23	Elevation:
	Test No.: 23-580	Preparation: Undisturbed	Depth: 4-4.5'
	Description:		
	Remarks:		

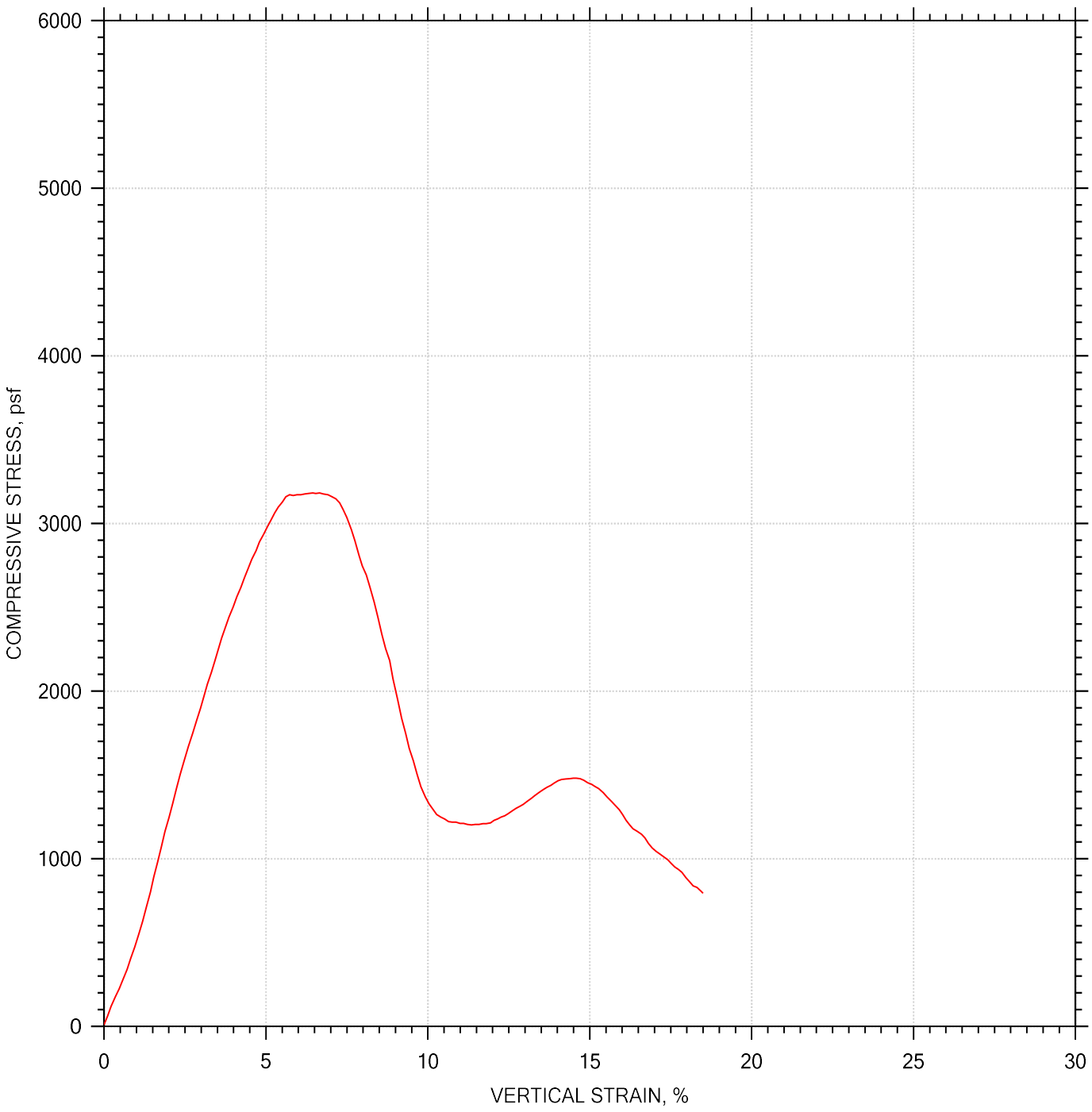
UNCONFINED COMPRESSION TEST REPORT



Symbol					
Test No.		23-583			
Initial	Diameter, in	2.4			
	Height, in	4.9			
	Water Content, %	20.16			
	Dry Density, pcf	106.7			
	Saturation, %	96.93			
	Void Ratio	0.551			
Unconfined Compressive Strength, psf		3182			
Undrained Shear Strength, psf		1591			
Time to Failure, min		5.7042			
Strain Rate, %/min		0.01			
Estimated Specific Gravity		2.65			
Liquid Limit		---			
Plastic Limit		---			
Plasticity Index		---			
Failure Sketch					

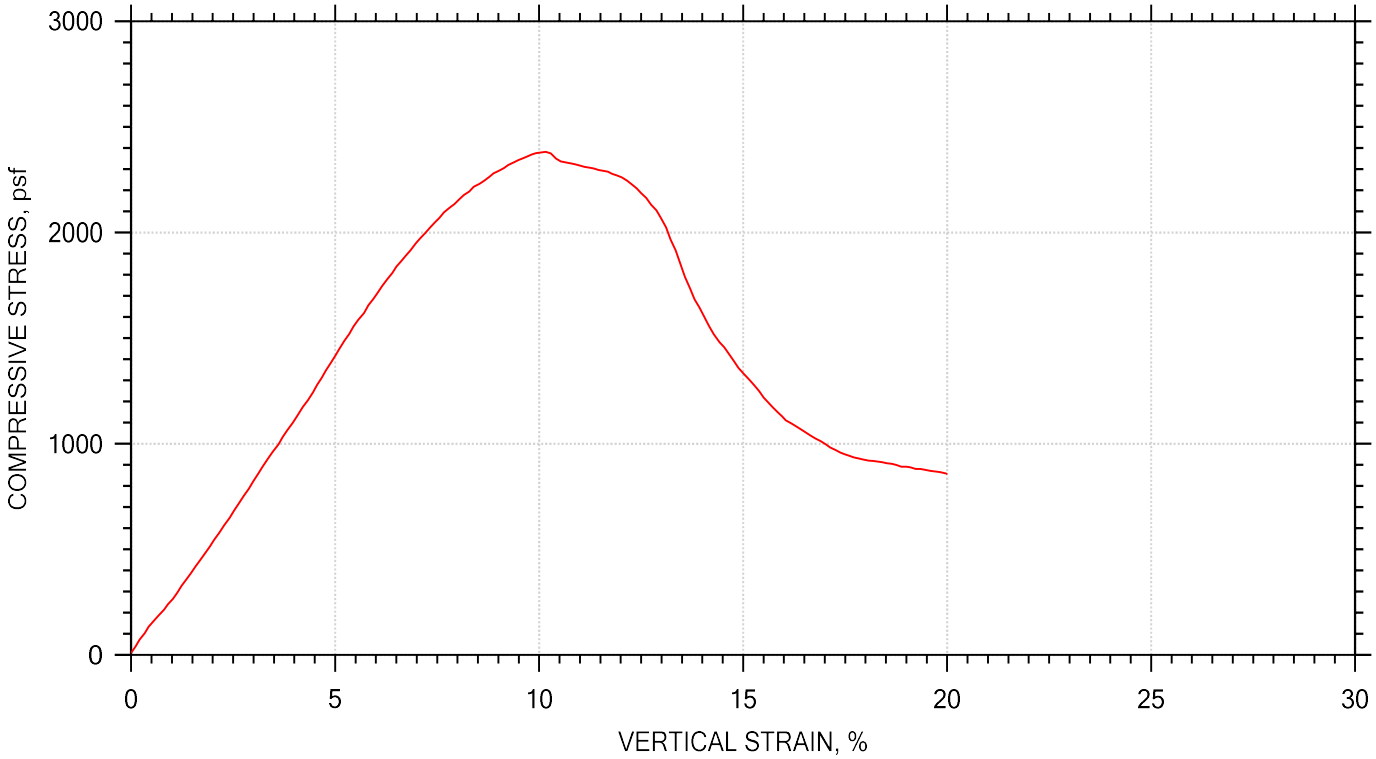
	Project: GSD Water	Location: Garberville	Project No.: 022067.400
	Boring No.: B-1-LH	Tested By: KEW	Checked By: KEW
	Sample No.: 6	Test Date: 6/29/23	Elevation:
	Test No.: 23-583	Preparation: Undisturbed	Depth: 8-8.5'
	Description:		
	Remarks:		

UNCONFINED COMPRESSION TEST REPORT



	Project: GSD Water	Location: Garberville	Project No.: 022067.400
	Boring No.: B-1-LH	Tested By: KEW	Checked By: KEW
	Sample No.: 6	Test Date: 6/29/23	Elevation:
	Test No.: 23-583	Preparation: Undisturbed	Depth: 8-8.5'
	Description:		
	Remarks:		

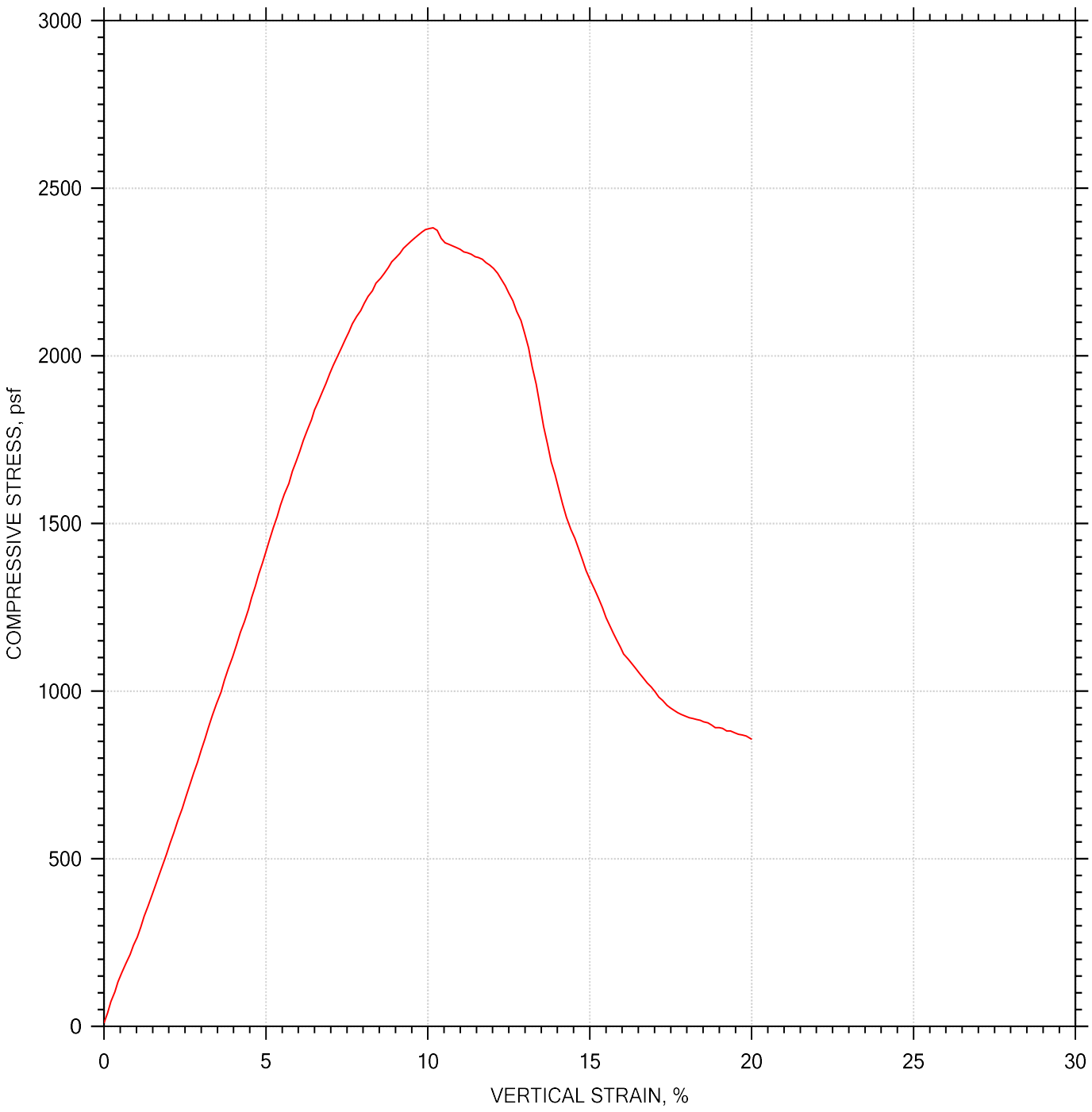
UNCONFINED COMPRESSION TEST REPORT



Symbol					
Test No.		23-586			
Initial	Diameter, in	2.4			
	Height, in	5			
	Water Content, %	21.96			
	Dry Density, pcf	103.8			
	Saturation, %	97.95			
	Void Ratio	0.594			
Unconfined Compressive Strength, psf		2382			
Undrained Shear Strength, psf		1191			
Time to Failure, min		8.7029			
Strain Rate, %/min		0.01			
Estimated Specific Gravity		2.65			
Liquid Limit		---			
Plastic Limit		---			
Plasticity Index		---			
Failure Sketch					

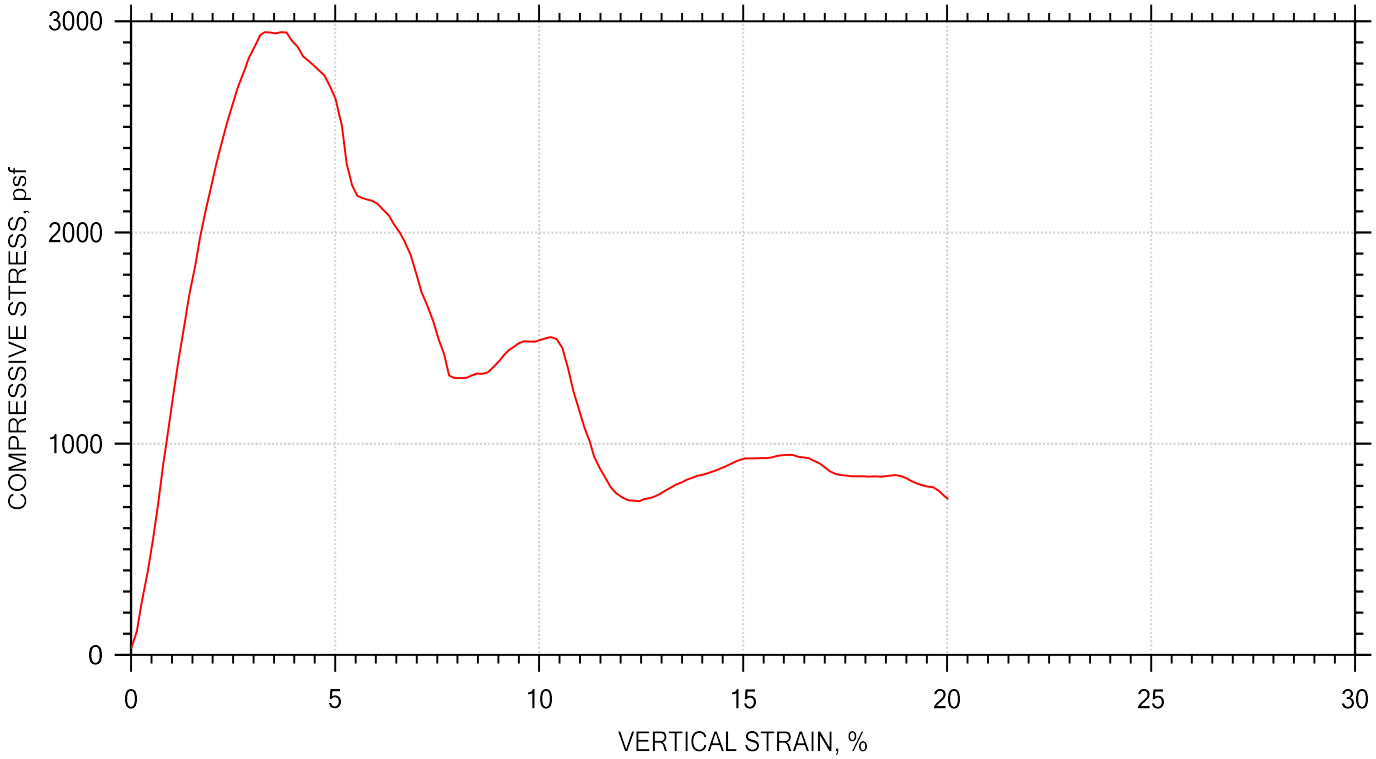
	Project: GSD Water	Location: Garberville	Project No.: 022067.400
	Boring No.: B-1-LH	Tested By: KEW	Checked By: KEW
	Sample No.: 9	Test Date: 6/29/23	Elevation:
	Test No.: 23-586	Preparation: Undisturbed	Depth: 16-16.5'
	Description:		
	Remarks:		

UNCONFINED COMPRESSION TEST REPORT



	Project: GSD Water	Location: Garberville	Project No.: 022067.400
	Boring No.: B-1-LH	Tested By: KEW	Checked By: KEW
	Sample No.: 9	Test Date: 6/29/23	Elevation:
	Test No.: 23-586	Preparation: Undisturbed	Depth: 16-16.5'
	Description:		
	Remarks:		

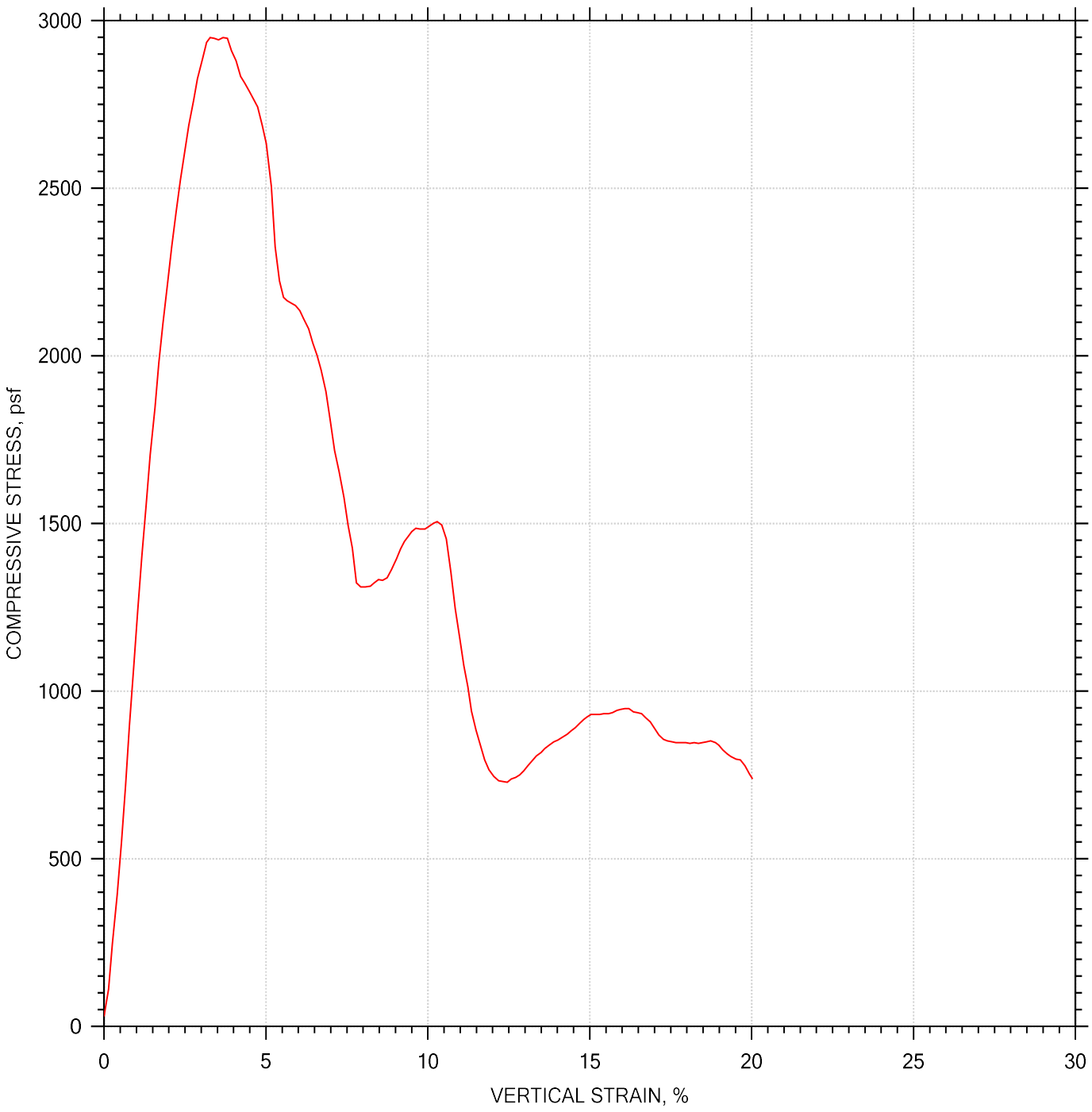
UNCONFINED COMPRESSION TEST REPORT



Symbol					
Test No.		23-595			
Initial	Diameter, in	2.4			
	Height, in	4.45			
	Water Content, %	19.27			
	Dry Density, pcf	99.48			
	Saturation, %	77.02			
	Void Ratio	0.663			
Unconfined Compressive Strength, psf		2950			
Undrained Shear Strength, psf		1475			
Time to Failure, min		2.8042			
Strain Rate, %/min		0.01			
Estimated Specific Gravity		2.65			
Liquid Limit		---			
Plastic Limit		---			
Plasticity Index		---			
Failure Sketch					

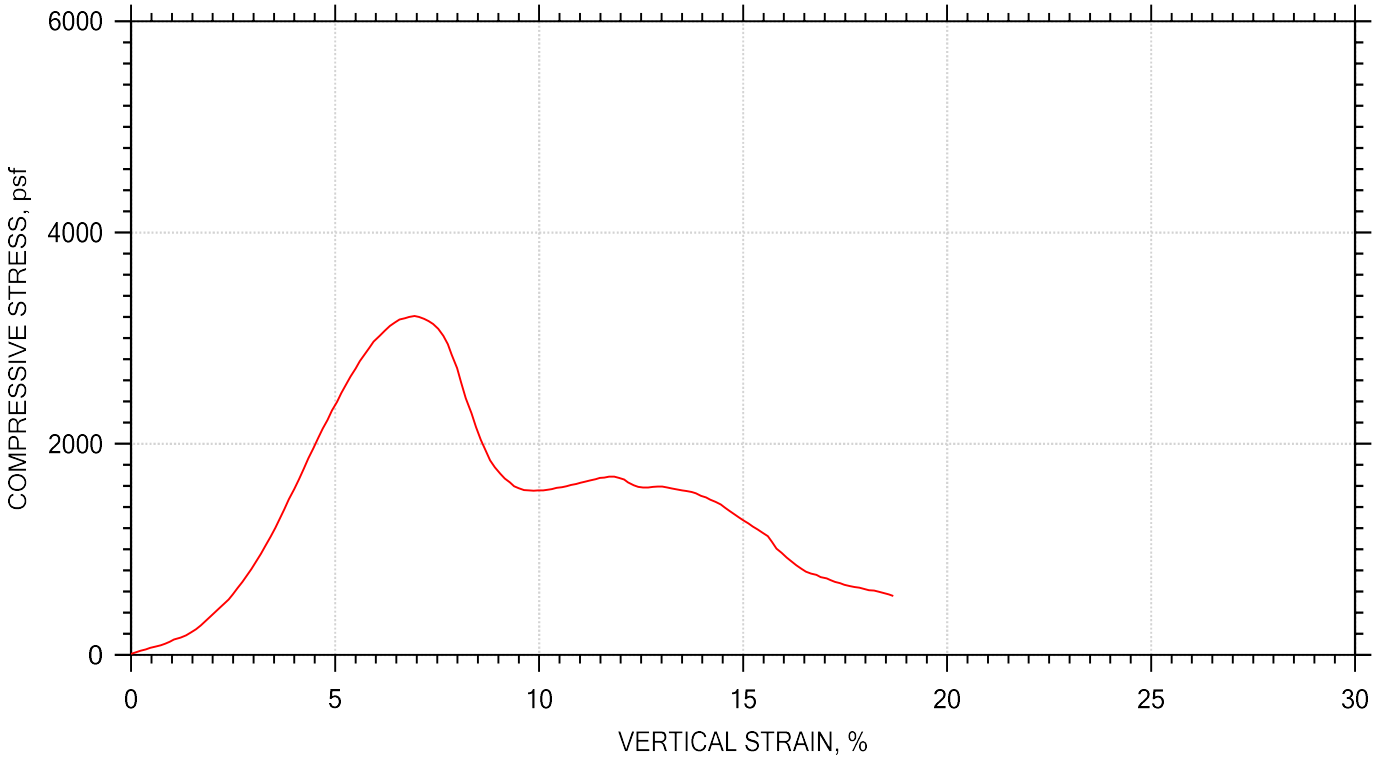
	Project: GSD Water	Location: Garberville	Project No.: 022067.4
	Boring No.: B-2-LH	Tested By: KEW	Checked By: KEW
	Sample No.: 18	Test Date: 6/29/23	Elevation:
	Test No.: 23-595	Preparation: Undisturbed	Depth: 4-4.5'
	Description:		
	Remarks:		

UNCONFINED COMPRESSION TEST REPORT



	Project: GSD Water	Location: Garberville	Project No.: 022067.4
	Boring No.: B-2-LH	Tested By: KEW	Checked By: KEW
	Sample No.: 18	Test Date: 6/29/23	Elevation:
	Test No.: 23-595	Preparation: Undisturbed	Depth: 4-4.5'
	Description:		
	Remarks:		

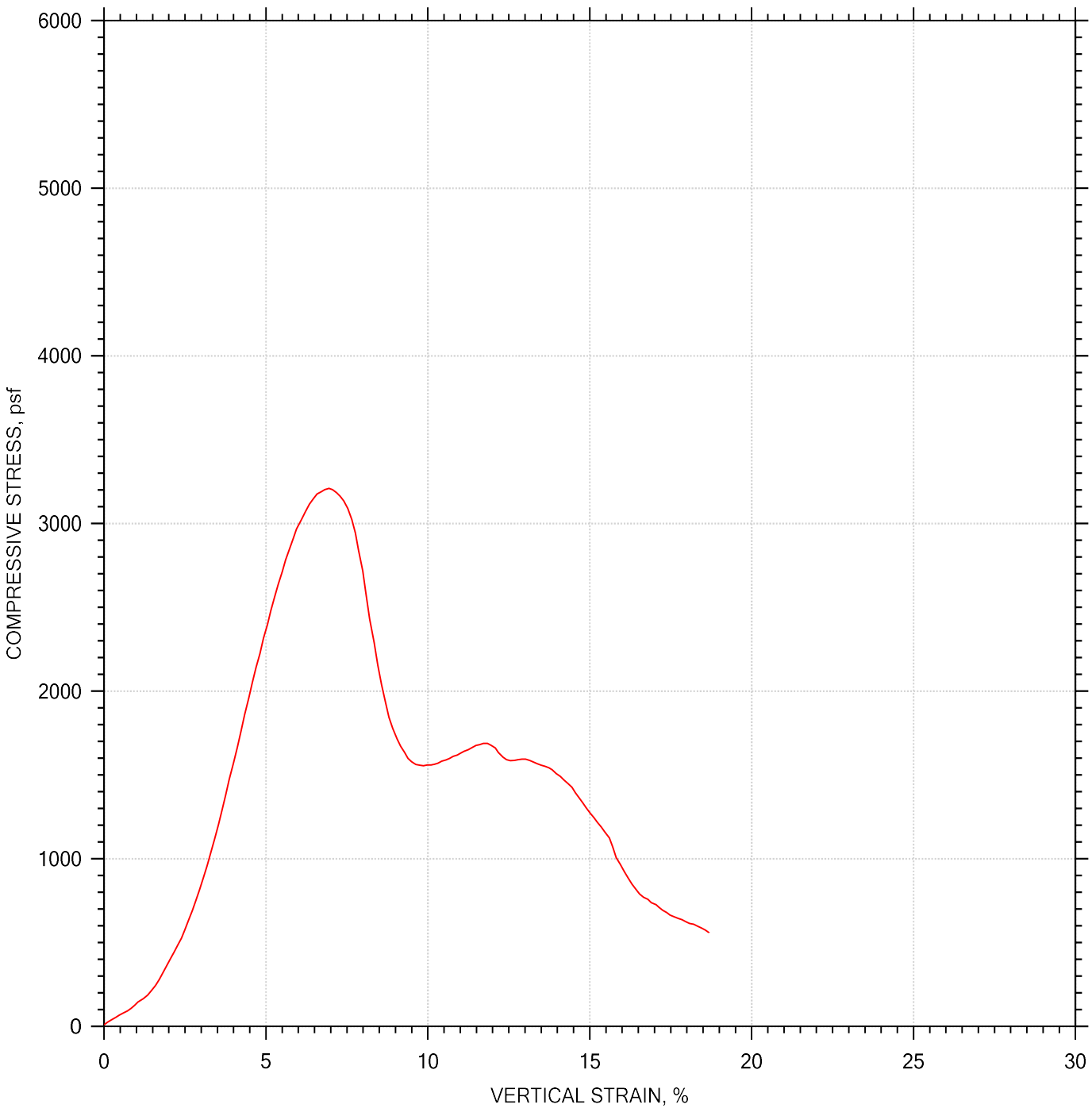
UNCONFINED COMPRESSION TEST REPORT



Symbol					
Test No.		23-609			
Initial	Diameter, in	2.4			
	Height, in	5			
	Water Content, %	22.53			
	Dry Density, pcf	103.2			
	Saturation, %	98.90			
	Void Ratio	0.604			
Unconfined Compressive Strength, psf		3209			
Undrained Shear Strength, psf		1605			
Time to Failure, min		5.9012			
Strain Rate, %/min		0.01			
Estimated Specific Gravity		2.65			
Liquid Limit		---			
Plastic Limit		---			
Plasticity Index		---			
Failure Sketch					

	Project: GSD Water	Location: Garberville	Project No.: 022067.4
	Boring No.: B-3-LH	Tested By: KEW	Checked By: KEW
	Sample No.: 32	Test Date: 6/29/23	Elevation:
	Test No.: 23-609	Preparation: Undisturbed	Depth: 11-11.5'
	Description:		
	Remarks:		

UNCONFINED COMPRESSION TEST REPORT



	Project: GSD Water	Location: Garberville	Project No.: 022067.4
	Boring No.: B-3-LH	Tested By: KEW	Checked By: KEW
	Sample No.: 32	Test Date: 6/29/23	Elevation:
	Test No.: 23-609	Preparation: Undisturbed	Depth: 11-11.5'
	Description:		
	Remarks:		

Phone: (707) 441-8855 Email: info@shn-engr.com Web: shn-engr.com
812 W. Wabash Avenue, Eureka, CA 95501-2138

DENSITY BY DRIVE- CYLINDER METHOD (ASTM D2937)

Project Name:	**GSD Wallan Tank**	**Project Number:**	**022067.400**
Performed By:	**JMA**	**Date:**	**7/12/2023**
Checked By:	**KEW**	**Date:**	**7/18/2023**
Project Manager:	**JOB**		

Lab Sample Number	23-653	23-656	23-664		
Boring Label	B-1-W	B-1-W	B-2-W		
Sample Depth (ft)	2-2.5'	6-6.5'	4-4.5'		
Diameter of Cylinder, in	2.42	2.42	2.42		
Total Length of Cylinder, in.	6.00	6.00	6.00		
Length of Empty Cylinder A, in.	0.00	0.00	0.82		
Length of Empty Cylinder B, in.	0.25	1.72	0.53		
Length of Cylinder Filled, in	5.75	4.28	4.65		
Volume of Sample, in^3	26.45	19.69	21.39		
Volume of Sample, cc.	433.40	322.60	350.49		

Pan #	ss7	ss5	ss10		
Weight of Wet Soil and Pan	1211.3	850.9	924.7		
Weight of Dry Soil and Pan	1027.9	744.2	853.6		
Weight of Water	183.4	106.7	71.1		
Weight of Pan	192.9	195.3	195.3		
Weight of Dry Soil	835.0	548.9	658.3		
Percent Moisture	22.0	19.4	10.8		
Dry Density, g/cc	1.93	1.70	1.88		
Dry Density, lb/ft^3	120.3	106.2	117.3		

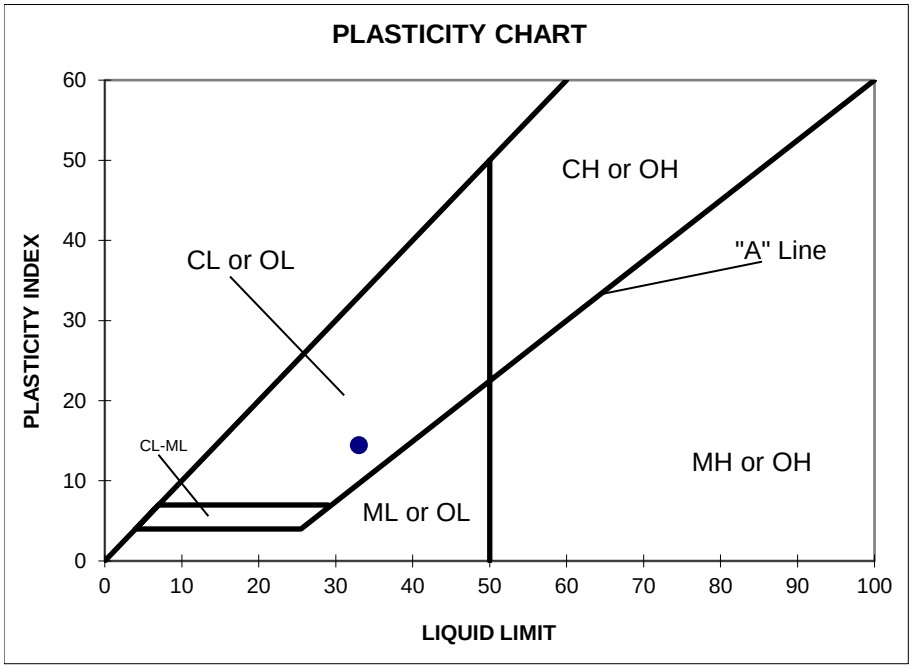
ENGINEERS & GEOLOGISTS, INC.
812 W. Wabash Eureka, CA 95501-2138 Tel: 707/441-8855 FAX: 707/441-8877 E-mail: shninfo@shn-engr.com

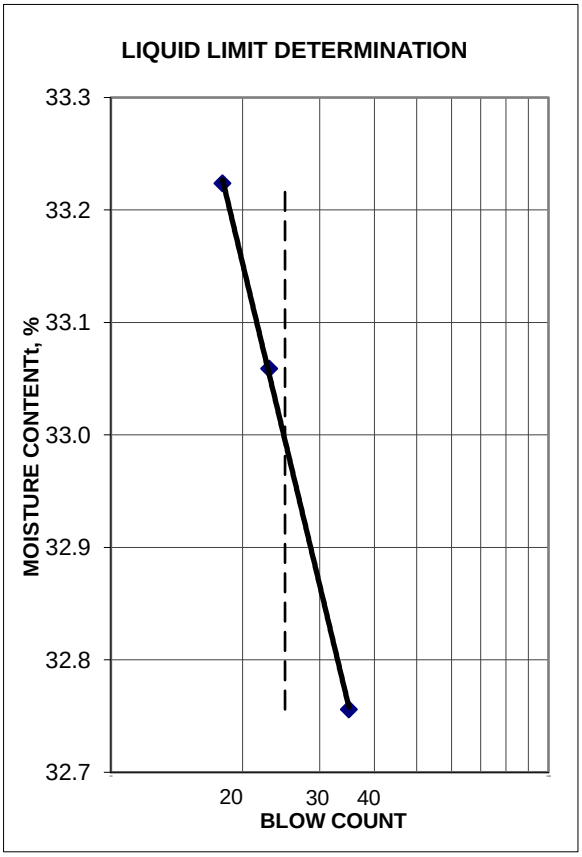
LIQUID LIMIT, PLASTIC LIMIT, and PLASTICITY INDEX (ASTM-D4318)

JOB NAME:	**GSD Wallan Tank**	JOB #:	**022067.400**	LAB SAMPLE #:	**23-654**
SAMPLE ID:	**B-1-W @ 3-4.5'**	PERFORMED BY:	**JMA/SC**	DATE:	**7/14/2023**
PROJECT MANAGER:	**JOB**	CHECKED BY:	**KEW**	DATE:	**7/18/2023**

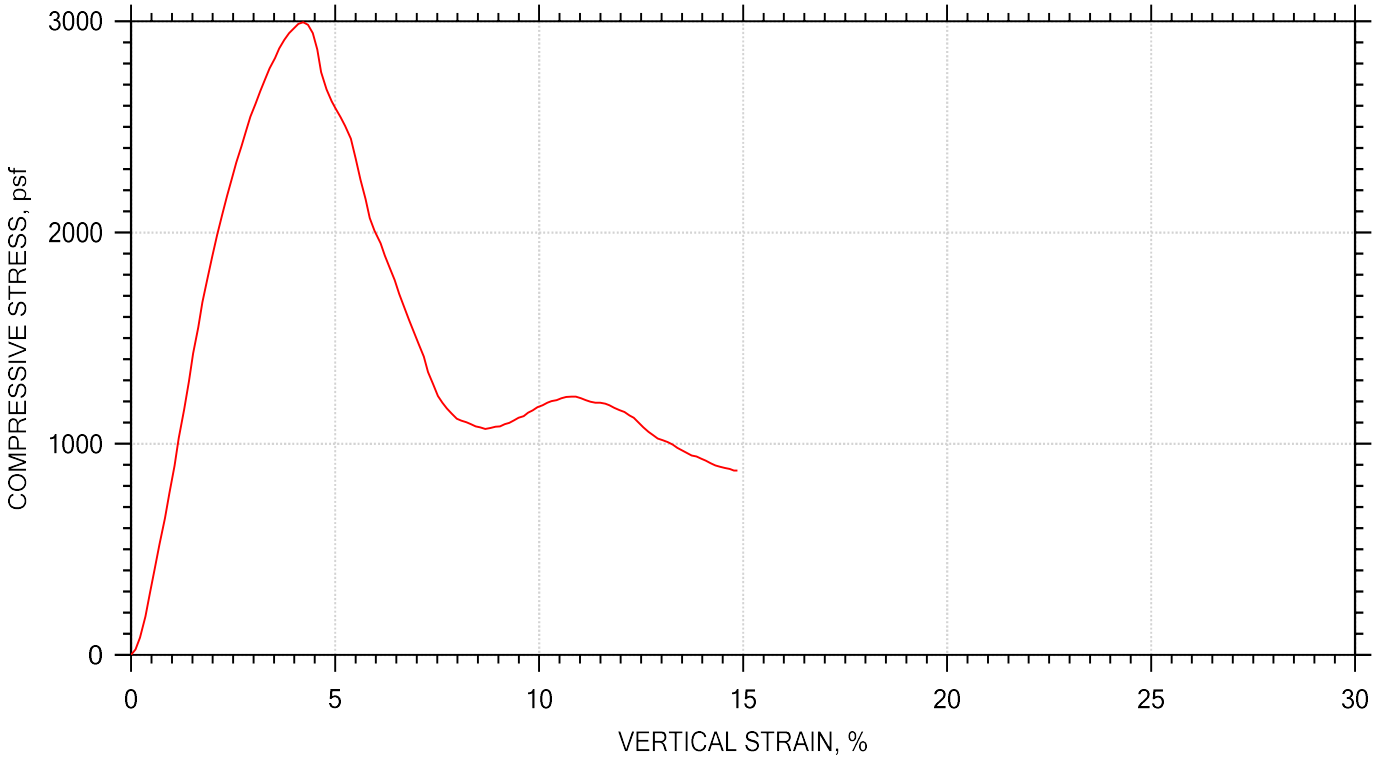
LINE NO.		TRIAL NO. 1	TRIAL NO. 2	TRIAL NO. 1	TRIAL NO. 2	TRIAL NO. 3
A	PAN #	1	2	3	13	14
B	PAN WT. (g)	29.560	28.920	28.970	21.970	20.140
C	WT. WET SOIL & PAN (g)	35.760	35.110	37.400	31.670	28.240
D	WT. DRY SOIL & PAN (g)	34.800	34.130	35.320	29.260	26.220
E	WT. WATER (C-D)	0.960	0.980	2.080	2.410	2.020
F	WT. DRY SOIL (D-B)	5.240	5.210	6.350	7.290	6.080
G	BLOW COUNT	--	--	35	23	18
H	MOISTURE CONTENT (E/F*100)	18.3	18.8	32.8	33.1	33.2

LIQUID LIMIT	**PLASTIC INDEX**	PLASTIC LIMIT
33	**14**	19





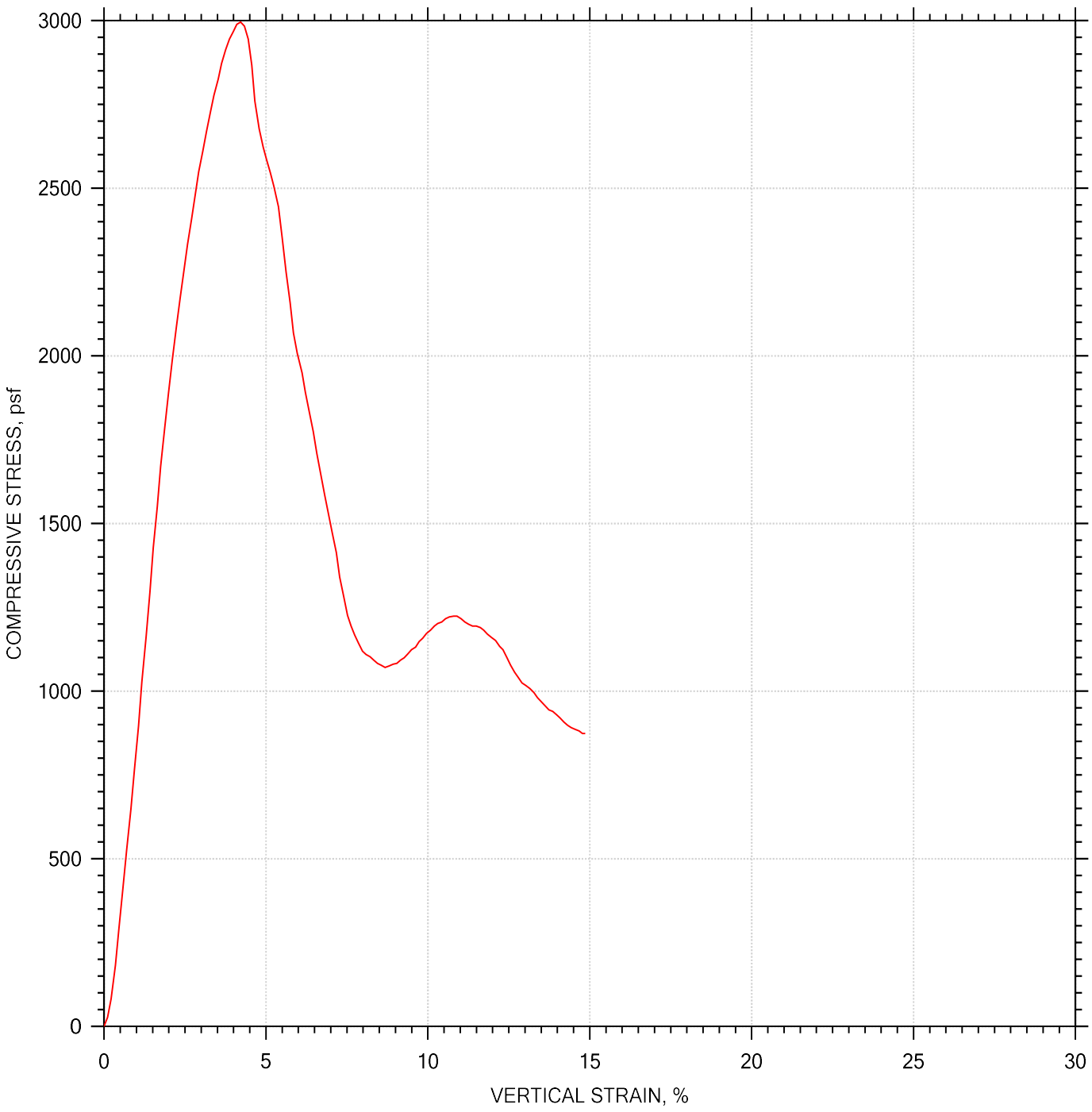
UNCONFINED COMPRESSION TEST REPORT



Symbol					
Test No.		23-662			
Initial	Diameter, in	2.42			
	Height, in	5.41			
	Water Content, %	16.44			
	Dry Density, pcf	103.9			
	Saturation, %	73.61			
	Void Ratio	0.592			
Unconfined Compressive Strength, psf		2996			
Undrained Shear Strength, psf		1498			
Time to Failure, min		3.6015			
Strain Rate, %/min		0.01			
Estimated Specific Gravity		2.65			
Liquid Limit		---			
Plastic Limit		---			
Plasticity Index		---			
Failure Sketch					

	Project: GSD Wallan Tank	Location: Garberville	Project No.: '022067.400
	Boring No.: B-2-W	Tested By: JMA	Checked By: KEW
	Sample No.: 2	Test Date: 7/14/23	Elevation:
	Test No.: 23-662	Preparation: Undisturbed	Depth: 2-2.5'
	Description: Medium stiff reddish brown SILT		
	Remarks:		

UNCONFINED COMPRESSION TEST REPORT



	Project: GSD Wallan Tank	Location: Garberville	Project No.: '022067.400
	Boring No.: B-2-W	Tested By: JMA	Checked By: KEW
	Sample No.: 2	Test Date: 7/14/23	Elevation:
	Test No.: 23-662	Preparation: Undisturbed	Depth: 2-2.5'
	Description: Medium stiff reddish brown SILT		
	Remarks:		

Corrosion Test Results

3

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

19 July 2023

Job No. 2307017
Cust. No. 11258

Ms. Alyssa Troia
SHN Consulting Engineers and Geologists
812 W. Wabash Avenue
Eureka, CA 95501

Subject: Project No.: 022067.400
Project Name: Lower Hurlbutt, GSD Water Improvements Project, Lower Hurlbutt Site
Corrosivity Analysis – ASTM Test Methods with Brief Evaluation

Dear Ms. Troia:

Pursuant to your request, CERCO Analytical has analyzed the soil sample submitted on July 12, 2023. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurement, this composite sample is classified as "mildly corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentration reflects none detected with a reporting limit of 15 mg/kg.

The sulfate ion concentration reflects none detected with a reporting limit of 15 mg/kg.

The pH of the soil is 6.72 which does not present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures.

The redox potential is 340-mV and is indicative of potentially "slightly corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: SHN Consulting Engineers & Geologists
Client's Project No.: 022067.400
Client's Project Name: Lower Hurlbutt - GSD Water Improvements Project, Lower Hurlbutt Site
Date Sampled: 8-Jun-23
Date Received: 12-Jul-23
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 19-Jul-2023

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
2307017-001AB	B-2-LH @ 15-16.5' and B-1-LH @ 25.5-26'	340	6.72	-	8,800	-	N.D.	N.D.

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	12-Jul-2023	13-Jul-2023	-	12-Jul-2023	-	18-Jul-2023	18-Jul-2023

* Results Reported on "As Received" Basis
N.D. - None Detected

Cheri McMillen
Chemist

Quality Control Summary - **All laboratory quality control parameters were found to be within established limits**

2307017

Chain of Custody

GSD Water Improvements Project, Lower Hurlbutt Site.

1100 Willow Pass Court
Concord, CA 94520-1006
925 462 2771
Fax: 925 462 2775

CERCO analytical

Job No.	CU#		Client Project I.D.
022067.400	11258		Lower Hurlbutt

Schedule
Analyte

Date Sampled

Date Due: 7/28/23

Full Name: Alyssa Troia

Phone: 707 441 8855

Fax:

Company and/or Mailing Address: SHN - 812 W WABASH AVE Eureka

Cell: 5306134819 ☒

Sample Source: SOIL

ANALYSIS — ASTM

Lab No.	Sample I.D.	Date	Time	Matrix	Contain.	Size	Preserv.	Qtv.	Redox Potential	pH	Sulfate	Chloride	Resistivity-100% Saturated			Brief Evaluation							
001	B-2-4H 15-16.5'	6/8/23		S	PL			1	X	X	X	X	X			X							
	B-1-4H 25.5-26'																						
	composite (please combine)																						

MATRIX	ABBREVIATIONS	SAMPLE RECEIPT	
DW - Drinking Water	HB - Hosebib	Total No. of Containers	
GW - Ground Water	PV - Petcock Valve	Rec'd Good Cond/Cold	
SW - Surface Water	PT - Pressure Tank	Conforms to Record	
WW - Waste Water	PH - Pump House	Temp. a t Lab -°C	
Water	RR - Restroom	Sampler	
SL - Sludge	GL - Glass		
S - Soil	PL - Plastic		
Product	ST - Sterile		

Relinquished By: Alyssa Troia	Date 7/10/2023	Time 12:00PM
Received By: Nicole Drieß	Date 7/12/23	Time 12:14PM
Relinquished By:	Date	Time
Received By:	Date	Time
Relinquished By:	Date	Time
Received By:	Date	Time

Comments:

THERE IS AN ADDITIONAL CHARGE FOR EXTRUDING SOIL FROM METAL TUBES

Email Address: atroia@shn-engr.com

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Attention: Accounts Payable
SHN Consulting Engineers & Geologists
812 W. Wabash Avenue
Eureka, CA 95501

sholler@shn-engr.com
kpryor@shn-engr.com

Project No.: 022067.400
Project Name: Lower Hurlbutt, GSD Water Improvements Project, Lower Hurlbutt Site
Date Sampled: 06/08/23
Date Received: 07012/23
Matrix: Soil
Authorization: Signed Chain of Custody

19 July 2023
Invoice/Job No. 2307017
Sample No. 001AB
Cust. No. 11258

INVOICE FOR ANALYTICAL SERVICES

Analyte	Amount
Corrosivity Analysis – ASTM Test Methods with Brief Evaluation* One (1) Sample @ $270.00/Sample	$270.00
Composite Charge Two (2) Samples @ $20.00/Sample	$40.00
Disposal Charge One (1) Sample @ $10.00/Sample	$10.00
TOTAL AMOUNT DUE THIS INVOICE	**$320.00**

* Includes Redox, pH, sulfate, resistivity (100% saturation), and chloride

Invoices are due and payable within 30 days from receipt. All overdue accounts are subject to a 1.5% interest charge per month.

REMINDER
FOR IMMEDIATE PROCESSING OF YOUR REMITTANCE PLEASE INCLUDE THE ABOVE REFERENCED JOB NUMBER ON YOUR CHECK

cc: Ms. Alyssa Troia

Eureka, CA | Arcata, CA | Redding, CA | Willits, CA | Fort Bragg, CA | Coos Bay, OR | Klamath Falls, OR

Asbestos Survey & Lead Paint Sampling Report

F

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Brunelle & Clark Consulting, LLC

ASBESTOS SURVEY
& LEAD PAINT SAMPLING
FOR DEMOLITION OF THREE WATER TANKS
& THREE PUMP STATION SHEDS
IN GARBERVILLE, CA

December 14, 2023

Project # 2307801

Prepared for:
Garberville Sanitary District
Attn: Jennie Short
919 Redwood Drive
Garberville, CA 95542
(707) 223-4567

Prepared by:
Brunelle & Clark Consulting, LLC
P.O. Box 1138
Arcata, CA 95518
(707) 672-5345

ASBESTOS SURVEY
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Zindar Brunelle
Certified Asbestos Consultant, #14-5295 (Exp. 10/15/24)
Certified Lead Inspector/Assessor, #LRC-00000482 (Exp. 09/02/24)
Certified Lead Supervisor, # LRC-00000481 (Exp. 09/02/24)

December 14, 2023

ASBESTOS SURVEY
& LEAD PAINT SAMPLING
FOR DEMOLITION OF THREE WATER TANKS
& THREE PUMP STATION SHEDS
IN GARBERVILLE, CA

TABLE OF CONTENTS

APPENDICES

ASBESTOS SURVEY
& LEAD PAINT SAMPLING
FOR DEMOLITION OF THREE WATER TANKS
& THREE PUMP STATION SHEDS
IN GARBERVILLE, CA

1.0 PURPOSE

On November 16, 2023, this office conducted an asbestos survey and paint sampling for lead, for demolition of three Garberville Sanitary District water tanks & three District pump station sheds, located in Garberville, CA.

This site is subject to the EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations concerning renovation and/or demolition activities (40 CFR, Part 61, Subpart M). This survey provides for compliance with NESHAP regulations.

The asbestos survey was also conducted to identify asbestos containing materials (ACM) pursuant to the requirements of the California Health & Safety Code, and for compliance with Cal/OSHA regulations (8 CCR 1529) for worker protection.

To provide for compliance with: the Cal/OSHA Lead in Construction Standard Title 8, CCR Section 1532.1; and the California Code of Regulations Title 17, CCR 35000-36100; representative paint chip sampling for lead was conducted.

The person completing this survey and report is certified through the Division of Occupational Safety & Health (DOSH) as an Asbestos Building Inspector and a Certified Asbestos Consultant (CAC), and is certified by the California Department of Public Health (CDPH) as a Lead Inspector/Assessor/Supervisor.

2.0 EXECUTIVE SUMMARY

The asbestos survey and lead sampling includes all "accessible" suspect materials on the interior and exterior of the following three (3) water tank structures, and three (3) pump station sheds:

- Main Tank
- Wallan Tank
- Robertson Tank
- Upper Maple Lane Pump Station Shed
- Wallan Pump Station Shed
- Arthur Pump Station Shed

Asbestos Survey

During the asbestos survey, 41 bulk samples were collected from suspect materials, and submitted for laboratory analysis of asbestos content. **One (1) type of material was found to contain asbestos.**

The disturbance, abatement, and demolition of the materials containing asbestos will require compliance with the EPA NESHAP, and Cal/OSHA regulations regarding asbestos in construction.

Lead Paint Sampling

Two (2) representative paint chip samples were collected from painted building components, and submitted for laboratory analysis of lead content.

All sampled components were found to contain trace to negative lead content. Lead Based Paint (LBP) was not identified.

The disturbance of any materials containing any amount of lead will require compliance with the Cal/OSHA Lead Construction Standard (Title 8 CCR 1532.1) for worker protection, and compliance with the California Code of Regulations Title 17, CCR 35000-36100.

3.0 ASBESTOS SURVEY

During this survey, a total of forty-one (41) bulk samples were collected from suspect materials and submitted for the laboratory analysis of asbestos content. A description of all samples, and sample locations are contained in Table 1, Appendix B. All sample locations are indicated on Figures 1-5, Appendix A.

The bulk samples were submitted to an NVLAP accredited laboratory, AmeriSci Richmond (Midlothian, VA) for the analysis of asbestos content by Polarized Light Microscopy (PLM) by EPA 600/R-93/116. The sample Chain of Custody and Laboratory Report is contained in Appendix B. All the Asbestos analytic data are summarized in Table 1, Appendix B.

One (1) type of material tested positive for asbestos by the initial PLM analyses. Two samples of the material were re-submitted for verification of the percent asbestos content by 400 Point Count analyses. The 400 Point Count analysis lab report is located at the end of the PLM lab report, and before the Chain of Custody form, Appendix B. The Point Count analysis data is summarized below.

400 Point Count Analyses

Sample ID#	Material	Initial PLM Result	Point Count Result
2378- 34	Tar, black	4% CH	0.7% CH
2378- 35	Tar, black	4% CH	0.5% CH

CH = Chrysotile Asbestos

Materials found to contain asbestos are divided into categories according to percentage and type of asbestos found in the materials, as defined below.

- ***Asbestos Containing Construction Materials (ACCM)*** contain asbestos in amounts between 0.1% and 1.0%.
- ***Asbestos Containing Materials (ACM)*** *are materials that contain >1% asbestos.*
- ***Presumed Asbestos Containing Material (PACM)*** *is material presumed to be >1% asbestos.*
- ***Regulated Asbestos Containing Materials (RACM)*** *refers to "regulated" ACM, a category of ACM that is subject to NESHAP regulation.*
- ***"Friable"*** *asbestos material is defined as: material containing >1% asbestos, that when dry, may be crumbled, pulverized, or reduced to powder by hand pressure.*

Asbestos was found present in one (1) building material, which is categorized as Asbestos Containing Construction Material (ACCM), and is listed below:

ACCM

- **Tar, black** (surfacing on the interior side of the concrete tank wall & bottom of the Robertson Tank)

Note: the interior walls and bottoms of the Main Tank and the Wallan Tank are currently inaccessible, and there is potential for asbestos containing surfacing to be present in either or both of the two tanks.

The project ACM and/or ACCM are listed in Table 2 below, including location, asbestos content, the agency categorization, abatement requirements, and waste categorization. The locations of the project ACM/ACCM are shown on Figure 6, Appendix A.

TABLE 2
ASBESTOS IDENTIFICATIONS & CLASSIFICATIONS

Garberville Water Tanks
& Pump Stations
Garberville, CA

MATERIAL	LOCATION	QUANTITY	ASBESTOS CONTENT & TYPE	OSHA CLASSIFICATION	NESHAP CATEGORY	WASTE DISPOSAL CLASSIFICATION
Tar surfacing, black	**Robertson Tank,** on the interior of the concrete tank wall & bottom (See Fig. 6)	Approx. 1,800 SF Quantity to be abated/ demolished TBD	4% CH by initial PLM 0.5-0.7% CH by 400 Point Count	ACCM, Class II abatement required where disturbed	ACCM Not RACM*	Non-Friable asbestos waste or general construction debris

ACCM = Asbestos Containing Construction Materials, asbestos content of 0.1% to 1.0%

ACM = Asbestos Containing Materials, containing >1% asbestos

CH = Chrysotile Asbestos

Friable = asbestos material containing >1% asbestos, that when dry, may be crumbled, pulverized, or reduced to powder by hand pressure

NAD = No asbestos detected

PACM = Presumed ACM

RACM = Regulated ACM under NESHAP regulations

RACM* = Not considered RACM if asbestos content is 1% or less, or if not made friable by disturbance

SF = Square Feet

TBD = To be determined

4.0 CONCLUSIONS AND REGULATORY REQUIREMENTS FOR ASBESTOS

Conclusions

Asbestos was identified in the black tar surfacing on the interior side of the concrete wall & bottom of the Roberson Tank. All other sampled materials were found to be negative for asbestos.

Any disturbance, abatement, or demolition of the materials containing asbestos will require compliance with the EPA NESHAP, and Cal/OSHA regulations regarding asbestos in construction.

All disturbance, abatement, or demolition of material containing any amount of asbestos must be done by a registered asbestos abatement contractor, using trained and certified personnel.

It may not be feasible or desirable to remove the asbestos containing tar surfacing from the concrete tank wall surface.

The asbestos contaminated concrete tank wall can be demolished as an asbestos abatement/demolition project, and the contaminated concrete can be disposed of as asbestos containing construction debris (ACCM). The transporter and waste facility must be informed that the waste material contains asbestos.

If it is decided to demolish above grade portion of the concrete tank wall, and bury the below grade portion of the asbestos contaminated concrete tank, the Garberville Sanitary District should get approval from the North Coast Unified Air Quality Management District (EPA).

Note: the interior walls and bottoms of the Main Tank and the Wallan Tank are currently inaccessible, and there is potential for asbestos containing surfacing to be present in either or both of the two tanks.

Once the Main Tank and the Wallan Tank have been drained, both tanks must be inspected for potential asbestos containing surfacing, and any suspect surfacing must be sampled for asbestos or presumed to be Asbestos Containing Material (ACM).

The data and conclusion contained in this report are only applicable to the sampled/surveyed spaces/materials and should not be used to assess materials elsewhere at the site. **If suspect materials that were not identified during this survey are encountered by the contractor during the project, the disturbance of the discovered materials must cease until the materials are sampled for asbestos.** Un-sampled materials must be presumed to contain asbestos until sampled and proven otherwise.

Regulatory Requirements

The EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) requires an asbestos survey to identify the possible presence of any *Asbestos Containing Materials* (ACM)

prior to any renovation and/or demolition work at "subject" sites. That requirement has been met with this report.

In Humboldt, Del Norte, and Trinity counties, the NESHAP regulations concerning renovation and/or demolition work is enforced by the North Coast Unified Air Quality Management District (NCUAQMD) located in Eureka, California. For questions regarding regulatory compliance, please contact the NCUAQMD at 707-443-3093.

Friable NESHAP Regulated Asbestos Containing Materials (RACM) was not identified during this survey. **A NESHAP Notification for "abatement" will not be required.**

This is a demolition project, **and a NESHAP Notification for "demolition" must be filed with the North Coast Unified Air Quality Management District (NCUAQMD).**

When NESHAP a Notifications is required, **it must be submitted to the NCUAQMD, at least 10 days prior to conducting asbestos abatement and/or demolition work.** The fillable NESHAP Notification Form and filing instructions can be found in Appendix C of this report, and on the NCUAQMD website at:

https://www.ncuaqmd.org/asbestos-neshap-regulations

Cal/OSHA regulates any disturbance or abatement of any material containing any amount of asbestos.

All asbestos abatement or disturbance must be performed by a registered asbestos abatement contractor, using properly trained and certified asbestos abatement workers.

All asbestos abatement or disturbance must be conducted following Cal/OSHA defined asbestos abatement methods.

A temporary worksite notification to the Division of Occupational Safety and Health, must be submitted a minimum of 24-hours prior to asbestos abatement activities.

If you are required to obtain a permit from a local or county building department, you will need to file this report with them.

Project ACM & ACCM

The regulatory requirements for the abatement and disposal of project ACM and/or ACCM identified in this survey are discussed below.

ACCM Tar Surfacing: The black tar surfacing identified in this survey contains asbestos. The material was found to contain <1% asbestos, and is defined as ACCM. While the ACCM designation excludes the materials from regulation under NESHAP, Cal/OSHA requires Class II methods for abatement/disturbance of the materials by a registered asbestos abatement contractor.

Materials determined to be ACCM are characterized as "general construction debris" however, asbestos abatement contractors may choose to dispose of the ACCM waste as "non-friable"

asbestos waste to avoid possible liabilities. If disposed of as "general construction debris," it is recommended herein that all ACCM be handled/contained at the jobsite and transported as ACM up to the point of actual disposal at an accepting waste facility. Waste transporters and waste facilities must be informed when the waste is ACCM containing construction debris.

5.0 PAINT SAMPLING/LEAD ANALYSIS

Lead paint sampling includes representative sampling of painted building component types on the project structures.

Paint Chip Sampling

Two (2) representative paint chip samples were collected from building components on project structures, and submitted to EHS Laboratories (Richmond, VA) for laboratory analyses of lead content.

A description of sampled components, sample locations, and paint chip sample analytic data is contained in Table 3, Appendix B. The laboratory report is also contained in Appendix B. All paint chip sample locations are indicated on Figures 1 & 2, Appendix A.

Paint chip sample results are placed in one of three categories, based on the weight of lead in the paint compared to the overall weight of the paint. The three categories are listed below.

- **Lead Based Paint (LBP)** is defined as paint with a lead content at or above 5,000 parts per million (ppm), or at or above 0.5% by weight.
- **Lead Containing Surface Coatings (LCSC)** are paints with quantifiable lead content less than 5,000 parts per million (ppm), or less than 0.5% by weight.
- **Trace Lead Content or Lead Free (TR/LF)** are paints with trace unquantifiable lead content or no lead content.

Both sampled components were found to have trace to negative lead content. Lead Based Paint (LBP) was "not" identified. See Table 3, Appendix B for all sampling data.

6.0 CONCLUSIONS & REGULATORY REQUIREMENTS FOR LEAD

Lead In Paint

All sampled paint was found to have trace to negative lead content, and **all project structure can be demolished without lead related restrictions.**

All lead related construction work requires compliance with the Cal/OSHA Lead Construction Standard, Title 8 CCR 1532.1; the California Code of Regulations Title 17, CCR 35000-36100; and when applicable, the EPA Lead Renovation, Repair, and Painting Rule, 40 CFR Part 745.

Any contractor conducting lead related construction work, including demolition of building components with paint containing lead, should be familiar with the applicable lead regulations,

conduct the work following the applicable regulatory requirements, and when required, be certified to conduct lead related activities.

All personnel conducting lead related construction work should be properly trained, and when required, be certified to conduct lead related activities.

Cal/OSHA requires exposure assessment personal air sampling, when paint with any amount of lead is disturbed by Cal/OSHA defined "trigger tasks," or any lead related construction work is conducted that may result in lead exposure to workers.

Pending exposure assessment, the contractor must provide interim protective measures, including but not limited to, proper respirators, protective clothing, and training.

Exposure Assessment requires the collection of personal air samples to be submitted for laboratory analyses of lead content, to determine if the Action Level (AL) or the Permissible Exposure Limit (PEL) for airborne lead will be met or exceeded during the work.

7.0 ASBESTOS REGULATIONS

The following regulations are some of the more pertinent Federal and California asbestos regulations, and one or more of these regulations will apply to construction projects in California.

EPA Asbestos Hazard Emergency Response Act (AHERA): The Asbestos-Containing Materials in Schools Rule (40 CFR Part 763, Subpart E) regulates asbestos in schools including, but not limited to; inspections, response actions, clearances, training, and certifications.

EPA National Emissions Standard For Hazardous Air Pollutants (NESHAP): The NESHAP regulation (40 CFR, Part 61, Subpart M) applies to all commercial, public, institutional, industrial, and residential structures with more than four dwelling units, and requires an asbestos survey prior to demolition and/or renovation activities on subject properties.

Cal/OSHA Asbestos Construction Standard: The Cal/OSHA standard (8 CCR 1529) is designed to protect employees (workers) from adverse exposure to asbestos in any workplace, and in particular, regulates the asbestos abatement industry.

Department of Toxic Substance Control (DTSC): The California code of Regulations, 22 CCR 66261- 66263 apply to hazardous waste generation and disposal in California, including "friable" asbestos.

Some of the general regulatory requirements for asbestos related construction work and asbestos containing waste are discussed below. Depending on the types of asbestos containing material found at a site, some or all of these regulatory requirements will apply.

EPA NESHAP

All commercial, public, institutional, industrial, and residential structures with more than four dwelling units, are subject to the EPA NESHAP regulations concerning renovation and/or demolition work. NESHAP requires an asbestos survey to identify the possible presence of any

Asbestos Containing Materials (ACM) prior to any renovation and/or demolition work at "subject" sites.

The NESHAP regulation requires filing a NESHAP Notification with the enforcing agency in the following two cases.

If Regulated Asbestos Containing Material (RACM) is present and is to be abated, and the amount of RACM to be abated exceed the threshold quantity of 160 square feet, 260 linear feet, or 35 cubic feet, a NESHAP Notification for the *abatement* of RACM will need to be filed with the enforcing agency, at least ten working days prior to the commencement of abatement activities. The notification includes: the NESHAP notification form; a copy of this report; and a filing fee.

If the proposed renovations will disturb any *"load bearing"* members, such work is considered "demolition" work, and a NESHAP Notification is required prior to any "demolition" work. The NESHAP Notification for *demolition* must be filed with the enforcing agency, at least ten working days prior to any "demolition" activity.

If both abatement of RACM and demolition are to be conducted, the NESHAP notification for "abatement" and "demolition" can be filed using the same form, however, a filing fee is required for each notification.

The assistance of the asbestos abatement contractor will typically be needed to file the NESHAP Notification form.

Cal/OSHA

The Cal/OSHA Asbestos Standard for the Construction Industry (8 CCR 1529) regulates any disturbance or abatement of any material containing any amount of asbestos. All employees are covered by OSHA regulations, and the disturbance of ACM or ACCM is subject to Cal/OSHA worker protection regulations for asbestos related work.

The Cal/OSHA regulations require that "any activities disturbing" ACM or ACCM materials must be done by properly trained and certified asbestos abatement contractors & workers, using proper abatement methods. It is therefore necessary to identify, and properly abate ACM and ACCM from buildings prior to the disturbance of such materials by renovation or demolition activities.

An employer who conducts asbestos related work involving more than 100 square feet of material containing any amount of asbestos must be registered with the Division of Occupational Safety and Health (DOSH).

A temporary worksite notification must be filed with Division of Occupational Safety and Health (DOSH) at least 24 hours prior to asbestos abatement activities. The asbestos abatement contractor will typically submit this notification.

DTSC

The Department of Toxic Substance Control (DTSC) is the California agency responsible for enforcing the hazardous waste laws. The California code of Regulations, 22 CCR 66261.24 (a)(2) defines "friable" asbestos waste as "hazardous" waste.

A hazardous waste generator "Temporary State Hazardous Waste Id Number" must be obtained from the DTSC when friable ACM waste is generated at a site, all friable asbestos waste must be transported as hazardous waste by a licensed hazardous waste hauler, and all friable asbestos waste must be disposed of as hazardous waste, at an approved Class I waste facility. The Temporary State Id number can be obtained on the DTSC website at:

https://dtsc.ca.gov/apply-for-hazardous-waste-epa-id-number/

Friable asbestos waste may be temporarily stored on-site pending transport for a period of up to 90 days. While being stored pending transport, such waste must be contained in proper bags of containers, clearly and properly labeled as hazardous asbestos material, and secured in a locked storage location with proper asbestos warning signs.

The shipping of "non-friable" asbestos waste does not require a hazardous waste hauler, and can be performed by an abatement contractor or other commercial transporters, however, the material must be handled and disposed of as asbestos containing material.

8.0 LEAD REGULATIONS

The following regulations are some of the more pertinent Federal and California regulations pertaining to lead, and some or all of these regulations will apply to construction projects in California.

Cal/OSHA Construction Safety Orders, Lead: The Cal/OSHA regulation (8 CCR 1532.1) pertains to all workers who may be exposed to lead in the work place.

Title 17, California Code of Regulations: The "Accreditation, Certification, and Work Practices For Lead-Based Paint and Lead Hazards" (17 CCR 35000-36100) regulation applies to lead related construction in California.

EPA Lead Renovation, Repair, and Painting Rule (RRP): The RRP rule (40 CFR Part 745) applies to all maintenance, renovation and other construction activities conducted in pre-1978 housing and child-occupied facilities, including residential, public, and commercial building.

Department of Toxic Substance Control (DTSC): The California code of Regulations, 22 CCR 66261- 66263 applies to generation and disposal of waste categorized as hazardous waste by California criteria, including hazardous lead containing construction waste.

Resource Conservation and Recovery Act (RCRA): The Federal code of Regulations, 40 CFR 260-262, applies to generation and disposal of waste categorized as hazardous waste by federal criteria, including hazardous lead containing construction waste.

U.S. Department of Housing and Urban Development (HUD): the HUD Lead Safe Housing Rule, 24 CFR 35, subparts B through R applies to pre-1978 housing that is federally owned, or receiving federal assistance.

HUD "Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing," second edition, 2012: is comprehensive document developed by HUD to help contractors, property owners, and other organizations identify lead-based paint, lead hazards, and control lead hazards, in an effort to reduce childhood exposure to lead. This guideline is not a regulation however, it is directly incorporated into some lead regulations.

Some of the basic regulatory requirements for lead related construction work and lead containing waste are discussed below.

Cal/OSHA Compliance Measures for Lead Related Construction Work

The disturbance of any LBP and/or LCSC by Cal/OSHA defined "trigger tasks" " or any lead related construction work that may result in lead exposure to workers or occupants requires compliance with the Cal/OSHA Lead Construction Standard (Title 8 CCR 1532.1) for worker protection. The Cal/OSHA "trigger tasks" include various actions that would disturb LBP or LCSC paint including, but not limited to, manual demolition, scraping, sanding, cutting, sawing, and torch cutting. Some key compliance measures are summarized below (see Title 8 CCR 1532.1 for all Cal/OSHA requirements).

Any contractor performing any of the Cal/OSHA trigger tasks must comply with the provisions of the Cal/OSHA Lead Construction Standard (Title 8 CCR 1532.1). More specifically, an Exposure Assessment must be performed at the start of any trigger task activities. This assessment involves the collection of personal air samples to be submitted for the laboratory analyses of lead content to determine if the Action Level (AL) or the Permissible Exposure Limit (PEL) for airborne lead will be met or exceeded during the work. Pending that assessment, the contractor must provide interim protective measures, including but not limited to, respirators, protective clothing, and training.

If initial assessment demonstrates the possibility that the AL will be met or exceeded during the work, continued worker exposure monitoring must be conducted. If initial assessment demonstrates the possibility that the PEL will be exceeded during the work Cal/OSHA requirements include but are not limited to: establishment of regulated areas, continued use of respirators, continued personal air monitoring, protective clothing, hygiene facilities, medical surveillance, and training certified by the California Department of Public Health (CDPH).

In addition, the disturbance of Lead Based Paint in excess of 100 square feet will require a contractor to file a "Lead-Work Pre-Job Notification" with Cal/OSHA at least 24 hours prior to performing any trigger tasks.

Title 17 Compliance Measures For Lead Related Construction Work & Lead Abatement

In California, lead activities are regulated by the California Code of Regulations Title 17, CCR 35000-36100, which include, but are not limited to, requirements for lead related construction work, lead abatement, worker training, and worker certification. Title 17 regulatory requirements

for worker certification, and work practices are enforced by the California Department of Public Health (CDPH).

Any contractor performing any lead activities must use "Lead-Safe Work Practices" (17 CCR 36050), which include: use of containment (17 CCR 35016), no visible dust or debris remaining at completion of work, and demonstrate compliance to the CDPH if requested.

Title 17 defines "Lead Activities" as "abatement, lead hazard evaluation, lead-related construction work, or any activity which disturbs lead-based paint, presumed lead-based paint, or creates a lead hazard (17 CCR 35032).

Title 17 defines "Lead Related Construction Work," as "any construction, alteration, painting, demolition, salvage, renovation, repair, or maintenance of any residential or public building, including preparation and cleanup, that, by using or disturbing lead-containing material or soil, may result in significant exposure of adults or children to lead (17 CCR 35040).

Title 17 defines "Abatement" as "any set of measures designed to reduce or eliminate lead hazards or lead-based paint for public and residential buildings, but does not include containment or cleaning" (17 CCR 35001). See 17 CCR 35000-36100 for all Title 17 regulatory requirements for lead activities.

Title 17 fully incorporates work practices defined by the "Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing," U.S. Department of Housing and Urban Development (HUD), June 1995.

Lead Containing Waste

Both State and Federal laws regulate the disposal of lead containing materials in landfills. In California, the disposal of lead containing materials is regulated by the Department of Toxic Substance Control (DTSC). If demolition debris potentially contains lead containing material; the waste stream must be tested for lead content, and characterized for proper waste disposal. Completion of a 'waste profile" requires that at least one representative bulk sample of the waste stream be collected and submitted for laboratory analysis of lead content for waste characterization.

The results of the lead waste characterization determine the "hazard level" of waste, which can range from unrestricted "general construction debris," California hazardous waste, and highly restrictive Resource Conservation and Recovery Act (RCRA) federal "hazardous" waste.

Generation of waste materials that meet the California hazardous waste criteria require the generator to obtain a Temporary State Hazardous Waste Id Number. Hazardous waste haulers and disposal sites are also required to have a State Id Number.

Generation of more than 100 kg (220 lbs.) of waste materials that meet the federal (RCRA) waste criteria require the generator to obtain a Temporary Hazardous Waste EPA Id Number. Hazardous waste haulers and disposal sites are also required to have an EPA Id Number for RCRA waste.

The Temporary State Id Number and the Temporary EPA Id Number can be obtained on the DTSC website at:

- **https://dtsc.ca.gov/apply-for-hazardous-waste-epa-id-number/**

Painted Metal Recycling

Painted metal components may be properly disposed of through a licensed recycling facility, regardless of lead content. In that case painted metal components need not be, and were not, included in the waste stream testing for lead. Recycling facilities must be notified when recycle components have lead containing surface coatings.

9.0 DISCLAIMER

The sole purpose of this investigation and of this report is to assess the site with respect to asbestos materials and/or lead containing surface coatings as defined by the scope of work. Brunelle & Clark Consulting, LLC, is not responsible for locating asbestos containing building material in inaccessible areas such as behind walls, above hard ceilings, beneath flooring or underground. The passage of time, manifestation of latent conditions, or occurrence of future events may require further exploration at the site, analysis of data, and reevaluation of the findings, observations, conclusions, and recommendations expressed in the report. This report has been prepared on behalf of and for the exclusive use of the client, and is subject to and issued in connection with the agreement and the provisions thereof. All findings, conclusions, and analytical data presented in this report are based on the information obtained by Brunelle & Clark Consulting, LLC's survey and by the laboratory analysis.

While the owner/operator was responsible for describing the extent and limits of site work, materials to be sampled were determined by the certified (asbestos) building inspector who performed this survey and was not otherwise subject to limitations by the owner/operator.

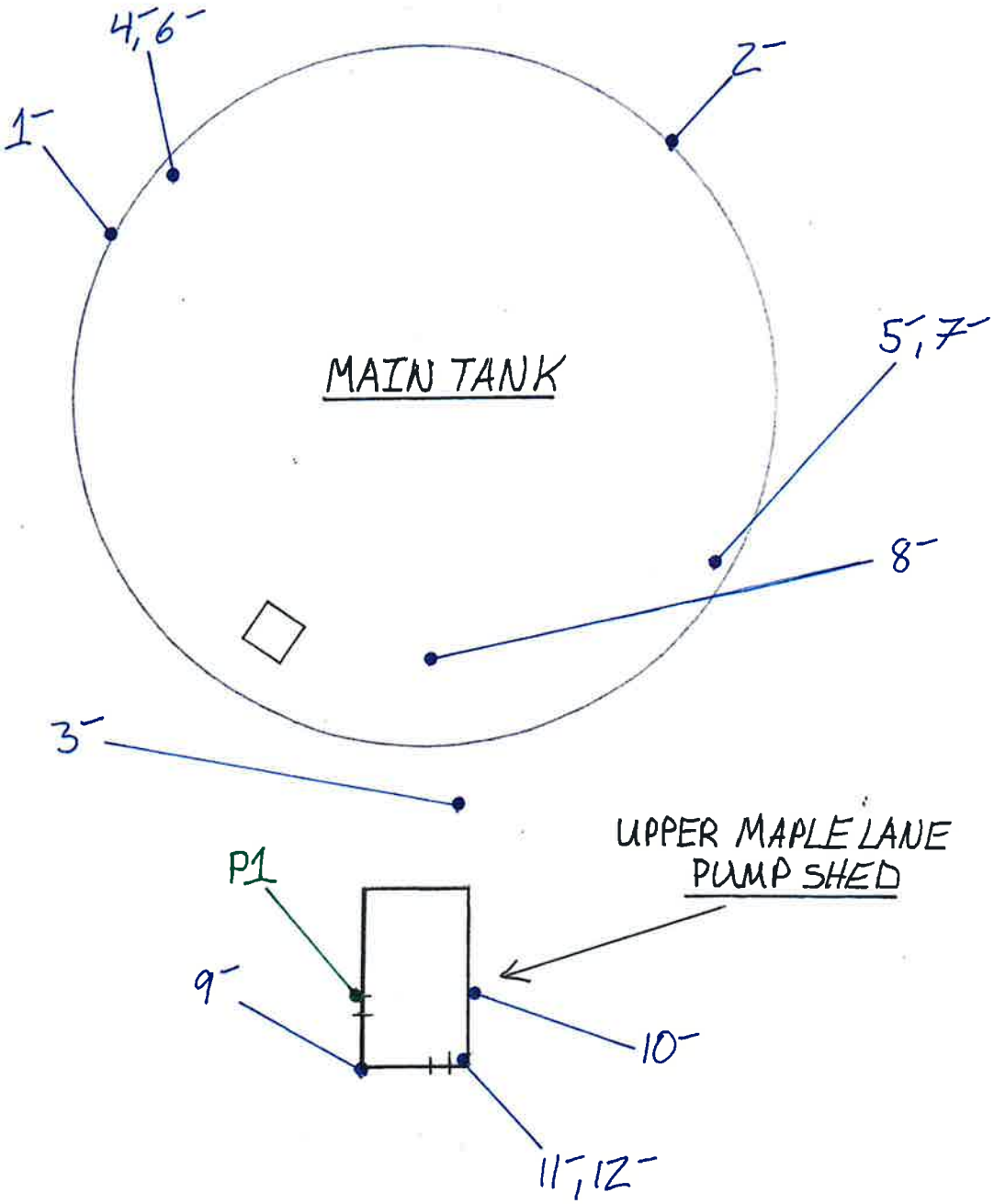
-end of text-

APPENDIX A

Figures

BRUNELLE & CLARK CONSULTING, LLC
P. O. Box 1138
Arcata, California 95518

2307801 12/14/23



ASBESTOS SAMPLE LOCATIONS

(Asbestos Samples: 1-12)

● — # Asbestos Sample Locations
(Prefixed 2378- #, with + or – designation)
(+) is positive for Asbestos, (–) is negative

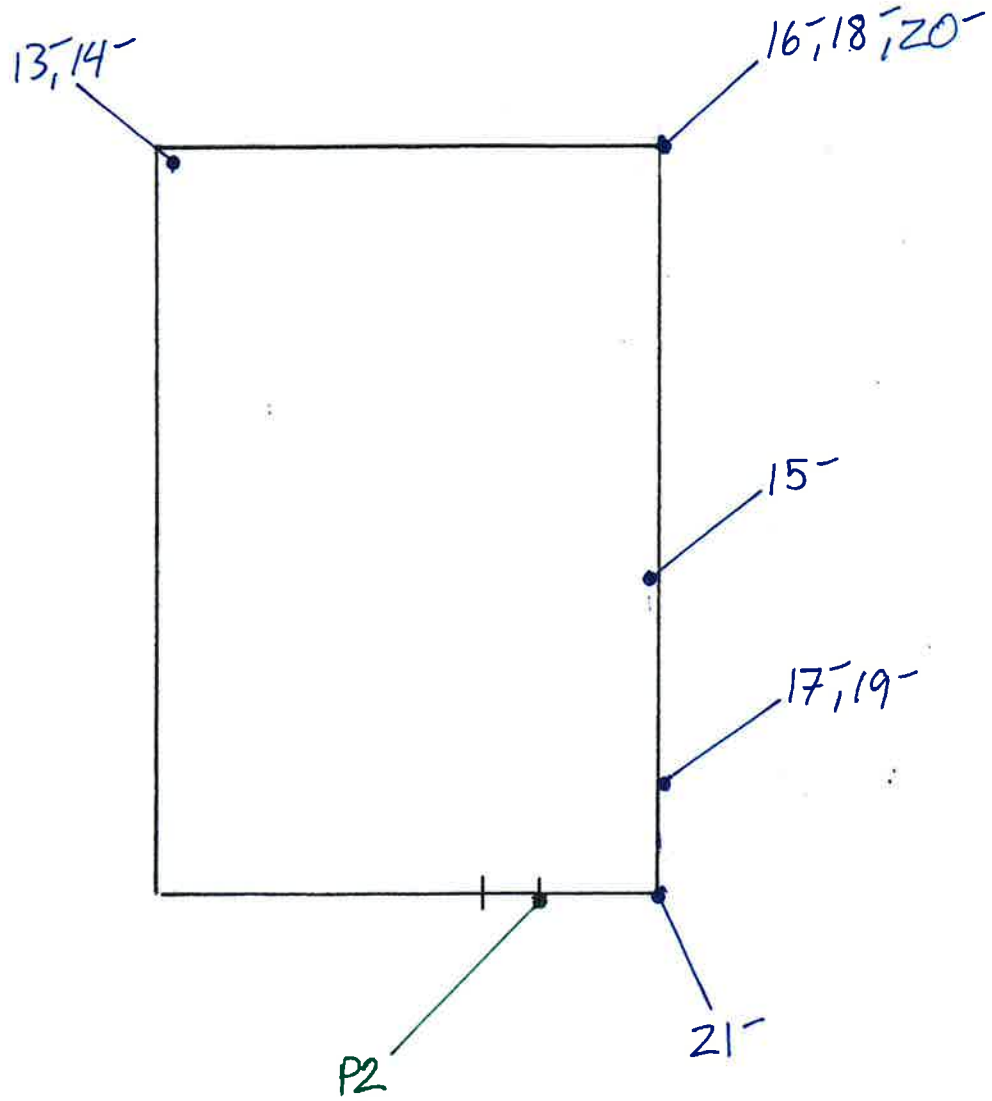
● — P# Paint Chip Sample Location

Main Tank & Upper Maple Lane Pump Station Shed
Garberville Sanitary District
Garberville, CA

FIG. 1

BRUNELLE & CLARK CONSULTING, LLC
P. O. Box 1138
Arcata, California 95518

2307801 12/14/23



ASBESTOS SAMPLE LOCATIONS

(Asbestos Samples: 13-21)

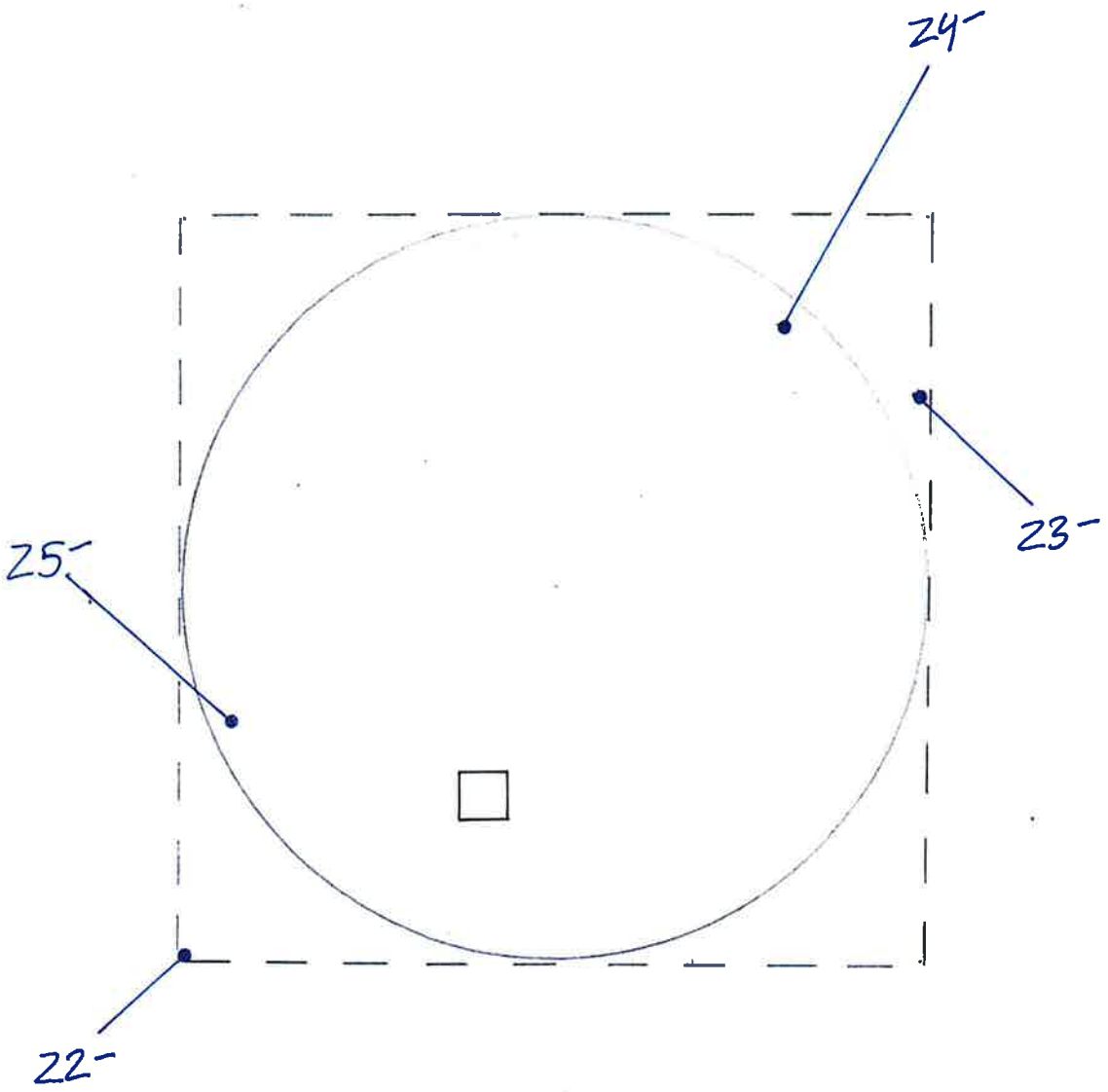
Asbestos Sample Locations
(Prefixed 2378- #, with + or – designation)
(+) is positive for Asbestos, (–) is negative

P# Paint Chip Sample Location

Wallan Pump Station Shed
Garberville Sanitary District
Garberville, CA

FIG. 2

BRUNELLE & CLARK CONSULTING, LLC
P. O. Box 1138
Arcata, California 95518
2307801 12/14/23



ASBESTOS SAMPLE LOCATIONS

(Asbestos Samples: 22-25)

● — # Asbestos Sample Locations
(Prefixed 2378- #, with + or – designation)
(+) is positive for Asbestos, (–) is negative

Wallan Tank
Garberville Sanitary District
Garberville, CA

FIG. 3

BRUNELLE & CLARK CONSULTING, LLC
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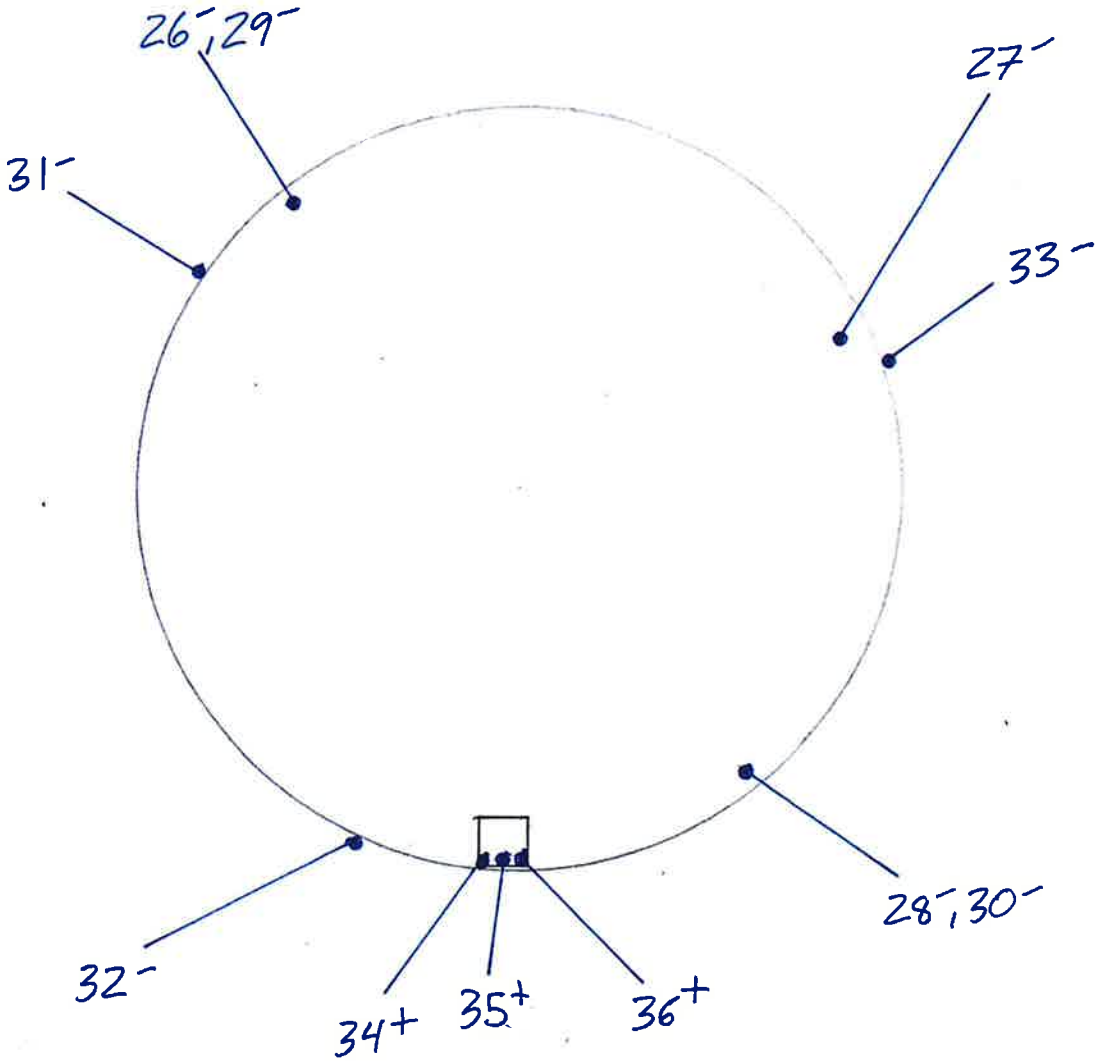
Arcata, California 95518

2307801 12/14/23



ASBESTOS SAMPLE LOCATIONS

(Asbestos Samples: 26-36)

● # Asbestos Sample Locations
(Prefixed 2378- #, with + or – designation)
(+) is positive for Asbestos, (–) is negative

Robertson Tank
Garberville Sanitary District
Garberville, CA

FIG. 4

BRUNELLE & CLARK CONSULTING, LLC
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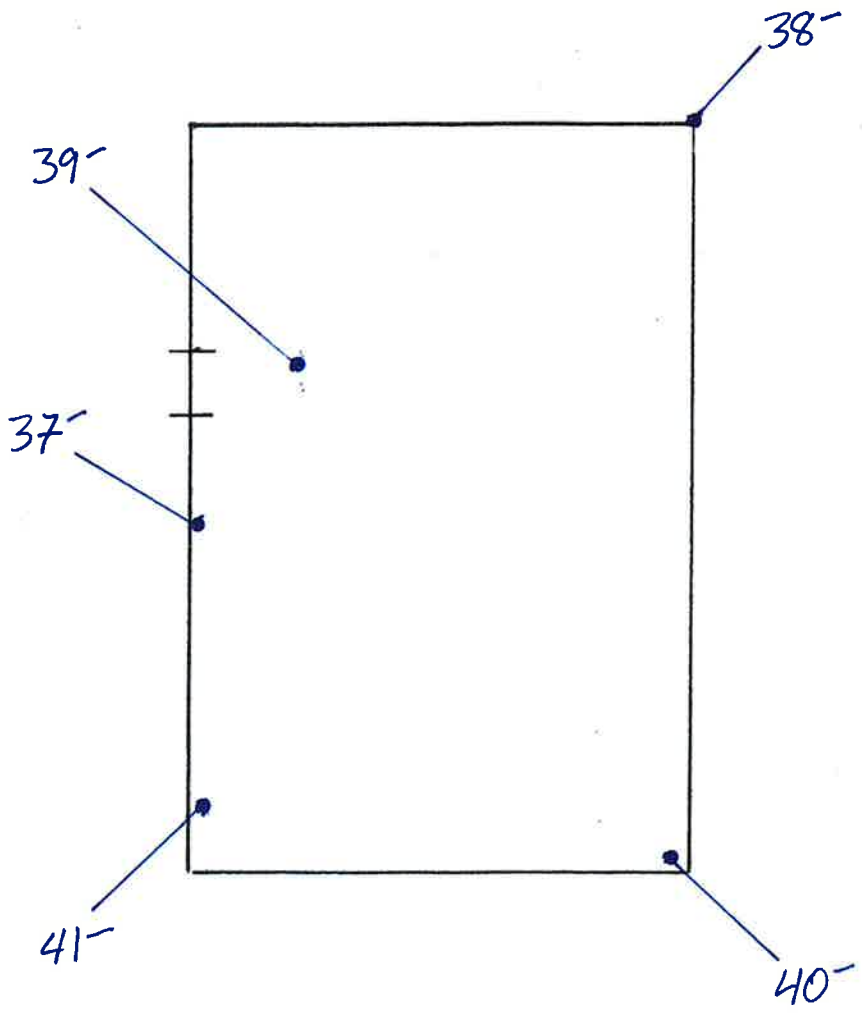
Arcata, California 95518
2307801 12/14/23



ASBESTOS SAMPLE LOCATIONS

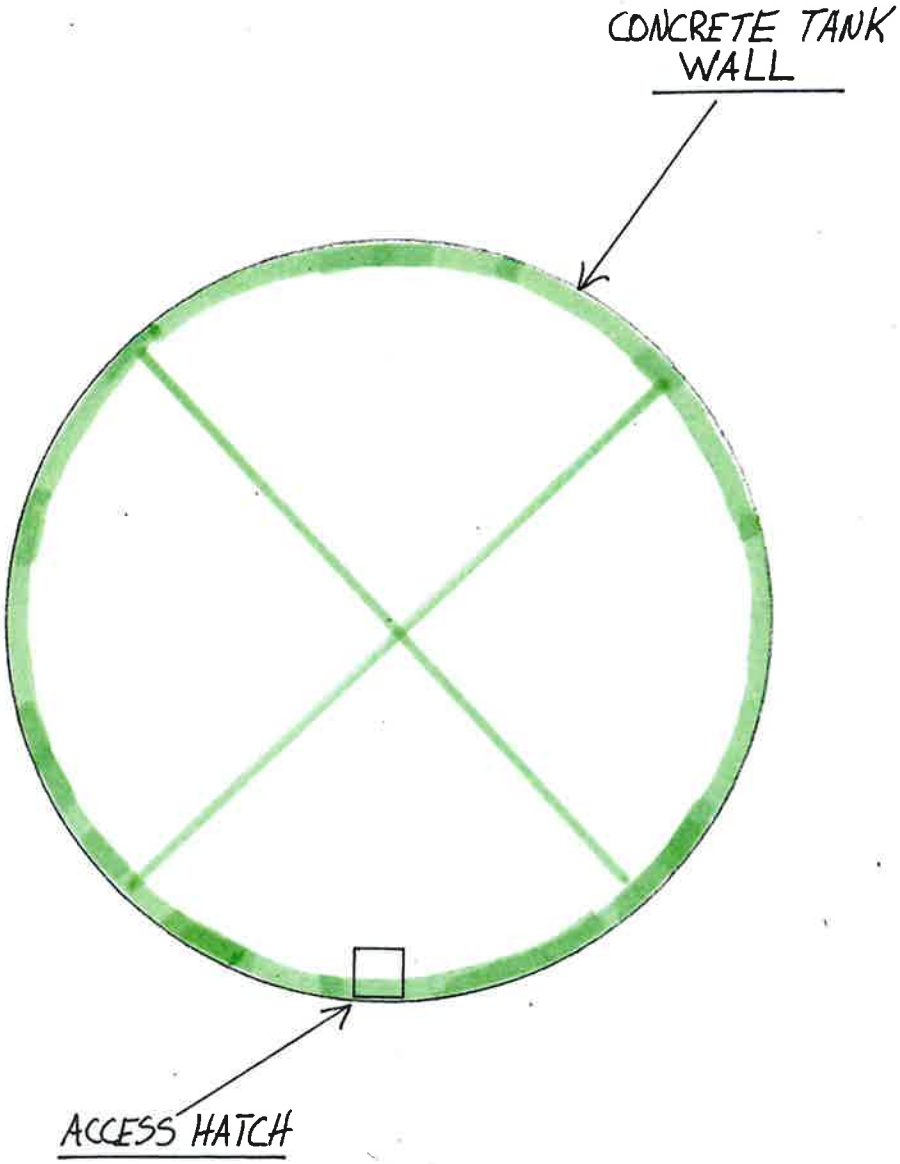
(Asbestos Samples: 37-41)

● # Asbestos Sample Locations
(Prefixed 2378- #, with + or – designation)
(+) is positive for Asbestos, (–) is negative

Arthur Pump Station Shed
Garberville Sanitary District
Garberville, CA

FIG. 5

BRUNELLE & CLARK CONSULTING, LLC
P. O. Box 1138
Arcata, California 95518
2307801 12/14/23



ASBESTOS LOCATIONS

ACCM Tar surfacing, black (on the interior of the concrete tank wall & bottom)

Note: see Table 2 for material & location details

Robertson Tank
Garberville Sanitary District
Garberville, CA

FIG. 6

APPENDIX B

Tables & Laboratory Reports

TABLE 1
SUMMARY OF ASBESTOS ANALYTIC DATA

Garberville Water Tanks
& Pump Stations
Garberville, CA

Sample Number	Sample Description (each layer)	Location	Asbestos % and Type	Friable vs. Non-Friable	Comments
2378- 1	Concrete, gray	Main Tank, tank wall	NAD	NF	
2378- 2	Concrete, gray	Main Tank, tank wall	NAD	NF	
2378- 3	Concrete, gray	Main Tank, exterior slab	NAD	NF	
2378- 4	Roofing, gray torch down comp.	Main Tank, tank roof	NAD	NF	
2378- 5	Roofing, gray torch down comp.	Main Tank, tank roof	NAD	NF	
2378- 6	Tarpaper, black	Main Tank, tank roof	NAD	NF	
2378- 7	Tarpaper, black	Main Tank, tank roof	NAD	NF	
2378- 8	Roofing, black torch down comp.	Main Tank, tank roof	NAD	NF	
2378- 9	Concrete, gray	Maple Lane Pump Station Shed, slab	NAD	NF	
2378- 10	Hardie-plank, gray	Maple Lane Pump Station Shed, siding	NAD	NF	
2nd layer	"	"	NAD	NF	
3rd layer	"	"	NAD	NF	
2378- 11	Roofing, brown comp shingle	Maple Lane Pump Station Shed, roof	NAD	NF	
2378- 12	Tarpaper, black	Maple Lane Pump Station Shed, roof	NAD	NF	
2378- 13	Roofing, brown comp shingle	Wallan Pump Station Shed, roof	NAD	NF	
2378- 14	Tarpaper, black	Wallan Pump Station Shed, roof	NAD	NF	

TABLE 1
SUMMARY OF ASBESTOS ANALYTIC DATA

Garberville Water Tanks
& Pump Stations
Garberville, CA

Sample Number	Sample Description (each layer)	Location	Asbestos % and Type	Friable vs. Non-Friable	Comments
2378- 15	Tarpaper, black	Wallan Pump Station Shed, siding	NAD	NF	
2378- 16	Mortar, gray	Wallan Pump Station Shed, wall	NAD	NF	
2378- 17	Mortar, gray	Wallan Pump Station Shed, wall	NAD	NF	
2378- 18	Cinderblock, gray	Wallan Pump Station Shed, wall	NAD	NF	
2378- 19	Cinderblock, gray	Wallan Pump Station Shed, wall	NAD	NF	
2378- 20	Concrete, gray	Wallan Pump Station Shed, slab	NAD	NF	
2378- 21	Concrete, gray	Wallan Pump Station Shed, slab	NAD	NF	
2378- 22	Concrete, gray	Wallan Tank, tank base slab	NAD	NF	
2378- 23	Concrete, gray	Wallan Tank, tank base slab	NAD	NF	
2378- 24	Roofing, gray torch down comp.	Wallan Tank, roof	NAD	NF	
2378- 25	Roofing, gray torch down comp.	Wallan Tank, roof	NAD	NF	
2378- 26	Roofing, brown comp shingle	Robertson Tank, roof	NAD	NF	
2378- 27	Roofing, green comp shingle	Robertson Tank, roof	NAD	NF	

TABLE 1
SUMMARY OF ASBESTOS ANALYTIC DATA

Garberville Water Tanks
& Pump Stations
Garberville, CA

Sample Number	Sample Description (each layer)	Location	Asbestos % and Type	Friable vs. Non-Friable	Comments
2378- 28	Roofing, green-gray comp shingle	Robertson Tank, roof	NAD	NF	
2378- 29	Tarpaper, black	Robertson Tank, roof	NAD	NF	
2378- 30	Tarpaper, black	Robertson Tank, roof	NAD	NF	
2378- 31	Concrete, gray	Robertson Tank, tank wall	NAD	NF	
2378- 32	Concrete, gray	Robertson Tank, tank wall	NAD	NF	
2378- 33	Concrete, gray	Robertson Tank, tank wall	NAD	NF	
2378- 34	**Tar surfacing, black**	**Robertson Tank, surfacing on the interior of the concrete tank wall**	**4% CH**	**NF**	
400 Point Count	***On tar surfacing sample above***	*“”*	***0.7% CH***	***NF***	***By 400 Point Count analysis***
2378- 35	**Tar surfacing, black**	**Robertson Tank, surfacing on the interior of the concrete tank wall**	**4% CH**	**NF**	
400 Point Count	***On tar surfacing sample above***	*“”*	***0.5% CH***	***NF***	***By 400 Point Count analysis***
2378- 36	**Tar surfacing, black**	**Robertson Tank, surfacing on the interior of the concrete tank wall**	**4% CH**	**NF**	
2378- 37	Tarpaper, black	Arthur Pump Station Shed, siding	NAD	NF	
2378- 38	Concrete, gray	Arthur Pump Station Shed, slab	NAD	NF	
2378- 39	Concrete, gray	Arthur Pump Station Shed, equipment base	NAD	NF	

TABLE 1
SUMMARY OF ASBESTOS ANALYTIC DATA

Garberville Water Tanks
& Pump Stations
Garberville, CA

Sample Number	Sample Description (each layer)	Location	Asbestos % and Type	Friable vs. Non-Friable	Comments
2378- 40	Roofing, green comp shingle	Arthur Pump Station Shed, roof	NAD	NF	
2378- 41	Roofing, green comp shingle	Arthur Pump Station Shed, roof	NAD	NF	

Bold Type = materials found to contain asbestos

CH = Chrysotile Asbestos

F = "Friable," asbestos material defined as: material containing >1% asbestos, that when dry, may be crumbled, pulverized, or reduced to powder by hand pressure

NAD = No Asbestos Detected

NA/PS = Not analyzed/Positive stop, stopped analysis after 1st positive test for identical material (see prev. sample)

NF = Non-friable

PACM = Presumed ACM

<1% = less than 1% asbestos content

Note: Some samples had multiple layers analyzed separately

TABLE 3
PAINT CHIP SAMPLING DATA

Garberville Water Tanks
& Pump Stations
Garberville, CA

Sample ID	Sample Location	Component Description	Lead Content % weight	Lead Content ppm or ug/g	Paint Classification	Surface Coating Material	Color	Substrate
P1	Maple Lane Pump Station Shed, exterior	Door trim	<0.0049	<49	TR/LF	Paint	Brown	Wood
P2	Wallen Pump Station Shed, exterior	Door trim	<0.0035	<35	TR/LF	Paint	Olive	Wood

LBP = Lead Based Paint (lead content at or above 5,000 parts per million (ppm), or 0.5% or greater by weight)

LCSC = Lead Containing Surface Coating (quantifiable lead content that is less than 4,999 ppm, or less than 0.5% by weight)

TR/LF = Trace Lead Content Or Lead Free (trace unquantifiable lead content or lead free)

ppm = Parts Per Million (ppm content is the same as ug/g content)

ug/g = Micrograms Per Gram (ug/g content is the same as ppm content)

Color = colors, noted by layers where possible, in descending order separated by slashes

Analysis by Lead in Paint USEPA Method SW846 7000B

AmeriSci Richmond
13635 GENITO ROAD
MIDLOTHIAN, VIRGINIA 23112
TEL: (804) 763-1200 • FAX: (804) 763-1800

PLM Bulk Asbestos Report

Brunelle & Clark Consulting, LLC
Attn: Zindar Brunelle
PO Box 1138

Arcata, CA 95518

Date Received 11/21/23
Date Examined 11/28/23

AmeriSci Job # 123111740
P.O. #
Page 1 of 8

RE: 2307801; Garberville Water Tanks & Pump Station Sheds; Garberville, CA

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2378-1	123111740-01	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Concrete, Gray; Main Tank / Tank Wall			
Analyst Description: Gray, Heterogeneous, Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Cellulose Trace, Non-fibrous 100%			
2378-2	123111740-02	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Concrete, Gray; Main Tank / Tank Wall			
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
2378-3	123111740-03	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Concrete, Gray; Main Tank / Ext Slab			
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
2378-4	123111740-04	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Roofing, Gray Torch Down Comp; Main Tank / Tank Roof			
Analyst Description: Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Synthetic fibers 5.0%, Non-fibrous 95%			
2378-5	123111740-05	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Roofing, Gray Torch Down Comp; Main Tank / Tank Roof			
Analyst Description: Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Synthetic fibers 5.0%, Non-fibrous 95%			

See Reporting notes on last page

PLM Bulk Asbestos Report

2307801; Garberville Water Tanks & Pump Station Sheds;
Garberville, CA

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2378-6	123111740-06	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Tarpaper, Black; Main Tank / Tank Roof			
Analyst Description: Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 7.0%, Non-fibrous 93%			
2378-7	123111740-07	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Tarpaper, Black; Main Tank / Tank Roof			
Analyst Description: Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 7.0%, Non-fibrous 93%			
2378-8	123111740-08	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Roofing, Black Torch down Comp; Main Tank / Tank Roof			
Analyst Description: Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Synthetic fibers 5.0%, Non-fibrous 95%			
2378-9	123111740-09	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Concrete, Gray; Maple Lane Pump Station Shed / Slab			
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
2378-10	123111740-10.1	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: HardiePlank, Gray; Maple Lane Pump Station Shed / Siding			
Analyst Description: Gray, Heterogeneous, Fibrous, Siding			
Asbestos Types:			
Other Material: Cellulose 90%, Non-fibrous 10%			
2378-10	123111740-10.2	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: HardiePlank, Gray; Maple Lane Pump Station Shed / Siding			
Analyst Description: Gray, Heterogeneous, Fibrous, Siding			
Asbestos Types:			
Other Material: Cellulose 90%, Non-fibrous 10%			

See Reporting notes on last page

PLM Bulk Asbestos Report

2307801; Garberville Water Tanks & Pump Station Sheds;
Garberville, CA

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2378-10	123111740-10.3	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: HardiePlank, Gray; Maple Lane Pump Station Shed / Siding			
Analyst Description: Gray, Heterogeneous, Fibrous, Siding			
Asbestos Types:			
Other Material: Cellulose 90%, Non-fibrous 10%			
2378-11	123111740-11	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Roofing, Brown Comp Shingle; Maple Lane Pump Station Shed / Roof			
Analyst Description: Reddish-Brown/Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 5.0%, Non-fibrous 95%			
2378-12	123111740-12	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Tarpaper, Black; Maple Lane Pump Station Shed / Roof			
Analyst Description: Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose 93%, Non-fibrous 7.0%			
2378-13	123111740-13	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Roofing, Brown Comp Shingle; Wallan Pump Station Shed / Roof			
Analyst Description: Brown/Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 5.0%, Non-fibrous 95%			
2378-14	123111740-14	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Tarpaper, Black; Wallan Pump Station Shed / Roof			
Analyst Description: Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose 88%, Non-fibrous 12%			
2378-15	123111740-15	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Tarpaper, Black; Wallan Pump Station Shed / Siding			
Analyst Description: Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose 88%, Non-fibrous 12%			

See Reporting notes on last page

PLM Bulk Asbestos Report

2307801; Garberville Water Tanks & Pump Station Sheds;
Garberville, CA

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2378-16	123111740-16	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Mortar, Gray; Wallan Pump Station Shed / Wall			
Analyst Description: White/Gray, Heterogeneous, Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Cellulose Trace, Non-fibrous 100%			
2378-17	123111740-17	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Mortar, Gray; Wallan Pump Station Shed / Wall			
Analyst Description: Lt. Grey, Heterogeneous, Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Cellulose Trace, Non-fibrous 100%			
2378-18	123111740-18	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Cinderblock, Gray; Wallan Pump Station Shed / Wall			
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
2378-19	123111740-19	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Cinderblock, Gray; Wallan Pump Station Shed / Wall			
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
2378-20	123111740-20	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Concrete, Gray; Wallan Pump Station Shed / Slab			
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
2378-21	123111740-21	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Concrete, Gray; Wallan Pump Station Shed / Slab			
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			

See Reporting notes on last page

PLM Bulk Asbestos Report

2307801; Garberville Water Tanks & Pump Station Sheds;
Garberville, CA

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2378-22	123111740-22	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Concrete, Gray; Wallan Tank / Tank Base Slab			
Analyst Description: Dark Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Cellulose Trace, Non-fibrous 100%			
2378-23	123111740-23	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Concrete, Gray; Wallan Tank / Tank Base Slab			
Analyst Description: Dark Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Cellulose Trace, Non-fibrous 100%			
2378-24	123111740-24	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Roofing, Gray Torch Down Comp; Wallan Tank / Roof			
Analyst Description: White/Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 4.0%, Non-fibrous 96%			
2378-25	123111740-25	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Roofing, Gray Torch Down Comp; Wallan Tank / Roof			
Analyst Description: White/Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 4.0%, Non-fibrous 96%			
2378-26	123111740-26	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Roofing, Brown Comp Shingle; Robertson Tank / Roof			
Analyst Description: Multi-Colored/Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 5.0%, Non-fibrous 95%			
2378-27	123111740-27	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Roofing, Green Comp Shingle; Robertson Tank / Roof			
Analyst Description: Green/Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 5.0%, Non-fibrous 95%			

See Reporting notes on last page

PLM Bulk Asbestos Report

2307801; Garberville Water Tanks & Pump Station Sheds;
Garberville, CA

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2378-28	123111740-28	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Roofing, Green-Gray Comp Shingle; Robertson Tank / Roof			
Analyst Description: Green-White/Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 5.0%, Non-fibrous 95%			
2378-29	123111740-29	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Tarpaper, Black; Robertson Tank / Roof			
Analyst Description: Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose 95%, Non-fibrous 5.0%			
2378-30	123111740-30	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Tarpaper, Black; Robertson Tank / Roof			
Analyst Description: Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose 95%, Non-fibrous 5.0%			
2378-31	123111740-31	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Concrete, Gray; Robertson Tank / Tank Wall			
Analyst Description: Lt. Brown/Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
2378-32	123111740-32	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Concrete, Gray; Robertson Tank / Tank Wall			
Analyst Description: Lt. Grey, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
2378-33	123111740-33	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Concrete, Gray; Robertson Tank / Tank Wall			
Analyst Description: Lt. Grey, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			

See Reporting notes on last page

PLM Bulk Asbestos Report

2307801; Garberville Water Tanks & Pump Station Sheds;
Garberville, CA

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2378-34	123111740-34	***Yes***	4.0%

Location: Tar, Black; Robertson Tank / Surfacing On Interior Of Concrete Tank Wall

(by CVES)
by David W. Ralbovsky
on 11/28/23

Analyst Description: Gray/Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types: Chrysotile 4.0%
Other Material: Non-fibrous 96%

2378-35	123111740-35	***Yes***	4.0%

Location: Tar, Black; Robertson Tank / Surfacing On Interior Of Concrete Tank Wall

(by CVES)
by David W. Ralbovsky
on 11/28/23

Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types: Chrysotile 4.0%
Other Material: Non-fibrous 96%

2378-36	123111740-36	***Yes***	4.0%

Location: Tar, Black; Robertson Tank / Surfacing On Interior Of Concrete Tank Wall

(by CVES)
by David W. Ralbovsky
on 11/28/23

Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types: Chrysotile 4.0%
Other Material: Non-fibrous 96%

2378-37	123111740-37	***No***	NAD

Location: Tarpaper, Black; Arthur Pump Station Shed / Siding

(by CVES)
by David W. Ralbovsky
on 11/28/23

Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Cellulose 95%, Non-fibrous 5.0%

2378-38	123111740-38	***No***	NAD

Location: Concrete, Gray; Arthur Pump Station Shed / Slab

(by CVES)
by David W. Ralbovsky
on 11/28/23

Analyst Description: Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 100%

2378-39	123111740-39	***No***	NAD

Location: Concrete, Gray; Arthur Pump Station Shed / Equip Base

(by CVES)
by David W. Ralbovsky
on 11/28/23

Analyst Description: Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 100%

See Reporting notes on last page

PLM Bulk Asbestos Report

2307801; Garberville Water Tanks & Pump Station Sheds;
Garberville, CA

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2378-40	123111740-40	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Roofing, Green Comp Shingle; Arthur Pump Station Shed / Roof			
Analyst Description: Green-White/Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose 4.0%, Non-fibrous 96%			
2378-41	123111740-41	***No***	NAD (by CVES) by David W. Ralbovsky on 11/28/23
Location: Roofing, Green Comp Shingle; Arthur Pump Station Shed / Roof			
Analyst Description: Green-White/Black, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose 4.0%, Non-fibrous 96%			

Reporting Notes:

Analyzed by: David W. Ralbovsky
Date: 11/28/2023

Reviewed by: David W. Ralbovsky

*NAD = no asbestos detected, Detection Limit <1%, Reporting Limits: CVES = 1%, 400 Pt Ct = 0.25%, 1000 Pt Ct = 0.1%; "Present" or NVA = "No Visible Asbestos" are observations made during a qualitative analysis; NA = not analyzed; NA/PS = not analyzed / positive stop; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 microscope, Serial #229707, by EPA 600/R-93/116 per 40 CFR 763 (NVLAP Lab Code 101904-0) and ELAP PLM Analysis Protocol 198.1 for New York friable samples which includes quantitation of any vermiculite observed (198.6 for NOB samples) or EPA 400 pt ct by EPA 600/M4-82-020 (NYSDOH ELAP Lab # 10984); CA ELAP Lab # 2508; Note: PLM is not consistently reliable in detecting asbestos in floor coverings and similar NOB materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos-containing in New York State (also see EPA Advisory for floor tile, FR 59, 146, 38970, 8/1/94). NIST Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the laboratory. This PLM report relates ONLY to the items tested.

AmeriSci Richmond
13635 GENITO ROAD
MIDLOTHIAN, VIRGINIA 23112
TEL: (804) 763-1200 • FAX: (804) 763-1800

PLM Bulk Asbestos Report

Brunelle & Clark Consulting, LLC
Attn: Zindar Brunelle
PO Box 1138

Arcata, CA 95518

Date Received 11/29/23
Date Examined 12/04/23

AmeriSci Job # 123111913
P.O. #
Page 1 of 1

RE: 2307801; Garberville Water Tanks & Pump Station Sheds; Garberville, CA (Ref: 123-11-1740)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2378-34	123111913-01	***Yes***	0.7% pc (by 400 pt ct) by Gordon T. Saleeby on 12/04/23
Location: Tar, Black; Robertson Tank/Surfacing On Interior Of Concrete Tank Wall			
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile 0.7% **Other Material:** Non-fibrous 9.9%			
2378-35	123111913-02	***Yes***	0.5% pc (by 400 pt ct) by Gordon T. Saleeby on 12/04/23
Location: Tar, Black; Robertson Tank/Surfacing On Interior Of Concrete Tank Wall			
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile 0.5% **Other Material:** Non-fibrous 10%			

Reporting Notes:

Analyzed by: Gordon T. Saleeby
Date: 12/4/2023

Reviewed by: Cory M. Parnell

*NAD = no asbestos detected, Detection Limit <1%, Reporting Limits: CVES = 1%, 400 Pt Ct = 0.25%, 1000 Pt Ct = 0.1%; "Present" or NVA = "No Visible Asbestos" are observations made during a qualitative analysis; NA = not analyzed; NA/PS = not analyzed / positive stop; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 microscope, Serial #237649, by EPA 600/R-93/116 per 40 CFR 763 (NVLAP Lab Code 101904-0) and ELAP PLM Analysis Protocol 198.1 for New York friable samples which includes quantitation of any vermiculite observed (198.6 for NOB samples) or EPA 400 pt ct by EPA 600/M4-82-020 (NYSDOH ELAP Lab # 10984); CA ELAP Lab # 2508; Note: PLM is not consistently reliable in detecting asbestos in floor coverings and similar NOB materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos-containing in New York State (also see EPA Advisory for floor tile, FR 59, 146, 38970, 8/1/94). NIST Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the laboratory. This PLM report relates ONLY to the items tested.

123111740

Analysis: X Standard PLM ___ 400 Point Count ___ 1,000 Point Count Turnaround Time: Rush/1-day/2-days/3-days/5-days	BRUNELLE & CLARK CONSULTING, LLC P.O. Box 1138 Arcata, CA 95518 (707) 672-5345 zbconsult@outlook.com	Date: 11/16/23 Site: Garberville Water Tanks & Pump Station Sheds Garberville, CA Proj. # 2307801

BULK ASBESTOS SAMPLING

Sample No.	Sample Description	Location	Mat'l Type	Friability
2378-1	Concrete, gray	Main Tank / Tank wall	MM	NF
-2				
-3		Ext. slab		
-4	Roofing, gray torch down comp	tank roof		
-5				
-6	Tarpaper, black			
-7				
-8	Roofing, black torch down comp.			
-9	Concrete, gray	Maple Lane Pump Station Shed / slab		
-10	Hardie plank, gray	siding		
-11	Roofing, brown comp. shingle	roof		
-12	Tarpaper, black			
-13	Roofing, brown comp shingle	Wallan Pump Station Shed / roof		
-14	Tarpaper, black			
-15		siding		

Sample Abbreviations

VFT = Vinyl Floor Tile
SF = Sheet Flooring
JC/GB = Joint Compound/Gypsum Board
CT = Ceiling Tile
CP = Ceiling Panel
BBM = Baseboard Mastic

Material Type

TSI = Thermal System Insulation
MM = Misc. Material
SM = Surfacing Material

* = Stop analysis for any layer at first positive, if >1%, where indicated.

Sampled by: Zinder Brunelle	Received by: Received
Relinquished by: Zinder Brunelle Date/Time: 11/20/23	Signature: Date/Time: NOV 21 2023

TM

123111740

Analysis: X Standard PLM ___ 400 Point Count ___ 1,000 Point Count Turnaround Time: Rush/1-day/2-days/3-days/5-days	BRUNELLE & CLARK CONSULTING, LLC P.O. Box 1138 Arcata, CA 95518 (707) 672-5345 zbconsult@outlook.com	Date: 11/16/23 Site: Garberville Water Tanks & Pump Station Sheds Garberville, CA Proj. # 2307801

BULK ASBESTOS SAMPLING

Sample No.	Sample Description	Location	Mat'l Type	Friability
2378-16	Mortar, gray	Wallan Pump Station Shed / wall	MM	NF
-17	↓	↓	↓	↓
-18	Cinderblock, gray	↓	↓	↓
-19	↓	↓	↓	↓
-20	Concrete, gray	slab	↓	↓
-21	↓	↓	↓	↓
-22	Concrete, gray	Wallan Tank / tank base slab	↓	↓
-23	↓	↓	↓	↓
-24	Roofing, gray torch down comp.	roof	↓	↓
-25	↓	↓	↓	↓
-26	Roofing, brown comp. shingle	Robertson Tank / roof	↓	↓
-27	Roofing, green comp. shingle	↓	↓	↓
-28	Roofing, green-gray comp. shingle	↓	↓	↓
-29	Tarpaper, black	↓	↓	↓
-30	↓	↓	↓	↓

Sample Abbreviations

VFT = Vinyl Floor Tile
SF = Sheet Flooring
JC/GB = Joint Compound/Gypsum Board
CT = Ceiling Tile
CP = Ceiling Panel
BBM = Baseboard Mastic

Material Type

TSI = Thermal System Insulation
MM = Misc. Material
SM = Surfacing Material

* = Stop analysis for any layer at first positive, if >1%, where indicated.

Sampled by: Zinder Brunelle	Received by:
Relinquished by: Zinder Brunelle Date/Time: 11/20/23	Signature: Received Date/Time:

NOV 21 2023
TW

123111740

Analysis: X Standard PLM ___ 400 Point Count ___ 1,000 Point Count Turnaround Time: Rush/1-day/2-days/3-days/5-days	BRUNELLE & CLARK CONSULTING, LLC P.O. Box 1138 Arcata, CA 95518 (707) 672-5345 zbconsult@outlook.com	Date: 11/16/23 Site: Garberville Water Tanks & Pump Station Sheds Garberville, CA Proj. # 2307801

BULK ASBESTOS SAMPLING

Sample No.	Sample Description	Location	Mat'l Type	Friability
2378-31	Concrete, gray	Robertson Tank / tank wall	MM	NF
-32	↓	↓	↓	↓
-33	↓	↓	↓	↓
-34	Tar, black	surfacing on interior of concrete tank wall	↓	↓
-35	↓	↓	↓	↓
-36	↓	↓	↓	↓
-37	Tarpaper, black	Arthur Pump Station Shed / siding	↓	↓
-38	Concrete, gray	slab	↓	↓
-39	↓	Equip. base	↓	↓
-40	Roofing, green comp shingle	roof	↓	↓
-41	↓	↓	↓	↓

Sample Abbreviations

VFT = Vinyl Floor Tile
SF = Sheet Flooring
JC/GB = Joint Compound/Gypsum Board
CT = Ceiling Tile
CP = Ceiling Panel
BBM = Baseboard Mastic

Material Type

TSI = Thermal System Insulation
MM = Misc. Material
SM = Surfacing Material

* = Stop analysis for any layer at first positive, if >1%, where indicated.

Sampled by: Zindar Brunelle	Received by:
Relinquished by: Zindar Brunelle Date/Time: 11/20/23	Signature: Date/Time: Received

NOV 21 2023
TM

Environmental Hazards Services, L.L.C.
7469 Whitepine Rd
Richmond, VA 23237
Telephone: 800.347.4010

Lead Paint Chip Analysis Report

Report Number: 23-11-03104

Client: Ameri-Sci Richmond
13635 Genito Road
Midlothian, VA 23112-400

Received Date: 11/21/2023
Analyzed Date: 11/22/2023
Reported Date: 11/22/2023

Project/Test Address: 123-11-1733; 2307801; Garberville Water Tanks & Pump Stations; Garberville, CA
Collection Date: 11/16/2023

Client Number: 48-3042

Laboratory Results

Fax Number: 804-763-1800

Lab Sample Number	Client Sample Number	Collection Location	Pb (ug/g) ppm	% Pb by Wt.	Narrative ID
23-11-03104-001	P1	MAPLE LANE PUMP STATION SHED EXTERIOR DOOR TRIM	<49	<0.0049	
23-11-03104-002	P2	WALL ON PUMP STATION SHED EXT DOOR TRIM	<35	<0.0035	

Preparation Method: ASTM E-1979-17
Analysis Method: EPA SW846 7000B

Reviewed By Authorized Signatory: Melissa Kanode

Melissa Kanode
QA/QC Clerk

The Reporting Limit (RL) for samples prepared by ASTM E-1979-17 is 10.0 ug Total Pb. The RL for samples prepared by EPA SW846 3050B is 25.0 ug Total Pb. Paint chip area and results are calculated based on area measurements determined by the client. All internal quality control requirements associated with this batch were met, unless otherwise noted.

The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Results represent the analysis of samples submitted by the client. Sample location, description, area, etc., was provided by the client. Results reported above in mg/cm3 are calculated based on area supplied by client. This report shall not be reproduced except in full, without the written consent of Environmental Hazards Services, L.L.C.

ELLAP Accredtitation through AIHA LAP, LLC (100420), NY ELAP #11714.

LEGEND	Pb= lead	ug = microgram	ppm = parts per million
	ug/g = micrograms per gram	Wt. = weight	

AMERI SCI

AMERISCI LOS ANGELES
24416 South Main St., Suite 308
888.724.5226 Toll Free
310.834.4868 Phone~310.834.4772 Fax

AMERISCI JOB NO:
DUE DATE:
☐ 1 DAY ☒ 2 DAY ☐ 3 DAY ☐ 5 DAY ☐ 7 DAY ☐ 10 DAY
DATA PACKAGE: 123111733

PAGE 1 OF 1
TEMP UPON RECEIPT:
P.O.#

COMPANY: BRUNELLE & CLARK CONSULTING, LLC
ADDRESS: P.O. Box 1138, Arcata, CA 95518
PHONE: (707) 672-5345 | FAX 1: | CELL: (707) 672-5345
CLIENT CONTACT: Zindar Brunelle | EMAIL: zbconsult@outlook.com
PROJECT NAME: Garberville Water Tanks & Pump Stations, Garberville, CA | PROJECT NUMBER: Z307801 | PROJECT STATE: CA
MATRIX: A-WATER S-SOIL/SOLIDS SL-SLUDGE OIL-OIL CH-CHIPS WI-WIPES C-CASSETTES W-WASTE O-OTHER
CONTAINER: P-PLASTIC G-GLASS V-VOA

LAB ID	CLIENT SAMPLE IDENTIFICATION	MATRIX	CONTAINER SIZE	CONTAINER TYPE	CONTAINER #	SAMPLING INFORMATION DATE	TIME	TECH	GRAB (G) OR COMPOSITE (C)	PRESERVATIVES	SAMPLE pH AT LOGIN	Lead in Paint Chip						Color Notes:
P1	Maple Lane / Shed / Door Pump Station / Exterior / Trim	CH	S	P	1	11/16/23	NA	[illegible]				X						Brown
P2	Wallan Pump Station / Shed Exta / Door Trim	↓	↓	↓	1	↓	NA	[illegible]				X						Olive

SAMPLED BY: (PRINT) Zindar Brunelle	DATE: 11/16/23	RECEIVED BY: (PRINT)	DATE:
(SIGN) [signature]	TIME: NA	(SIGN)	TIME:
RELINQUISHED BY: (PRINT) Zindar Brunelle	DATE: 11/20/23	RECEIVED BY: (PRINT)	DATE:
(SIGN) [signature]	TIME: NA	(SIGN)	TIME:
RELINQUISHED BY: (PRINT)	DATE:	RECEIVED FOR LABORATORY BY:	DATE:
(SIGN)	TIME:	(SIGN)	TIME:

Received
NOV 21 2023
KLM

APPENDIX C

NESHAP Notification Form

North Coast Unified
Air Quality Management District
707 L Street, Eureka, CA 95501
Telephone (707) 443-3093 FAX (707) 443-3099
http://www.ncuaqmd.org

COMPLIANCE ADVISORY
ASBESTOS NESHAP APPLICABILITY
TO DEMOLITION AND RENOVATION PROJECTS

In order to reduce the public's potential exposure to airborne asbestos, the Environmental Protection Agency (EPA) established the asbestos National Emission Standards for Hazardous Air Pollutants (NESHAP) regulation. The asbestos NESHAP regulates the demolition and renovation of buildings containing asbestos materials including, but not limited to fireproofing and insulating materials, paints, cements, joint compounds, and floor tiles. The regulation applies to commercial structures, industrial structures, and housing units having greater than four dwelling units. Single family dwellings are *generally* exempt. The following is a summary of some of the important NESHAP requirements. Other regulations may apply. For example, CAL/OSHA requires that the asbestos survey be completed by a Certified Asbestos Consultant (CAC) or by a Site Surveillance Technician, under the supervision of a CAC.

Definitions

Demolition – the wrecking or removal of any load supporting structural member of a building. Moving a structure from one location to another and the burning of a structure are also considered demolitions.

Regulated Asbestos Containing Material – (a) friable asbestos material; (b) Category I non-friable material that has become friable; (c) Category I material that has or will be subjected to grinding, sanding, cutting, or abrading; (d) Category II non-friable material that has a high probability of becoming crumbled, pulverized, or reduced to powder by forces expected to act upon the material in the course of demolition or renovation operations.

Renovation – altering a facility or one or more facility components in any way; this includes and is not limited to the stripping or removal or Regulated Asbestos Containing Material (RACM) from a facility component. Also included are projects on the exterior of a structure, such as façade enhancements or remodels.

Prior to beginning any demolition or renovation activity, the structure must be thoroughly surveyed for the presence of asbestos containing material. Survey must be conducted by an AHERA-accredited Building Inspector (40 CFR 763, Subpart E, App. C).

For a renovation - Upon completion of the asbestos survey, determine if the combined amount of RACM to be stripped, removed, dislodged, cut, drilled or similarly disturbed during a renovation is at least 260 linear feet (on pipes), 160 square feet (i.e. flooring, drywall), or 35 cubic feet in volume whichever is least. If the amount of RACM is at least the threshold amounts, District notification prior to the removal is required.

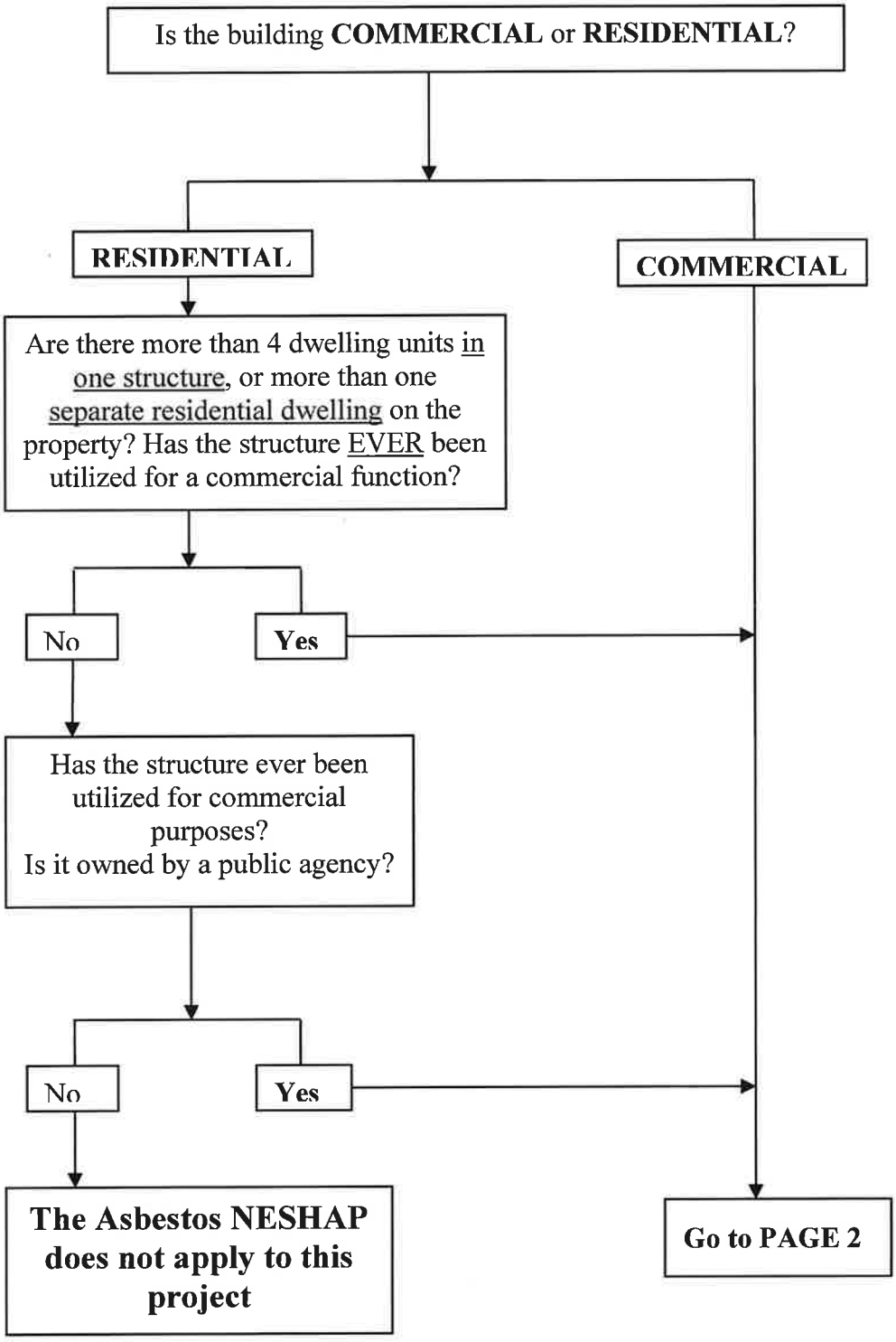
For a demolition - Upon completion of the asbestos survey, a demolition notification form must be submitted to the District at least 10 working days prior to the start date of the demolition. Notification of a demolition is required regardless of the amount of asbestos present. When asbestos-containing material of a quantity greater than or equal to the threshold amounts above will be removed prior to demolition, a separate notification is required.

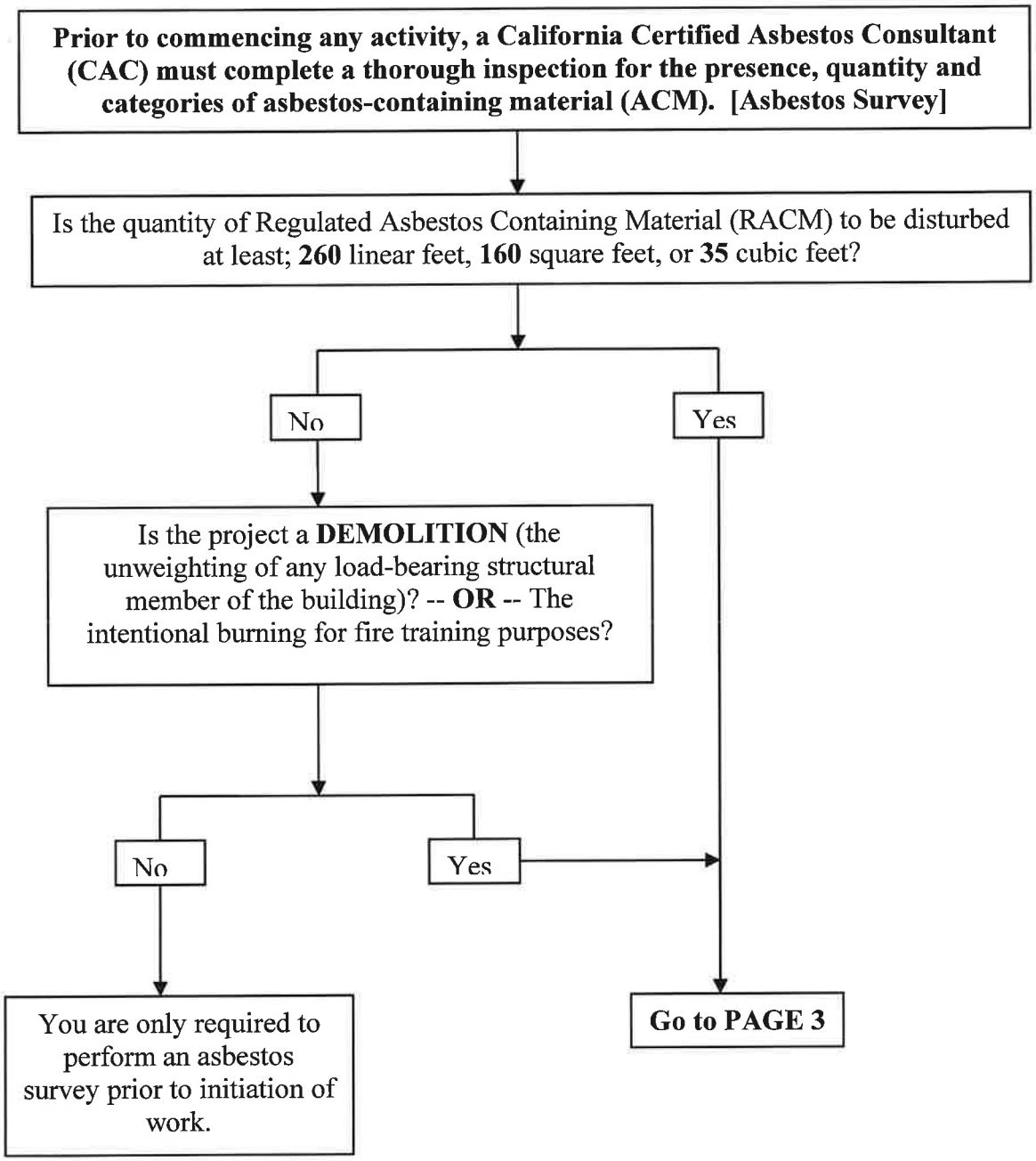
Other Training Requirements – *When removing or disturbing RACM, an AHERA-accredited Contractor/Supervisor must be present and all workers must be AHERA-accredited Workers (40 CFR 763, Subpart E, App. C). All training must be current.*

f Violations of NESHAP regulations can be prosecuted as felony offenses carrying penalties of $37,500 per day per offense.f

For further clarification or additional guidance, contact the NCUAQMD office at (707) 443-3093.

GUIDE TO ASBESTOS NESHAP QUESTIONS




Prior to commencing any activity, a California Certified Asbestos Consultant (CAC) must complete a thorough inspection for the presence, quantity and categories of asbestos-containing material (ACM). [Asbestos Survey]
Is the quantity of Regulated Asbestos Containing Material (RACM) to be disturbed at least; 260 linear feet, 160 square feet, or 35 cubic feet?
No
Yes
Is the project a DEMOLITION (the unweighting of any load-bearing structural member of the building)? -- OR -- The intentional burning for fire training purposes?
No
Yes
You are only required to perform an asbestos survey prior to initiation of work.
Go to PAGE 3

REGULATED RENOVATIONS AND DEMOLITIONS

1) You must submit an Asbestos Survey and completed Notification Form at least 10 working days prior to initiating work on the project.
2) Demolitions:
   a) Requires a 2-**X** notification fee (unless the building is donated to a fire department for training purposes).
   b) (Regulation IV, Rule 401, §1.1.2) An additional 2-**X*** fee is added if Asbestos Abatement is required **for a <u>Demolition</u>** Project.
3) Renovations require only a 2-**X*** notification fee.
4) IF, after notification has been submitted, the quantity of asbestos containing material (ACM) changes by at least 20%, then update the notification.
5) IF, after notification has been submitted, the start date changes to a date <u>after</u> the original start date, then notify by phone as soon as possible AND provide written notice as soon as possible AND no later than original start date.
6) IF, after notification has been submitted, start date changes to a date earlier than the original start date, then provide written notice at least 10 days prior to the new start date.

<u>IN NO EVENT SHALL A PROJECT START ON A DATE OTHER THAN THE DATE CONTAINED IN THE WRITTEN NOTIFICATION.</u>

(40 CFR 61.145 (b) (iv) (C))

* The **X** value changes annually.
Call to get current value: 707-443-3093

North Coast Unified
Air Quality Management District
707 L Street, Eureka, CA 95501
Telephone (707) 443-3093 FAX (707) 443-3099
http://www.ncuaqmd.org

ASBESTOS DEMOLITION AND RENOVATION NOTIFICATION FORM
GENERAL INFORMATION

The Asbestos NESHAP, 40 CFR Part 61, Subpart M, requires written notification of demolition or renovation operations under Section 61.145. This form may be used to fulfill this requirement. Only complete notification forms are acceptable. Incomplete notification may result in enforcement action.

This notification should be typewritten and postmarked or delivered no later than ten days prior to the beginning of the asbestos removal activity (dates specified in Section VIII) or demolition (dates specified in Section IX). Please submit the form, along with the appropriate fee, to: **NORTH COAST UNIFIED AQMD**
707 L STREET, EUREKA, CA 95501

INSTRUCTIONS:

I. Type of Notification: Enter "O" if the notification is a first time or original notification, "R" if the notification is a revision of a prior notification, or "C" if the activity has been cancelled.

II. Facility Information: Enter the names, addresses, contact persons and telephone numbers of the following:
Owner: Legal owner of the site at which asbestos is being removed or demolition planned
Asbestos Removal Contractor: Certified asbestos contractor hired to remove asbestos (include DOSH registration #)
Other Demolition or Renovation Operator: Demolition contractor, general contractor, or other person who leases, operates, controls, or supervises the site (fire dept if training burn).

III. Type of Operation: Enter "D" for facility demolition, "R" for facility renovation, "O" for ordered demolition, or "E" for emergency renovation. Fire training burns are considered facility demolitions ("D").

IV. Is Asbestos Present?: Answer "yes" or "no" regardless of the amount of asbestos present.

V. Facility Description: Provide detailed information on the areas being renovated or demolished. If applicable, provide the floor numbers and room numbers where renovations are to be conducted.
Site Location: Provide information needed to locate site in event that the address alone is inadequate.
Building Size: Provide in square meters or square feet.
No. of Floors: Enter the number of floors including basement or ground floors.
Age in Years: Enter approximate age of the facility.
Present Use / Prior Use: Describe the primary use of the facility or enter the following codes: H - hospital; S - school; P - public building; O - office; I - industrial; U - university or college; B - ship; C - commercial; or R - residential.

VI. Asbestos Detection Procedure: Describe methods and procedures used to determine whether asbestos is present at the site, including a description of the analytical methods employed. **Building inspections must be performed by an AHERA-accredited Building Inspector** (40 CFR 763, Subpart E, App. C). Include copy of current accreditation. If an inspection report has been prepared by a consultant for the facility please include a copy with the notification.

VII. Approximate Amount of Asbestos, Including: (1) Regulated asbestos containing material (RACM) to be removed (including nonfriable ACM to be sanded, ground, or abraded); (2) Category I ACM not removed ; and (3) Category II ACM not removed. For both removals and demolition, enter the amount of RACM to be removed by entering a number in the appropriate box and an "X" for the unit. For demolition only, enter the amount of Category I and II nonfriable asbestos not to be removed in the appropriate boxes. Category I nonfriable material includes packing, gasket, resilient floor covering, and asphalt roofing materials containing more than one percent asbestos. Category II nonfriable material includes any material, excluding Category I products, containing more than one percent asbestos, that when dry, cannot be crumbled, pulverized, or reduced to powder. Facilities to be used for fire training purposes must have all materials containing more than one percent asbestos removed.

VIII. Scheduled Dates of Asbestos Removal: Enter scheduled dates (month/day/year) for asbestos removal work. Asbestos removal work includes any activity, including site preparation, which may break up, dislodge, or disturb asbestos material. **These dates must be accurate.** Asbestos removal work occurring prior to the start date or after the end date is a violation and could result in substantial enforcement action. If these dates change, notify the District immediately, by submitting a revision request form.

IX. Scheduled Dates of Demo/Renovation: Enter scheduled dates (month/day/year) for beginning and ending of the planned demolition or renovation. For fire training burns this is the time period when the actual fire training burn will take place. **These dates must be accurate.** Demolition or renovation activity occurring prior to the start date or after the end date is a violation and could result in substantial enforcement action. If these dates change, notify the District immediately, by submitting a revision request form.

X. Description of Planned Demolition or Renovation Work, and Method(s) to be Used: Include here a description of the overall work being done and the techniques being used. A work plan can be attached to address this item.

XI. Description of Engineering Controls and Work Practices to be Used to Control Emissions of Asbestos at the Demolition or Renovation Site: Describe the work practices and engineering controls selected to ensure compliance with the requirements of the regulation, including removal and waste handling emission control procedures. A work plan can be attached to address this item.

XII. Waste Transporter(s): Enter the name, addresses, contact persons and telephone numbers of the persons or companies responsible for transporting ACM from the removal site to the waste disposal site. If the removal contractor or owner is the waste transporter, state "same as owner" or "same as removal contractor".

XIII. Waste Disposal Site: Identify the waste disposal site, including the complete name, location, and telephone number of the facility. If ACM is to be disposed of at more than one site, provide complete information on an additional sheet submitted with the form.

XIV. If Demolition Ordered by a Government Agency: Provide the name of the responsible official, title and agency, authority under which the order was issued, the dates of the order and the dates of the ordered demolition. Include a copy of the order with the notification.

XV. Emergency Renovation Information: Provide the date and time of the emergency, a description of the event and a description of unsafe conditions, equipment damage or financial burden resulting from the event. The information should be detailed enough to evaluate whether a renovation falls within the emergency exception.

XVI. Description of Procedures to be Followed in the Event that Unexpected Asbestos is Found or Previously Nonfriable Asbestos Material Becomes Crumbled, Pulverized, or Reduced to Powder: Provide adequate information to demonstrate that appropriate actions have been considered and can be implemented to control asbestos emissions adequately, including at a minimum, conformance with applicable work practice standards. Typically these will include a work stoppage, wetting of material, and notification to the District.

XVII. Certification of Presence of Trained Supervisor: Certify that a person trained in asbestos removal procedures and the provisions of this regulation will be on-site and supervise the demolition or renovation. **When handling RACM, the supervisor must be a current AHERA-accredited contractor/supervisor, and the workers must be AHERA-accredited workers** (40 CFR 763 Subpart E App. C). The supervisor is responsible for the activity on-site. Evidence that the training has been completed by the supervisor must be available for inspection during normal business hours.

XVIII. Verification: Please certify the accuracy and completeness of the information provided by signing and dating the notification form.

FEES AND OTHER REQUIREMENTS:

Demolition - **OR** - Renovation Notifications ..... **2 X** (Regulation IV, Rule 401(B))
Asbestos Abatement (**with** Demolition Projects) ..... **4 X** (Regulation IV, Rule 401(B))

- All fees must accompany the notification form.
- Notification forms must be mailed or hand delivered to the District office; faxes are acceptable, if followed by the original within three (3) days.
- Notifications must be received or post-marked at least 10 business days prior to the start of demolition or renovation.
- Incomplete forms will be returned for correction. The 10 day clock does not start until a correctly completed notification is received by the District office.
- If a person cancels a notification, they may request a fee refund provided:
  1. the fee has been paid,
  2. the District has not performed an inspection,
  3. the request is in writing,
  4. and the request is made within ten days following cancellation.
- When a Fire Department receives a fee or donation from the property owner of a structure that is to be used for fire training purposes, the notification/inspection fee noted above shall be paid. Coordinated Burn Authorization Permits are required for Fire Department training burns; however they are exempt from the permit fees (Regulation II, Rule 408(C)(4)).
- **Rule 401 (B)** - Where a demolition project includes the removal of Regulated Asbestos Containing Material from a facility prior to the wrecking of the structure, the *removal is treated as a separate renovation project for the purposes of fees*, although they may be included in a single notification. This requires a **second 2 X fee**.
- Any demolition or renovation project that requires physical barriers for the purpose of controlling asbestos emissions (containment) shall install transparent viewing ports which allow observation, to the extent possible, of all stripping and removal of regulated asbestos containing material from outside the containment area.

Questions on completing the asbestos demolition / notification form, or on the NESHAP regulations covering asbestos, can be directed to District staff at (707) 443-3093.

NORTH COAST UNIFIED AIR QUALITY MANAGEMENT DISTRICT

NOTIFICATION OF DEMOLITION OR RENOVATION SUBJECT TO ABESTOS NESHAP's (40 CFR PART 61.145)

***IMPORTANT*: Notifications must be signed in ink. All numbered items *must be addressed*, regardless of applicability – e.g., enter N/A where numbered items don't apply to your project. Only originals accepted.**

Operator Project #	Postmark	Date Received	Notification #

I. TYPE OF NOTIFICATION Circle One: **O** = Original **R** = Revised **C** = Canceled

II. FACILITY INFORMATION (*Identify owner, removal contractor and any other contractors*)

OWNER NAME:		
Address:		
City:	State:	Zip:
Contact:	Tel:	
ASBESTOS REMOVAL CONTRACTOR:		DOSH Reg #
Address:		
City:	State:	Zip:
Contact:	Tel:	
OTHER DEMOLITION OR RENOVATION OPERATOR:		
Address:		
City:	State:	Zip:
Contact:	Tel:	

III. TYPE OF OPERATION Circle One: **D** = Demolition **O** = Ordered Demolition **R** = Renovation **E** = Emergency Renov.

IV. IS ASBESTOS PRESENT Circle One: (**Y**es **N**o)

V. FACILITY DESCRIPTION (*Include building name, number and floor or room numbers*)

Bldg. Name:			
Address:			
City:	State:	Zip:	County:
Site Location:			
Building Size:	# of Floors:	Age in Years:	
Present Use:		Prior Use:	

VI. PROCEDURE USED TO DETECT THE PRESENCE OF ASBESTOS MATERIAL {An asbestos survey performed by a California "Certified Asbestos Consultant", is required to process this notification}

C.A.C. Certification #	**Certification Experation Date:**

VII. APPROXIMATE AMOUNT OF ASBESTOS, INCLUDING: 1. Regulated ACM to be Removed 2. Category I ACM to be Removed 3. Category II ACM to be Removed	RACM To Be Removed		Nonfriable Asbestos Material To Be Removed		Indicate Unit of Measurement Below	
			Category I	Category II	Units	
Pipes					Ln Ft:	Ln m:
Surface Area					Sq Ft:	Sq m:
Vol. RACM Off Facility Component					Cu Ft:	Cu m:

VIII. SCHEDULED DATES ASBESTOS REMOVAL (*MM/DD/YY*)	**Start:**	**Complete**
IX. SCHEDULED DATES DEMO/RENOVATION (*MM/DD/YY*)	**Start:**	**Complete**

X. DESCRIPTION OF PLANNED DEMOLITION OR RENOVATION WORK, AND METHOD(S) TO BE USED:

District Use Only	**Date Payment Received:**	**Payment Method:**	**Check Number:**	**Amount:**

XI. DESCRIPTION OF WORK PRACTICES AND ENGINEERING CONTROLS TO BE USED TO PREVENT EMISSIONS OF ASBESTOS AT TH DEMOLITION OR RENOVATION SITE (*attach work plan, if appropriate*):

XII. WASTE TRANSPORTER #1

Name:

Address:

City: State: Zip:

Contact Person: Tel:

WASTE TRANSPORTER #2

Name:

Address:

City: State: Zip:

Contact Person: Tel:

XIII. WASTE DISPOSAL SITE

Name: Tel:

Address:

City: State: Zip:

XIV. IF DEMOLITION ORDERED BY A GOVERNMENT AGENCY PLEASE IDENTIFY THE AGENCY BELOW (*attach copy of demolition order*):

Name: Title

Authority

Date of Order (*MM/DD/YY*): Date Ordered to Begin (mm/dd/yy):

XV. FOR EMERGENCY RENOVATIONS

Date and Hour of Emergency (*mm/dd/yy*):

Description of the Sudden, Unexpected Event:

Explanation of how the event caused unsafe conditions or would cause equipment damage or an unreasonable financial burden:

XVI. DESCRIPTION OF PROCEDURES TO BE FOLLOWED IN THE EVENT THAT UNEXPECTED ASBESTOS IS FOUND, OR PREVIOUSL NONFRIABLE ASBESTOS MATERIAL BECOMES FRIABLE:

XVII. I CERTIFY THAT AN INDIVIDUAL TRAINED IN THE PROVISIONS OF THIS REGULATION (40 CFR PART 61, SUBPART M) WILL BE ON-SITE DURING ALL ASBESTOS ABATEMENT, AND EVIDENCE THAT THE REQUIRED CERTIFICATION ACCOMPLISHED BY THIS PERSON WILL BE AVAILABLE FOR INSPECTION BY REGULATING AUTHORITIES DURING NORMAL BUSINESS HOURS.

(Print Name of Owner/Operator) (Signature of Owner/Operator)

XVIII. I CERTIFY THAT THE ABOVE INFORMATION IS CORRECT.

(Print Name of Owner/Operator) (Signature of Owner/Operator)

Any owner or operator of a demolition or renovation project which is subject to 40 CFR-61, Subpart M (NESHAPS) for asbestos and is required to submit a written notification of the demolition/renovation to the District shall submit with the notification form the following fee:

SINGLE DEMOLITION – OR – RENOVATION PROJECTS . . . . . **2 X**

ASBESTOS ABATEMENT accompanying a demolition (Regulation IV, Rule 401, §1.1.2) . . . . . **4 X**

Fire Department training burns shall be exempted from the fees noted above.

APPENDIX D
Consultant Certifications

State of California
Division of Occupational Safety and Health
Certified Asbestos Consultant

Name: **Zindar Brunelle**

Certification No. ~~14-5295~~

Expires on ~~10/15/24~~

This certification was issued by the Division of Occupational Safety and Health as authorized by Sections 7180 et seq. of the Business and Professions Code.

California Department of PublicHealth

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH

LEAD-RELATED CONSTRUCTION CERTIFICATE

INDIVIDUAL:	CERTIFICATE TYPE:	NUMBER:	EXPIRATION DATE:
 Zindar Brunelle	Lead Inspector/Assessor	LRC-00000482	9/2/2024
	Lead Supervisor	LRC-00000481	9/2/2024

Disclaimer: This document alone should not be relied upon to confirm certification status. Compare the individual's photo and name to another valid form of government issued photo identification. Verify the individual's certification status by searching for Lead-Related Construction Professionals at www.cdph.ca.gov/programs/clppb or calling (800) 597-LEAD

CALINC TRAINING LLC

This is to certify that

Zindar Brunelle

has successfully completed an A.H.E.R.A course approved by the Department of Industrial Relations Division of Occupational Safety and Health of the State of California entitled

Asbestos Building Inspector Refresher 1011

as required under Toxic Substances Control Act Title II

1/4/2023		174753
Class Date(s)		Certificate Number
David Esparza - President	CA-001-06	1/4/2024
	Cal/OSHA Number	Expiration Date

2040 Peabody Road Vacaville, CA 95687 Phone (800) 359-4467 Fax (707) 446-9072

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Stormwater Pollution Prevention Plan

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Stormwater Pollution Prevention Plan

Garberville Sanitary District
Water System Improvements

Prepared for:

Garberville Sanitary District

April 2024

022067.610

Phone: (707) 441-8855 **Email:** info@shn-engr.com
Web: shn-engr.com • 812 W. Wabash Avenue, Eureka, CA 95501-2138

Stormwater Pollution Prevention Plan

Garberville Sanitary District Water System Improvements

Client Name:
Garberville Sanitary District Water System Improvements

Project Location:
919 Redwood Drive
Garberville, CA 95542

WDID: TBD
RISK LEVEL: 2

Legally Responsible Person (LRP):
Ralph Emerson
707-923-9566

Duly Authorized Representative (DAR):
DAR if designated by LRP
Phone Number

Project Address:
Garberville Sanitary District
919 Redwood Drive
Garberville, CA 95542

Site Operating Hours:
8 a.m.–5 p.m.: Monday-Friday

Estimated Project Dates:
Start of Construction: April 1, 2025
Completion of Construction: October 2, 2026

SWPPP Prepared by:
SHN
812 W. Wabash Avenue
Eureka, CA 95501

SWPPP Preparation Date:
April 4, 2024

QSD Name and Signature:

Peter Dunn, QSD

Contact Information

Role	Name	Phone Number	License or Certification Number, if Applicable
Qualified SWPPP Developer (QSD)	Peter Dunn	707-441-8855	P.E. #78956; QSD #23862
Qualified SWPPP Practitioner (QSP)	Max Kaufman	707-441-8855	QSP #26190
Qualified SWPPP Practitioner (QSP)	Roger Klakken	707-441-8855	QSP #27420
QSP Delegate	Whitney Brown	707-441-8855	
QSP Delegate	Jacob Aguilera	707-441-8855	
QSP Delegate			
QSP Delegate			

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Appendices

List of Illustrations

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Qualified SWPPP Developer

Approval and Certification of the Stormwater Pollution Prevention Plan

Project Name: Garberville Sanitary District Water System Improvements

WDID: TBD

"This stormwater pollution prevention plan and its appendices were prepared under my direction to meet the requirements of the California Construction Stormwater General Permit (Order No. 2022-0057-DWQ). I certify that I am a Qualified SWPPP Developer in good standing as of the date signed below and will maintain up to date credentials for the duration of the project."

QSD Signature	4/5/24 Date
Peter Dunn Q SD Name	**23862** QSD Certificate Number
PE, QSD, SHN Consulting Engineers & Geologists, Inc. Title and Affiliation	**707-441-8855** Telephone Number
pdunn@shn-engr.com Email	

Amendment Log

Project Name: **Garberville Sanitary District Water System Improvements**

WDID:

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#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#

Section 1.0 SWPPP Requirements

1.1 Introduction

This stormwater pollution prevention plan (SWPPP) is designed to comply with California's "General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities" (2022 CGP), State Water Resources Control Board (SWRCB) Order No. 2022-0057-DWQ (National Pollutant Discharge Elimination System [NPDES] No. CAS000002; Appendix N). This SWPPP has been prepared following the 2022 CGP SWPPP Template for Traditional Projects provided in the California Stormwater Quality Association (CASQA) "Stormwater Best Management Practice (BMP) Handbook: Construction" (CASQA, 2023).

This project is a traditional construction project.

In accordance with the 2022 CGP, Section IV.O, this SWPPP is designed to address the following:

- Identification of all pollutants, their sources, and control mechanisms, including sources of sediment associated with all construction activities (for example, sediment, paint, cement, stucco, cleaners, site erosion)
- Pollutant source assessments, including a list of potential pollutant sources and identification of site areas where additional BMPs are necessary to reduce or prevent pollutants in stormwater and authorized non-stormwater discharges, in accordance with the minimum requirements when developing the pollutant source assessment
- Description of site-specific BMPs implemented to reduce or eliminate stormwater pollution
- Where not otherwise required to be under a North Coast Regional Water Quality Control Board (RWQCB) permit, all non-stormwater discharges are identified and either eliminated, controlled, or treated
- Site BMPs are effective and result in the reduction or elimination of pollutants in stormwater discharges and authorized non-stormwater discharges from construction activity to the Best Available Technology/Best Control Technology (BAT/BCT) standard
- Stabilization BMPs are installed to reduce or eliminate pollutants after construction is completed are effective and maintained
- Calculations and design details, as well as BMP controls, are complete and correct

The Garberville Sanitary District Water System Improvements Project (project) comprises approximately 3.58 acres, of which 3.57 acres will be disturbed. The project is located within the boundaries of the Garberville Sanitary District (District) in the unincorporated community of Garberville in northern California, approximately 52 miles south-southeast of Eureka, in Humboldt County. The District is the project proponent, and the LRP is Ralph Emerson, General Manager of the District.

The project's location is shown on the Site Maps in Appendix A.

1.2 Permit Registration Documents

Required permit registration documents (PRDs) shall be submitted to the SWRCB using the Stormwater Multiple Application and Report Tracking System (SMARTS) by the Legally Responsible Person (LRP) or

Duly Authorized Representative (DAR). The project-specific PRDs include (2022 CGP Section III.A):

1. Notice of Intent (NOI)
2. Risk Level Determination (Construction Site Sediment and Receiving Water Risk Determination)
3. Site Drawings and Map
4. SWPPP
5. Applicable plans, calculations, and other supporting documentation for compliance with post-construction requirements or the post-construction standards of the 2022 CGP

Dischargers proposing an alternate soil erodibility (K) factor or length-slope (LS) factor must submit documentation to support the site-specific factors, if applicable.

Site maps can be found in Appendix A. A copy of the submitted PRDs shall also be kept in Appendix B along with the Waste Discharge Identification (WDID) confirmation.

1.3 SWPPP Availability and Implementation

The SWPPP will be available at the construction site during operating hours listed on the title sheet and while construction is occurring. The SWPPP shall be made available upon request by a federal, state, or municipal inspector. A current copy of the site-specific SWPPP and any site inspection reports required by the 2022 CGP 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 legible and available in hard copy at the site (2022 CGP Section IV.O.1).

The SWPPP must be implemented at the appropriate level to protect water quality at all times throughout the life of the project. The SWPPP must remain on the site during construction activities, commencing with the initial mobilization and ending with the termination of coverage under the 2022 CGP.

1.4 SWPPP Amendments

SWPPP changes or amendments will be uploaded through SMARTS within 30 calendar days. The SWPPP will be revised when:

- there is a 2022 CGP violation (2022 CGP Section VI.Q.1);
- there is a reduction or increase in total disturbed acreage (2022 CGP Section III.F.2 and F.4.);
- BMPs are not effective and are not resulting in a reduction or elimination of pollutants in stormwater discharges and authorized non-stormwater discharges (2022 CGP Section VI.Q.1 and Attachment D Section III.C.5);
- there is a change in the project duration that changes the project's risk level (2022 CGP Section III.F.1); or
- dischargers with projects where all construction activities (including passive treatment, active treatment systems, and/or active equipment) will be suspended for 30 days or more (2022 CGP Section III.G.).

Additionally, the SWPPP will be amended when:

- there is a change in construction or operations that may affect the discharge of pollutants to surface waters, groundwater(s), or a municipal separate storm sewer system (MS4; 2022 CGP Sections IV.O. and VI.Q.1); or

- when deemed necessary by the Qualified SWPPP Developer (QSD).

The QSD has determined that the changes listed in Table 1-1 can be field determined by the Qualified SWPPP Practitioner (QSP). All other changes will be made by the QSD as formal amendments to the SWPPP. Note that the 2022 CGP requires that the QSD revise the SWPPP to address potential problems identified by visual inspections, sampling data, comments from a QSP, or their own site observations (2022 CGP Section V.C.2.).

Table 1.1 List of Changes to be Field Determined

Candidate changes for field location or determination by QSP[a]	Changes that can be field located or field determined by QSP
Increase quantity of an erosion or sediment control measure	Yes
Relocate/add stockpiles or stored materials	Yes
Relocate or add toilets	Yes
Relocate vehicle storage and/or fueling locations	Yes
Relocate areas for waste storage	Yes
Relocate water storage and/or water transfer location	Yes
Changes to access points (entrance/exits)	Yes
Change type of erosion or sediment control measure	Yes
Changes to location of erosion or sediment control	Yes
Minor changes to schedule or construction phases	Yes
Changes in construction materials	Yes

a. Field changes not identified for field location or determination by Qualified SWPPP Practitioner (QSP) must be approved by Qualified SWPPP Developer (QSD).

The following items shall be included in each amendment:

- Who requested the amendment;
- The location of proposed change;
- The reason for change;
- The original BMP(s) proposed, if any;
- The new BMP(s) proposed; and
- QSD certification.

SWPPP amendments will be logged at the front of the SWPPP and SWPPP Amendment QSD certifications will be located in Appendix C. The SWPPP text will be revised, replaced and/or hand annotated as necessary to properly convey the amendment. SWPPP amendments must be made by a QSD. The following changes have been designated by the QSD as "to be field determined" (TBD) and constitute minor changes that the QSP may implement based on field conditions.

1.5 Retention of Records

Paper or electronic records of documents required by this SWPPP (SWPPP, amendments, and monitoring records) shall be retained for a minimum of three years from the date generated or date submitted, whichever is later.

These records will be available at the site until construction is complete. Records assisting in the determination of compliance with the 2022 CGP will be made available within a

reasonable time, to the RWQCB, SWRCB, or U.S. Environmental Protection Agency (EPA) upon request. Requests by the RWQCB for retention of records for a period longer than three years will be followed.

1.6 Reporting

Completed inspection checklists are not required to be submitted to the RWQCB. However, completed inspection checklists will be kept with the SWPPP on-site or electronically. The 2022 CGP requires that permittees prepare, certify, and electronically submit an annual report no later than September 1 of each year. Reporting requirements are identified in 2022 CGP Section VI.P. Annual reports will be filed in SMARTS and in accordance with information required by the online forms.

Planned changes in site construction activities that may result in non-compliance with the 2022 CGP are required to be provided in writing to the RWQCB and local stormwater agency in advance of the changes.

If a 2022 CGP discharge violation occurs, the QSP will immediately notify the LRP. The LRP will include information on the violation with the annual report. Corrective measures will be implemented immediately following identification of the discharge or written notice of non-compliance from the RWQCB. Discharges and corrective actions must be documented and include the following items:

- The date, time, location, nature of operation, and type of unauthorized discharge;
- The cause or nature of the notice or order;
- The BMPs deployed before the discharge event, or prior to receiving notice or order; and
- The date of deployment and type of BMPs deployed after the discharge event, or after receiving the notice or order, including additional measures installed or planned to reduce or prevent re-occurrence.

Results of monitoring will be electronically submitted through SMARTS for all field sampling results within 30 days of the completion of the precipitation event or within 10 days if the field sampling results demonstrate the exceedance of the pH and/or turbidity NALs. See Section 7.7.2.7 for additional discussion of the reporting requirements.

Results of non-visible pollutant monitoring and corrective actions will be electronically submitted within 30 days after obtaining analytical results or within 10 days if the analytical results demonstrate the exceedance of an applicable total maximum daily load (TMDL)-related numeric action limits (NAL) or numeric effluent level (NEL) or Basin Plan parameter. See Section 7.7.1.7 for additional discussion of the reporting requirements.

A NAL exceedance report will be prepared when requested, in writing, by the RWQCB.

In the event of a TMDL NEL exceedance, by the end of each reporting year the project will submit and certify, in SMARTS, documentation of the site assessment, SWPPP evaluation, and implementation of the corrective actions.

The RWQCB will be notified by email 24 hours prior to the beginning of a planned dewatering discharge. In the event of an emergency dewatering, the RWQCB and applicable MS4 are to be notified within 24 hours of a discharge occurring. An emergency is defined as the need to protect human life and health or prevent severe property damage.

See Section 7.7.4.5 for additional discussion of the reporting requirements including contacts for RWQCB and MS4 notifications.

A passive treatment plan, if necessary, will be submitted electronically 14 days before passive treatment chemicals are used on site. Passive treatment use is not planned for this project.

1.7 Changes to Permit Coverage

The 2022 CGP allows for the reduction or increase of the total acreage covered under the 2022 CGP when:

- a portion of the project is complete and/or conditions for termination of coverage have been met,
- ownership of a portion of the project is purchased by a different entity, or
- new acreage is added to the project.

Modified PRDs will be filed electronically through a Change of Information (COI) within 30 days of a reduction or increase in total disturbed area if a change in permit-covered acreage is to be sought. The SWPPP will be modified appropriately and will be logged at the front of the SWPPP. SWPPP Amendment QSD Certifications will be located in Appendix C. COIs submitted electronically using SMARTS can be found in Appendix D.

1.8 Notice of Termination

A Notice of Termination (NOT) must be submitted electronically by the LRP or DAR using SMARTS to terminate coverage under the 2022 CGP.

According to the requirements of 2022 CGP Section III.H.4., one of the following final stabilization methods will be used to satisfy final stabilization condition requirements:

- The 70 percent final cover method will be supported by pre- and post-project photographs demonstrating stabilization.
- The RUSLE or RUSLE2 method will have computation proof supported by pre- and post-project photographs demonstrating stabilization.
- A custom method for which RWQCB approval has been obtained, will be supported by documentation required by the RWQCB and pre- and post-project photographs demonstrating stabilization.

The RWQCB will consider a construction site complete when the conditions of the 2022 CGP Section III.H., have been met.

The discharger is required to submit the following in SMARTS:

- NOT SMARTS Form,
- QSP-prepared final NOT inspection which includes the QSP name and valid QSP certificate number,
- final site map with photo orientation references,

- photos demonstrating final stabilization and the applicable post-construction BMPs and/or low impact development, and
- a long-term maintenance plan for the post-construction stormwater runoff BMPs and/or low impact development features being implemented.

According to the 2022 CGP, the NOT will be automatically approved within 30 calendar days after the date the NOT was submitted, unless, within the 30 calendar days the RWQCB notifies the discharger through SMARTS that the NOT has been denied, returned, or accepted for review (2022 CGP Section III.H.7).

Note: If an annual report has not been filed in the current reporting year, an annual report will need to be submitted prior to the NOT.

Section 2.0 Project Information

2.1 Project and Site Description

2.1.1 Site Description

The Garberville Sanitary District Water System Improvements Project is a Risk Level 2 project that comprises approximately 3.6 acres and is located within the boundaries of the Garberville Sanitary District (District) in the unincorporated community of Garberville in northern California, approximately 52 miles south-southeast of Eureka along the south fork of the Eel River and adjacent to U.S. Highway 101 in Humboldt County.

The project is located in several separate areas in and around the town of Garberville:

- Main Tank Site and Upper Maple Lane Pump Station (Figures 1, 6, 7)
- Wallan Tank and Wallan Pump Station (Figure 2)
- Arthur/Alderpoint Pump Stations (Figures 3, 8)
- Robertson Tank site (Figure 4)
- Tobin Well Generator Site (Figure 5)

The project locations are identified on the Site Maps in Appendix A.

2.1.2 Existing Conditions

The District serves the unincorporated town of Garberville and surrounding area with sewer, wastewater, and water services. The District was formed in 1932 for the purpose of providing sanitary sewer services. After purchasing the privately held Garberville Water Company in 2004, the District began providing drinking water to customers in the district. The District owns, operates, maintains, and manages the public drinking water system (CA1210008), which includes two drinking water sources, water treatment facilities, three finished water storage tanks currently in service, multiple pumping stations, and a distribution piping network. The District's service area covers 581 acres, and the water system serves approximately 1,200 people in the Garberville community through approximately 470 service connections. The SWRCB Division of Drinking Water (DDW) has jurisdiction over the District's drinking water system (SHN, December 2023).

The project locations are identified on the Site Maps in Appendix A and described below:

- The Main/Hurlbutt Tank and Upper Maple Lane Pump Station site is developed with rural residential uses and existing District water system infrastructure. It is surrounded by timberlands to the east, the urbanized Garberville downtown to the north, and U.S. Highway 101 to the west and south.
- The Wallan Tank and Wallan Pump Station site is developed with rural residential uses and existing District water system infrastructure. It is surrounded by rural residential and agricultural uses.
- The Arthur/Alderpoint Pump Stations sites are developed with the existing Arthur Pump Station and a California Department of Forestry and Fire Protection (CALFIRE) station, respectively and are surrounded by rural residential and agricultural uses as well as forested areas.

- The Robertson Tank site is developed with existing District water system infrastructure and is surrounded by rural residential and agricultural uses, as well as forested areas.
- The Tobin Well site is developed with existing District water system infrastructure and is surrounded by single-family residential development.

2.1.3 Existing Drainage

The project site is located 13 miles east of the Pacific Ocean and 650 feet east of the South Fork Eel River. Existing site topography, drainage patterns, and stormwater conveyance systems are shown on site maps in Appendix A.

Elevation and topography for each project area are listed below:

- The Wallan Tank site is atop a steep south-southwest-facing slope approximately 1,150 feet above sea level, and the Wallan Pump Station is on a moderately steep south-southwest facing slope approximately 855 feet above sea level.
- The Robertson Tank site is atop a south-facing steep slope approximately 780 feet above sea level, uphill from the Arthur Road Pump Station, which is on a generally-level hillside bench approximately 615 feet above sea level.
- The proposed Alderpoint Road Pump Station is downslope from the Arthur Road Pump Station on a larger hillside bench, between 550 and 600 feet above sea level.
- The existing Hurlbutt Tank and proposed Main Tank site is on a west-facing moderately steep slope approximately 700 feet above sea level.
- The Tobin Well site is in downtown Garberville on a west-facing hillside bench with a gentle slope approximately 550 feet above sea level within an urban residential area.

The RWQCB adopts and implements the "Water Quality Control Plan for the North Coast Region" (Basin Plan), which identifies beneficial uses and recognizes water quality problems unique to the region. The project is located in the Eel River Hydrologic Unit, South Fork Eel River Watershed, and North Coast Region.

The water quality impairments (303 (d) list and TMDLs identified in the 2022 CGP Table H-1 for the receiving waters are identified in Table 2-1.

Table 2-1. Applicable 303(d) List Impairments and Total Maximum Daily Loads (TMDLs)

Receiving Water	Water Quality Impairment	
	303(d) list	TMDL (2022 CGP[a] Table H-1)
South Fork, Eel River	Sediment	Sediment
	Temperature	

a. CGP: Construction General Permit

A biological and wetland assessment was prepared for this project (SHN, October 2023), which mapped wetland features and streams within or near the study area. These features are identified on the Site Maps in Appendix A.

Stream #4 is an ephemeral stream dependent upon storm events for flows. The stream headwaters occur within a partially excavated and manipulated swale that collects water from impervious surfaces associated with a residence and a sloping pasture surrounded by forested

slopes. Stream conditions become more pronounced and incised with natural conditions down slope. A total of 427.72 linear feet of Stream #4 is mapped on Figure 9, which is the entire stream reach between the headwaters and the culvert under U.S. Highway 101.

It is assumed that the stream flows under U.S. Highway 101 through the culvert and eventually into the South Fork of the Eel River.

Limited constructed stormwater facilities exist within the project sites. Several drainage inlets were mapped during the wetland delineation between the Hurlbutt/Main Tank sites and U.S. Highway 101 (Figure 9).

2.1.4 Geology and Groundwater

The project area is located within the western portion of the Coast Range Geomorphic Province in southern Humboldt County, California. The site is located in a complex and dynamic geologic environment, approximately 40 miles southeast of Cape Mendocino. Cape Mendocino marks the intersection of three crustal plates known as the Mendocino Triple Junction and is characterized by active tectonic deformation and high rates of seismicity (SHN, August 2023).

Geologic mapping of the area shows that the water system is primarily underlain by bedrock associated with the Quaternary-Tertiary-aged undifferentiated Wildcat Group. Bedrock associated with the Broken Formation of the Cretaceous-Jurassic aged Franciscan Complex is located directly east of the Wallan Tank in the northeastern part of the project area. The two geologic units are separated along a northwest-trending contact, which is interpreted as a relict[1] bedrock fault. Portions of the project vicinity are underlain by alluvial terrace deposits associated with the ancestral Eel River. These alluvial terraces typically consist of an abrasion platform cut across Wildcat sediments, with terrace sediments consisting of terrestrial alluvial deposits (sand, silt, and gravel). Bedrock of the undifferentiated Wildcat group is described as mudstone, shale, sandstone, siltstone, and minor amounts of conglomerate with highly variable degrees of consolidation.

The underlying soils in the study areas have the U.S. Department of Agriculture—Natural Resource Conservation Service (USDA-NRCS) soil map unit designations of 311–Urban land-Garberville complex, 5- to 15% slopes; 461–Tannin-Burgsblock-Rockyglen complex, 30- to 50% slopes; the 667–Dryfield-Yorknorth-Witherell complex, 5- to 30% slopes; and the 673–Coolyork-Yorknorth Complex, 30- to 50% slope (USDA-NRCS, 2023).

The District's primary water source is surface water from the South Fork Eel River and a backup water source is groundwater from the Tobin Well. Garberville and its water sources are located in the Garberville Town Area (1-032) Groundwater Basin. The California Department of Water Resources (DWR) has ranked the basin as a "Very Low" priority groundwater basin because of the condition of the basin and the minimal risk of overdraft and other impacts indicating that the basin is not at risk of overdraft (DWR, 2023). The proposed project would reduce water losses associated with leaks and water main

[1] Relict: a thing which has survived from an earlier period or in a primitive form (Oxford Languages Online Dictionary).

breaks. As such, it would not interfere with the implementation of a sustainable groundwater management plan. The proposed project should not substantially decrease groundwater supplies or interfere with groundwater recharge.

2.1.5 Project Description

Project grading and construction will occur on approximately3.6 acres of the project, which comprises approximately 100% of the total area. The limits of grading are shown on site maps in Appendix A. Grading will include both cut and fill activities. Fill material will be imported during grading activities. Graded materials are expected to be balanced onsite or hauled away.

The District proposes to replace the existing 180,000-gallon, in-ground, concrete, finished water storage tank (Hurlbutt/Main Tank) and a 20,000-gallon, failing, redwood, drinking water storage tank (Wallan Tank) with two new increased capacity tanks. In addition, the failing Robertson Tank, which has been taken out of service, would be demolished. The new Main Tank would be an in-ground, approximately 550,000-gallon, pre-stressed concrete tank located on an adjacent parcel and similar elevation to the existing tank. The existing Wallan Tank would be replaced with an approximately 77,000-gallon bolted steel tank. Both of the existing tanks in operation are leaking and lack sufficient storage capacity for maximum daily consumption and fire suppression; they also do not meet current seismic design standards.

In addition, the District proposes to replace or upgrade three booster pump stations (Upper Maple Lane Pump Station, Arthur/Alderpoint Pump Station, and Wallan Pump Station). The existing Upper Maple Lane Pump Station is located in the existing Hurlbutt Tank and would be demolished when the Hurlbutt Tank is demolished. A new Upper Maple Lane Pump Station would need to be constructed at the site of the new Main Tank. The existing Arthur Pump Station is in poor condition and has operational deficiencies that would be improved when this pump station is replaced by the Alderpoint Pump Station. The Wallan Pump Station is in poor condition and requires upgrades to meet the operational requirements of the new Wallan Tank. New backup generators would be installed at each replaced or upgraded booster pump station and at the Tobin Well.

Some new segments of distribution piping would need to be installed as part of this project in order to connect the new tanks and pump stations to the existing distribution system.

The construction project includes the components listed in Table 2-2. Some components listed do not include significant earth disturbance and are not further discussed in the SWPPP. An overall map of the selected project components is provided on the Site Maps in Appendix A.

Table 2-2. Proposed Project Components

Proposed Project Component	Description
Storage: Main Tank	See Figure 1. Replace the existing, partially underground, 180,000-gallon, concrete storage tank with new, partially underground, 550,000-gallon (approximate) pre-stressed concrete tank at the new site approximately 350 feet south of the existing tank. New tank level instrumentation would be installed. The existing Hurlbutt Tank would be demolished as part of this project component. Also, the installation of the new Main Tank would require the installation of a new segment of Zone 1 water main.

Table 2-2. Proposed Project Components

Proposed Project Component	Description
Storage: Wallan Tank	See Figure 2. Replace the existing, 20,000-gallon, leaking, redwood, water storage tank with a new, 77,000-gallon, bolted steel, water storage tank at the same site. A new pressure transducer, floats, and radio tower would be installed. The existing redwood tank would be demolished as part of this project component. Also, the installation of the new Wallan Tank would include the installation of a new segment of water main.
Storage: Robertson Tank	See Figure 4. Existing retired 50,000-gallon concrete storage tank would be demolished along with electrical components, piping, and other appurtenances. The site would be restored to match adjacent ground surfaces. The demolition of this tank would require that a segment of the distribution main near the tank be routed around the tank to maintain service.
Pumping: Upper Maple Lane Pump Station	Replace the existing booster pump station with a new pump station at the new Main Tank site. New pumps would include variable speed drives, upgraded bladder tank(s), new electrical service, new pump control panel, and control building. The existing Upper Maple Lane Pump Station would be demolished as part of this project component. Also, the installation of the new Upper Maple Lane Pump Station would require the installation of a new segment of Zone 2 water main and a new service connection to the nearby residence.
Pumping: Alderpoint Pump Station	See Figure 3. Replace the existing pump station with a new pump station at a lower elevation. A new building with new electrical service would house new higher capacity variable speed drive pumps, new piping, and a new motor control panel. The existing Arthur Pump Station would be demolished. Installation of the new Alderpoint Pump Station would require the installation of a new segment of water main and would modify existing radio antenna and/or install an approximately 40-foot-tall unlit communications tower.
Pumping: Wallan Pump Station	Upgrade the existing pump station in the existing building. Upgrades would include new pumps, new pump control panel, and some limited new piping.
Electrical Upgrades: Standby Generators	Appropriately sized, new, permanent, diesel-powered, backup generators would be installed at the Tobin Well (Figure 5), the Upper Maple Lane Pump Station, and the Alderpoint Pump Station. A trailer-mounted generator would be provided for the Wallan Pump Station.
Instrumentation and Controls Improvements	New instrumentation would be installed at new tanks and pump stations; programmable logic controllers (PLCs) would be replaced or reused, where possible, for system-wide monitoring and controls at the surface water treatment plant (SWTP); radio telemetry would be provided to communicate tank levels to pump stations.

Regarding operations, the proposed project would alter the location of some of the District's water storage and conveyance infrastructure but would not change the type of ongoing operations.

The actual limits of construction have yet to be finalized. Mapped wetlands and streams would be avoided to the greatest extent practicable; however, the project may potentially require temporary disturbance of wetlands and/or streams within the construction area.

2.1.6 Developed Condition

The project does not propose an alteration of the course of a stream or river. The proposed project would result in a small increase in impervious surface area associated with tank removals and replacements. Three water tanks would be removed, and two water tanks would be constructed.

Post-construction site estimates are listed in Table 2-3.

Table 2-3. Construction Site Estimates

Construction site area	3.6 acres
Total area of disturbance	3.6 acres
Percent impervious before construction	TBD %
Runoff coefficient before construction	TBD
Percent impervious after construction	TBD %
Runoff coefficient after construction	TBD

The associated increase in stormwater runoff would be negligible. The project would also decrease non-stormwater runoff because it would replace the existing Hurlbutt and Wallan Tanks, which are both currently leaking (SHN, October 17, 2023). This would improve water quality in those locations by reducing sedimentation/siltation.

Post-construction surface drainage will be directed as surface flow through stormwater conveyance systems and/or sheet flow.

Post-construction drainage patterns and conveyance systems are presented on site maps in Appendix A.

2.2 Permits and Governing Documents

In addition to the 2022 CGP, the following documents have been taken into account while preparing this SWPPP:

- North Coast Regional Water Quality Control Board Waste Discharge Requirements
- Basin Plan requirements
- Final Environmental Initial Study and Mitigation Monitoring and Reporting program
- CA Department of Fish and Wildlife 1600 Streambed Alteration Agreement
- Humboldt County Special Permit

2.3 Stormwater Runon from Offsite Areas

Offsite runon is expected at the site from upgradient sources. Elevations at the project site are between approximately 326 and 1108 feet above mean sea level. The highest elevations are represented at the Wallan storage tank, dropping to approximately 320 feet at the Hurlbutt storage tank.

Stormwater runon will be diverted away from disturbed areas using temporary BMPs. The locations of these BMPs shall be along the perimeter of the project area, as necessary. Potential changes to BMPs will be determined in the field and identified on the site plan, as necessary.

2.4 Findings of the Construction Site Sediment and Receiving Water Risk Determination

A construction site risk assessment has been performed for the project and the resultant risk level is Risk Level 2. The risk level was determined using the "Risk Determination Worksheets" manual. The risk level is based on project duration, location, proximity to impaired receiving waters, and soil conditions. A copy of the risk level determination, which was submitted on SMARTS with the PRDs, is included in Appendix B.

Summaries of calculations for sediment risk and receiving water risk are presented below.

2.4.1 Site-Specific Sediment Risk

The rainfall erosivity (R) factor was determined using the online EPA Rainfall Erosivity Factor Calculator for Small Construction Sites. The R-value was calculated using a construction duration of approximately 18 months from April 2025 through October 2026. Two calculations were performed, to account for the duration of the project being longer than one year, and the results were summarized to provide the overall R factor. As previously indicated, the center of the project is located at latitude 40.0946382° and longitude -123.793175497°. The calculated R-value is 154.69.

The soil erodibility (K) factor was determined from results provided by the online 2022 Construction Stormwater General Permit Soil Erodibility (K) Factor Map Tool, which indicated an estimated K-factor of 0.28 for the project.

The length-slope (LS) factor was determined using the LS Factor for Construction Sites table (Renard et al., 1997), based on the site-specific conditions of average 3% grade and maximum 550-foot slope length. Based on the site-specific conditions, the LS factor is estimated to be 0.96 for the project.

Table 2-3 summarizes the sediment risk factors and documents the sources of information used to derive the factors.

Table 2-3. Summary of Sediment Risk

RUSLE[a] Factor	Value	Method for Establishing Value
Rainfall Erosivity (R)	154.69	GIS[b] Map Method–EPA[c] Rainfall Erosivity Calculator
Soil Erodibility (K)	0.28	USDA[d] NRCS[e] soil mapping, K values
Length-Slope (LS)	0.96	LS Factors for Construction Sites. Table from Renard et al., 1997.
Total Predicted Sediment Loss (tons/acre) = 41.58		
Overall Sediment Risk[f] **Low Sediment Risk <15 tons/ acre** **Medium Sediment Risk ≥15 and <75 tons/acre** **High Sediment Risk ≥75 tons/acre**		☐ Low ☒ Medium ☐ High

a. RUSLE: Revised Universal Soil Loss Equation
b. GIS: geographic information system
c. EPA: U.S. Environmental Protection Agency
d. USDA: U.S. Division of Agriculture
e. NRCS: Natural Resources Conservation Service
f. <: less than; ≥: greater than or equal to

2.4.2 Receiving Water Risk

Although it is not expected to directly discharge, stormwater runoff from work activities could potentially flow eventually to the South Fork Eel River.

The project site is located in the Eel River Hydrologic Unit, South Fork Eel River Watershed, and North Coast Region (HUC 18010106).

The RWQCB adopts and implements the "Water Quality Control Plan for the North Coast Region" (Basin Plan), which identifies beneficial uses and recognizes water quality problems unique to the region. The South Fork Eel River Watershed is listed as impaired for sediment and temperature (RWQCB, 2023). This hydraulic unit is listed as impaired for sediment and temperature related pollutants on the EPA most recent Clean Water Act Section 303(d) list.

This South Fork Eel River hydrologic area (HA) has several beneficial uses[2] including "cold," "migratory," and "spawn." Therefore, this project has a high receiving water risk. Table 2-4 summarizes the receiving water risk factors.

Table 2-4. Summary of Receiving Water Risk

Receiving Water Name	303(d) Listed for Sediment Related Pollutant[1]	TMDL[a] for Sediment Related Pollutant[b]	Beneficial Uses of Cold, Spawn, and Migratory[b]
South Fork Eel River Hydrologic Area	Yes	☒ Yes ☐ No	Yes
		Overall Receiving Water Risk	High

a. TMDL: total maximum daily load
b. If yes is selected for any option, the Receiving Water Risk is High

It has been determined this traditional construction project is a Risk Level 2 site. Please refer to Appendix B, which shows the conclusion of the risk assessment and the supporting documentation. Risk Level 2 projects must implement the specific Risk Level 2 requirements that are included in Attachment D of the 2022 CGP.

2.4.3 Effluent Limitations and Action Levels

Risk Level 2 construction sites are subject to both the narrative effluent limitations and numeric action limits (NALs). The narrative effluent limitations require stormwater discharges associated with construction activity to minimize or prevent pollutants in stormwater and authorized non-stormwater discharges using controls, structures, and BMPs.

Discharges from a Risk Level 2 construction project are subject to numeric effluent standards that set NALs for pH and turbidity, as shown in Table 2-5. This SWPPP has been prepared to address Risk Level 2 requirements in accordance with the 2022 CGP Attachment D.

2. "Beneficial uses" of the waters of the state are designated within the North Coast Region Basin Plan (Water Quality Control Plan) to protect public health or welfare, enhance the quality of water, and serve the purposes of the Clean Water Act (as defined in Sections 101(a)(2), and 303(c) of the Act).

Table 2-5. Risk Level 2 Numeric Action Levels and Numeric Effluent Limitations

Parameter	Unit	Numeric Action Level (NAL)	Numeric Effluent Limitations
pH	pH units	Lower NAL = 6.5 Upper NAL = 8.5	Not Applicable
Turbidity	NTU[a]	> 250[b] NTU	Not Applicable

a. NTU: nephelometric turbidity unit
b. >: greater than

When applicable, Risk Level 3 sites are subject to the narrative effluent limitations, NALs, and numeric effluent limitations (NELs). The narrative effluent limitations require stormwater discharges associated with construction activity to minimize or prevent pollutants in stormwater and authorized non-stormwater through the use of controls, structures, and BMPs. Discharges from Risk Level 3 sites are subject to NALs. Dischargers that employ an active treatment system (ATS) are also subject to NELs. Discharges from Risk Level 3 sites that directly discharge to the receiving water are subject to receiving water monitoring triggers for pH and turbidity. NALs and receiving water monitoring triggers are shown in Table 2-6.

Table 2-6. Risk Level 3 Numeric Action Levels, Numeric Effluent Limits, and Receiving Water Monitoring Triggers

Parameter	Unit	Numeric Action Level (NAL)	Numeric Effluent Limit	Receiving Water Monitoring Trigger
pH	pH units	Lower NAL = 6.5 Upper NAL = 8.5	Not Applicable	Lower Trigger = 6.0 Upper Trigger = 9.0
Turbidity	NTU[a]	250 NTU	Not Applicable	500 NTU

a. NTU: nephelometric turbidity unit

This SWPPP has been prepared to address TMDL requirements (2022 CGP Attachment H). A brief summary of requirements from Table H-2 is listed in Table 2-7.

Table 2-7. General TMDL[a] Numeric Action Levels, Numeric Effluent Limits

TMDL	Parameter	Unit	Numeric Action Level	Numeric Effluent Limit
Eel River–South Fork	Sediment	Refer to Table H-2 in Attachment H	Not Applicable	Not Applicable

a. TMDL: Total Maximum Daily Load

Although the South Fork of the Eel River is subject to a sediment TMDL, waste load allocations, provided in Table H-3 of the CGP, are not provided. Accordingly, waste load allocation modeling and calculations are not required for this project.

2.5 Construction Schedule

The project is anticipated to take approximately 18 months to construct. The site sediment risk was determined based on construction that will take place between April 1, 2025, and October 2, 2026. Modification or extension of the schedule may affect risk determination and permit

requirements. The LRP shall contact the QSD if the schedule changes before or during construction to address potential impact to the SWPPP. The schedule for planned work is included in Appendix E.

2.6 Potential Construction Activity and Pollutant Sources

Appendix F includes a list of construction activities and associated materials that are anticipated to be used onsite.

The following is a list of construction activities that may be performed at the project site that may have the potential to contribute sediment to stormwater discharges:

- Equipment staging and parking
- Debris loading and transporting offsite
- Clearing and grubbing operations
- Grading operations
- Concrete operations
- Excavation operations
- Landscape operations
- Equipment tire tracking

The following is a list of construction materials that may be encountered within the project area, and construction activities that may be performed, that have the potential to contribute pollutants other than sediment to stormwater runoff:

- Vehicle fluids, including oil, grease, petroleum, and coolants
- Delivery and storage of construction materials
- Hazardous/non-hazardous materials
- General construction materials
- Concrete/mortar, grout, and other concrete-related mixes
- Landscape materials
- Equipment maintenance

The anticipated activities and associated pollutants are used in Section 3.0 to select the BMPs for the project. BMPs are shown on the Site Maps in Appendix A.

For sampling requirements for non-visible pollutants associated with construction activity, please refer to Section 7.7.1. For a full and complete list of potential onsite pollutants, refer to the product-specific safety data sheets (SDSs), which are retained with the Contractor.

2.7 TMDL Requirements

Although stormwater runoff is not expected to directly discharge to receiving water, the South Fork Eel River hydrologic area (HA) is listed in 2022 CGP Table H-2 and is subject to the narrative and numeric effluent limitations imposed by the TMDL requirements in Attachment H of the 2022 CGP.

Narrative effluent limitations and Numeric Effluent Limitations applicable to this project are listed in Table 2-8 (on the following page). This SWPPP has been prepared to address the TMDL requirements (2022 CGP Attachment H).

Table 2-8. Specific TMDL[a] Numeric Action Levels, Numeric Effluent Limits

TMDL	Applicable Water Body/ Watershed	Pollutants	Additional TMDL-Related NAL[b] or NEL[c]	Compliance Actions
Eel River–South Fork Sediment TMDL	South Fork Eel River Watershed	Sediment	Not Applicable	Not Applicable

a. TMDL: Total Maximum Daily Load
b. NAL: Numeric Action Level
c. NEL: Numeric Effluent Limit

In addition to the regular numeric action level sediment monitoring required by the permit, dischargers in some watersheds located in Region 1, as specified in Attachment H, shall conduct additional related NAL or NEL requirements as described in Section I.E.2 of the 2022 CGP Appendix H, including the use of RUSLE 2 modeling, to demonstrate compliance with the waste load allocations, if applicable.

After review of Section I.E.2 of the 2022 CGP Appendix H, this project is not assigned a mass-based sediment waste load allocation for sediment and, therefore, the use of RUSLE2 modeling is not applicable. Although the South Fork of the Eel River is subject to a sediment TMDL, waste load allocations, provided in Table H-3 of the CGP, are not provided for that waterbody. Accordingly, waste load allocation modeling and calculations are not required for this project.

2.8 Identification of Non-Stormwater Discharges

Non-stormwater discharges consist of discharges that do not originate from precipitation events. The 2022 CGP provides allowances for specified non-stormwater discharges that do not cause erosion or carry other pollutants.

Non-stormwater discharges into storm drainage systems or waterways, which are not authorized under the 2022 CGP and listed in the SWPPP or authorized under a separate National Pollutant Discharge Elimination System (NPDES) permit, are prohibited.

Non-stormwater discharges that are authorized from this project site include the following:

- Fire-fighting activity
- Fire hydrant system flushing
- Irrigation of vegetative erosion control measures or landscaping
- De-chlorinated potable water, including uncontaminated water line flushing
- Pipe flushing and testing
- Air condition or compressor condensate
- Uncontaminated groundwater or spring water from construction dewatering activities in compliance with Attachment J of the 2022 CGP
- Water to control dust

These authorized non-stormwater discharges will be managed with the stormwater and non-stormwater BMPs described in Section 3.0 of this SWPPP and will be minimized by the QSP.

Activities at this site that may result in unauthorized non-stormwater discharges include:

- Vehicle and equipment cleaning, fueling, and maintenance operations
- Slurries from concrete cutting and coring operations
- Slurries from concrete or asphalt grinding operations
- Slurries from concrete or mortar mixing operations
- Sanitary wastes
- Chemical leaks and/or spills of any kind, including, but not limited to, petroleum, paints, cure compounds, sealers, fillers, binders, and so on
- Groundwater dewatering activities that are not in compliance with Attachment J of the 2022 CGP, including contaminated groundwater

Steps will be taken, including the implementation of appropriate BMPs, to ensure that unauthorized discharges are eliminated, controlled, disposed of, or treated onsite. Discharges of construction materials and wastes (such as fuel or paint) resulting from dumping, spills, or direct contact with rainwater or stormwater runoff are also prohibited.

2.9 Required Site Map Information

Site maps showing the project location, surface water boundaries, geographic features, construction site perimeter, general topography, and other requirements identified in the General Permit are located in Appendix A of this SWPPP. Table 2-9 identifies required map elements.

Table 2-9. Required Map Information

Included on Figure/Sheet No.[a]	Required Element
Appendix A Site Maps	Site and project boundaries
Appendix A Site Maps	Areas of soil disturbance
Appendix A Site Maps	Existing roads and trails
Appendix A Site Maps	Drainage areas
Appendix A Site Maps	Discharge and sampling locations
Appendix A Site Maps	Sampling locations
Appendix A Site Maps	Existing storm drain system if applicable
Appendix A Site Maps	Proposed locations of storage areas for waste
Appendix A Site Maps	Proposed locations of construction materials
Appendix A Site Maps	Proposed locations of project staging areas
Appendix A Site Maps	Proposed locations of stockpiles
Appendix A Site Maps	Proposed locations of vehicles, equipment staging and vehicle maintenance
Appendix A Site Maps	Proposed locations of loading/unloading materials
Appendix A Site Maps	Proposed locations of site access (entrance/exits)
Appendix A Site Maps	Proposed locations of fueling, water storage, water transfer for dust control
Appendix A Site Maps	Proposed locations of demolition
Appendix A Site Maps	Proposed locations of other construction support activities
Appendix A Site Maps	Proposed locations of erosion control BMPs
Appendix A Site Maps	Proposed locations of sediment control BMPs

Table 2-9. Required Map Information

Included on Figure/Sheet No.[a]	Required Element
Appendix A Site Maps	Site-specific procedures to implement final stabilization BMPs as soon as reasonably practicable

a. NOTE: BMPs not illustrated on figures will be identified in the field.

Section 3.0 Best Management Practices

3.1 Schedule for BMP Implementation

The BMP schedule is the component of the project SWPPP that shows the timeline for when BMPs will be installed so that the project complies with the 2022 CGP. The schedule provides information necessary to plan for adequate materials and crews to install BMPs at the right time so that they are effective. Table 3-1 identifies BMPs and their schedule for implementation. In order to be effective, some BMPs must be installed before the site is disturbed. Appendix G includes BMP Fact Sheets that have been selected for the construction project.

Table 3-1. BMP[a] Implementation Schedule

BMP		Implementation	Duration
Erosion Control	EC-1, Scheduling	Prior to construction	Entirety of project
	EC-2, Preservation of Existing Vegetation	Start of construction	Entirety of project
	EC-6, Straw Mulch	During construction	As needed
	EC-7, Geotextiles & Mats	During construction	As needed
	EC-9, Earth Dikes & Drainage Swales	During construction	As needed
	EC-10 Velocity Dissipation Device	During construction	As needed
	EC-16, Non-Vegetated Stabilization	During construction	As needed
Sediment Control	SE-1, Silt Fence	Prior to and during construction	Entirety of project and as needed
	SE-4, Check Dams	Prior to and during construction	Entirety of project and as needed
	SE-5, Fiber Rolls	Prior to and during construction	Entirety of project and as needed
	SE-6, Gravel Bag Berm	Prior to and during construction	As needed during storm events
	SE-7, Street Sweeping	Prior to and during construction	Entirety of project and as needed
	SE-9	Straw Bale Barrier	As needed
	SE-10, Storm Drain Inlet Protection	Prior to and during construction	Entirety of project and as needed
	SE-12, Manufactured Linear Sediment Control	During construction	As needed
Tracking Control	TC-1, Stabilized Construction Entrance/Exit	Prior to construction and during construction	Entirety of project

Table 3-1. BMP[a] Implementation Schedule

BMP		Implementation	Duration
Non-Stormwater Management	NS-1, Water Conservation Practices	Start of construction and during construction	Entirety of project
	NS-5, Clear Water Diversion	While working in 50-foot buffer zones	Entirety of project
	NS-6, Illicit Connection/Discharge	Start of construction	Entirety of project
	NS-7, Potable Water/Irrigation	During construction	As needed
	NS-8, Vehicle and Equipment Cleaning	Start of construction and during construction	Entirety of project
	NS-9, Vehicle and Equipment Fueling	Start of construction and during construction	Entirety of project
	NS-10, Vehicle and Equipment Maintenance	Start of construction and during construction	Entirety of project
	NS-12, Concrete Curing	Start of construction and during construction	Entirety of project
	NS-13, Concrete Finishing	Start of construction and during construction	Entirety of project
Wind Erosion	WE-1, Wind Erosion Control	During construction	As needed
Waste Management	WM-1, Material Delivery and Storage	Start of construction and during construction	Entirety of project
	WM-2, Material Use	Start of construction and during construction	Entirety of project
	WM-3, Stockpile Management	Start of construction and during construction	Entirety of project
	WM-4, Spill Prevention and Control	Start of construction and during construction	Entirety of project
	WM-5, Solid Waste Management	Start of construction and during construction	Entirety of project
	WM-6, Hazardous Waste Management	During construction	As needed
	WM-8, Concrete Waste Management	Start of construction and during construction	Entirety of project
	WM-9, Sanitary/Septic Waste Management	Start of construction and during construction	Entirety of project
	WM-10, Liquid Waste Management	During construction	As needed

a. BMP: best management practice

3.2 Erosion and Sediment Control

Erosion and sediment controls are required by the 2022 CGP to provide effective reduction or elimination of sediment related pollutants in stormwater discharges and authorized non-stormwater discharges from the site. Applicable BMPs are identified in this section for erosion control, sediment control, tracking control, wind erosion control, non-stormwater controls, and waste management controls.

3.2.1 Erosion Control

Erosion control, also referred to as soil stabilization, consists of source control measures that are designed to prevent soil particles from detaching and becoming transported in stormwater runoff. Erosion control BMPs protect the soil surface by covering and/or binding soil particles.

This construction project will implement the following practices to provide effective temporary and final erosion control during construction:

1. Preserve existing vegetation where feasible.
2. The area of soil disturbing operations shall be controlled such that the Contractor is able to implement erosion control BMPs quickly and effectively.
3. Stabilize non-active areas within 14 days of cessation of construction activities or sooner if stipulated by local requirements.
4. Control erosion in concentrated flow paths by applying erosion control blankets, check dams, erosion control seeding, or alternate methods.
5. Prior to the completion of construction, apply permanent erosion control to remaining disturbed soil areas.

Sufficient erosion control materials shall be maintained onsite to allow implementation in conformance with this SWPPP.

Table 3-2 (on the next page) indicates the BMPs that will be implemented to control erosion on the construction site. Erosion control BMP Fact Sheets are provided in Appendix G.

These temporary erosion control BMPs shall be implemented in conformance with the following guidelines and as outlined in the BMP Fact Sheets provided in Appendix G. If there is a conflict between documents, the Site Maps in Appendix A will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site-specific details on the Site Maps prevail over standard details included in the Site Maps. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets. If conflicting information is not readily reconcilable, the project QSD shall be consulted to resolve the conflict.

Scheduling (EC-1)—Scheduling for the project shall include the sequencing of construction activities and implementation of BMPs, while taking into consideration the local climate conditions, in order to reduce the amount and duration of soil exposure.

Preservation of Existing Vegetation (EC-2)—Unless directed otherwise by the landscape contractor, disturbance or removal of existing vegetation shall be kept to the minimum necessary to complete operations. When vegetation is removed, it shall be cut off no lower than ground level. The root systems shall be left intact and protected from damage to facilitate re-growth.

Straw Mulch (EC-6)—Oat or wheat straw mulch, free from weeds, shall be used as necessary on areas requiring temporary protection until permanent stabilization is established.

Table 3-2. Temporary Erosion Control BMPs[a]

CASQA[b] fact sheet	BMP Name	2022 CGP[c] Minimum Requirement[d]	BMP Used		Notes
			Yes	No	
EC-1	Scheduling	✓	X		
EC-2	Preservation of Existing Vegetation	✓	X		
EC-3	Hydraulic Mulch	✓[e]		X	
EC-4	Hydroseed	✓[e]		X	
EC-5	Soil Binders	✓[e]		X	
EC-6	Straw Mulch	✓[e]	X		As needed
EC-7	Geotextiles and Mats	✓[e]	X		As needed
EC-8	Wood Mulching	✓[e]		X	
EC-9	Earth Dike and Drainage Swales	✓[f]	X		As needed, to manage runon and runoff
EC-10	Velocity Dissipation Devices		X		As needed
EC-11	Slope Drains	✓[f]		X	
EC-12	Stream Bank Stabilization			X	
EC-14	Compost Blankets	✓[f]		X	
EC-15	Soil Preparation-Roughening			X	
EC-16	Non-Vegetated Stabilization	✓[e]	X		
WE-1	Wind Erosion Control	✓	X		If necessary
Alternate BMPs Used:					**If used, state reason:**

a. BMPs: best management practices
b. CASQA: California Stormwater Quality Association
c. CGP: Construction General Permit
d. Applicability to a specific project shall be determined by the Qualified SWPPP Developer (QSD)
e. The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements.
f. Runon from offsite shall be directed away from all disturbed areas, diversion of offsite flows may require design/analysis by a licensed civil engineer and/or additional environmental permitting.

Geotextiles and Mats (EC-7)—Rolled erosion control products (RECPs), such as erosion control mats or blankets, are used to cover the soil surface to reduce erosion from rainfall impact and hold soil in place. RECPs made of natural fibers, such as jute mat, are preferred and can be left in place, whereas synthetic materials will need to be removed once they are no longer needed or effective.

Earth Dikes and Drainage Swales (EC-9)—Earth dikes and drainage swales shall be used as necessary to prevent offsite runon from entering the construction site or disturbed areas, by way of diversion.

Velocity Dissipation Devices (EC-10)—Velocity dissipation devices shall be used whenever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach.

Non-Vegetative Stabilization (EC-16)—Non-vegetative stabilization shall be used as necessary on areas that require temporary protection until permanent stabilization is obtained or on disturbed areas that will be re-disturbed following extended periods of inactivity.

3.2.2 Wind Erosion Control

BMPs to address wind erosion control shall be considered and implemented during the construction activities on disturbed soils within the project area that may be subject to wind erosion, and when significant wind and dry conditions are anticipated during the project. The objective of implementing wind erosion control measures is to prevent the transport of soil or sediments from disturbed areas of the project site to offsite locations by wind.

Appendix G includes fact sheets for the following BMP, which has been selected to control windblown dust from the construction site:

Wind Erosion Control (WE-1)—During windy conditions (forecast or actual wind conditions of approximately 25 mile per hour or greater), dust control will be applied to disturbed areas to control wind erosion adequately. WE-1: Wind Erosion Control and NS-1: Water Conservation Practices will be implemented together to provide dust control and prevent discharges from dust control activities and water supply equipment.

Water application rates will be minimized as necessary to prevent runoff and ponding, and watering equipment leaks will be repaired immediately. For stockpile locations, WM-3: Stockpile Management will be implemented to prevent wind dispersal of sediment from stockpiles.

3.2.3 Sediment Controls

Sediment controls are temporary or permanent structural measures that are intended to complement the selected erosion control measures and reduce sediment discharges from active construction areas. Sediment controls are designed to intercept and settle out soil particles that have been detached and transported by the force of water.

Sufficient quantities of temporary sediment control materials will be maintained onsite for the duration of the project to protect the active disturbed soil areas prior to predicted rain events and for rapid response to failures or emergencies.

Table 3-3, on the following page, indicates the BMPs that shall be implemented to control sediment on the construction site. The temporary sediment control BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix G.

Silt Fence (SE-1)—Silt fences shall be installed as necessary prior to construction activities in areas shown on site plans or as directed by the supervising engineer, and following grading activities in other areas. Silt fences are to remain in place until surface restoration is complete, soil stockpiles are removed, and vegetation is established.

Check Dams (SE-4)—Check dams may be used to entrain sediment from stormwater runoff and reduce stormwater velocity on scour. Check dams shall not be located within live streams or in channels with extended base flows.

Fiber Rolls (SE-5)—Fiber roll barriers shall be installed as necessary prior to construction activities in select areas and following grading activities in other areas, and they are to remain in place until surface restoration is complete, soil stockpiles are removed, and vegetation is established. Fiber rolls shall be placed along the site's perimeter in locations where there is potential for sediment to migrate offsite.

Gravel Bag Berm (SE-6)—Gravel bag berm barriers shall be installed as needed to control runoff from select areas and are to remain in place until surface restoration is complete, soil stockpiles are removed, and vegetation is re-established.

Street Sweeping and Vacuuming (SE-7)—Street sweeping and cleaning must be performed using a hand or vacuum sweeper. Street washing is not allowed. Contractor shall perform street sweeping daily or more often, as required or directed by the engineer during construction, and after construction in areas deemed complete.

Straw Bale Barrier (SE-9)—Straw bale barriers shall be installed prior to construction activities and as needed. They are to remain in place until surface restoration is complete, and soil stockpiles are removed.

Storm Drain Inlet Protection (SE-10)—Inlet protection shall be installed prior to construction activities and is to remain in place until surface restoration is complete, soil stockpiles are removed, and vegetation is re-established. Storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits shall be maintained frequently and protected from activities that reduce their effectiveness.

Manufactured Linear Sediment Controls (SE-12)—Compost socks can be installed, as needed, prior to storm events, in areas where sediment-laden runoff will leave the site.

The Site Maps (Appendix A) show the extent and location of the proposed temporary sediment control BMPs. During the non-rainy season, sediment control materials will be maintained at the staging area for easy deployment.

Table 3-3. Temporary Sediment Control BMPs[a]

CASQA[b] fact Sheet	BMP Name	2022 CGP[c] Minimum Requirement[d]	BMP used		If not used, state reason
			Yes	No	
SE-1	Silt Fence	✓[e,f]	X		
SE-2	Sediment Basin			X	Not applicable
SE-3	Sediment Trap			X	Not applicable
SE-4	Check Dams		X		
SE-5	Fiber Rolls	✓[e,f]	X		
SE-6	Gravel Bag Berm	✓[e]	X		
SE-7	Street Sweeping	✓	X		
SE-8	Sandbag Barrier			X	Not applicable
SE-9	Straw Bale Barrier		X		
SE-10	Storm Drain Inlet Protection	✓[e]	X		
SE-11	ATS			X	Not applicable
SE-12	Manufactured Linear Sediment Controls		X		
SE-13	Compost Sock and Berm	✓[e]		X	Not applicable
SE-14	Biofilter Bags	✓		X	Not applicable
TC-1	Stabilized Construction Entrance and Exit	✓	X		
TC-2	Stabilized Construction Roadway			X	Not applicable
TC-3	Entrance Outlet Tire Wash			X	Not applicable
Alternate BMPs Used: Surface Water buffer					**If used, state reason:** 2022 CGP Section II.G

a. BMPs: best management practices
b. CASQA: California Stormwater Quality Association
c. CGP: Construction General Permit
d. Applicability to a specific project shall be determined by the Qualified SWPPP Developer (QSD).
e. The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements.
f. Risk Level 2 and 3 shall provide linear sediment control along toe of slope, face of slope, and at the grade breaks of exposed slope.

3.2.4 Tracking Control

Appendix G includes fact sheet for the following BMP, which has been selected to reduce sediment tracking from the construction site onto private and public roadways:

Stabilized Construction Entrance/Exit (TC-1)—The construction site entrances and exits will be stabilized to prevent erosion and to control tracking of mud and soil materials onto adjacent paved roads.

Appropriate measures will be developed and implemented to ensure that sediment and other debris is not tracked from the project site onto paved public or private roadways. Safety precautions will be employed, including restricted speed limits and dust control measures.

Under no circumstances will washing of sediments tracked onto roadways into drainage canals and storm drains be allowed anywhere on or near the project site. The Site Maps (Appendix A) show the extent and location of proposed tracking control BMPs.

3.2.5 Additional Risk Level 2 Requirements

Risk Level 2 shall implement the following additional erosion and sediment control BMPs for areas under active construction:

- Design and construct cut and fill slopes in a manner to ensure slope stability and to minimize erosion including, but not limited to, these practices:
  - Reduce continuous slope length using terracing and diversions;
  - Reduce slope steepness; and
  - Roughen slope surfaces with large cobble or track walking.
- Implement linear sediment controls along the toe of the slope, face of the slope, and at grade breaks of exposed slopes to comply with the following sheet flow lengths:
  - Slope Ratio >1:20 to <1:4—Sheet flow length not to exceed 35 feet
  - Slope Ratio >1:4 to <1:3—Sheet flow length not to exceed 20 feet
  - Slope Ratio >1:3 to <1:2—Sheet flow length not to exceed 15 feet
  - Slope Ratio >1:2 —Sheet flow length not to exceed 10 feet
- Limit construction activity traffic to and from the project to entrances and exits that employ effective controls to prevent off-site tracking of sediment.
- Maintain and protect all storm drain inlets, perimeter controls, and BMPs at entrances and exits (for example, tire wash off locations).
- Remove any excess sediment or other construction activity-related materials that are deposited on the impervious roads by vacuuming or sweeping prior to any precipitation event.
- Implement additional site-specific sediment controls upon written request by the RWQCB when the implementation of the other requirements in this section are determined to inadequately protect the site's receiving water(s).

3.2.6 Surface Water Buffer

Construction sites are required to provide and maintain natural buffers and/or equivalent erosion and sediment controls when a water of the U.S. is located within 50 feet of the site's earth disturbances, unless infeasible.

- Dischargers shall comply with one of the following alternatives for any discharges to waters of the U.S. located within 50 feet of a site's earth disturbances:
  - Provide and maintain a 50-foot undisturbed natural buffer from the edge of the disturbed area to the top of bank;
  - 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 undisturbed natural buffer.
    - The equivalent sediment load may be calculated using RUSLE2 or another method approved by the RWQCB; or
  - Implement erosion and sediment controls to achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer when infeasible to provide and maintain an undisturbed natural buffer of any size. The equivalent sediment load may be calculated using RUSLE2 or another method approved by the RWQCB.

3.2.7 Demolition of Existing Structures

Dischargers shall prevent exposing demolition materials to precipitation. Demolition materials should be covered with an impermeable barrier such as, but not limited to, plastic sheeting prior to precipitation to prevent known contaminants from being mobilized. Dischargers unable to cover demolished material that were not previously investigated or found to be absent of applicable pollutants in reportable quantities shall sample for any non-visible pollutants that may be in stormwater discharges such as, but not limited to, asbestos, leaded paint, or polychlorinated biphenyls (PCBs).

3.2.8 Mitigation and Monitoring and Reporting Program

As required by the California Environmental Quality Act (CEQA), the District also adopted a mitigation and monitoring reporting program (MMRP) for all required mitigation measure identified to reduce or avoid impacts associated with implementing the proposed Garberville Sanitary District Water System Improvements project. The MMRP shall be maintained by the District (SHN, October 17, 2023).

3.2.8.1 AQ-1: Fugitive Dust Control Measures

Compliance with the following requirements shall be required to minimize dust generation during construction activity:

- All active construction areas (for example, parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered a minimum of two times per day during the dry season;
- Hydroseed or apply non-toxic soil stabilizers to inactive construction areas;
- Dust-generating activities shall be limited during periods of high winds (over 15 miles per hour [mph]);
- Suspend excavation and grading activity when winds exceed 25 mph;

- All haul trucks transporting soil, sand, or other loose material, likely to give rise to airborne dust, shall be covered;
- All vehicle speeds shall be limited to 15 miles per hour within the construction area;
- Promptly remove earth or other tracked out material from paved streets onto which soil or other material has been transported by trucking or earth-moving equipment; and
- Conduct digging, backfilling, and paving of utility trenches in such a manner as to minimize the creation of airborne dust.

3.2.8.2 BIO-5: Avoidance and Minimization Measures to Project Wetlands/Waters

The District shall implement the following avoidance and protection measures for Waters of the United States and Waters of the State that would not be impacted (filled or excavated) during project construction:

1. The District shall attempt to avoid or minimize impacts to wetlands/waters to the greatest extent feasible in the final design plans.
2. Wetlands/waters shall be clearly identified in the construction documents and reviewed by the District prior to issuing for bid to ensure they are clearly marked as equipment exclusion zones during construction.
3. Suitable perimeter control BMPs, such as silt fences, or straw wattles shall be placed below all construction activities at the edge of surface water features to intercept sediment before it reaches the waterway. These BMPs shall be installed prior to any clearing or grading activities.

3.3 Non-Stormwater Controls and Waste and Materials Management

3.3.1 Non-Stormwater Controls

Non-stormwater discharges into storm drainage systems or waterways, which are not authorized under the 2022 CGP, are prohibited. Non-stormwater discharges for which a separate NPDES permit is required by the RWQCB are prohibited unless coverage under the separate NPDES permit has been obtained for the discharge. The selection of non-stormwater BMPs is based on the list of construction activities with a potential for non-stormwater discharges identified in Section 2.8 of this SWPPP.

Table 3-4 (on the next page) indicates the BMPs that will be implemented to control sediment on the construction site. Fact sheets for temporary non-stormwater control BMPs are provided in Appendix G.

Non-stormwater BMPs will be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix G. If there is a conflict between documents, the site drawings and maps will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the site drawings and maps prevail over standard details included in the site drawings and maps. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Table 3-4. Temporary Non-Stormwater BMPs[a]

CASQA[b] Fact Sheet	BMP Name	2022 CGP[c] Minimum Requirement[d]	BMP Used		Notes
			Yes	No	
NS-1	Water Conservation Practices	✓	X		
NS-2	Dewatering Operation	✓		X	
NS-3	Paving and Grinding Operation			X	
NS-4	Temporary Stream Crossing			X	Not applicable
NS-5	Clear Water Diversion		X		
NS-6	Illicit Connection/Discharge	✓	X		
NS-7	Potable Water/Irrigation	✓	X		
NS-8	Vehicle and Equipment Cleaning	✓	X		
NS-9	Vehicle and Equipment Fueling	✓	X		
NS-10	Vehicle and Equipment Maintenance	✓	X		
NS-11	Pile Driving Operation			X	
NS-12	Concrete Curing		X		
NS-13	Concrete Finishing		X		
NS-14	Material and Equipment Use Over Water			X	
NS-15	Demolition Removal Adjacent to Water			X	
NS-16	Temporary Batch Plants			X	

a. BMPs: best management practices
b. CASQA: California Stormwater Quality Association
c. CGP: Construction General Permit
d. Applicability to a specific project shall be determined by the Qualified SWPPP Developer (QSD)

Water Conservation Practices (NS-1)—Water conservation practices shall be implemented during construction activities to reduce non-stormwater discharges and prevent erosion and pollutant transport from the construction site.

Clear Water Diversion (NS-5)—Where earthwork will occur within 50 feet of protected water bodies, runon will be minimized using gravel bag berms and directed away from earthwork.

Illicit Connection/Illegal Discharge Detection and Reporting (NS-6)—Designated procedures shall be followed if illicit connections have been made at the construction site or if there has been illegally dumped or discharged materials.

Potable Water/Irrigation (NS-7)—Practices and procedures to manage discharge of potential pollutants from water flow generated by irrigation lines, irrigation application, potable water sources, turf watering, water line flushing, and hydrant flushing shall be implemented as needed throughout the project.

Vehicle and Equipment Cleaning (NS-8)—Vehicle and equipment cleaning procedures shall be implemented to reduce or eliminate the amount of pollutants that could be potentially discharged to stormwater. This may include the use of offsite cleaning facilities or washing in designated, contained areas only. Vehicle and equipment cleaning occuring onsite will be conducted in a manner that will, to the extent feasible, not create a non-stormwater discharge (NSWD).

Vehicle and Equipment Fueling (NS-9)—Vehicle and equipment fueling procedures shall be implemented to reduce or eliminate the amount of pollutants that could be potentially discharged to stormwater. This may include the use of offsite fueling facilities or fueling in designated, contained areas only.

Vehicle and Equipment Maintenance (NS-10)—Equipment shall not leak fluids, lubricants, or fuels. The owner or engineer may inspect the Contractor's equipment and may reject equipment that demonstrates evidence of leakage. Vehicle and equipment mainteance BMPs shall be implemented during maintenance operations to reduce or eliminate the amount of pollutants that could be potentially discharged into stormwater. This may include the use of offsite maintenance in desginated, contained areas only.

Conrete Curing (NS-12)—Appropriate practices and procedures shall be implemented as necessary to reduce or eliminate the contamination of stormwater runoff during concrete curing.

Conrete Finishing (NS-13)—Appropriate practices and procedures shall be implemented as necessary to minimize the impact that concrete-finishing materials and methods may have on stormwater and non-stormwater discharges.

3.3.2 Materials Management and Waste Management

Materials management control practices consist of implementing procedural and structural BMPs for handling, storing, and using construction materials to prevent the release of those materials into stormwater discharges. The amount and type of construction materials to be used at the site will depend upon the type of construction and the length of the construction period. The materials may be used continuously, such as fuel for vehicles and equipment, or the materials may be used for a discrete period, such as soil binders for temporary stabilization.

Waste management consists of implementing procedural and structural BMPs for handling, storing, and ensuring proper disposal of wastes to prevent the release of those wastes into stormwater discharges.

Materials and waste management pollution control BMPs shall be implemented to minimize stormwater contact with construction materials, wastes, and service areas, and to prevent materials and wastes from being discharged offsite.

The primary mechanisms for stormwater contact with materials and wastes that shall be addressed include:

- Direct contact with precipitation
- Contact with stormwater runon and runoff
- Wind dispersion of loose materials
- Direct discharge to the storm drain system through spills or dumping
- Extended contact with asphalt cold mix and treated wood products, which can leach pollutants into stormwater

A list of construction activities is provided in Section 2.6. Appendix F provides a full list of materials that might be anticipated at the project site. Table 3-5 (on the next page) indicates the BMPs that shall be implemented to handle materials and control construction site wastes associated with these construction activities. Material management BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix G.

Material Delivery and Storage (WM-1)—Material delivery and storage areas shall be maintained to reduce or eliminate the amount of pollutants that could be potentially discharged to stormwater. This shall be accomplished by minimizing the storage of hazardous materials onsite, storing materials in designated areas, installing secondary containment, conducting regular inspections, and training employees and/or contractors on proper storage procedures.

Material Use (WM-2)—The use of hazardous materials shall be minimized and/or include the use of alternate products to reduce or eliminate the amount of pollutants that could be potentially discharged to stormwater.

Stockpile Management (WM-3)—Soil stockpiles shall be contained and protected with soil stabilization measures when they are not actively being used. Stockpiled soils should not be mounded higher than 8 feet above existing ground.

Spill Prevention and Control (WM-4)—Spill prevention and control procedures shall be implemented in order to prevent the discharge of pollutants to stormwater. These procedures may include, but are not limited to, reducing the chances for spills, containing and cleaning up spills, and properly disposing of spilled material. Hazardous materials spills shall be managed in accordance with RWQCB requirements and as directed by the engineer for the project.

Solid Waste Management (WM-5)—Solid and/or construction waste shall be effectively managed to prevent the discharge of pollutants to stormwater. Dumpsters and waste containers shall be covered when not in use during rainy weather and at the end of each day.

Hazardous Waste Management (WM-6)—Hazardous waste shall be effectively managed to prevent the discharge of pollutants to stormwater.

Concrete Waste Management (WM-8)—Concrete washout areas shall be designated and designed to reduce and/or prevent the discharge of pollutants to stormwater. A sign with a minimum dimension 36 inches by 24 inches noting “Concrete Washout” shall be installed adjacent to the temporary concrete washout facility

Table 3-5. Temporary Materials Management BMPs[a]

CASQA[b] Fact Sheet	BMP Name	Meets a Minimum Requirement[c]	BMP used		If not used, state reason
			Yes	No	
WM-1	Material Delivery and Storage	✓	X		
WM-2	Material Use	✓	X		
WM-3	Stockpile Management	✓	X		
WM-4	Spill Prevention and Control	✓	X		
WM-5	Solid Waste Management	✓	X		
WM-6	Hazardous Waste Management	✓	X		
WM-7	Contaminated Soil Management			X	Not applicable
WM-8	Concrete Waste Management	✓	X		
WM-9	Sanitary-Septic Waste Management	✓	X		
WM-10	Liquid Waste Management		X		If necessary
Alternate BMPs Used:			**If used, state reason:**		

a. BMPs: best management practices
b. CASQA: California Stormwater Quality Association
c. Applicability to a specific project shall be determined by the Qualified SWPPP Developer (QSD)

Sanitary/Septic Waste Management (WM-9)—Sanitary waste management procedures shall be implemented to prevent the discharge of pollutants to stormwater.

Liquid Waste Management (WM-10)—Liquid waste management procedures shall be implemented as necessary to prevent the discharge of pollutants to stormwater.

3.4 TMDL-Related BMPS

The project discharges ultimately to the South Fork of the Eel River, which is listed as sediment-impaired in Table H-2 of the CGP. However, no waste load allocation is provided for it in CGP Section I.E.a.iv, Table H-3, and the project does not discharge directly to the river. Accordingly, RUSLE2 modeling was not required to demonstrate that the erosion and sediment control BMP design will yield less sediment delivery during construction than pre-constructions conditions.

3.5 Post-construction Stormwater Management Measures

Post-construction BMPs are permanent measures installed during construction, designed to reduce or eliminate pollutant discharges from the site and reduce runoff rates after construction is completed.

The post-construction runoff reduction requirements will be satisfied through compliance with 2022 CGP Provision IV.N.3 and use of the SMARTS water balance calculator. The post-construction requirements were uploaded as part of the PRDs as required by 2022 CGP Provision IV.N.2.

A plan for the post-construction funding and maintenance of these BMPs has been developed to address at minimum five years following construction. The post-construction BMPs will be funded and maintained as described in the operations and maintenance plan that will be uploaded with the NOT.

Section 4.0 BMP Inspection and Maintenance

The 2022 CGP Attachment D Section III.C requires routine weekly inspections of BMPs along with inspections before and during qualifying precipitation events (QPEs). Risk Level 2 construction projects are additionally required to conduct inspections post-QPEs.

A BMP inspection checklist must be filled out for inspections and maintained onsite with the SWPPP. The inspection checklist must include the necessary information covered in Section 7.6. Monitoring and Inspection Forms can be found in Appendix H. Completed forms will be kept with the SWPPP.

Maintenance, repair, or design and implementation of new BMPs alternatives will begin within 72 hours of the identification of failures or other shortcomings. Corrections will be completed as soon as possible, prior to the next forecasted precipitation event (2022 CGP Attachment D Section II.J).

The QSP will verify that all BMP maintenance and repairs were appropriately implemented during the next visual inspection following completion.

The QSP may delegate BMP maintenance and repair verification to an appropriately trained QSP Delegate.

Specific details for maintenance, inspection, and repair of Construction Site BMPs can be found in the BMP Fact Sheets in Appendix G.

Section 5.0 Training

The supervisor for each contractor and sub-contractor shall be knowledgeable of the requirements of this SWPPP and its implementation strategies. Personnel at the site shall receive training appropriate for individual roles and responsibilities on the project. Appropriate personnel shall receive training on SWPPP implementation, BMP inspection and maintenance, and record keeping. Training activities (formal and informal) shall be documented on the forms provided in Appendix I.

The General Permit requires that elements of the SWPPP be developed by a QSD and implemented by a QSP. The QSP may delegate some tasks to trained employees if adequate supervision and oversight is provided. The QSD and QSP are identified at the beginning of this document and their training documentation can be found in Appendix J.

To satisfy the General Permit requirement, the person or persons designated shall indicate on the training form (Appendix I), the specific training received. Informal training will include “tailgate” safety meetings addressing the following topics:

- Erosion control BMPs
- Sediment control BMPs
- Tracking control BMPs
- Wind erosion control BMPs
- Non-stormwater control BMPs
- Waste management and materials pollution control BMPs

The delegate cannot perform the QSD and QSP inspections required in Section V.C.4 or Section V.D.2, respectively. A QSP must provide site-specific training to any delegates that will perform inspections or sampling.

Documentation of training activities will be retained with the SWPPP.

Section 6.0 Responsible Parties and Operators

6.1 Responsible Parties

The Legally Responsible Person (LRP) and Duly Authorized Representatives (DARs) responsible for SWPPP implementation and have authority to sign permit-related documents are listed in Table 6-1, below.

Table 6-1. Responsible Parties

Name	Title	Phone Number
Ralph Emerson	Legally Responsible Person (LRP)	707-923-9566
TBD	TBD	TBD

QSD(s) identified for the project are identified in Appendix J. The QSD will have primary responsibility for assessing how construction activities will affect sediment transport, erosion, and other discharges of pollutants in stormwater runoff throughout the project. The QSD is required to revise the SWPPP to address potential problems identified by visual inspections, sampling data, comments from a QSP, or their own site observations. The QSD is required to perform the following onsite visual inspections:

- within 30 days of construction activities commencing onsite;
- within 30 days when a new QSD is assigned to the project;
- twice annually, once August through October and once January through March;
- within 14 calendar days after a numeric action level exceedance; and
- within the time period requested in writing from RWQCB staff.

QSPs and QSP Delegates identified for the project are listed in Appendix J. The QSP will have primary responsibility and significant authority for the implementation, maintenance, and inspection/monitoring of SWPPP requirements. The QSP will be available at all times throughout the duration of the project.

Duties of the QSP include but are not limited to:

- Implementing all elements of the 2022 CGP and SWPPP, including but not limited to:
  - Performing the following onsite visual inspections:
    - One inspection per calendar month; other weekly inspections in the month can be delegated to a trained QSP Delegate under the specific direction of the QSP.
    - 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, then the Pre-Precipitation Event inspection may be done up to 120 hours in advance.
    - Within 14 days after a NAL exceedance
    - Prior to the submittal for the NOT or COI (for acreage changes)
  - Ensuring BMPs are implemented, inspected, and properly maintained
  - Ensuring that the SMARTS generated WDID Number Notification form is posted onsite, in a location viewable by the public or readily available upon request, and the dates are correct and match the dates listed in SMARTS
  - Implementing non-stormwater management, and materials and waste management activities such as: monitoring discharges; general Site clean-up; vehicle and equipment

cleaning, fueling and maintenance; spill control; ensuring that no materials other than stormwater are discharged in quantities that will have an adverse effect on receiving waters or storm drain systems, and so on

- Ensuring elimination of unauthorized discharges
- Coordinating with the Contractor(s) to ensure that the necessary corrections/repairs are made immediately and that the project complies with the SWPPP, the 2022 CGP, and approved plans at all times
- Notifying the LRP or DAR immediately of offsite discharges or other noncompliance events
- Providing foundation and site-specific training to QSP Delegates and overseeing QSP Delegate work; tasks that may be delegated to appropriately trained QSP-delegates include:
  - performing non-stormwater and stormwater visual observations and inspections;
  - performing stormwater sampling and analysis, as required; and
  - performing routine inspections and observations.

Table 6-2. QSP[a] and QSP Delegate Authorized Inspections

	Weekly BMP[b] and NSW[c]	Pre-QPE[d]	Daily-QPE Visual Inspections	Post-QPE Visual Inspections	Post-NAL[e] Exceedances	Monthly BMP and NSW	NOT[f]
QSP	X	X	X	X	X	X	X
QSP Delegate	X		X	X			

a. QSP: Qualified SWPPP Practitioner
b. BMP: best management practice
c. NSW: non-stormwater
d. QPE: qualifying precipitation event
e. NAL: numeric action limit
f. NOT: notice of termination

6.2 Contractor List

Contractor Name:	TBD
Title:	TBD
Contractor Company:	TBD
Address	TBD
Phone Number:	TBD
Phone Number (24/7)	TBD

Contractor Name:	TBD
Title:	TBD
Contractor Company:	TBD
Address	TBD
Phone Number:	TBD
Phone Number (24/7)	TBD

Section 7.0 Construction Site Monitoring Program

7.1 Purpose

This construction site monitoring program (CSMP) was developed to address the following objectives:

1. to demonstrate that the site is in compliance with the Discharge Prohibitions and NALs of the 2022 CGP;
2. to demonstrate that the site is in compliance with applicable TMDL NALs and NELs;
3. to determine whether non-visible pollutants are discharged from the construction site and are causing or contributing to exceedances of water quality objectives;
4. to determine whether immediate corrective actions, additional BMP implementation, or SWPPP revisions are necessary to reduce pollutants in stormwater discharges and authorized non-stormwater discharges; and
5. to determine whether BMPs included in the SWPPP are effective in preventing or reducing pollutants in stormwater discharges and authorized non-stormwater discharges.

7.2 Applicability of Permit Requirements

This project has been determined to be a Risk Level 2 site. The 2022 CGP Attachment D identifies the following types of monitoring as being applicable for a Risk Level 2 project.

Risk Type 2

- Routine weekly visual inspections of BMPs
- Visual monitoring of the site related to pre-, during, and post-QPEs
- Visual monitoring of the site for non-stormwater discharges
- Sampling and analysis of construction site runoff for pH and turbidity
- Sampling and analysis of construction site runoff for non-visible pollutants, including TMDL pollutants if applicable, identified during the pollutant source assessments, when applicable; and
- Sampling and analysis of construction site runoff as required by the RWQCB, when applicable.

7.3 Weather and Precipitation Event Tracking

Visual monitoring and inspections requirements of the 2022 CGP are triggered by a QPE. A QPE is defined as any weather pattern that is forecast to have a 50 percent or greater probability of precipitation (PoP) and a quantitative precipitation forecast (QPF) of 0.5 inches or more within a 24-hour period. The event begins with the 24-hour period when 0.5 inches has been forecast and continues on subsequent 24-hour periods when 0.25 inches of precipitation or more is forecast.

7.3.1 Weather Tracking

The QSP should consult the National Oceanographic and Atmospheric Administration (NOAA) for the Forecast Weather Table Interface. These forecasts can be obtained at http://www.weather.gov/. Weather reports should be printed and maintained with the SWPPP. Record the date and time the forecast was printed.

7.3.2 Rain Gauges

The QSP shall install rain gauge(s) on the project site. Locate the gauge in an open area away from obstructions such as trees or overhangs. Mount the gauge on a post at a height of 3 to 5 feet with the gauge extending several inches beyond the post. Make sure that the top of the gauge is level. Make sure the post is not in an area where rainwater can indirectly splash from sheds, equipment, trailers, and so on.

The rain gauge(s) shall be read daily during normal site scheduled hours. The rain gauge should be read at approximately the same time every day and the date and time of each reading recorded. An example rain gauge log sheet is provided in Appendix K. Retain rain gauge readings in the SWPPP.

Follow the rain gauge instructions to obtain accurate measurements. Once the rain gauge reading has been recorded, accumulated rain shall be emptied, and the gauge reset.

For comparison with the site rain gauge, the nearest appropriate governmental rain gauge(s) is located at obtained at http://www.weather.gov/.

7.4 Monitoring Locations

Monitoring locations are shown on the site drawings and maps in Appendix A. Monitoring locations are described in Sections 7.6 and 7.7.

Whenever changes in the construction site might affect the appropriateness of sampling locations, the sampling locations shall be revised accordingly. All such revisions shall be implemented as soon as feasible and the SWPPP amended. Temporary changes that result in a one-time additional sampling location do not require a SWPPP amendment.

7.5 Safety and Monitoring Exemptions

Safety practices for sample collection will be in accordance with the specific safety requirements outlined in this section.

This project is not required to collect samples or conduct visual observations (inspections) under the following conditions:

1. During dangerous weather conditions, such as flooding and electrical storms
2. Outside of scheduled site business hours—typical scheduled site business hours are Monday through Friday, 8 a.m. to 5 p.m.
3. When the linear project site is not accessible to personnel.

If monitoring (visual monitoring or sample collection) of the site is unsafe because of the dangerous conditions noted above, then the QSP shall document the conditions for why an exception to performing the monitoring was necessary. The exemption documentation shall be filed with SWPPP monitoring records and the annual report.

7.6 Visual Monitoring

In accordance with Section III.B.2. of Attachment D in the 2022 CGP, for inactive projects, dischargers may reduce the visual inspection frequency and suspend sampling per Section III.G.

Dischargers shall provide an explanation with supporting information for all missed visual inspections or sampling required by this attachment, to be included in the annual report.

Visual monitoring includes observations and inspections. Inspections of BMPs are required to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Visual observations of the site are required to observe stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. All inspections shall include photographs of areas of concern and the QSP's description of the problem, if any.

Table 7-1 identifies the required frequency of visual observations and inspections. Inspections and observations will be conducted at the locations identified in Section 7.6.5.

Table 7-1. Summary of Visual Monitoring and Inspections

Type of Inspection	Frequency	Performed By
Routine Inspections[a]		
BMP[b] Inspections	Weekly	QSP[c]/QSP Delegate
Qualifying Precipitation Event (QPE) Triggered Inspections[d]		
Prior to QPE[e]	Within 72 hours of a QPE or up to 120 hours prior if supported with forecast	QSP
During Extended QPE[f]	Once every 24-hour period of a QPE	QSP/QSP Delegate
Post-QPE[g]	Within 96 hours of a QPE	QSP/QSP Delegate

a. Inspections are required during scheduled site operating hours.
b. BMP: best management practice
c. QSP: Qualified SWPPP Practitioner
d. Any weather pattern that is forecasted to have a 50 percent or greater chance of 0.5 inches or more in a 24-hour period
e. QPE: qualifying precipitation event
f. QPEs are extended for each subsequent 24-hour period forecast to have at least 0.25 inches of precipitation and end with two consecutive 24-hour periods with less than 0.25" forecast
g. Required if 0.5 inches or more precipitation is measured during the duration of the QPE.

7.6.1 Routine Observations and Inspections

Weekly BMP inspections and visual monitoring are necessary to confirm that the project is in compliance with the requirements of the 2022 CGP.

7.6.1.1 Routine BMP Inspections

Inspections of BMPs are conducted to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

7.6.1.2 Non-Stormwater Discharge Observations

Each drainage area will be inspected for the presence of or indications of prior unauthorized and authorized non-stormwater discharges. Inspections will record:

- Presence or evidence of any non-stormwater discharge (authorized or unauthorized);
- Identification and elimination of unauthorized non-stormwater discharges
- Pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, and so on); and
- Source of discharge.

7.6.2 Qualifying Precipitation Event Triggered Observations and Inspections

Visual observations of the site and inspections of BMPs are required prior to a qualifying precipitation event, following a qualifying precipitation event, and every 24-hour period during a QPE.

7.6.2.1 Visual Observations Prior to a Forecasted Qualifying Precipitation Event

Risk Level 2 projects shall have a QSP conduct a pre-QPE inspection within 72 hours prior to any weather pattern that is forecasted to have a 50 percent chance of 0.5 inches or more in a 24-hour period. Precipitation forecast information shall be obtained from the National Weather Service Forecast Office for the project location at https://www.weather.gov/ and shall be included as part of the inspection checklist weather information.

If extended forecast precipitation data (greater than three days) is available from the National Weather Service, the pre-precipitation event inspection may be done up to 120 hours in advance. The pre-Qualifying Precipitation Event inspection shall include an inspection of the following:

- All stormwater drainage areas to identify leaks, spills, or uncontrolled pollutant sources and when necessary, implement appropriate corrective actions.
- All BMPs to identify whether they have been properly implemented per the SWPPP and implement appropriate corrective actions, as necessary.
- All stormwater storage and containment areas to detect leaks and check for available capacity to prevent overflow.

7.6.2.2 BMP Inspections During a Qualifying Precipitation Event

During an extended QPE, BMP inspections will be conducted at least once every 24 hours on scheduled work days. QPEs are extended for each subsequent 24-hour period forecast to have at least 0.25 inches of precipitation.

The BMP inspections are to identify and record:

- BMPs were adequately designed, implemented and effective.
- BMPs that require repair or replacement due to damage.
- Additional BMPs that need to be implemented and revise the SWPPP accordingly.

If the construction site is not accessible during the precipitation event, the visual inspections shall be performed at all relevant outfalls, discharge points, downstream locations. The inspections should record any projected maintenance activities or BMP repairs in this SWPPP and the reason the site was not accessible.

7.6.2.3 Visual Observations Following a Qualifying Precipitation Event

Risk Level 2 dischargers shall conduct post-QPE visual inspections within 96 hours after each QPE if 0.5 inches or more precipitation is measured during the duration of the QPE using the onsite rain gauge.

The 96-hour time frame may include the two consecutive 24-hour periods with less than 0.25 inches forecast, which mark the end of the precipitation event. The inspection is to verify and record:

- if BMPs were adequately designed, implemented, and effective;
- BMPs that require repair or replacement due to damage; and
- additional BMPs that need to be implemented and revise the SWPPP accordingly.

7.6.3 Visual Monitoring Procedures

Visual monitoring shall be conducted by the QSD, QSP, or QSP Delegates. The name(s) and contact number(s) of the QSPs or QSP Delegates assigned to conduct visual observations are listed below and their training qualifications are provided in Appendix J.

Alternate Inspector: Peter Dunn, SHN QSD#23862	Contact Phone: 707-441-8855 (office)
Assigned Inspector: Max Kaufman, SHN QSP#26190	Contact Phone: 707-441-8855 (office)
Alternate Inspector: Roger Klakken, SHN QSP#27420	Contact Phone: 707-441-8855 (office)
Alternate Inspector: Whitney Brown, SHN QSP Delegate	Contact Phone: 707-441-8855 (office)
Alternate Inspector: Jacob Aguilera, SHN QSP Delegate	Contact Phone: 707-441-8855 (office)

Stormwater observations shall be documented on the "Visual Inspection Field Log Sheet" found in Appendix H. BMP inspections shall be documented on the site-specific BMP inspection checklist and include photographs of areas of concern along with the QSP's description of the problem.

The QSP shall submit copies of the completed inspection report to the BMP Contractor and LRP. The completed reports will be kept in the SWPPP. Results of visual monitoring must be summarized and reported in the annual report.

7.6.4 Visual Monitoring Follow-Up and Reporting

Maintenance, repairs, and correction of deficiencies, including design changes to BMPs, identified by the observations or inspections, including required repairs or maintenance of BMPs, shall be initiated with 72 hours of identification, and completed as soon as possible prior to the next forecasted precipitation event.

When design changes to BMPs are required, the SWPPP shall be amended to reflect the changes. QSP Delegates shall report issues identified during inspections that require corrective action to the QSP within 24 hours of the observation. Results of visual monitoring must be summarized and reported in the annual report.

7.6.5 Visual Monitoring Locations

The inspections and observations identified in Sections 7.6.1 and 7.6.2 will be conducted at the locations identified in this section. Visual monitoring is required in all areas of active construction. Locations where BMPs are installed will be inspected. BMP locations are shown on the Site Maps in Appendix A.

There are five phases to the project site with each location having unique drainage area(s) particular to the phase location. Drainage area(s) are shown on the Site Maps in Appendix A and Table 7-2 identifies each drainage area by location.

Table 7-2. Site Drainage Areas

Location Name	Location
Main Tank Site and Upper Maple Lane Pump Station	Visual monitoring is required in all areas of active construction
Tobin Well	Visual monitoring is required in all areas of active construction
Arthur/Alderpoint Pump Station Site	Visual monitoring is required in all areas of active construction
Robertson Tank Site	Visual monitoring is required in all areas of active construction
Wallan Tank Site	Visual monitoring is required in all areas of active construction
Wallan Pump Station	Visual monitoring is required in all areas of active construction

As Table 7-3 shows, there are no identified stormwater storage or containment area(s) on the project site. Stormwater storage or containment area(s) will be shown on the Site Maps in Appendix A and Table 7-3 will be updated, as needed, to identify each stormwater storage or containment area by location if any are created.

Table 7-3. Stormwater Storage and Containment Areas

Location No.	Location
Stormwater Containment Area	TBD

There are six separate construction locations to the project site with each having unique locations from where stormwater will be discharged. Site stormwater discharge locations are shown on the Site Maps in Appendix A, and Table 7-4 will be updated to identify each stormwater discharge location.

Table 7-4. Site Stormwater Discharge Locations

Location Name	Location Number and Coordinates
Main Tank Site and Upper Maple Lane Pump Station	Discharge Location 1- 40.0954062°,-123.7938201°
	Discharge Location 2- 40.0953642°,-123.7935490°
	Discharge Location 3- 40.0961185°,-123.7950460°
	Discharge Location 4- 40.0950976°,-123.7939845°
Wallan Tank Site	Discharge Location 5- 40.1076776°,-123.7709722°
	Discharge Location 6- 40.1069340°,-123.7707682°
	Discharge Location 7- 40.1075963°,-123.7704301°
Arthur / Alderpoint Pump Station Site	Discharge Location 8- 40.1053855°,-123.7898290°
	Discharge Location 9- 40.1049921°,-123.7895238°
	Discharge Location 10- 40.1051941°,-123.7885958°
Robertson Tank Site	Discharge Location 11- 40.1061994°,-123.7864244°
	Discharge Location 12- 40.1060530°,-123.7865478°
Tobin Well	Discharge Location 13- 40.1006382°,-123.7924943°
Wallan Pump Station	No significant earth disturbance anticipated.

7.7 Water Quality Sampling and Analysis

7.7.1 Sampling and Analysis Plan for Non-Visible Pollutants in Stormwater Runoff Discharges

This "Sampling and Analysis Plan for Non-Visible Pollutants" describes the sampling and analysis strategy and schedule for monitoring non-visible pollutants in stormwater runoff discharges from the project site.

Sampling for non-visible pollutants, including those associated with TMDLs will be conducted when

1) a breach, leakage, malfunction, or spill is observed;
2) the leak or spill has not been cleaned up prior to the rain event; and
3) there is the potential for discharge of non-visible pollutants to surface waters or drainage system.

The following construction materials, wastes, or activities, as identified in Section 2.6, are potential sources of non-visible pollutants to stormwater discharges from the project. Storage, use, and operational locations shall be annotated on the Site Maps in Appendix A as determined during construction activities.

- Demolition and removal of pavement and roadway materials, including asphalt, concrete, and backfill materials
- Vehicle fluids, including oil, grease, petroleum, and coolants
- Delivery and storage of construction materials
- Hazardous/non-hazardous materials
- General construction materials
- Concrete/mortar, grout, and other concrete-related mixes
- Asphalt pavement and resurfacing
- Paints and solvents
- Landscape materials
- Equipment maintenance

The project has the potential to receive stormwater runon from upgradient locations with the potential to contribute non-visible pollutants to stormwater discharges from the project. Locations of such runon to the project site are shown on the Site Maps in Appendix A and will be updated as needed.

- No site runon locations are currently identified.
- The absence of site runon locations is to be field verified by QSP/QSP delegate during inspections.

7.7.1.1 Sampling Schedule

Samples for the potential non-visible pollutant(s) and a sufficiently large unaffected background sample shall be collected during the first eight hours of discharge from rain events that result in a sufficient discharge for sample collection. Samples shall be collected during the site's scheduled hours and shall be collected regardless of the time of year and phase of the construction.

Collection of discharge samples for non-visible pollutant monitoring will be triggered only when any of the following conditions are observed during site inspections conducted prior to or during a rain event.

- Materials or wastes containing potential non-visible pollutants are not stored under watertight conditions. Watertight conditions are defined as
    1) storage in a watertight container,
    2) storage under a watertight roof or within a building, or
    3) protected by temporary cover and containment that prevents stormwater contact and runoff from the storage area.
- Materials or wastes containing potential non-visible pollutants are stored under watertight conditions, but
    1) a breach, malfunction, leakage, or spill is observed,
    2) the leak or spill is not cleaned up prior to the rain event, and
    3) there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- A construction activity, including but not limited to those in Section 2.6, with the potential to contribute non-visible pollutants
    1) was occurring during or within 24 hours prior to the rain event,
    2) BMPs were observed to be breached, malfunctioning, or improperly implemented, and
    3) there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- Soil amendments that have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil have been applied, and there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- Stormwater runoff from an area contaminated by historical usage of the site has been observed to combine with stormwater runoff from the site, and there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.

7.7.1.2 Sampling Locations

Sampling locations are based on proximity to non-visible pollutant storage, occurrence, or use; accessibility for sampling; and personnel safety. Potential non-visible pollutant sampling locations will be determined in the field and shall be noted on the Site Maps in Appendix A, as needed. This location will be selected such that the sample will not have come in contact with the operations, activities, or areas identified in Section 7.7.1 or with disturbed soils areas.

If a stormwater visual monitoring site inspection conducted prior to or during a storm event identifies the presence of a material storage, waste storage, or operations area with spills or the potential for the discharge of non-visible pollutants to surface waters or a storm drain system that is at a location not listed above and has not been identified on the Site Maps, sampling locations will be selected by the QSP using the same rationale as that used to identify planned locations. Non-visible pollutant sampling locations shall be identified by the QSP on the pre-rain event inspection form prior to a forecasted qualifying rain event.

7.7.1.3 Monitoring Preparation

Non-visible pollutant samples will be collected by:

QSP	☒ Yes	☐ No
QSP Delegate	☒ Yes	☐ No

An adequate stock of monitoring supplies and equipment for monitoring non-visible pollutants will be available prior to a sampling event. Monitoring supplies and equipment will be stored in a cool temperature environment that will not come into contact with rain or direct sunlight. The QSP or QSP Delegates responsible for sampling will be available to collect samples in accordance with the sampling schedule.

Supplies maintained will include, but are not limited to, clean powder-free nitrile gloves, sample collection equipment, coolers, appropriate number and volume of sample bottles, identification labels, re-sealable storage bags, paper towels, personal rain gear, ice, and "Effluent Sampling Field Log Sheets" and "Chain-of-Custody" (CoC) forms, which are provided in Appendix H.

7.7.1.4 Analytical Constituents

Table 7-5 (on the following page) lists the specific sources and types of potential non-visible pollutants based on the project pollutant source assessment and the water quality indicator constituent(s) for that pollutant. Table 7-6 (page 51) provides the specific analytical methods and reporting limits for the potential non-visible pollutants. Analytical methods were selected in compliance with EPA sufficiently sensitive method requirements in 40 Code of Federal Regulations (CFR) Part 136, as evidenced by the method detection limit and minimum level.

7.7.1.5 Sample Collection

Samples of discharge shall be collected at the designated non-visible pollutant sampling locations identified in Section 7.7.1.2 and shown on the site drawings and maps in Appendix A or in the locations determined by observed breaches, malfunctions, leakages, spills, operational areas, soil amendment application areas, and historical site usage areas that triggered the sampling event.

Grab samples shall be collected and preserved in accordance with the methods identified in Table 7-5.. Only the QSP or QSP Delegates trained on sample collection identified in Section 7.6.3 shall collect samples.

Sample collection and handling requirements are described in Section 7.7.7.

Table 7-5. Sample Collection, Preservation, and Analysis for Monitoring Non-Visible Pollutants

Constituent	Analytical Method	Minimum Sample Volume	Sample Containers	Sample Preservation	Minimum Level	Method Detection Limit	Maximum Holding Time
COD[a]	SM 5220 D	20 ml[b]	250 ml plastic	H_2SO_4[c]			28 days
VOCs[d]	EPA 624	40 ml	40 ml VOA[e]	HCl[f]			14 days
SVOCs[g]	EPA 625	1 L[h]	1 L amber glass	$NA_2S_2O_3$[i]			7 days
Phenols	EPA 420.1	200 ml	500 ml amber glass	H_2SO_4			28 days
BOD[j]	SM 5210B	300 ml	1 L plastic	4°C[k]			48 hours
TOC[l]	SM 5310 C	40 ml	40 ml VOA	H_3PO_4[m]			28 days
TKN[n]	SM4500-NoB	300 ml	1 L plastic	H_2SO_4			28 days
NO_3[o]	EPA 300.0	20 ml	250 ml plastic	None			2 days
Sulfate	EPA 300.0	20 ml	250 ml plastic	None			28 days
Phosphate	EPA 300.0	20 ml	250 ml plastic	None			48 hours
Potassium	EPA 6010B	200 ml	500 ml plastic	HNO_3[p]			180 days
Metals	EPA 6010B/1640/200.8	100 ml	250 ml plastic	HNO_3			180 days
Residual Chlorine	SM 4500- CL G	20 ml	250 ml plastic	None			0 days
QSP will coordinate with laboratory regarding confirmation of the minimum sample volumes, type of sample containers, preservation requirements, reporting limits, and maximum hold times during bottle order request process							

a. COD: chemical oxygen demand
b. ml: milliliters
c. H_2SO_4: sulfuric acid
d. VOCs: volatile organic compounds
e. VOA: volatile organic analysis (container)
f. HCl: hydrochloric acid
g. SVOCs: semi-volatile organic compounds
h. L: liters
i. $NA_2S_2O_3$: sodium thiosulphate
j. BOD: biological oxygen demand
k. °C: degrees Celsius
l. TOC: total organic carbon
m. H_3PO_4: phosphoric acid
n. TKN: total Kjeldahl nitrogen
o. NO_3: nitrate
p. HNO_3: nitric acid

7.7.1.6 Sample Analysis

Samples shall be analyzed using the analytical methods identified in Table 7-5.

Samples will be analyzed by:
North Coast Laboratories Ltd
5680 West End Road
Arcata, CA 95521
(707) 822-4649
ELAP Certification No. 1247

Samples will be delivered to the laboratory by:
Driven by QSP/QSP Delegate/Contractor
☒ Yes ☐ No
Picked up by Laboratory Courier
☒ Yes ☐ No
Shipped
☒ Yes ☐ No

7.7.1.7 Data Evaluation and Reporting

The QSP shall complete an evaluation of the water quality sample analytical results based on a comparison of the results to the unaffected sample and, if applicable, to the TMDL NALs or NELs. Runoff/downgradient results shall be compared with the associated upgradient/unaffected results and any associated runon results. Should the runoff/downgradient sample show an increased level of the tested analyte relative to the unaffected background sample, which cannot be explained by runon results, the BMPs, site conditions, and surrounding influences shall be assessed to determine the probable cause for the increase.

As determined by the site and data evaluation, appropriate BMPs shall be repaired or modified to mitigate discharges of non-visible pollutant concentrations. Any revisions to the BMPs shall be recorded as an amendment to the SWPPP.

Analytical results of non-visible pollutant monitoring shall be submitted to SMARTS within 30 days of obtaining the analytical results. Results demonstrating an exceedance of an applicable TMDL-related NAL, NEL, or Basin Plan parameter shall be submitted to SMARTS within 10 days of obtaining the analytical results.

The 2022 CGP prohibits stormwater discharges that contain hazardous substances equal to or in excess of reportable quantities established in 40 CFR §§ 117.3 and 302.4. The results of any discharge results that indicate the presence of a hazardous substance in excess of established reportable quantities shall be immediately reported to the RWQCB and other agencies as required by 40 CFR §§ 117.3 and 302.4.

A TMDL related exceedance occurs on the second, and each subsequent, analytical result for samples taken from any and all discharge location(s) within the same drainage area, during the same reporting year and taken in accordance with 2022 CGP Attachment D Section III.D.3, that is above the concentration set forth in an applicable NAL and NEL.

In the event that the TMDL NAL or NEL is exceeded, the QSP shall immediately notify the LRP and investigate the cause of the exceedance and identify corrective actions.

If requested by the RWQCB in writing, a TMDL NAL exceedance report will be submitted within 30 days of the request. The TMDL NAL exceedance report must contain the following information:

- analytical method(s), method reporting unit(s), and method detection limit(s) of each parameter;
- date, place, time of sampling, visual observation, and/or measurements, including precipitation; and

- description of the current BMPs associated with the sample that exceeded the TMDL NAL, a description of each corrective action taken including photographs, and date of implementation.

In the event of a TMDL NEL exceedance, by the end of each reporting year, project shall implement the following water quality-based corrective actions:

- conducting a site assessment to identify pollutant source(s) within the site that are associated with construction activity and whether the BMPs described in the SWPPP have been properly implemented;
- evaluating the SWPPP and its implementation to determine whether additional BMPs or SWPPP implementation measures are necessary to reduce or prevent pollutants in all regulated discharges to comply applicable NELs, and
- certifying and submitting through SMARTS a report of the above site assessment and SWPPP evaluation that:
    - additional BMPs or SWPPP implementation measures have been identified and included in the SWPPP, or
    - no additional BMPs or SWPPP implementation measures are required to reduce or prevent pollutants in all regulated discharges to comply with applicable NELs.

7.7.2 Sampling and Analysis Plan for pH and Turbidity in Stormwater Runoff Discharges

Sampling and analysis of runoff for pH and turbidity is required for this Risk Level 2 project. This sampling and analysis plan describes the strategy for monitoring turbidity and pH levels of stormwater runoff discharges from the project site and runon that may contribute to an exceedance of a NAL or the exceedance of a receiving water monitoring trigger.

Samples for pH and turbidity will be collected at all discharge points where stormwater is discharged offsite.

7.7.2.1 Sampling Schedule

Stormwater samples shall be collected for pH and turbidity from sampling locations at one or more discharge locations representative of the project's construction activities, during discharge and within site operating hours. The samples will be representative of the discharge flow and characteristics. One sample from each representative sample location per 24-hour period of each qualifying precipitation event, during active discharge, will be collected.

Runon samples shall be collected whenever the QSP identifies that runon has the potential to contribute to an exceedance of a NAL.

7.7.2.2 Sampling Locations

Sampling locations are based on the site runoff discharge locations and locations where runon enters the site; accessibility for sampling; and personnel safety. Planned pH and turbidity sampling locations are shown on the Site Maps in Appendix A. Discharge locations on the maps are subject to change, based on on-the-ground conditions during rain events.

There are six separate construction locations to the project site, each having unique stormwater sampling locations. Table 7-6 identifies each stormwater sample location, which are shown on the Site Maps in Appendix A.

Table 7-6. Turbidity and pH Runoff Sample Locations

Sample Location Identifier	Sample Location Description	Sample Location Latitude, Longitude
Main Tank Site and Upper Maple Lane Pump Station	Samples for pH and turbidity will be collected at all discharge points where stormwater is discharged offsite.	DL 1- 40.0954062°,-123.7938201°
		DL 2- 40.0953642°,-123.7935490°
		DL 3- 40.0961185°,-123.7950460°
		DL 4- 40.0950976°,-123.7939845°
Tobin Well	Samples for pH and turbidity will be collected at all discharge points where stormwater is discharged offsite.	DL 13- 40.1006382°,-123.7924943°
Arthur / Alderpoint Pump Station Site	Samples for pH and turbidity will be collected at all discharge points where stormwater is discharged offsite.	DL 8- 40.1053855°,-123.7898290°
		DL 9- 40.1049921°,-123.7895238°
		DL 10- 40.1051941°,-123.7885958°
Robertson Tank Site	Samples for pH and turbidity will be collected at all discharge points where stormwater is discharged offsite.	DL 11- 40.1061994°,-123.7864244°
		DL 12- 40.1060530°,-123.7865478°
Wallan Tank Site	Samples for pH and turbidity will be collected at all discharge points where stormwater is discharged offsite.	DL 5- 40.1076776°,-123.7709722°
		DL 6- 40.1069340°,-123.7707682°
		DL 7- 40.1075963°,-123.7704301°
Wallan Pump Station	Samples for pH and turbidity will be collected at all discharge points where stormwater is discharged offsite.	No significant earth disturbance anticipated

There are no specific sampling locations identified for the collection of runon samples where the runon has the potential to contribute to an exceedance of a NAL. Site Maps in Appendix A will be updated, as necessary.

7.7.2.3 Monitoring Preparation

See Section 7.7.1.3.

Turbidity and pH samples will be collected and analyzed by:

QSP	☒ Yes	☐ No
QSD Delegate	☒ Yes	☐ No

The QSP or QSP Delegates will obtain and maintain the field testing instruments, as identified in Section 7.7.2.6, for analyzing samples in the field. Field meter instructions are provided in Appendix L.

7.7.2.4 Field Parameters

Samples shall be analyzed for the constituents indicated in Table 7-7, below.

Table 7-7. Sample Collection and Analysis for Monitoring Turbidity and pH

Parameter	Test Method	Minimum Sample Volume [a]	Sample Collection Container Type	Detection Limit (minimum)
Turbidity	Field meter/probe with calibrated portable instrument	500 mL[b]	Polypropylene or glass (Do not collect in meter sample cells)	1 NTU [c]
pH	Field meter/probe with calibrated portable instrument or calibrated pH test kit	100 mL	Polypropylene	0.2 pH units

a. Minimum sample volume recommended. Specific volume requirements will vary by instrument; check instrument manufacturer instructions.
b. mL: milliliters
c. NTU: nephelometric turbidity unit

7.7.2.5 Sample Collection

Samples of stormwater discharge shall be collected at the designated sampling locations listed in Table 7-6 and shown on the Site Maps in Appendix A.

Runon samples shall be collected within close proximity of the point of runon to the project.

Sample collection and handling requirements are described in Section 7.7.7.

7.7.2.6 Field Measurements

The collection and analysis of samples in the field and equipment calibration shall be in accordance with the field instrument manufacturer's specifications. Immediately following collection, samples for field analysis shall be tested in accordance with the field instrument manufacturer's instructions and results recorded on the "Effluent Sampling Field Log Sheets."

The field instruments listed in Table 7-8 will be used to analyze the following constituents.

Table 7-8. Field Instruments

Field Instrument (Manufacturer and Model)	Constituent
Apera Instruments pH60 Tester	pH
Oakton Turbidimeter T-100	Turbidity

The manufacturers' instructions are included in Appendix L. Field sampling staff shall review the instructions prior to each sampling event and follow the instructions in completing measurement of the samples.

- The instrument(s) shall be maintained in accordance with manufacturer's instructions.
- The instrument(s) shall be calibrated before each sampling and analysis event.
- Maintenance and calibration records shall be maintained with the SWPPP.

The QSP may authorize alternate equipment provided that the equipment meets the 2022 CGP's requirements and the manufacturers' instructions for calibration and use are added to Appendix L.

7.7.2.7 Data Evaluation and Reporting

Upon completing the measurements for the sampling event, provide the "Effluent Sampling Field Log Sheets" to the QSP for evaluation.

7.7.2.8 Numeric Action Levels

LRP or DAR shall electronically report all stormwater pH and turbidity results to the SWRCB through SMARTS within 30 days of receiving the results. Exceedances of NALs shall be electronically reported to the SWRCB by the LRP or DAR through SMARTS within 10 days of receiving the results.

Compliance with the NALs for pH and turbidity is based on a single sample evaluation. A NAL exceedance occurs when any sample exceeds the turbidity NAL or is outside of the pH range shown in Table 7-9.

Table 7-9. Numeric Action Levels (NALs)

Parameter	Unit	NAL
pH	pH units	Lower NAL < 6.5[a] Upper NAL > 8.5[b]
Turbidity	NTU [c]	>250

a. <: less than
b. >: greater than
c. NTU: nephelometric turbidity units

The QSP shall submit copies of the completed "Effluent Sampling Field Log Sheets" to the Contractor and LRP. In the event that the pH or turbidity NAL is exceeded, the QSP shall immediately notify the Contractor and LRP and investigate the cause of the exceedance and identify corrective actions.

If requested by the RWQCB in writing, a NAL exceedance report will be submitted within 30 days of the request. The NAL exceedance report must contain the following information:

- analytical method(s), method reporting unit(s), and method detection limits (MDLs) of each parameter;
- date, place, time of sampling, visual observation, and/or measurements, including precipitation; and
- an assessment of the existing BMPs associated with the sample that exceeded the NAL, a description of each corrective action taken including photographs, and date of implementation.

7.7.3 Receiving Water Monitoring Triggers

This project is not subject to receiving water monitoring triggers because it does not directly discharge to a receiving water and the Risk Level is 2. Risk Level 3 receiving water monitoring requirements are found in 2022 CGP Attachment D. Section III.D.2.

7.7.4 Sampling and Analysis Plan for Dewatering Discharges

Dewatering activities planned for this project will be conducted and monitored according to the requirements of the 2022 CGP Attachment J. No specific dewatering needs have been identified at this time.

This sampling and analysis plan for dewatering discharges describes the sampling and analysis strategy and schedule for monitoring dewatering discharges in accordance with the requirements of the 2022 CGP.

7.7.4.1 Sample Schedule

Sampling of dewatering discharges will be conducted within the first hour of the commencement of discharge and daily each day that the discharge continues.

7.7.4.2 Sample Locations

Sampling locations are based on planned dewatering locations. No specific dewatering needs have been identified at this time. Any required dewatering locations will be updated on the Site Maps in Appendix A, if necessary.

In the event that dewatering is required at a location not listed and has not been identified on the site drawings and maps, sampling locations will be selected by the QSP using the same rationale as that used to identify planned locations. Dewatering sampling locations shall be documented by the QSP on the "Effluent Sampling Field Log Sheets," which are provided in Appendix H.

7.7.4.3 Monitoring Preparation

See Section 7.7.1.3.

7.7.4.4 Sample Collection and Field Analysis

Samples for field parameters shall be analyzed for the constituents indicated in Table 7-7. Turbidity and pH samples shall be analyzed immediately.

Sample collection and handling requirements are described in Section 7.7.7.

7.7.4.5 Data Evaluation and Reporting

At least 24 hours prior to the beginning of a dewatering discharge, the QSP, QSP Delegate, DAR, or LRP shall notify the RWQCB via email of the anticipated dewatering discharge.

The QSP shall submit copies of the completed "Effluent Sampling Field Log Sheets" to the Contractor and LRP.

Compliance with the NALs for pH and turbidity in dewatering discharges is based on a single sample evaluation. A NAL exceedance occurs when any sample exceeds the turbidity NAL or is outside of the pH range shown in Table 7-9.

In the event that the pH or turbidity NAL is exceeded, the QSP shall immediately notify the Contractor and LRP and investigate the cause of the exceedance and identify corrective actions.

The QSP or QSP Delegate shall immediately cease dewatering discharges if the NALs are exceeded. If the discharge is necessary to protect human life and health or prevent severe property damage and cannot be ceased, the QSP, QSP Delegate, DAR, or LRP shall notify the RWQCB and the local stormwater agency within 24 hours (Table 7-10).

Table 7-10. Dewatering Notification Contacts

Agency	Name	Email
North Coast Regional Water Quality Board	TBD	TBD
Local Stormwater Agency	TBD	TBD

Exceedances of NALs shall be electronically reported to the SWRCB by the LRP or DAR through SMARTS within 10 days of receiving the results.

Following a NAL exceedance, the QSD shall revise the SWPPP to incorporate corrective actions to prevent further exceedances within 10 days of the measurement.

7.7.5 Sampling and Analysis Plan for Other Pollutant Required by the RWQCB

The RWQCB has not specified monitoring for additional pollutants.

7.7.6 Training of Sampling Personnel

QSP Delegates assigned to conduct sampling shall be trained by the QSP to collect, maintain, and ship samples in accordance with the 2022 CGP Sample Collection and Handling Instructions and supplemental information as needed. Training records of QSP Delegates assigned to sample are provided in Appendix I.

7.7.7 Sample Collection and Handling

7.7.7.1 Sample Collection

Samples shall be collected at the designated sampling locations shown on the Site Maps and listed in the preceding sections. Samples shall be collected, maintained, and shipped in accordance with the 2022 CGP Sample Collection and Handling Instructions.

Grab samples shall be collected and preserved in accordance with the methods identified in preceding sections.

To maintain sample integrity and prevent cross-contamination, sample collection personnel shall follow the following protocols:

- Collect samples (for laboratory analysis) in analytical laboratory-provided or specified sample containers.
    - Use of any other type of containers could cause sample contamination and may result in NAL or NEL exceedances.
- Wear clean, powder-free nitrile gloves when collecting samples.
- Change gloves whenever something not known to be clean has been touched.
- Change gloves between sampling locations.

- Decontaminate all equipment (for example, bucket, tubing) prior to sample collection;
    - Use a trisodium phosphate water wash, distilled water rinse, and final rinse with distilled water.
    - Dispose of wash and rinse water appropriately (that is, do not discharge to storm drain or receiving water).
    - Do not decontaminate laboratory provided sample containers.
- Do not smoke during sampling events.
- Never sample near a running vehicle.
- Do not park vehicles in the immediate sample collection area (even non-running vehicles).
- Do not eat or drink during sample collection.
- Do not breathe, sneeze, or cough in the direction of an open sample container.

The most important aspect of grab sampling is to collect a sample that represents the entire runoff stream. Typically, samples are collected by dipping the collection container in the runoff flow paths and streams as noted below.

i. For small streams and flow paths, simply dip the bottle facing upstream until full.
ii. For larger stream that can be safely accessed, collect a sample in the middle of the flow stream by directly dipping the mouth of the bottle. Once again making sure that the opening of the bottle is facing upstream as to avoid any contamination by the sampler.
iii. For larger streams that cannot be safely waded, pole-samplers may be needed to safely access the representative flow.
iv. Avoid collecting samples from ponded, sluggish or stagnant water.
v. Avoid collecting samples directly downstream from a bridge as the samples can be affected by the bridge structure or runoff from the road surface.

Note, that depending upon the specific analytical test, some containers may contain preservatives. These containers should **never** be dipped into the stream but filled indirectly from the collection container.

7.7.7.2 Sample Handling

Turbidity and pH measurements must be conducted immediately. Do not store turbidity or pH samples for later measurement.

Samples for laboratory analysis must be handled as follows.

Immediately following sample collection:

- Cap sample containers.
- Complete sample container labels.
- Place sealed containers in a re-sealable storage bag.
- Place sample containers into an ice-chilled cooler.
- Document sample information on the “Effluent Sampling Field Log Sheets” (Appendix H).
- Complete the CoC.

All samples for laboratory analysis must be maintained between 0-6 degrees Celsius during delivery to the laboratory. Samples must be kept on ice, or refrigerated, from sample collection through delivery to the laboratory. Place samples to be shipped inside coolers with ice. Make sure the sample bottles are well packaged to prevent breakage and secure cooler lids with packaging tape.

Ship samples that will be laboratory analyzed to the analytical laboratory right away. Hold times are measured from the time the sample is collected to the time the sample is analyzed. The 2022 CGP requires that samples be received by the analytical laboratory within 48 hours of the physical sampling (unless required sooner by the analytical laboratory to meet all hold times).

North Coast Laboratories Ltd.
5680 West End Road
Arcata, CA 95521
(707) 822-4649
ELAP Certification No. 1247

7.7.7.3 Sample Documentation Procedures

All original data documented on sample container identification labels, "Effluent Sampling Field Log Sheets," and CoCs (Appendix H), shall be recorded using waterproof ink. These shall be considered accountable documents. If an error is made on an accountable document, the individual shall make corrections by lining through the error and entering the correct information. The erroneous information shall not be obliterated. All corrections shall be initialed and dated.

Duplicate samples shall be identified consistent with the numbering system for other samples to prevent the laboratory from identifying duplicate samples. Duplicate samples shall be identified in the "Effluent Sampling Field Log Sheets."

Sample documentation procedures include the following:

- **Sample Bottle Identification Labels:** Sampling personnel shall attach an identification label to each sample bottle. Sample identification shall uniquely identify each sample location. (These location identifiers should be listed in the tables in the SWPPP.)
- **Field Log Sheets:** Sampling personnel shall complete the "Effluent Sampling Field Log Sheets" and "Receiving Water Sampling Field Log Sheet" (Appendix H) for each sampling event, as appropriate.
- **Chain-of-Custody:** Sampling personnel shall complete the CoC for each sampling event for which samples are collected for laboratory analysis. The sampler will sign the CoC (Appendix H) when the sample(s) is turned over to the testing laboratory or courier.

7.8 Active Treatment System Monitoring

This project does not require a project-specific sampling and analysis plan for an active treatment system (ATS) because deployment of an ATS is not planned.

7.9 Passive Treatment Monitoring

This project does not require a project-specific sampling and analysis plan for passive treatment because deployment of passive treatment is not planned.

7.10 Watershed Monitoring Option

This project is not participating in a watershed monitoring option.

7.11 Quality Assurance and Quality Control

An effective quality assurance and quality control (QA/QC) plan shall be implemented as part of the CSMP to ensure that analytical data can be used with confidence. QA/QC procedures to be initiated include the following:

- field logs;
- clean sampling techniques;
- CoCs;
- QA/QC Samples; and
- data verification.

Each of these procedures is discussed in more detail in the following sections.

7.11.1 Field Logs

The purpose of field logs is to record sampling information and field observations during monitoring that may explain any uncharacteristic analytical results. Sampling information to be included in the field log include the date and time of water quality sample collection, names of sampling personnel, sample container identification numbers, and types of samples that were collected. Field observations should be noted in the field log for any abnormalities at the sampling location (color, odor, BMPs, and so on). Field measurements for pH and turbidity should also be recorded in the field log. A "Visual Inspection Field Log," an "Effluent Sampling Field Log Sheet," and a "Receiving Water Sampling Field Log Sheet" are included in Appendix H.

7.11.2 Clean Sampling Techniques

Clean sampling techniques involve the use of certified clean containers for sample collection and clean powder-free nitrile gloves during sample collection and handling. As discussed in Section 7.7.7, adoption of a clean sampling approach will minimize the chance of field contamination and questionable data results.

7.11.3 Chain-of-Custody

The sample CoC is an important documentation step that tracks samples from collection through analysis to ensure the validity of the sample. Sample CoC procedures include the following:

- proper labeling of samples;
- use of CoC forms for all samples; and
- prompt sample delivery to the analytical laboratory.

Analytical laboratories usually provide CoC forms to be filled out for sample containers. An example CoC is included in Appendix H.

7.11.4 QA/QC Samples

QA/QC samples provide an indication of the accuracy and precision of the sample collection; sample handling; field measurements; and analytical laboratory methods. The following types of QA/QC may be conducted for this project:

☐ Field Duplicates
☐ Equipment Blanks
☐ Field Blanks
☐ Travel Blanks

7.11.4.1 Field Duplicates

Field duplicates provide verification of laboratory or field analysis and sample collection. Duplicate samples shall be collected, handled, and analyzed using the same protocols as primary samples. The sample location where field duplicates are collected shall be randomly selected from the discharge locations. Duplicate samples shall be collected immediately after the primary sample has been collected. Duplicate samples must be collected in the same manner and as close in time as possible to the original sample. Duplicate samples shall not influence any evaluations or conclusion.

7.11.4.2 Equipment Blanks

Equipment blanks provide verification that equipment has not introduced a pollutant into the sample. Equipment blanks are typically collected when:

- new equipment is used;
- equipment that has been cleaned after use at a contaminated site;
- equipment that is not dedicated for surface water sampling is used; or
- whenever a new lot of filters is used when sampling metals.

7.11.4.3 Field Blanks

Field blanks assess potential sample contamination levels that occur during field sampling activities. De-ionized water field blanks are taken to the field, transferred to the appropriate container, and treated the same as the corresponding sample type during the course of a sampling event.

7.11.4.4 Travel Blanks

Travel blanks assess the potential for cross-contamination of volatile constituents between sample containers during shipment from the field to the laboratory. De-ionized water blanks are taken along for the trip and held unopened in the same cooler with the volatile organic compound (VOC) samples.

7.11.5 Data Verification

After results are received from the analytical laboratory, the QSP or QSP Delegates shall verify the data to ensure that it is complete, accurate, and the appropriate QA/QC requirements were met. Data must be verified as soon as the data reports are received. Data verification shall include:

- Check the CoC and laboratory reports.
  - Make sure all requested analyses were performed and all samples are accounted for in the reports.
- Check laboratory reports to make sure hold times were met and that the reporting levels meet or are lower than the reporting levels agreed to in the contract.
- Check data for outlier values and follow up with the laboratory.
  - Occasionally typographical errors, unit reporting errors, or incomplete results are reported and should be easily detected. These errors need to be identified, clarified, and corrected quickly by the laboratory. The QSP or QSP Delegates should especially note data that is an

order of magnitude or more different than similar locations or is inconsistent with previous data from the same location.

- Check laboratory QA/QC results.
  - EPA establishes QA/QC checks and acceptable criteria for laboratory analyses. These data are typically reported along with the sample results. The QSP or QSP Delegates shall evaluate the reported QA/QC data to check for contamination (method, field, and equipment blanks), precision (laboratory matrix spike duplicates), and accuracy (matrix spikes and laboratory control samples). When QA/QC checks are outside acceptable ranges, the laboratory must flag the data, and usually provides an explanation of the potential impact to the sample results.
- Check the data set for outlier values and (accordingly) confirm results and re-analyze samples where appropriate.
  - Sample re-analysis should only be undertaken when it appears that some part of the QA/QC resulted in a value out of the accepted range. Sample results may not be discounted unless the analytical laboratory identifies the required QA/QC criteria were not met and confirms this in writing.

Field data including inspections and observations must be verified as soon as the field logs are received, typically at the end of the sampling event. Field data verification shall include:***

- Check field logs to make sure all required measurements were completed and appropriately documented.
- Check reported values that appear out of the typical range or inconsistent.
  - Follow-up immediately to identify potential reporting or equipment problems, if appropriate, recalibrate equipment after sampling.
- Verify equipment calibrations.
- Review observations noted on the field logs.
- Review notations of any errors and actions taken to correct the equipment or recording errors.

7.12 Records Retention

All records of stormwater monitoring information and copies of reports (including annual reports) must be retained for a period of at least three years from date of submittal or longer if required by the RWQCB.

Results of visual monitoring, field measurements, and laboratory analyses must be kept in the SWPPP along with CoCs and other documentation related to the monitoring.

Records are to be kept onsite while construction is ongoing. Records to be retained include:

- the date, place, and time of inspections, sampling, visual observations, and/or measurements, including precipitation;
- names of the individual(s) who performed the inspections, sampling, visual observation, and/or field measurements;
- the date and approximate time of field measurements and laboratory analyses;
- names of the individual(s) who performed the laboratory analyses;
- a summary of all analytical results, the method detection limits and reporting limits, and the analytical techniques or methods used;
- rain gauge readings from site inspections;
- QA/QC records and results;
- calibration records;
- visual observation and sample collection exception records;
- the records of any corrective actions and follow-up activities that resulted from analytical results, visual observations, or inspections;
- dewatering notifications to the RWQCB;
- dewatering exception notifications to the RWQCB and local stormwater agency;]
- NAL Exceedance Report;
- NEL water quality based corrective action reports; and
- specific records added as required by TMDLs.

Section 8.0 References

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---. (October 17, 2023). "CEQA MMRP 2023. Mitigation Monitoring and Reporting Program Garberville Sanitary District - Robertson/Wallan/Hurlbutt Tanks Replacement Project." Eureka, CA:SHN.

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U.S. Department of Agriculture, Natural Resource Conservation Service (. (2023). Custom Soils Map.

Appendix A: Site Maps and Drawings

EXPLANATION

- WETLAND AREA
- SENSITIVE PLANTS COMMUNITY
- CONSTRUCTION ENVIRONMENTALLY SENSITIVE AREA FENCE
- 50-FOOT BUFFER
- SWPPP DISTURBED AREA
- SOIL STOCKPILE AREA
- EQUIPMENT FUELING AND REPAIR AREA
- DISCHARGE LOCATION

BMP EXPLANATION

- VELOCITY DISSIPATION, 6 INCH PLUS WASHED ROCK
- GRAVEL BAG DIVERSION BERM, MINIMUM HEIGHT 2 FEET
- FIBER ROLL
- SILT FENCE
- OIL ABSORBENT BOOM
- EROSION CONTROL MAT
- STABILIZED CONSTRUCTION ENTRANCE/EXIT
- GRAVEL BAG CHECK DAM

NOTE:

FOLLOW INSTRUCTIONS ON BMP FACT SHEETS FOR INSTALLATION AND MAINTENANCE.

N

0 100

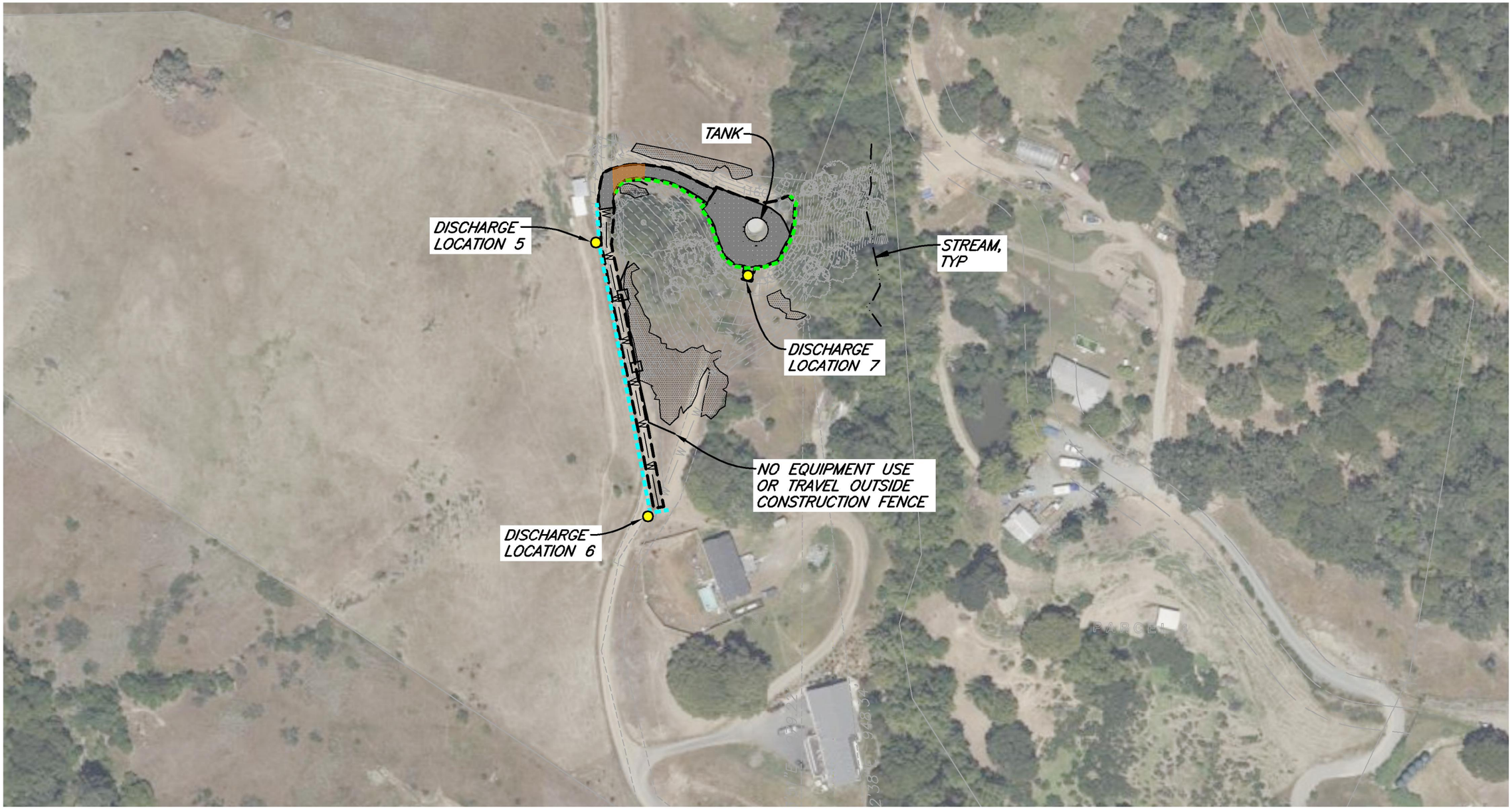
1"=100'

Garberville Sanitary District
SWPPP
Garberville, California

Main Tank Site

February 2024 - 022067

Figure 1



EXPLANATION

- AGGREGATE BASE
- SENSITIVE PLANTS COMMUNITY
- CONSTRUCTION ENVIRONMENTALLY SENSITIVE AREA FENCE
- DISCHARGE LOCATION
- 50-FOOT BUFFER
- SWPPP DISTURBED AREA

BMP EXPLANATION

- STABILIZED CONSTRUCTION ENTRANCE/EXIT
- FIBER ROLL
- SILT FENCE

NOTE:

FOLLOW INSTRUCTIONS ON BMP FACT SHEETS FOR INSTALLATION AND MAINTENANCE.

N

0 100

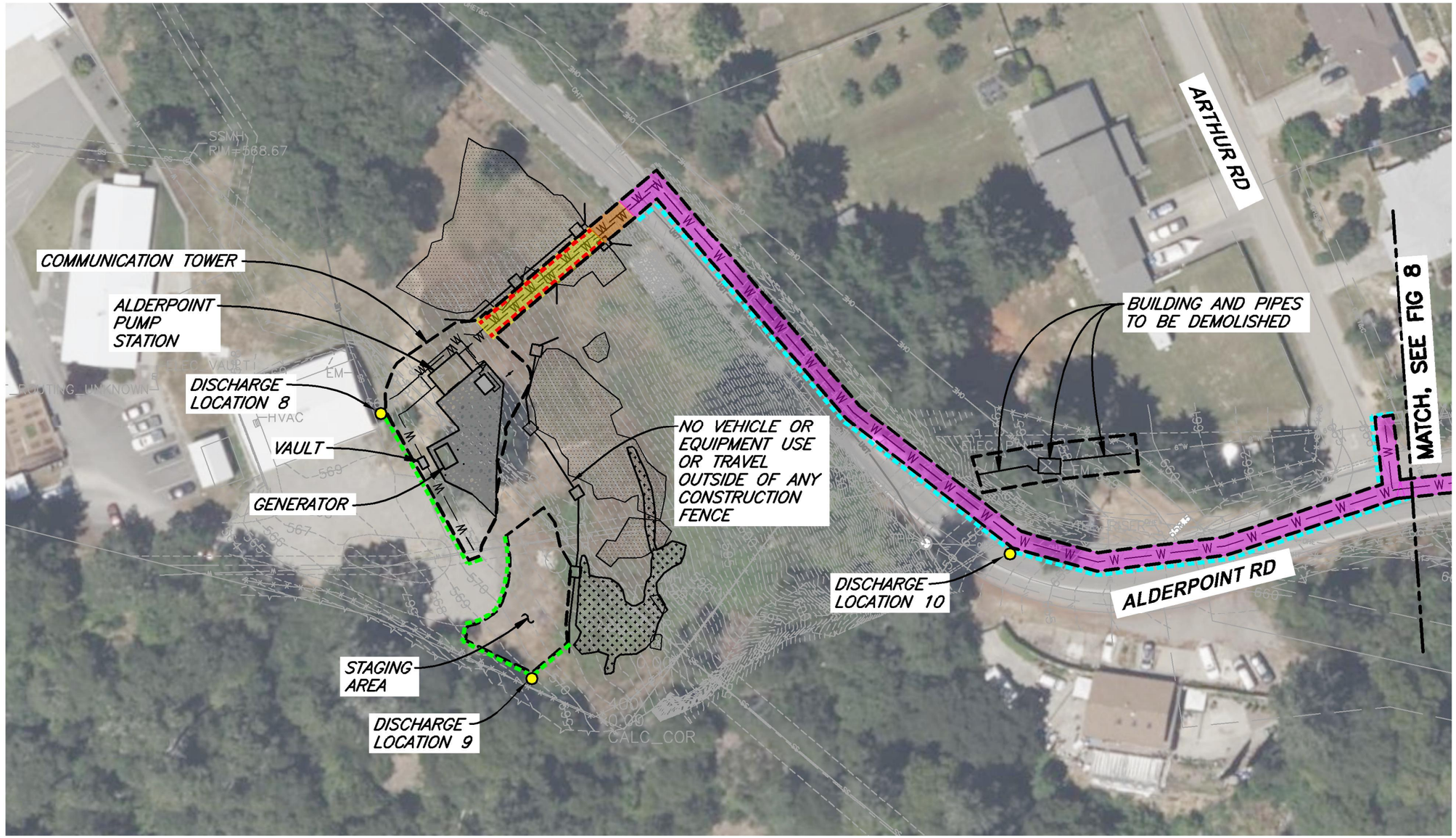
1"=100'

Garberville Sanitary District
SWPPP
Garberville, California

Wallan Tank Site

February 2024 - 022067

Figure 2



EXPLANATION

- WETLAND AREA
- SENSITIVE PLANTS COMMUNITY
- AGGREGATE BASE
- CONSTRUCTION ENVIRONMENTALLY SENSITIVE AREA FENCE
- SWPPP DISTURBED AREA
- DISCHARGE LOCATION

BMP EXPLANATION

- GRAVEL BAG DIVERSION BERM, MINIMUM HEIGHT 2 FEET
- FIBER ROLL
- SILT FENCE
- EROSION CONTROL MAT
- 2 INCH MINIMUM COVER CLEAN HARD GRAVEL
- STABILIZED CONSTRUCTION ENTRANCE/EXIT

NOTE:

FOLLOW INSTRUCTIONS ON BMP FACT SHEETS FOR INSTALLATION AND MAINTENANCE.

N

0 60

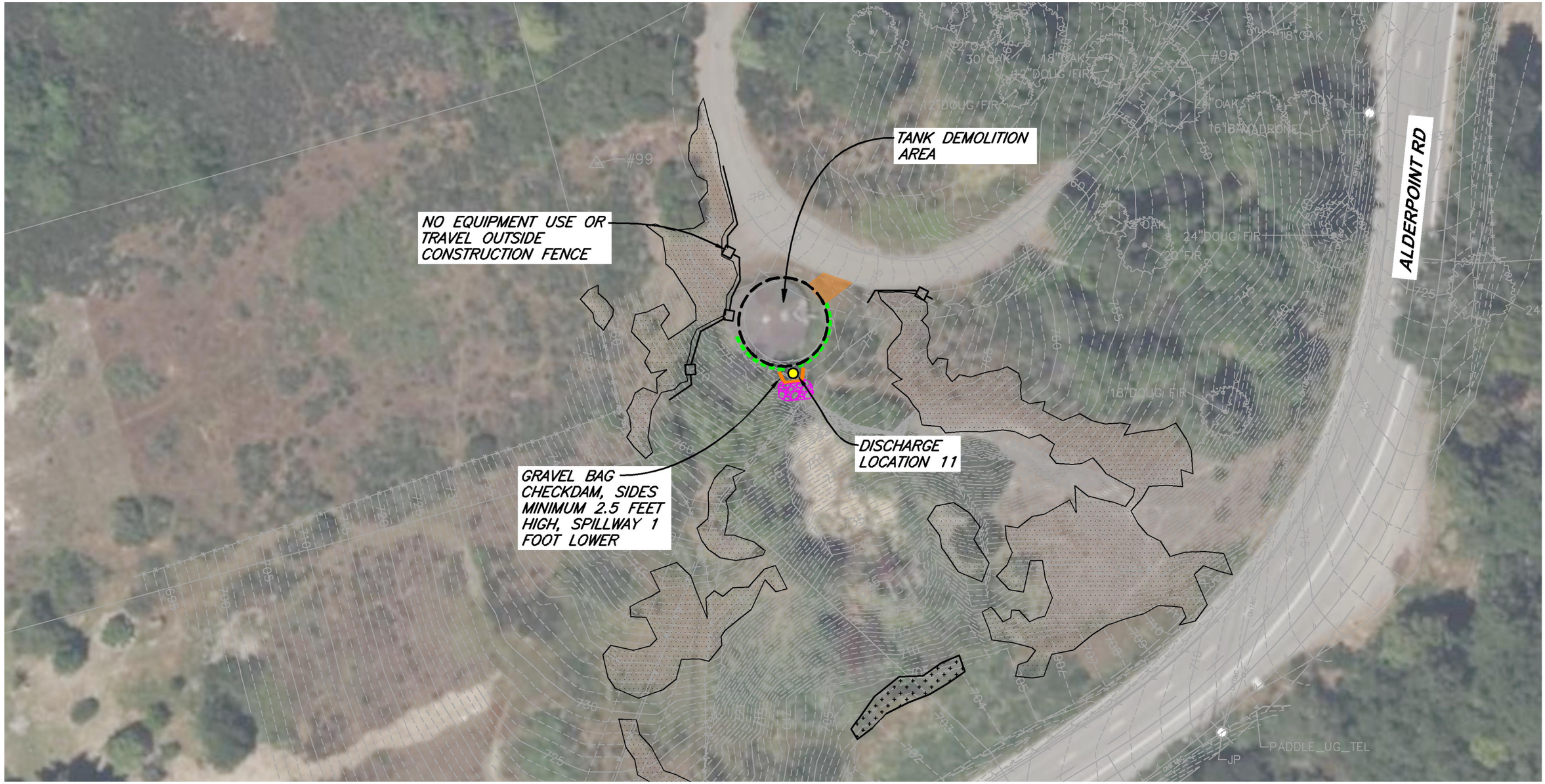
1"=60'

Garberville Sanitary District
SWPPP
Garberville, California

Alderpoint Pump Station Site

February 2024 - 022067

Figure 3



EXPLANATION

- WETLAND AREA
- SENSITIVE PLANTS COMMUNITY
- CONSTRUCTION ENVIRONMENTALLY SENSITIVE AREA FENCE
- SWPPP DISTURBED AREA
- DISCHARGE LOCATION

BMP EXPLANATION

- FIBER ROLL
- SILT FENCE
- GRAVEL BAG CHECK DAM
- VELOCITY DISSIPATION, 6 INCH PLUS WASHED ROCK
- STABILIZED CONSTRUCTION ENTRANCE/EXIT

NOTE:

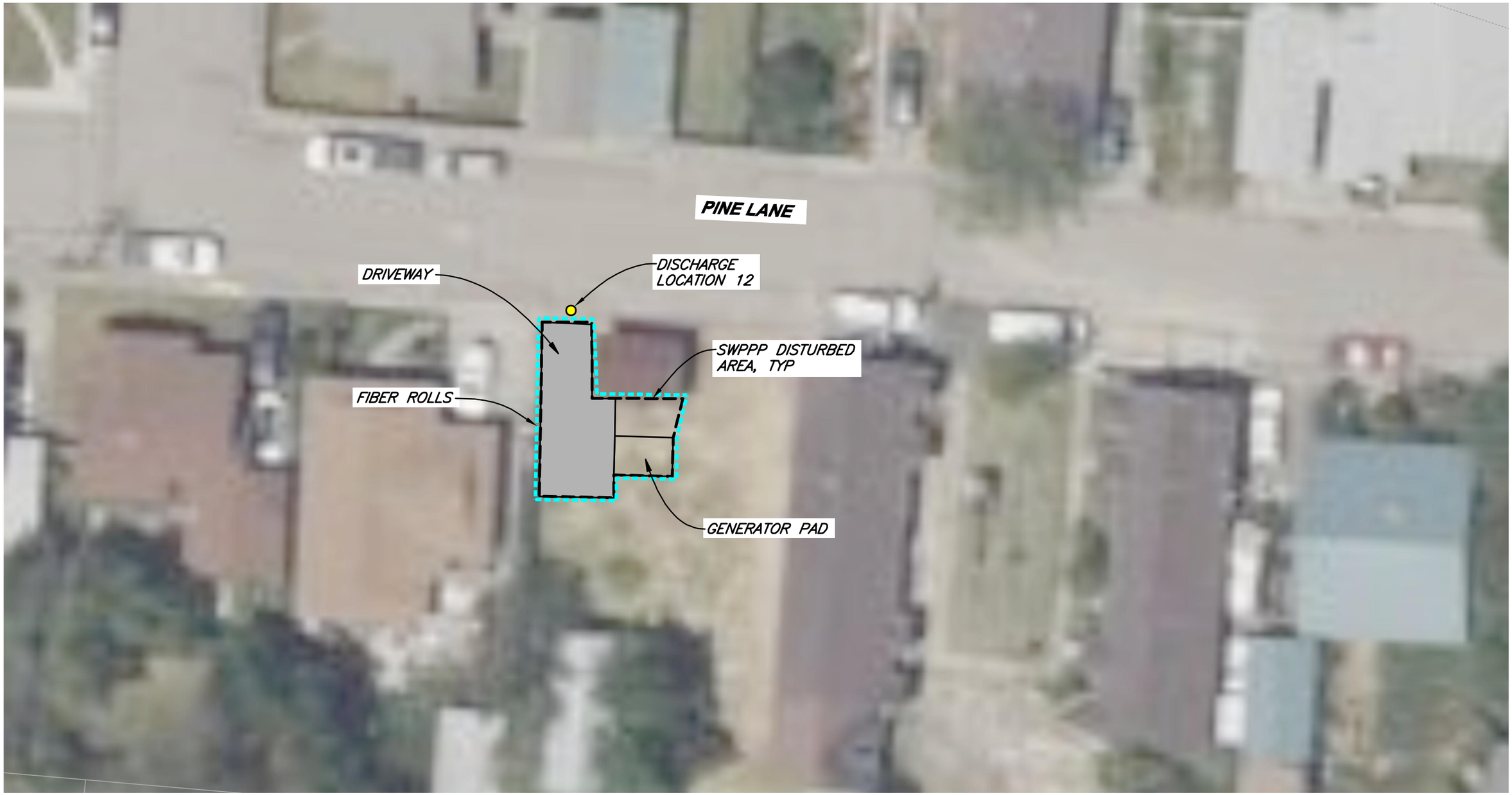
FOLLOW INSTRUCTIONS ON BMP FACT SHEETS FOR INSTALLATION AND MAINTENANCE.

N

0 40

1"=40'

Garberville Sanitary District SWPPP Garberville, California	**Robertson Tank Site** February 2024 - 022067	**Figure** **4**



NOTE:

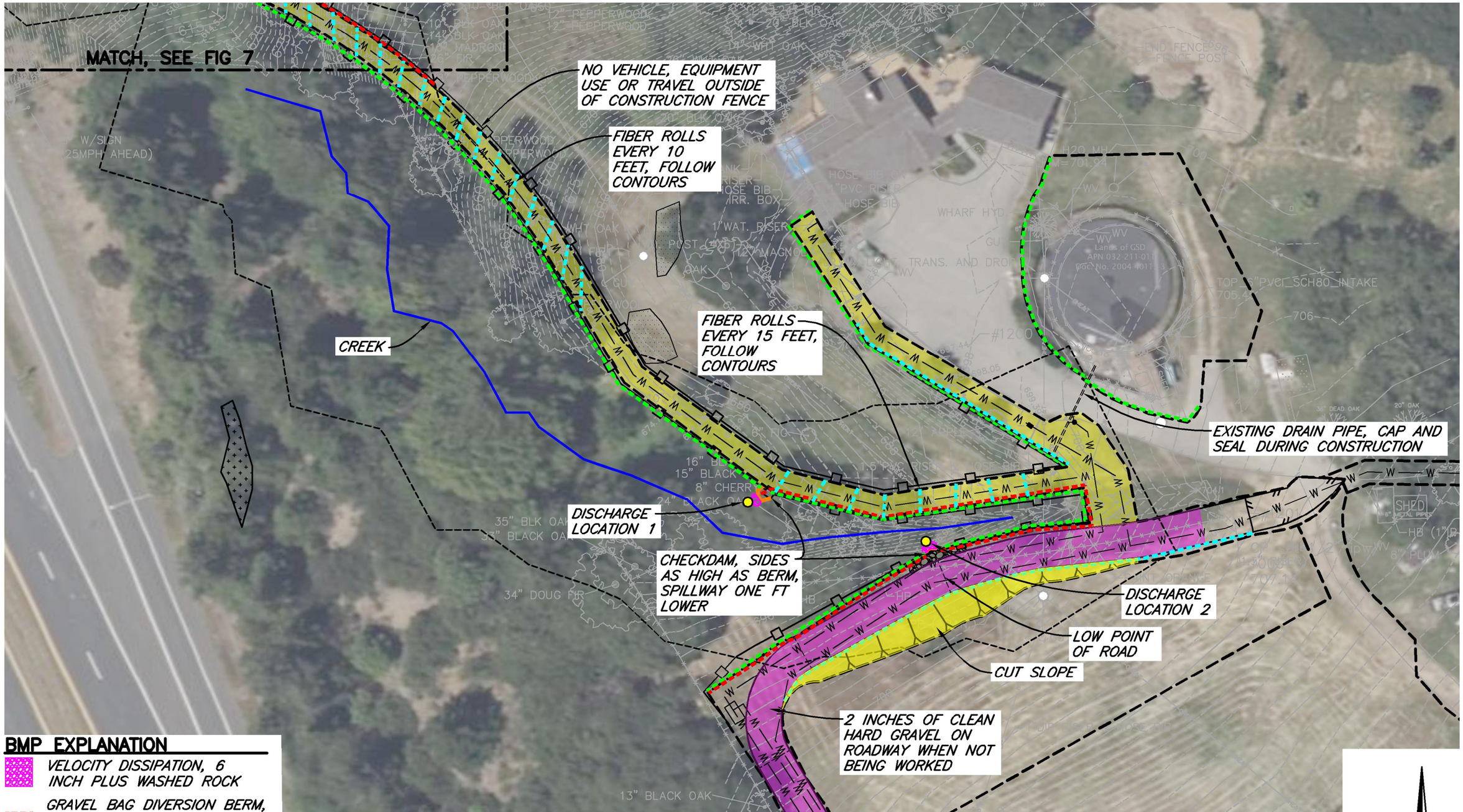
FOLLOW INSTRUCTIONS ON BMP FACT SHEETS FOR INSTALLATION AND MAINTENANCE.

N

0 20

1"=20'

SHN	Garberville Sanitary District SWPPP Garberville, California	Tobin Well Generator Site February 2024 - 022067	Figure 5



BMP EXPLANATION

- VELOCITY DISSIPATION, 6 INCH PLUS WASHED ROCK
- GRAVEL BAG DIVERSION BERM, MINIMUM HEIGHT 2 FEET
- FIBER ROLL
- SILT FENCE
- GRAVEL BAG CHECK DAM
- EROSION CONTROL MAT
- 2 INCH MINIMUM COVER CLEAN HARD GRAVEL

EXPLANATION

- SENSITIVE PLANTS COMMUNITY
- WETLAND AREA
- CONSTRUCTION ENVIRONMENTALLY SENSITIVE AREA FENCE
- 50-FOOT BUFFER
- SWPPP DISTURBED AREA
- DISCHARGE LOCATION

NOTE:

FOLLOW INSTRUCTIONS ON BMP FACT SHEETS FOR INSTALLATION AND MAINTENANCE.

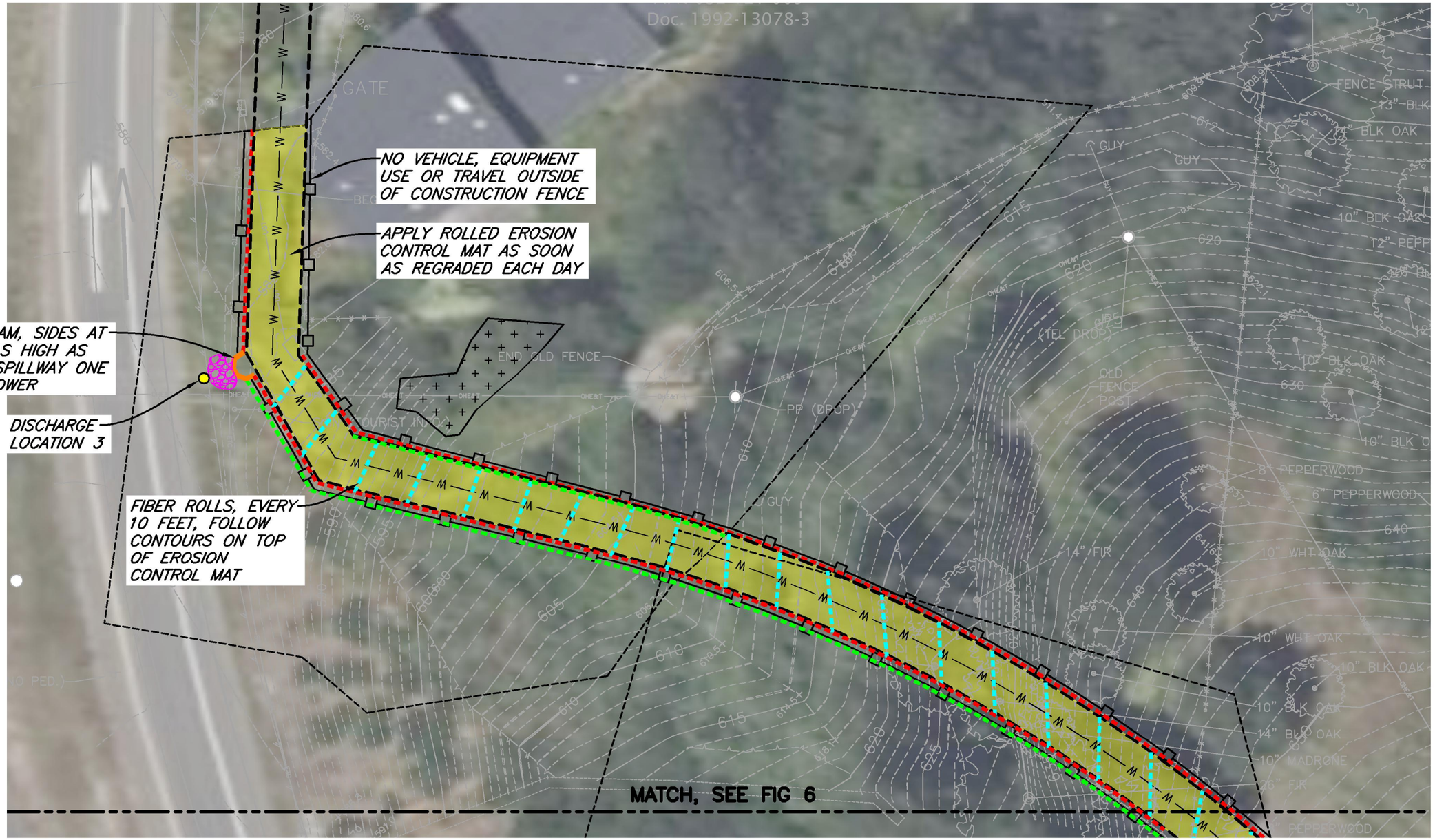
0 40
1"=40'

Garberville Sanitary District
SWPPP
Garberville, California

Main Tank Site
Water Body 1
Februaury 2024 - 022067

Figure
6

P:\Eureka\2022\022067-GSD-Water\Dwgs\022067-MAIN-TANK-SWPPP , SAVED: 2/8/2024 4:19 PM JFOSTER, PLOTTED: 2/9/2024 10:41 AM, JOHN FOSTER



EXPLANATION

- WETLAND AREA
- CONSTRUCTION ENVIRONMENTALLY SENSITIVE AREA FENCE
- 50-FOOT BUFFER
- SWPPP DISTURBED AREA
- DISCHARGE LOCATION

BMP EXPLANATION

- VELOCITY DISSIPATION, 6 INCH PLUS WASHED ROCK
- GRAVEL BAG DIVERSION BERM, MINIMUM HEIGHT 2 FEET
- FIBER ROLL
- SILT FENCE
- GRAVEL BAG CHECK DAM
- EROSION CONTROL MAT

NOTE:

FOLLOW INSTRUCTIONS ON BMP FACT SHEETS FOR INSTALLATION AND MAINTENANCE.

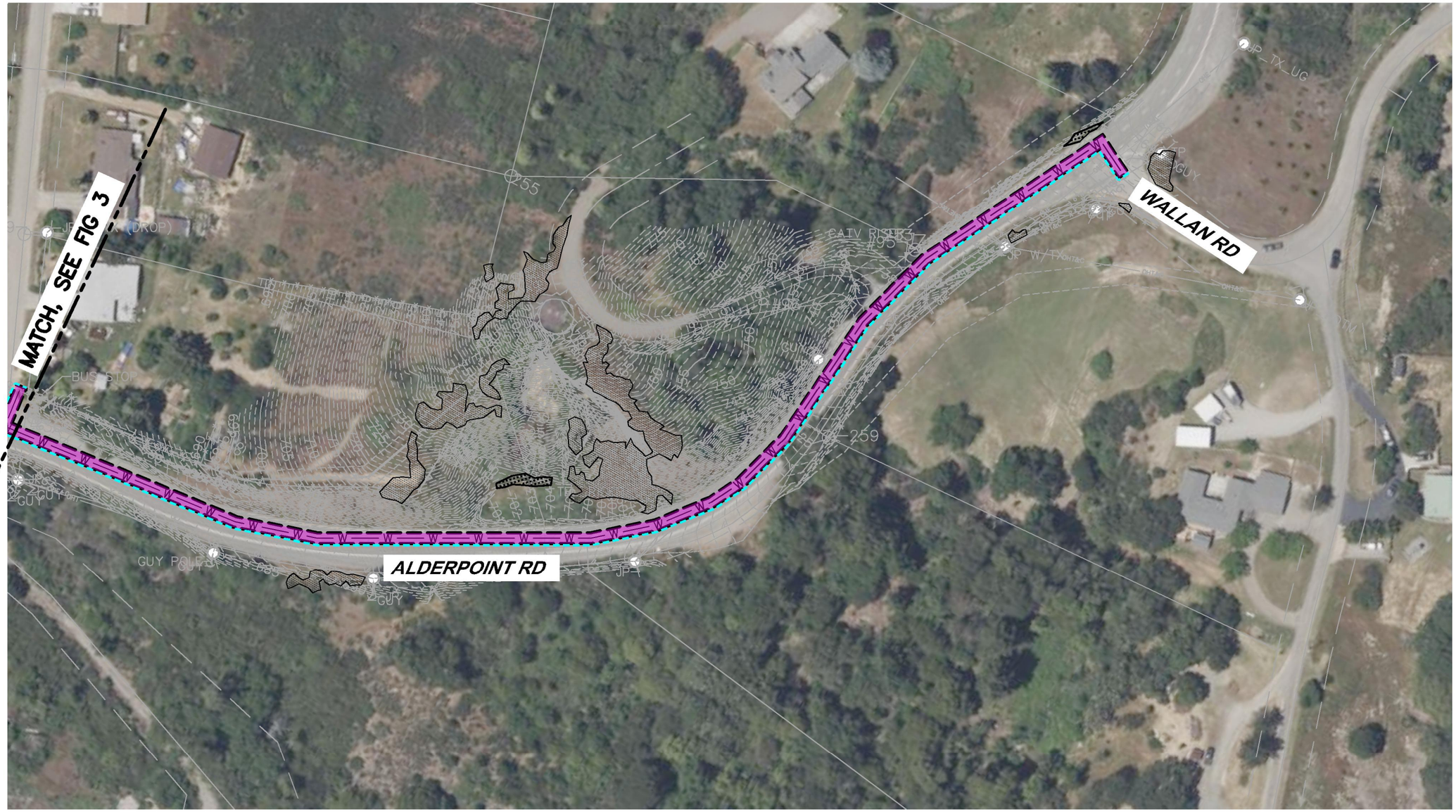
0 20
1"=20'

Garberville Sanitary District
SWPPP
Garberville, California

Main Tank Site
Water Body 2
Febraury 2024 - 022067

Figure
7

P:\Eureka\2022\022067-GSD-Water\Dwgs\022067-MAIN-TANK-SWPPP , SAVED: 2/8/2024 4:19 PM JFOSTER, PLOTTED: 2/9/2024 10:41 AM, JOHN FOSTER



EXPLANATION

- WETLAND AREA
- SENSITIVE PLANTS COMMUNITY
- SWPPP DISTURBED AREA

BMP EXPLANATION

- FIBER ROLL
- 2 INCH MINIMUM COVER CLEAN HARD GRAVEL

NOTE:

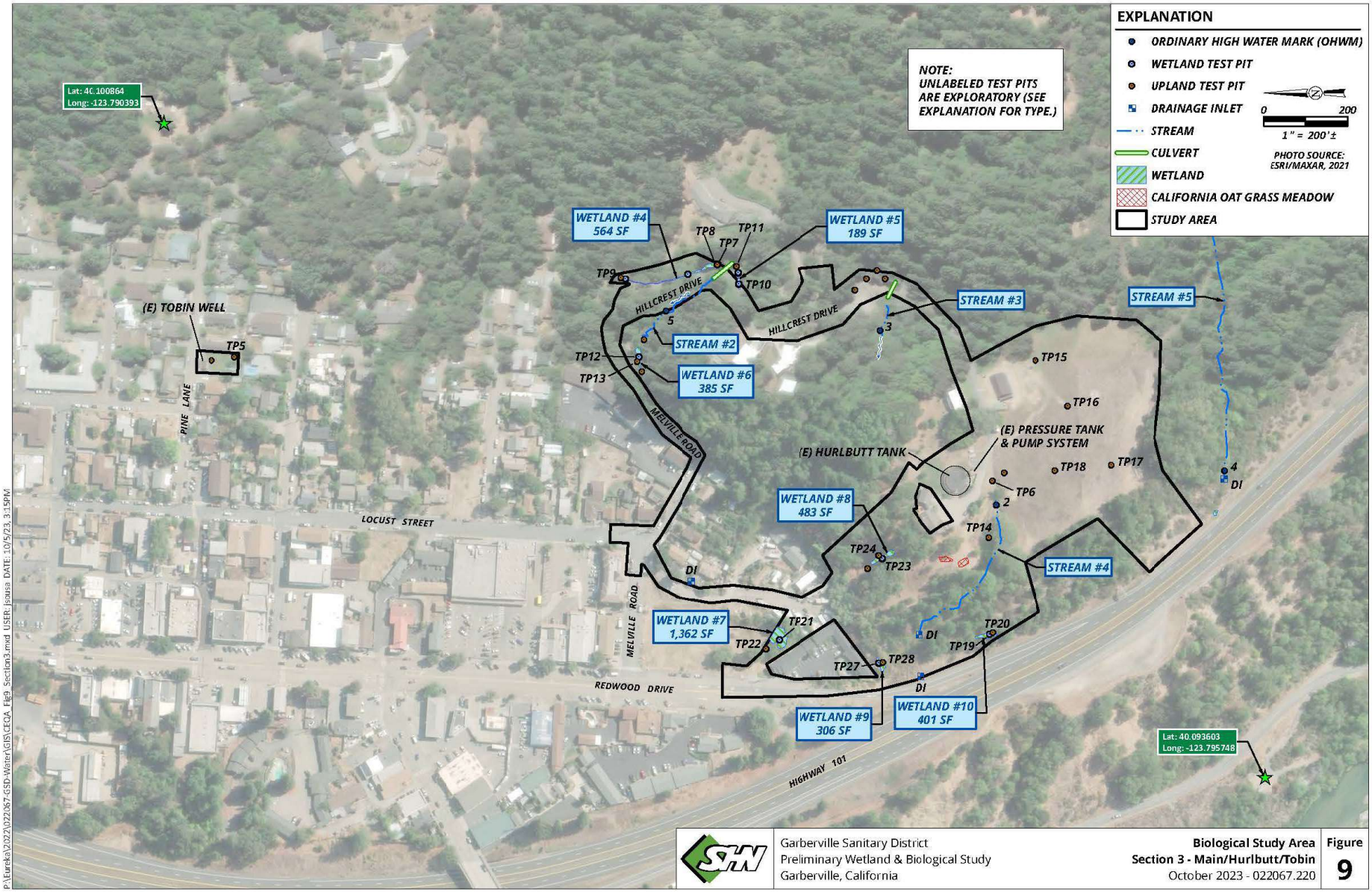
FOLLOW INSTRUCTIONS ON BMP FACT SHEETS FOR INSTALLATION AND MAINTENANCE.

0 100
1"=100'

Garberville Sanitary District
SWPPP
Garberville, California

Alderpoint Road Water Main
February 2024 - 022067

Figure 8

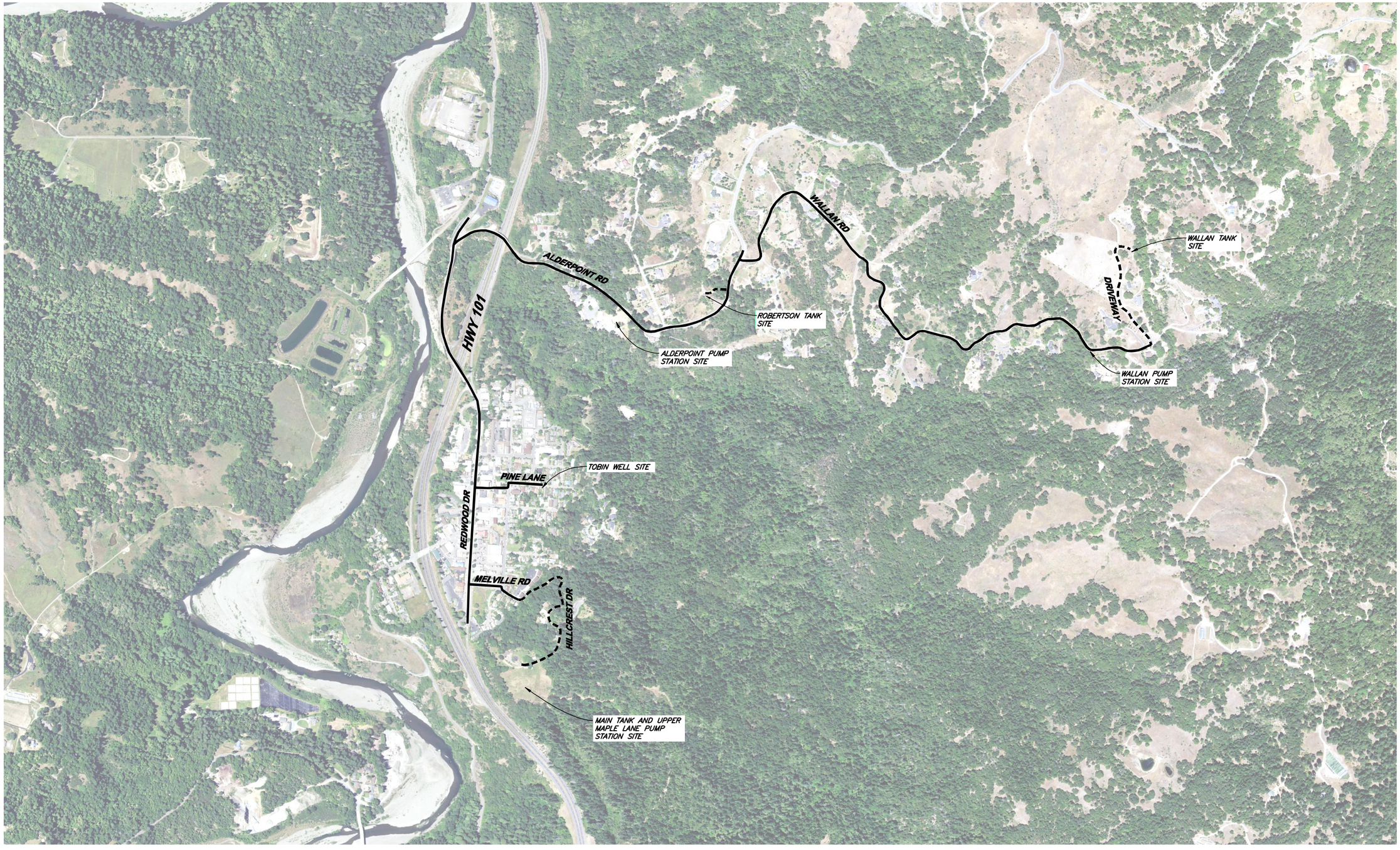


Garberville Sanitary District
Preliminary Wetland & Biological Study
Garberville, California

Biological Study Area
Section 3 - Main/Hurlbutt/Tobin
October 2023 - 022067.220

Figure 9

P:\Eureka\2022\022067-GSD-Water\GIS\CEQA Fig9 Section3.mxd USER: jsousa DATE: 10/5/23, 3:15PM



LEGEND

STREET

DRIVEWAY

1"=500'

90% DESIGN

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

812 W. WABASH AVE.
EUREKA, CA. 95501
WWW.SHN-ENGR.COM
707-441-8855

NO.	DATE	REVISION	BY

DSGN JSO
DR CDN/JWF
CHK PEG
APVD

CARBERVILLE SANITARY DISTRICT
ROBERTSON/WALLAN/HURLBUTT TANKS REPLACEMENT
GARBERVILLE, CALIFORNIA

SITE ACCESS PLAN

SHEET G5.0

SEQ

DATE 01/2024

PROJ. NO. 022067

SAVED: 1/24/2024 10:07 AM JFOSTER, PLOTTED: 2/1/2024 8:18 AM JOHN FOSTER
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Appendix B: Permit Registration Documents

Permit Registration Documents included in this Appendix:

Location in SWPPP	Permit Registration Document (in addition to a copy of the SWPPP)
	Notice of Intent
	Risk Level Determination
	Certification
	Post-Construction Requirements, if applicable
	Post-Construction Water Balance Calculator, if applicable
	Copy of Annual Fee Receipt
	ATS Design Documents, if applicable
	Passive Treatment Design Documents, if applicable
	Site Maps and Drawings, see Appendix A

	A	B	C
1	**Sediment Risk Factor Worksheet**		**Entry**
2	**A) R Factor**		
3	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-min 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. Refer to the link below to determine the R factor for the project site.		
4	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
5	**R Factor Value**		154.69
6	**B) K Factor (weighted average, by area, for all site soils)**		
7	The soil-erodibility factor K 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. Use Site-specific data must be submitted.		
8	Site-specific K factor guidance		
9	**K Factor Value**		0.28
10	**C) LS Factor (weighted average, by area, for all slopes)**		
11	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. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.		
12	LS Table		
13	**LS Factor Value**		0.96
14			
15	**Watershed Erosion Estimate (=RxKxLS) in tons/acre**		41.580672
16	**Site Sediment Risk Factor**		**Medium**
17	Low Sediment Risk: < 15 tons/acre		
18	Medium Sediment Risk: >=15 and <75 tons/acre		
19	High Sediment Risk: >= 75 tons/acre		
20			

Receiving Water (RW) Risk Factor Worksheet	Entry	Score
A. Watershed Characteristics	**yes/no**	
A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed waterbody impaired by sediment** (For help with impaired waterbodies please visit the link below) or has a **USEPA approved TMDL implementation plan for sediment**?: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml **OR** A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? (For help please review the appropriate Regional Board Basin Plan) http://www.waterboards.ca.gov/waterboards_map.shtml	**yes**	**High**
Region 1 Basin Plan Region 2 Basin Plan Region 3 Basin Plan Region 4 Basin Plan Region 5 Basin Plan Region 6 Basin Plan Region 7 Basin Plan Region 8 Basin Plan Region 9 Basin Plan		

Combined Risk Level Matrix

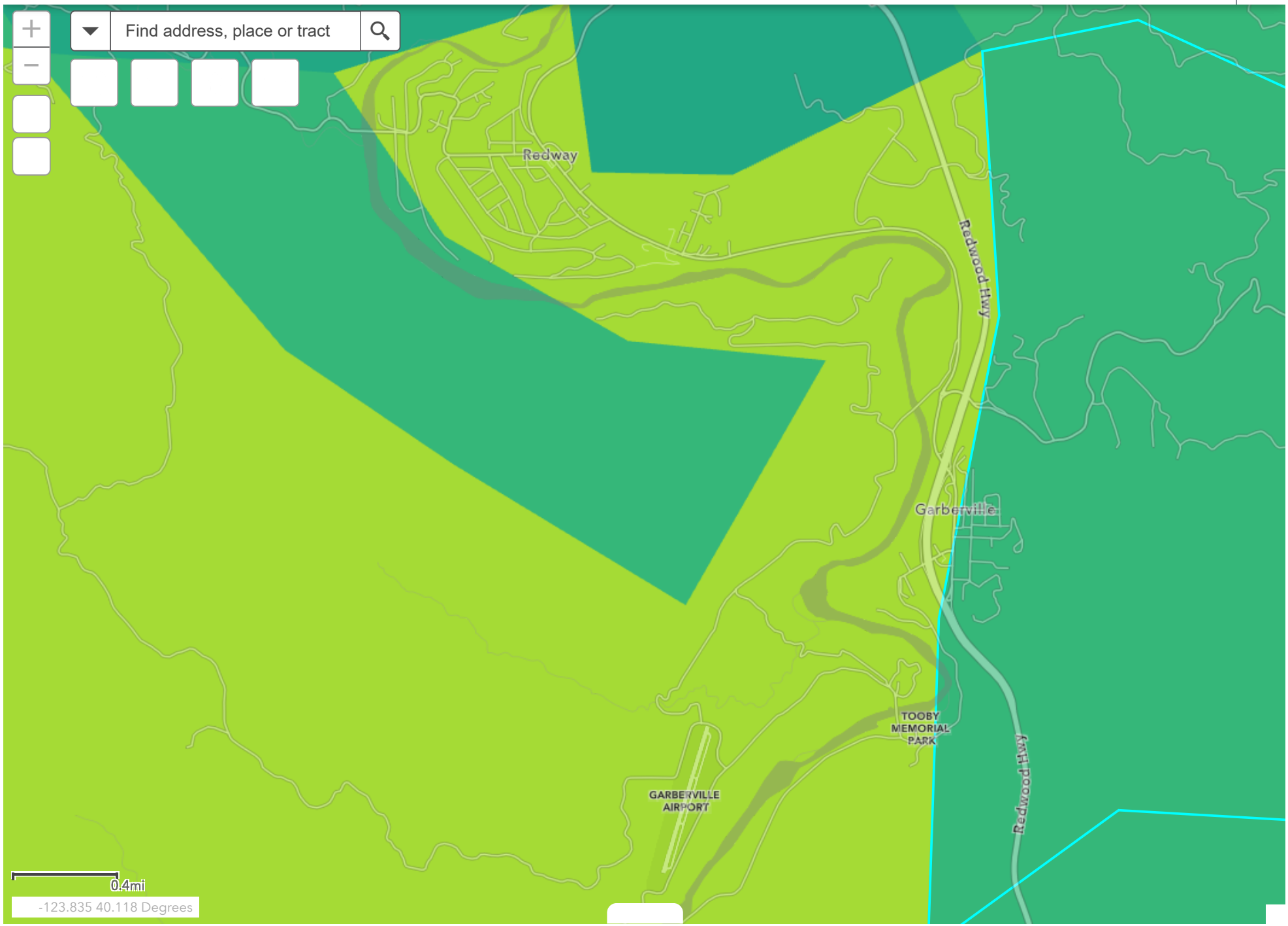
Receiving Water Risk	Sediment Risk: Low	Sediment Risk: Medium	Sediment Risk: High
Low	Level 1	Level 2	
High	Level 2		Level 3

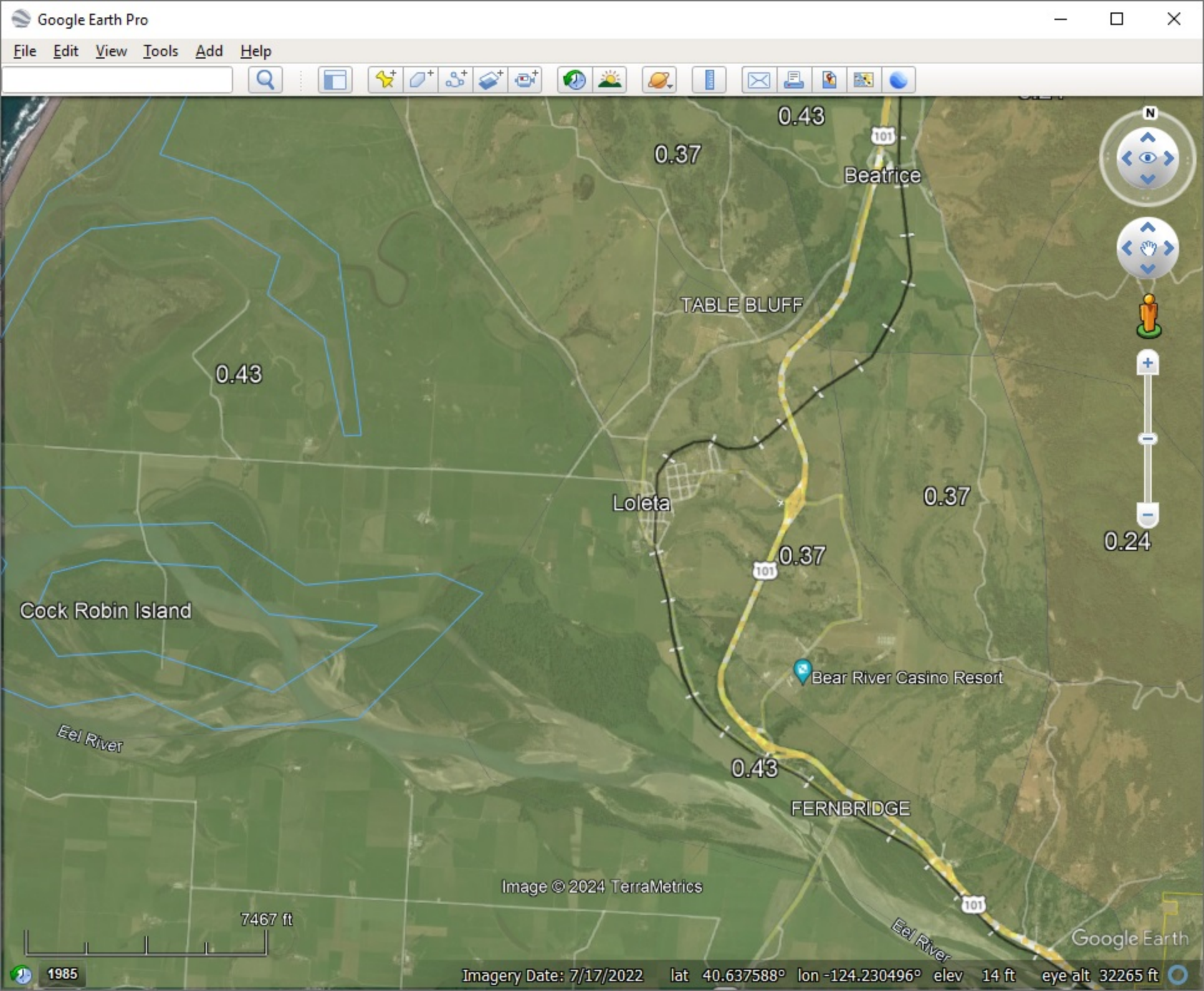
Project Sediment Risk: Medium

Project RW Risk: High

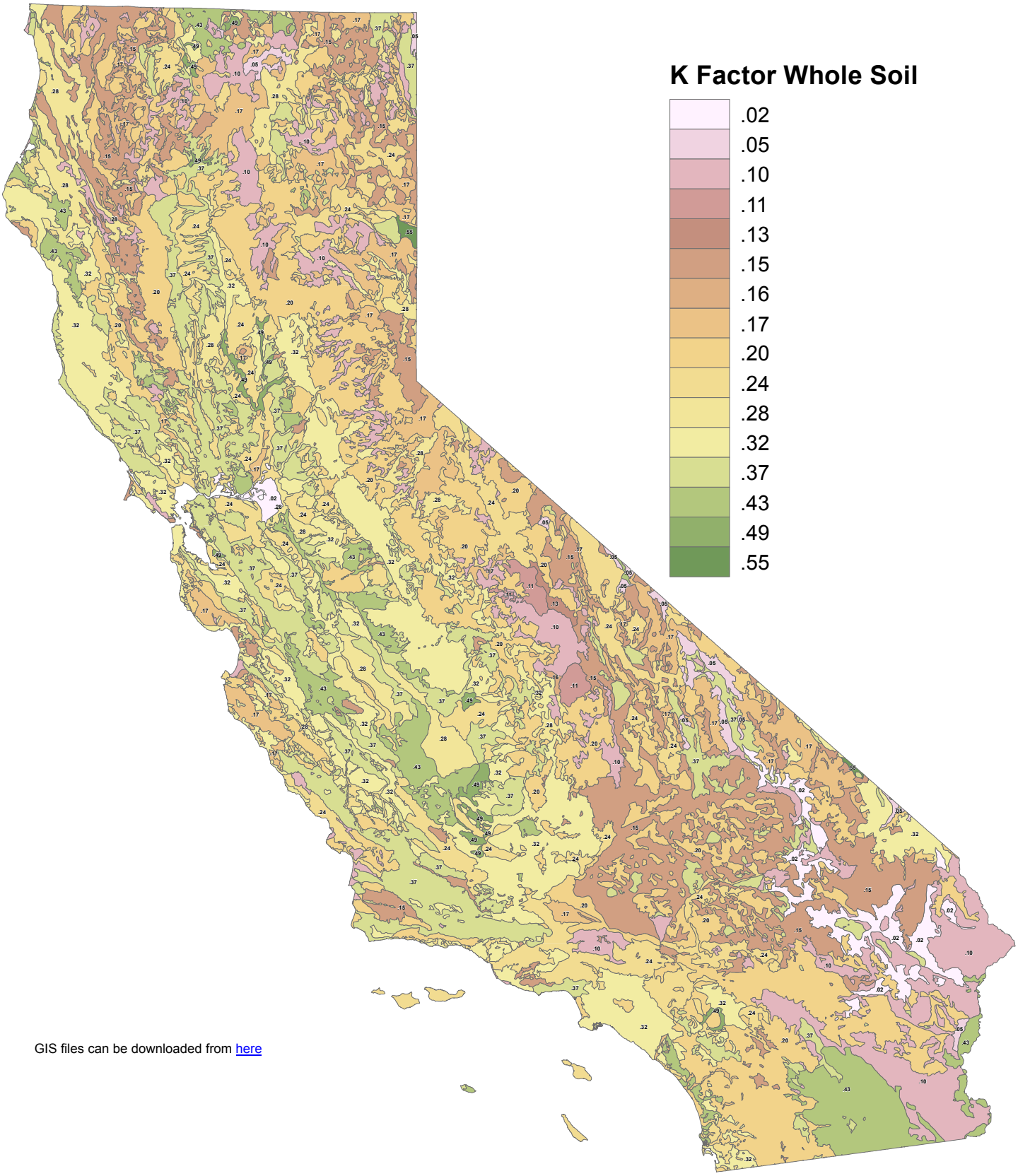
Project Combined Risk: Level 2

2022 Construction Stormwater General Permit Soil Erodibility (K) Factor Map Tool




Google Earth Pro
File
Edit
View
Tools
Add
Help
0.43
0.37
Beatrice
101
TABLE BLUFF
0.43
Loleta
0.37
0.37
0.24
Cock Robin Island
Bear River Casino Resort
Eel River
0.43
FERNBRIDGE
Image © 2024 TerraMetrics
7467 ft
Eel River
Google Earth
1985
Imagery Date: 7/17/2022 lat 40.637588° lon -124.230496° elev 14 ft eye alt 32265 ft

RUSLE K Values



GIS files can be downloaded from here

Water Boards

Data Source: *Natural Resources Conservation Service, U.S. Dept. of Agriculture and State Water Resources Control Board*

RUSLE K Factor Watershed Map Methodology

Objective:
To provide guidance for determining the Revised Universal Soil Loss Equation (RUSLE) K Factor with regards to the Construction General Permit. The K factor represents the combination of detachability of the soil, runoff potential of the soil, and the transportability of the sediment eroded from the soil. Using the methodology, a discharger will be able to identify the appropriate, areally-weighted K Factor value for a construction project.

Background:
The soil-erodibility factor (K) represents: (1) the susceptibility of soil or surface material to erosion, (2) the 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, although 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 runoff rates and large runoff volumes. For more information on the Construction General Permit and references for the RUSLE, please visit:
http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml

Data and Method:
Soil data was acquired from the Natural Resources Conservation Service (NRCS) and was used in conjunction with an NRCS Microsoft Access template and the NRCS Soil Data Viewer. The Microsoft Access template was used in conjunction with the data received from the Soil Data Mart to produce the background data needed to create the K Factor values (for whole soil) in ArcMap.

- The California subset of the U.S. General Soils Map dataset can be downloaded from: http://soildatamart.nrcs.usda.gov/Default.aspx
- The Microsoft Access template needed to produce K Factor values can be downloaded from: http://soildatamart.nrcs.usda.gov/Templates.aspx
- The GIS extension “Soil Data Viewer” used in creating this data can be downloaded from: http://soils.usda.gov/sdv/download.html

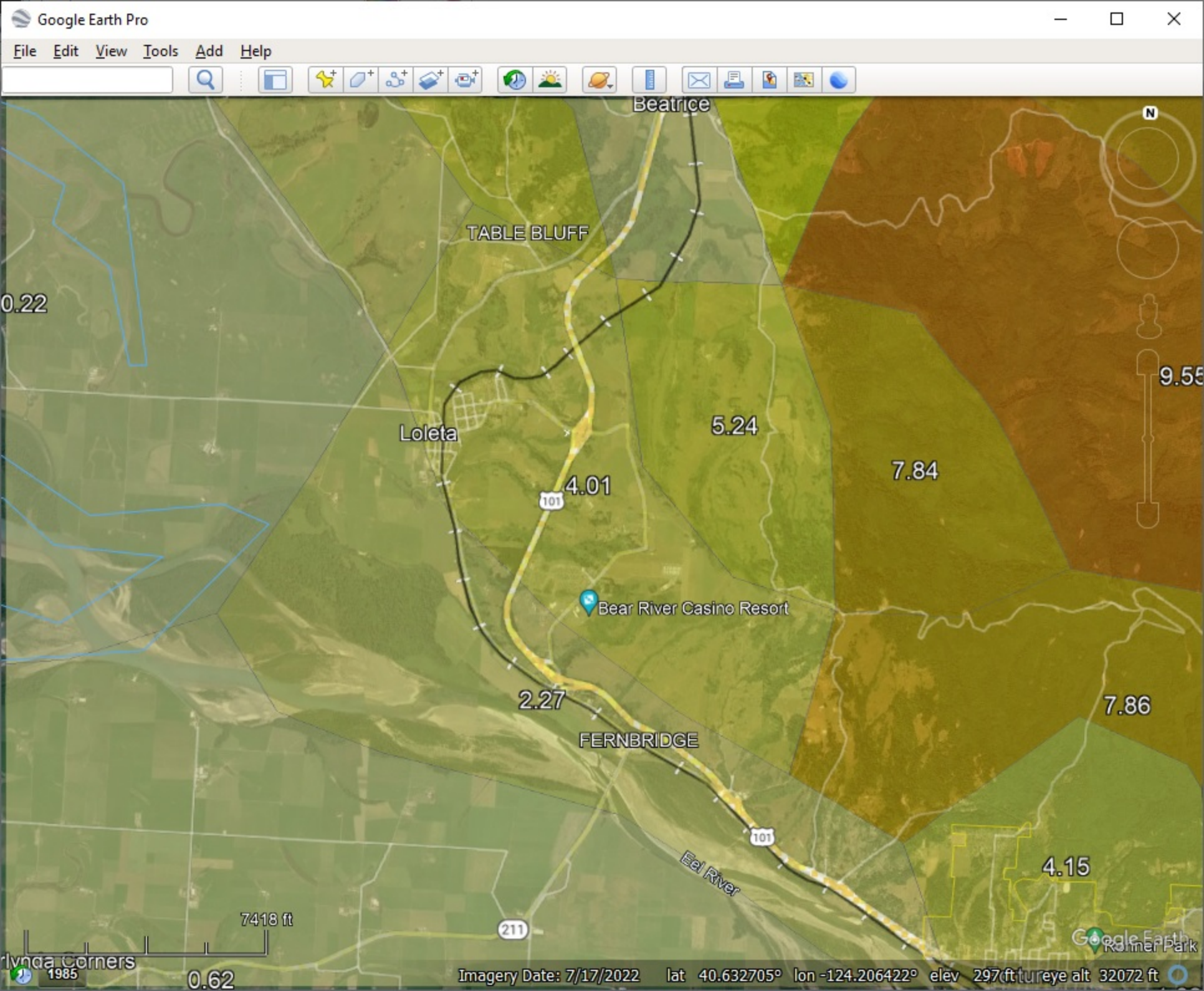
For a complete list of NRCS soil survey data and methods please visit:

- http://soildatamart.nrcs.usda.gov/SSURGOMetadata.aspx

Contact:
Please contact the Storm Water help desk with any questions or comments:

- Phone: 916-341-5537
- Email: stormwater@waterboards.ca.gov

Geographic Information System (GIS) Data can be accessed here:
https://ftp.waterboards.ca.gov/?u=GIS_Shared&p=GIS_Download&path=/swrcb/dwq/cgp/Risk/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File Edit View Tools Add Help
Beatrice
TABLE BLUFF
0.22
Loleta
5.24
4.01
101
7.84
9.55
Bear River Casino Resort
2.27
FERNBRIDGE
7.86
101
Eel River
4.15
7418 ft
211
Google Earth
Ramer Park
lynda corners
1985
0.62
Imagery Date: 7/17/2022 lat 40.632705° lon -124.206422° elev 297 ft eye alt 32072 ft

GSD Main Tank LS

552' long; 720' elevation high; 704 elevation low
16'/552=0.0289; 2.89%; 3%

Rainfall Erosivity Factor Calculator for Small Construction Sites

EPA's stormwater regulations allow NPDES permitting authorities to waive NPDES permitting requirements for stormwater discharges from small construction sites if:

- the construction site disturbs less than five acres, and
- the rainfall erosivity factor ("R" in the revised universal soil loss equation, or RUSLE) value is less than five during the period of construction activity.

If your small construction project is located in an area where EPA is the permitting authority and your R factor is less than five, you qualify for a low erosivity waiver (LEW) from NPDES stormwater permitting. If your small construction project does not qualify for a waiver, then NPDES stormwater permit coverage is required. Follow the steps below to calculate your R-Factor.

LEW certifications are submitted through the NPDES eReporting Tool or "CGP-NeT". Several states that are authorized to implement the NPDES permitting program also accept LEWs. Check with your state NPDES permitting authority for more information.

- Submit your LEW through EPA's eReporting Tool
- List of states, Indian country, and territories where EPA is the permitting authority (pdf)
- Construction Rainfall Erosivity Waiver Fact Sheet
- Small Construction Waivers and Instructions (pdf)

The R-factor calculation can also be integrated directly into custom applications using the R-Factor web service.

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

Select the estimated start and end dates of construction by clicking the boxes and using the dropdown calendar.

The period of construction activity begins at initial earth disturbance and ends with final stabilization.

Start Date: 04/02/2026

End Date: 10/02/2026

Locate your small construction project using the search box below or by clicking on the map.

Location: -123.79337222245115 , 40.094487361445076 **Search**

+

−

Click the "Calculate R Factor" button below to calculate an R Factor for your small construction project.

Calculate R Factor

Facility Information

Start Date: 04/02/2026	**Latitude:** 40.0945
End Date: 10/02/2026	**Longitude:** -123.7934

Calculation Results

Rainfall erosivity factor (R Factor) = **13.69**

A rainfall erosivity factor of 5.0 or greater has been calculated for your site's period of construction.

You do NOT qualify for a waiver from NPDES permitting requirements and must seek Construction General Permit (CGP) coverage. If you are located in an area where EPA is the permitting authority (pdf), you must submit a Notice of Intent (NOI) through the NPDES eReporting Tool (NeT).Otherwise, you must seek coverage under your state's CGP.

Rainfall Erosivity Factor Calculator for Small Construction Sites

EPA's stormwater regulations allow NPDES permitting authorities to waive NPDES permitting requirements for stormwater discharges from small construction sites if:

- the construction site disturbs less than five acres, and
- the rainfall erosivity factor ("R" in the revised universal soil loss equation, or RUSLE) value is less than five during the period of construction activity.

If your small construction project is located in an area where EPA is the permitting authority and your R factor is less than five, you qualify for a low erosivity waiver (LEW) from NPDES stormwater permitting. If your small construction project does not qualify for a waiver, then NPDES stormwater permit coverage is required. Follow the steps below to calculate your R-Factor.

LEW certifications are submitted through the NPDES eReporting Tool or "CGP-NeT". Several states that are authorized to implement the NPDES permitting program also accept LEWs. Check with your state NPDES permitting authority for more information.

- Submit your LEW through EPA's eReporting Tool
- List of states, Indian country, and territories where EPA is the permitting authority (pdf)
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- Small Construction Waivers and Instructions (pdf)

The R-factor calculation can also be integrated directly into custom applications using the R-Factor web service.

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

Select the estimated start and end dates of construction by clicking the boxes and using the dropdown calendar.

The period of construction activity begins at initial earth disturbance and ends with final stabilization.

Start Date: 04/01/2025

End Date: 04/01/2026

Locate your small construction project using the search box below or by clicking on the map.

Location: -123.79337222245115 , 40.094487361445076 **Search**

+

−

Click the "Calculate R Factor" button below to calculate an R Factor for your small construction project.

Calculate R Factor

Facility Information

Start Date: 04/01/2025	**Latitude:** 40.0945
End Date: 04/01/2026	**Longitude:** -123.7934

Calculation Results

Rainfall erosivity factor (R Factor) = **141**

A rainfall erosivity factor of 5.0 or greater has been calculated for your site's period of construction.

You do NOT qualify for a waiver from NPDES permitting requirements and must seek Construction General Permit (CGP) coverage. If you are located in an area where EPA is the permitting authority (pdf), you must submit a Notice of Intent (NOI) through the NPDES eReporting Tool (NeT).Otherwise, you must seek coverage under your state's CGP.

Appendix C: SWPPP Amendment QSD Certifications

SWPPP Amendment No. _____

Project Name: **Garberville Sanitary District Water System Improvements**

Project Number: _____

Qualified SWPPP Developer's Certification of the Stormwater Pollution Prevention Plan Amendment

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

QSD's Signature	Date
QSD Name	QSD Certificate Number
Title and Affiliation	Telephone
Address	Email

Appendix D: Submitted Changes of Information

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 Change of Information (COI)	Timeline for Filing COI
Reduction or increase in total disturbed area	Within 30 days of the reduction or increase
Updating site specific best management practices (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 Legally Responsible Person or Duly Authorized Representative	Date
Name of Legally Responsible Person or Duly Authorized Representative	Telephone Number

Appendix E: Construction Schedule

Tentative Construction Schedule

Everything at the main tank site is anticipated for 2026 construction.
This includes :

- Main tank site work & tank and service road construction
- Installation of all piping between the main tank, Redwood Dr tie in, and Hillcrest Rd tie in
- Demolition of Existing Hurlbutt tank and site
- Reestablishment of the service connections nearby
- Site restoration for all of the above

Anticipated for 2025 construction:

- Robertson Tank Demolition and site restoration
- Alderpoint Pump Station demolition and new construction
- Installation of piping along Alderpoint Rd.
- Wallan tank replacement, site work and pump station upgrades

The Tobin Well Improvements are being considered as an additive alternate and could take place in 2025 or 2026 contingent on funding source and what's available.

Appendix F: Construction Activities, Materials Used, and Associated Pollutants

The following is a list of construction activities that may be performed at the project site that may have the potential to contribute sediment to stormwater discharges:

- Equipment staging and parking
- Debris loading and transporting offsite
- Clearing and grubbing operations
- Grading operations
- Concrete operations
- Excavation operations
- Landscape operations
- Equipment tire tracking

The following is a list of construction materials that may be encountered within the project area, and construction activities that may be performed, that have the potential to contribute pollutants other than sediment to stormwater runoff:

- Vehicle fluids, including oil, grease, petroleum, and coolants
- Delivery and storage of construction materials
- Hazardous/non-hazardous materials
- General construction materials
- Concrete/mortar, grout, and other concrete-related mixes
- Landscape materials
- Equipment maintenance

Sample Collection, Preservation, and Analysis for Monitoring Non-Visible Pollutants

Constituent	Analytical Method	Minimum Sample Volume	Sample Containers	Sample Preservation	Minimum Level	Method Detection Limit	Maximum Holding Time
COD[a]	SM 5220 D	20 ml[b]	250 ml plastic	H_2SO_4[c]			28 days
VOCs[d]	EPA 624	40 ml	40 ml VOA[e]	HCl[f]			14 days
SVOCs[g]	EPA 625	1 L[h]	1 L amber glass	$NA_2S_2O_3$[i]			7 days
Phenols	EPA 420.1	200 ml	500 ml amber glass	H_2SO_4			28 days
BOD[j]	SM 5210B	300 ml	1 L plastic	4°C[k]			48 hours
TOC[l]	SM 5310 C	40 ml	40 ml VOA	H_3PO_4[m]			28 days
TKN[n]	SM4500-NoB	300 ml	1 L plastic	H_2SO_4			28 days
NO_3[o]	EPA 300.0	20 ml	250 ml plastic	None			2 days
Sulfate	EPA 300.0	20 ml	250 ml plastic	None			28 days
Phosphate	EPA 300.0	20 ml	250 ml plastic	None			48 hours
Potassium	EPA 6010B	200 ml	500 ml plastic	HNO_3[p]			180 days
Metals	EPA 6010B/1640/200.8	100 ml	250 ml plastic	HNO_3			180 days
Residual Chlorine	SM 4500- CL G	20 ml	250 ml plastic	None			0 days
QSP will coordinate with laboratory regarding confirmation of the minimum sample volumes, type of sample containers, preservation requirements, reporting limits, and maximum hold times during bottle order request process							

a. COD: chemical oxygen demand
b. ml: milliliters
c. H_2SO_4: sulfuric acid
d. VOCs: volatile organic compounds
e. VOA: volatile organic analysis (container)
f. HCl: hydrochloric acid
g. SVOCs: semi-volatile organic compounds
h. L: liters
i. $NA_2S_2O_3$: sodium thiosulphate
j. BOD: biological oxygen demand
k. °C: degrees Celsius
l. TOC: total organic carbon
m. H_3PO_4: phosphoric acid
n. TKN: total Kjeldahl nitrogen
o. NO_3: nitrate
p. HNO_3: nitric acid

Table F. Pollutant Source Assessment Form -Construction Activities and Associated Pollutants

Phase	Activity	Associated Materials or Pollutants	Pollutant Category[a]
Through-out Project	Vehicle and Equipment Use	Equipment operation, maintenance and fuleing	Oil and Grease
	Solid Waste	Litter, trash, debris	Gross Pollutants
	Sanitary Waste	Portable toilets	Nutrients, Bacteria and Viruses
	Liquid Waste	Wash waters	Metals, Synthetic Organics
Grading and Land Development	Building Demolition	Concrete, masonary, framing, roofing, and metal structures	Metals, Oil & Grease, Synthetic Organincs
	Grading	Sediment	Sediment
Streets and Utilities Phase	Sanitary Waste	Connection to existing sewer lines	Nutrients, Bacteria and Viruses
	Concrete/Masonry	Cement and brick dust, colored chalks, concrete curing compounds, glazing compounds, surface cleaners, saw cut slurries, and tile cutting	Metals, Synthetic Organics
	Utility line testing and flushing	Hydrostatic test water and pipe flushing	Synthetic organics
Vertical Construction Phase	Concrete Work	Cement and brick dust, colored chalks, concrete curing compounds, glazing compounds, surface cleaners, saw cut slurries, and tile cutting	Gross Pollutants
	Painting	Paint, thinners, acetone, stripper paints, lacquers, varnishes	Metals, Synthetic Organics
	Adhesives	Adhesives, glues, resins, epoxy, PVC cemnet, caulks	Oil and Grease, Synthetic Organics
	Sealants	Sealants	Synthetic Organics
	Cleaners	Polishes, etching agents, ammonia, lye, caustic sodas, bleaching agents	Metals, synthetic organics

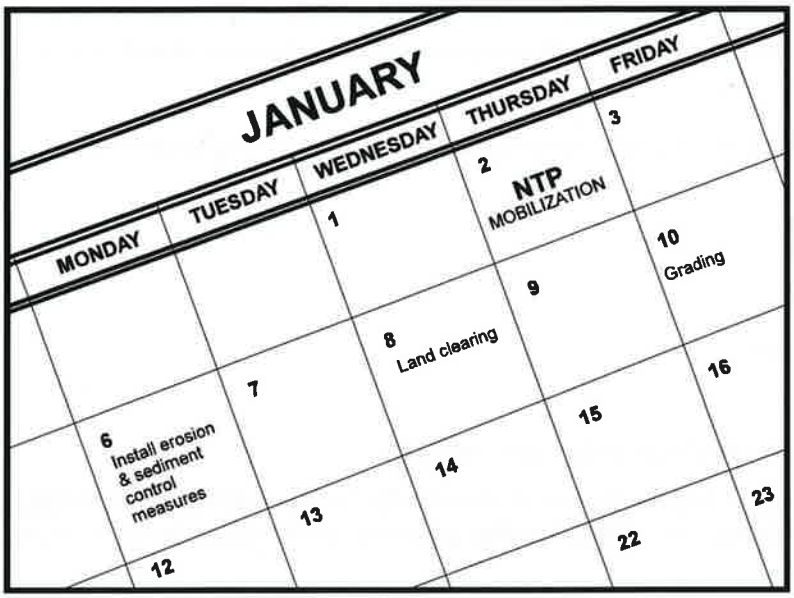
Table F. Pollutant Source Assessment Form -Construction Activities and Associated Pollutants

Phase	Activity	Associated Materials or Pollutants	Pollutant Category[a]
	Framing/Carpentry	Sawdust, particle board dust, and treated woods, and saw cut slurries	**Metals, synthetic organics**
	Roofing	Flashing, saw cut slurries (tile cutting) and shingle scrap and debris	Metals, Oil and Grease, Synthetic Organics
	Painting	Paint thinners, acetone, methyl ethyl ketone, stripper paints, lacquers, varnish, enamels, turpentine, gum spirit, solvents, dyes, stripping pigments and sanding	**Metals, Synthetic Organics**
	Plumbing	Solder (lead, tin), flux (zinc chloride), pipe fitting, and galvanized metal in nails, fences, and electric wiring	**Metals, Synthetic Organics**
Landscaping and Site Stabilization Phase	Landscaping/ Planting / Vegetation Management	Fertilizers, Vegetation control, herbicides, pesticides, planting and plant maintenance	**Nutrients**
	Soil preparation and amendments	Use of soil additives and amendments	**Nutrients**

[a] Categories per CASQA BMP Handbook (that is, Sediment, Nutrients, Bacteria and Viruses, Oil and Grease, Metals, Synthetic Organics, Pesticides, Gross Pollutants, and Vector Production)

Appendix G: CASQA Stormwater BMP Handbook: Construction Fact Sheets

Scheduling EC-1



Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Description and Purpose

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

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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

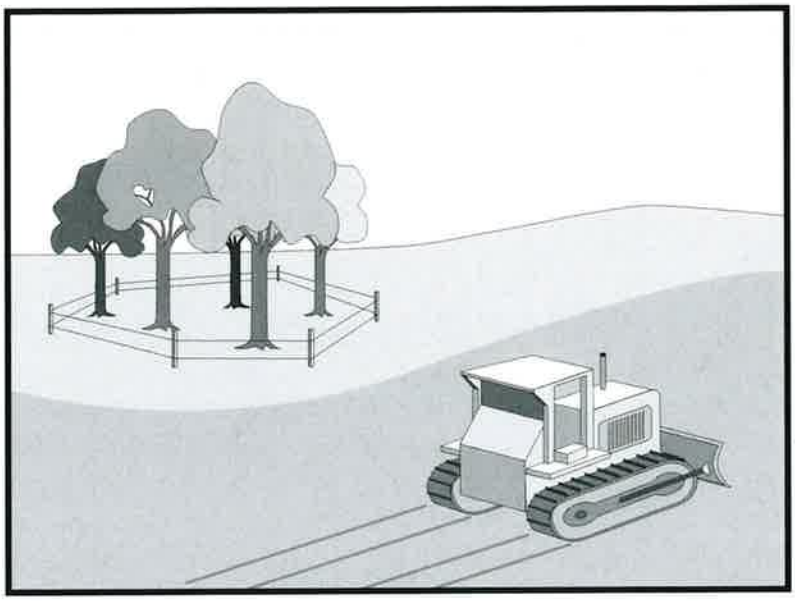
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

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

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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.

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.

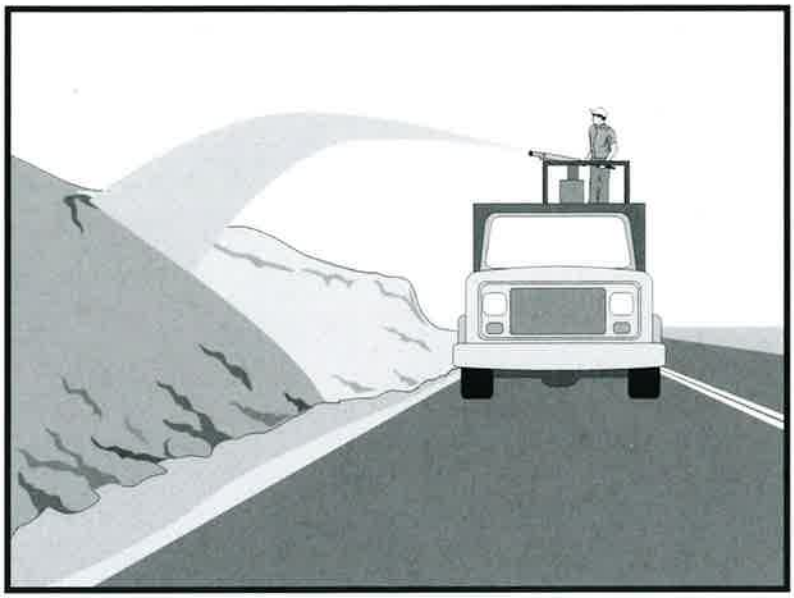
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

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.

Straw Mulch

EC-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 Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-5 Soil Binders

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

EC-14 Compost Blanket

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Description and Purpose

Straw mulch consists of placing a uniform layer of straw and incorporating it into the soil with a studded roller or crimper or anchoring it with a tackifier or stabilizing emulsion. Straw mulch protects the soil surface from the impact of rain drops, preventing soil particles from becoming dislodged.

Suitable Applications

Straw mulch is suitable for disturbed areas requiring temporary protection until permanent stabilization is established. Straw mulch can be specified for the following applications:

- As a stand-alone BMP on disturbed areas until soils can be prepared for permanent vegetation. The longevity of straw mulch is typically less than six months.
- Applied in combination with temporary seeding strategies
- Applied in combination with permanent seeding strategies to enhance plant establishment and final soil stabilization
- Applied around containerized plantings to control erosion until the plants become established to provide permanent stabilization

Limitations

Availability of straw and straw blowing equipment may be limited just prior to the rainy season and prior to storms due to high demand.

- There is a potential for introduction of weed seed and unwanted plant material if weed-free agricultural straw is not specified.
- Straw mulch applied by hand is more time intensive and potentially costly.
- Wind may limit application of straw and blow straw into undesired locations.
- May have to be removed prior to permanent seeding or prior to further earthwork.
- "Punching" of straw does not work in sandy soils, necessitating the use of tackifiers.
- Potential fugitive dust control issues associated with straw applications can occur. Application of a stabilizing emulsion or a water stream at the same time straw is being blown can reduce this problem.
- Use of plastic netting should be avoided in areas where wildlife may be entrapped and may be prohibited for projects in certain areas with sensitive wildlife species, especially reptiles and amphibians.

Implementation

- Straw should be derived from weed-free wheat, rice, or barley. Where required by the plans, specifications, permits, or environmental documents, native grass straw should be used.
- Use tackifier to anchor straw mulch to the soil on slopes.
- Crimping, punch roller-type rollers, or track walking may also be used to incorporate straw mulch into the soil on slopes. Track walking can be used where other methods are impractical.
- Avoid placing straw onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.
- Straw mulch with tackifier should not be applied during or immediately before rainfall.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Application Procedures

- When using a tackifier to anchor the straw mulch, roughen embankment or fill areas by rolling with a crimping or punching-type roller or by track walking before placing the straw mulch. Track walking should only be used where rolling is impractical.
- Apply straw at a rate of between 3,000 and 4,000 lb./acre, either by machine or by hand distribution and provide 100% ground cover. A lighter application is used for flat surfaces and a heavier application is used for slopes.
- Evenly distribute straw mulch on the soil surface.
- Anchoring straw mulch to the soil surface by "punching" it into the soil mechanically (incorporating) can be used in lieu of a tackifier.

- Methods for holding the straw mulch in place depend upon the slope steepness, accessibility, soil conditions, and longevity.
  - A tackifier acts to glue the straw fibers together and to the soil surface. The tackifier should be selected based on longevity and ability to hold the fibers in place. A tackifier is typically applied at a rate of 125 lb./acre. In windy conditions, the rates are typically 180 lb./acre.
  - On very small areas, a spade or shovel can be used to punch in straw mulch.
  - On slopes with soils that are stable enough and of sufficient gradient to safely support construction equipment without contributing to compaction and instability problems, straw can be "punched" into the ground using a knife blade roller or a straight bladed coulter, known commercially as a "crimper."

Costs

Average annual cost for installation and maintenance is included in the table below. Application by hand is more time intensive and potentially more costly.

BMP	Unit Cost per Acre
Straw mulch, crimped or punched	$3,150-$6,900
Straw mulch with tackifier	$2,300-$6,200

Source: Cost information received from individual product suppliers 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.
- The key consideration in inspection and maintenance is that the straw needs to last long enough to achieve erosion control objectives. Straw mulch as a stand-alone BMP is temporary and is not suited for long-term erosion control.
- Maintain an unbroken, temporary mulched ground cover while disturbed soil areas are inactive. Repair any damaged ground cover and re-mulch exposed areas.
- Reapplication of straw mulch and tackifier may be required to maintain effective soil stabilization over disturbed areas and slopes.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

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

Controlling Erosion of Construction Sites, Agricultural Information Bulletin #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.

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

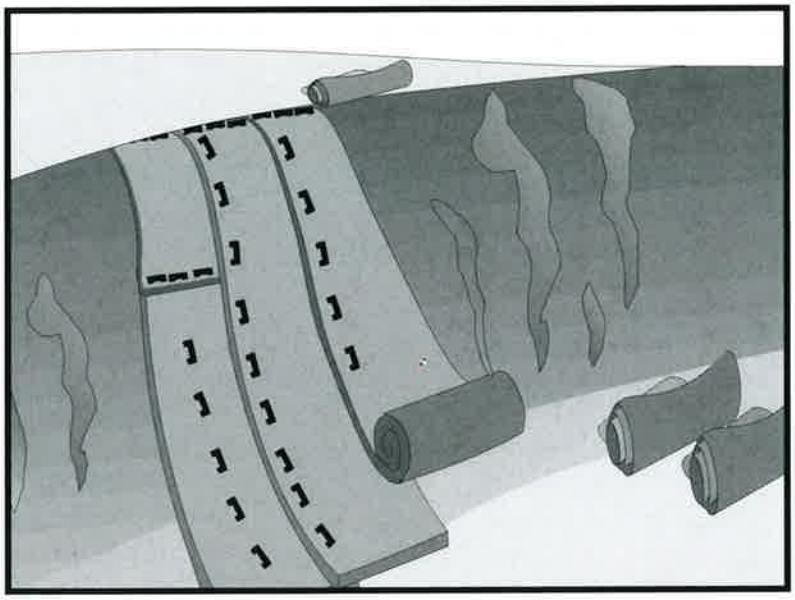
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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.

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

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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.

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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.

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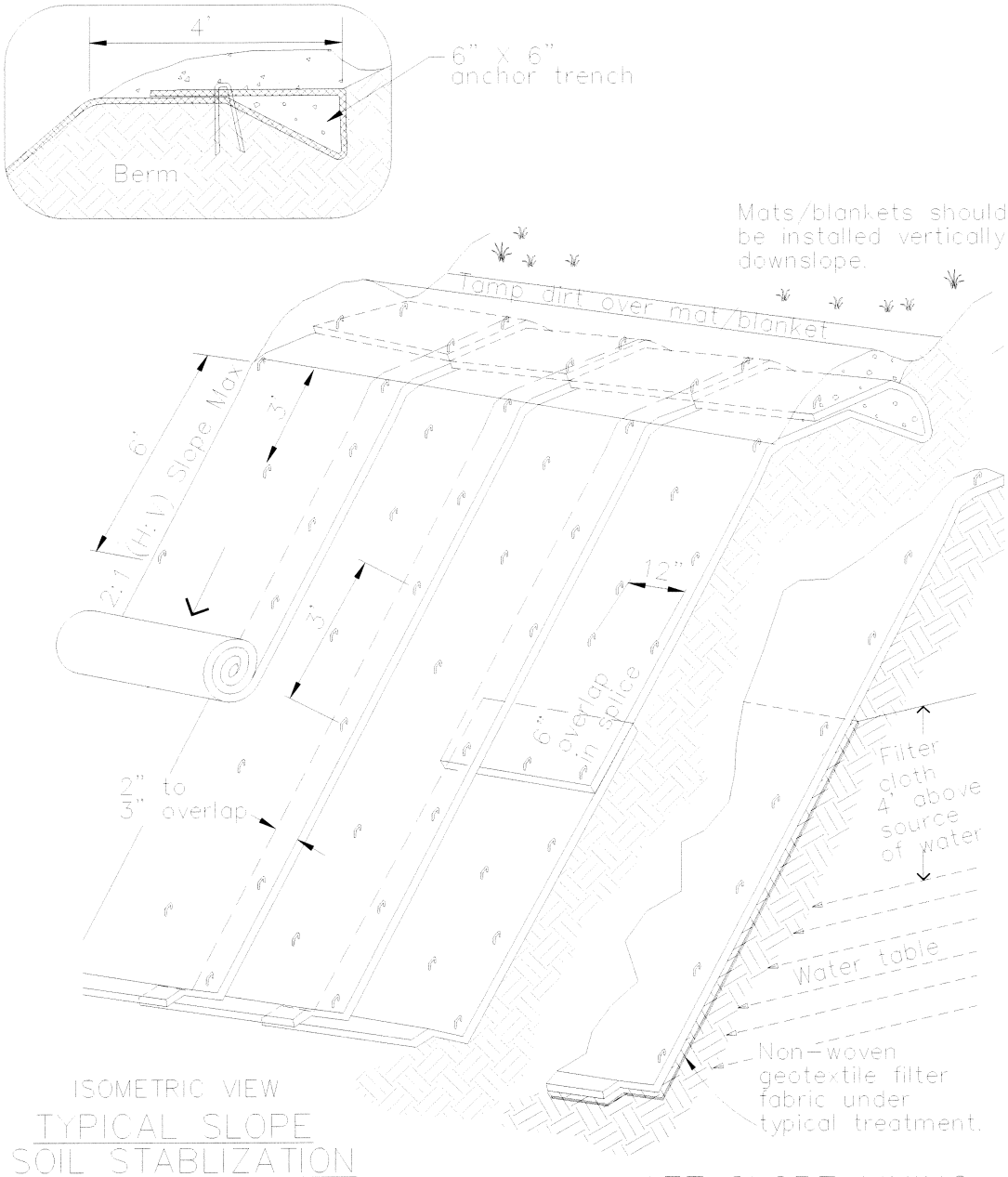


ISOMETRIC VIEW

TYPICAL SLOPE SOIL STABLIZATION

NTS

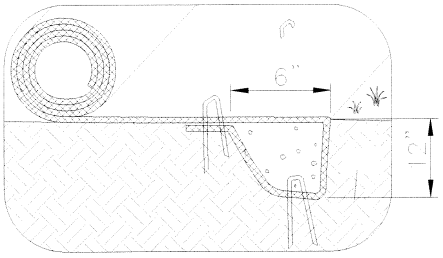
WET SLOPE LINING

NTS

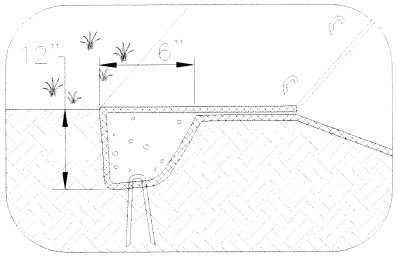
NOTES:

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
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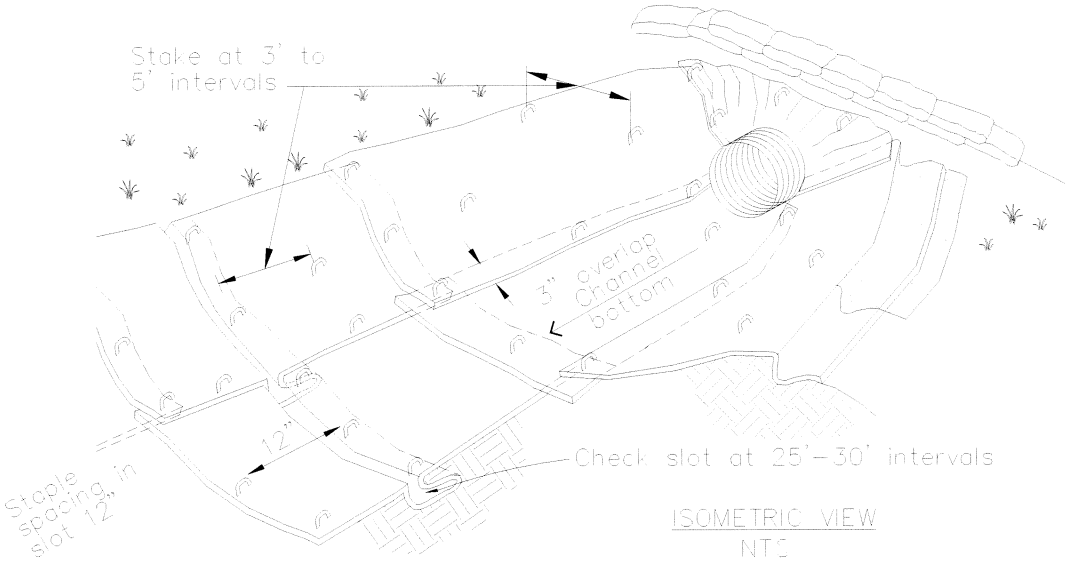

ISOMETRIC VIEW
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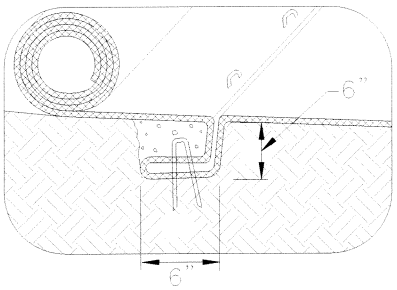
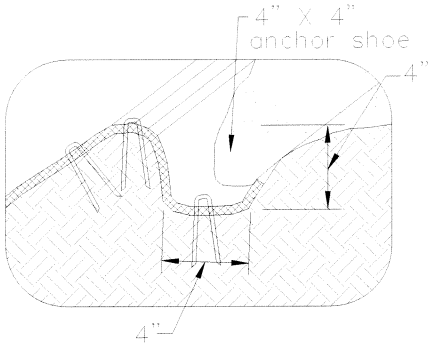


INTERMITTENT CHECK SLOT
NTS

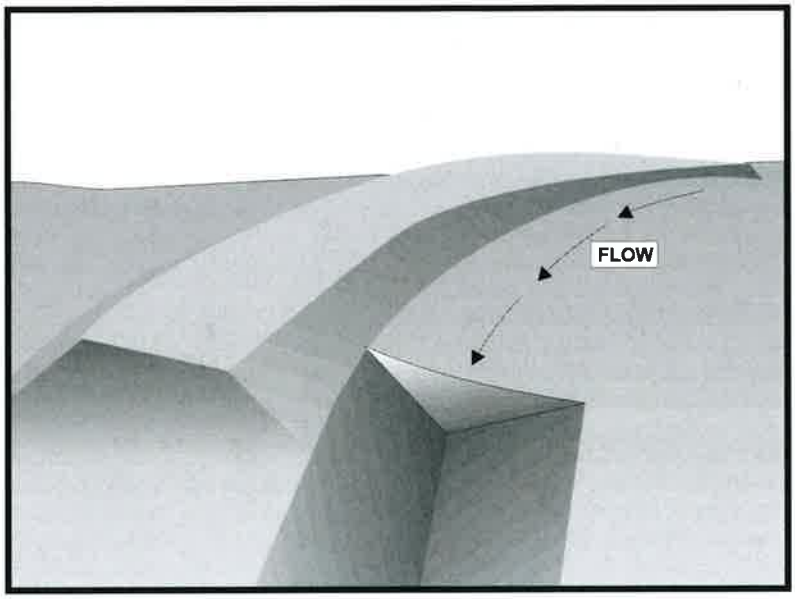


LONGITUDINAL ANCHOR TRENCH
NTS

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

Earth Dikes and Drainage Swales EC-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

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Description and Purpose

An earth dike is a temporary berm or ridge of compacted soil used to divert runoff or channel water to a desired location. A drainage swale is a shaped and sloped depression in the soil surface used to convey runoff to a desired location. Earth dikes and drainage swales are used to divert off site runoff around the construction site, divert runoff from stabilized areas and disturbed areas, and direct runoff into sediment basins or traps.

Suitable Applications

Earth dikes and drainage swales are suitable for use, individually or together, where runoff needs to be diverted from one area and conveyed to another.

- Earth dikes and drainage swales may be used:
  - To convey surface runoff down sloping land
  - To intercept and divert runoff to avoid sheet flow over sloped surfaces
  - To divert and direct runoff towards a stabilized watercourse, drainage pipe or channel
  - To intercept runoff from paved surfaces
  - To intercept and divert run-on
  - Below steep grades where runoff begins to concentrate

- Along roadways and facility improvements subject to flood drainage
- At the top of slopes to divert runon from adjacent or undisturbed slopes
- At bottom and mid slope locations to intercept sheet flow and convey concentrated flows
- Divert sediment laden runoff into sediment basins or traps

Limitations

Dikes should not be used for drainage areas greater than 10 acres or along slopes greater than 10 percent. For larger areas more permanent drainage structures should be built. All drainage structures should be built in compliance with local municipal requirements.

- Earth dikes may create more disturbed area on site and become barriers to construction equipment.
- Earth dikes must be stabilized immediately, which adds cost and maintenance concerns.
- Diverted stormwater may cause downstream flood damage.
- Dikes should not be constructed of soils that may be easily eroded.
- Regrading the site to remove the dike may add additional cost.
- Temporary drains and swales or any other diversion of runoff should not adversely impact upstream or downstream properties.
- Temporary drains and swales must conform to local floodplain management requirements.
- Earth dikes/drainage swales are not suitable as sediment trapping devices.
- It may be necessary to use other soil stabilization and sediment controls such as check dams, plastics, and blankets, to prevent scour and erosion in newly graded dikes, swales, and ditches.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in drainage swales.

Implementation

The temporary earth dike is a berm or ridge of compacted soil, located in such a manner as to divert stormwater to a sediment trapping device or a stabilized outlet, thereby reducing the potential for erosion and offsite sedimentation. Earth dikes can also be used to divert runoff from off site and from undisturbed areas away from disturbed areas and to divert sheet flows away from unprotected slopes.

An earth dike does not itself control erosion or remove sediment from runoff. A dike prevents erosion by directing runoff to an erosion control device such as a sediment trap or directing runoff away from an erodible area. Temporary diversion dikes should not adversely impact adjacent properties and must conform to local floodplain management regulations and should not be used in areas with slopes steeper than 10%.

Slopes that are formed during cut and fill operations should be protected from erosion by runoff. A combination of a temporary drainage swale and an earth dike at the top of a slope can divert runoff to a location where it can be brought to the bottom of the slope (see EC-11, Slope Drains). A combination dike and swale is easily constructed by a single pass of a bulldozer or grader and compacted by a second pass of the tracks or wheels over the ridge. Diversion structures should be installed when the site is initially graded and remain in place until post construction BMPs are installed and the slopes are stabilized.

Diversion practices concentrate surface runoff, increasing its velocity and erosive force. Thus, the flow out of the drain or swale must be directed onto a stabilized area or into a grade stabilization structure. If significant erosion will occur, a swale should be stabilized using vegetation, chemical treatment, rock rip-rap, matting, or other physical means of stabilization. Any drain or swale that conveys sediment laden runoff must be diverted into a sediment basin or trap before it is discharged from the site.

General

- Care must be applied to correctly size and locate earth dikes, drainage swales. Excessively steep, unlined dikes, and swales are subject to erosion and gully formation.
- Conveyances should be stabilized.
- Use a lined ditch for high flow velocities.
- Select flow velocity based on careful evaluation of the risks due to erosion of the measure, soil types, overtopping, flow backups, washout, and drainage flow patterns for each project site.
- Compact any fills to prevent unequal settlement.
- Do not divert runoff onto other property without securing written authorization from the property owner.
- When possible, install and utilize permanent dikes, swales, and ditches early in the construction process.
- Provide stabilized outlets.

Earth Dikes

Temporary earth dikes are a practical, inexpensive BMP used to divert stormwater runoff. Temporary diversion dikes should be installed in the following manner:

- All dikes should be compacted by earth moving equipment.
- All dikes should have positive drainage to an outlet.
- All dikes should have 2:1 or flatter side slopes, 18 in. minimum height, and a minimum top width of 24 in. Wide top widths and flat slopes are usually needed at crossings for construction traffic.

- May be covered with hydro mulch, hydroseed, wood mulch, compost blanket, or RECP for stabilization.
- The outlet from the earth dike must function with a minimum of erosion. Runoff should be conveyed to a sediment trapping device such as a Sediment Trap (SE-3) or Sediment Basin (SE-2) when either the dike channel or the drainage area above the dike are not adequately stabilized.
- Temporary stabilization may be achieved using seed and mulching for slopes less than 5% and either rip-rap or sod for slopes in excess of 5%. In either case, stabilization of the earth dike should be completed immediately after construction or prior to the first rain.
- If riprap is used to stabilize the channel formed along the toe of the dike, the following typical specifications apply:

Channel Grade	Riprap Stabilization
0.5-1.0%	4 in. Rock
1.1-2.0%	6 in. Rock
2.1-4.0%	8 in. Rock
4.1-5.0%	8 in. -12 in. Riprap

- The stone riprap, recycled concrete, etc. used for stabilization should be pressed into the soil with construction equipment.
- Filter cloth may be used to cover dikes in use for long periods.
- Construction activity on the earth dike should be kept to a minimum.

Drainage Swales

Drainage swales are only effective if they are properly installed. Swales are more effective than dikes because they tend to be more stable. The combination of a swale with a dike on the downhill side is the most cost-effective diversion.

Standard engineering design criteria for small open channel and closed conveyance systems should be used (see the local drainage design manual). Unless local drainage design criteria state otherwise, drainage swales should be designed as follows:

- No more than 5 acres may drain to a temporary drainage swale.
- Place drainage swales above or below, not on, a cut or fill slope.
- Swale bottom width should be at least 2 ft.
- Depth of the swale should be at least 18 in.
- Side slopes should be 2:1 or flatter.
- Drainage or swales should be laid at a grade of at least 1 %, but not more than 15 %.

- The swale must not be overtopped by the peak discharge from a 10-year storm, irrespective of the design criteria stated above.
- Remove all trees, stumps, obstructions, and other objectionable material from the swale when it is built.
- Compact any fill material along the path of the swale.
- Stabilize all swales immediately. Seed and mulch swales at a slope of less than 5 % and use rip-rap or sod for swales with a slope between 5 and 15 %. For temporary swales, geotextiles and mats (EC-7) may provide immediate stabilization.
- Irrigation may be required to establish sufficient vegetation to prevent erosion.
- Do not operate construction vehicles across a swale unless a stabilized crossing is provided.
- Permanent drainage facilities must be designed by a professional engineer (see the local drainage design criteria for proper design).
- At a minimum, the drainage swale should conform to predevelopment drainage patterns and capacities.
- Construct the drainage swale with a positive grade to a stabilized outlet.
- Provide erosion protection or energy dissipation measures if the flow out of the drainage swale can reach an erosive velocity.

Costs

- Cost ranges from $19 to $70 per ft. for both earthwork and stabilization and depends on availability of material, site location, and access (Adjusted for inflation (2016 dollars) by Tetra Tech, Inc.).
- Small dikes: $3 - $8/linear ft.; Large dikes: $3/yd^3 (Adjusted for inflation (2016 dollars) by Tetra Tech, Inc.).
- The cost of a drainage swale increases with drainage area and slope. Typical swales for controlling internal erosion are inexpensive, as they are quickly formed during routine earthwork.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect ditches and berms for washouts. Replace lost riprap, damaged linings or soil stabilizers as needed.

- Inspect channel linings, embankments, and beds of ditches and berms for erosion and accumulation of debris and sediment. Remove debris and sediment and repair linings and embankments as needed.
- Temporary conveyances should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction

References

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursetynsky, P.E., McGraw Hill Book Company, 1986.

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

Metzger, M.E. 2004. Managing mosquitoes in stormwater treatment devices. University of California Division of Agriculture and Natural Resources, Publication 8125. On-line: http://anrcatalog.ucdavis.edu/pdf/8125.pdf

National Association of Home Builders (NAHB). Stormwater Runoff & Nonpoint Source Pollution Control Guide for Builders and Developers. National Association of Home Builders, Washington, D.C., 1995

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

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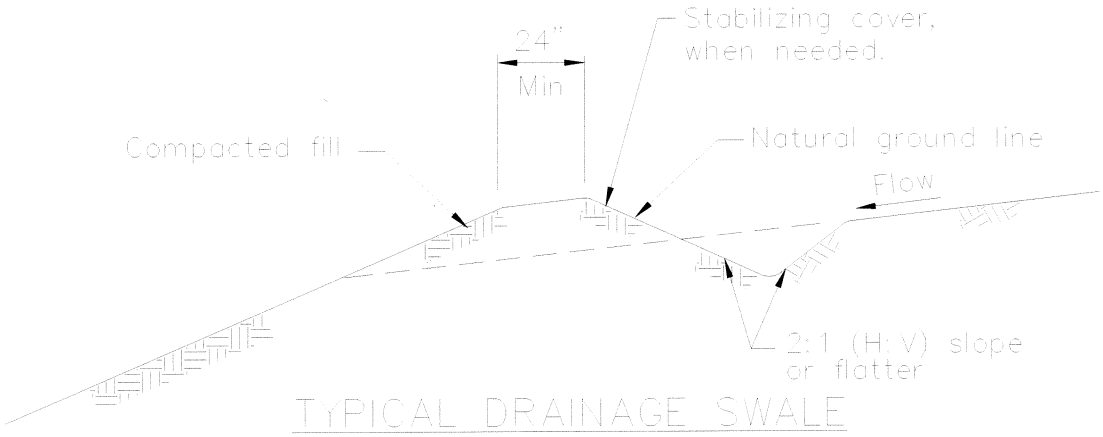
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

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

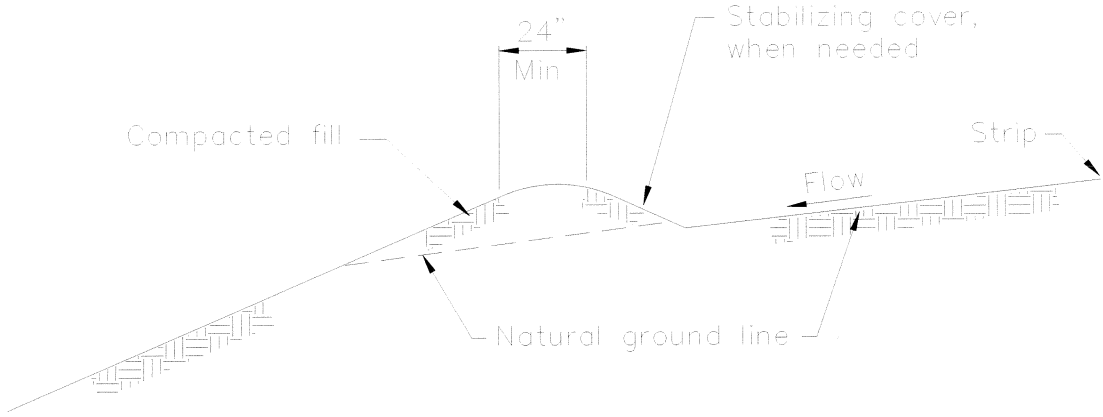
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



TYPICAL DRAINAGE SWALE
NOT TO SCALE

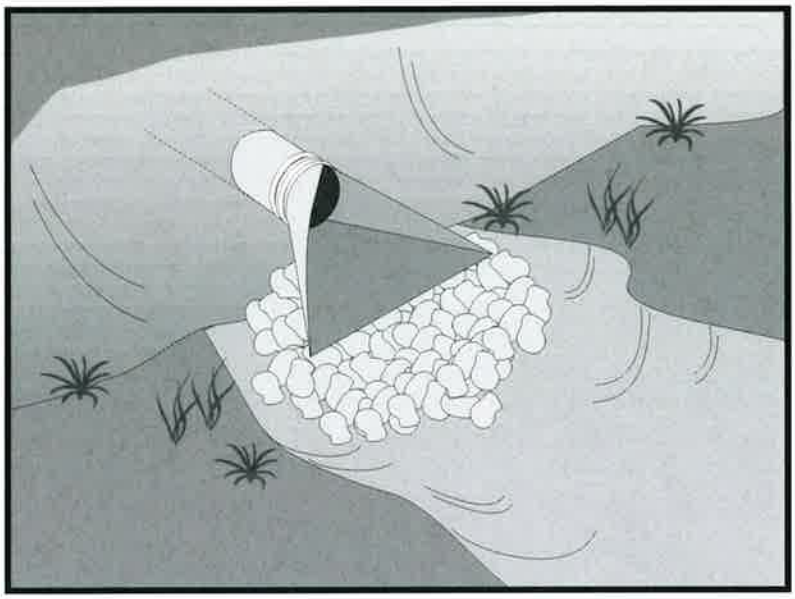
NOTES:

1. Stabilize inlet, outlets and slopes.
2. Properly compact the subgrade.



TYPICAL EARTH DIKE
NOT TO SCALE

Velocity Dissipation Devices EC-10



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Description and Purpose

Outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble, which is placed at the outlet of a pipe or channel to prevent scour of the soil caused by concentrated, high velocity flows.

Suitable Applications

Whenever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This includes temporary diversion structures to divert runon during construction.

- These devices may be used at the following locations:
  - Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits, or channels.
  - Outlets located at the bottom of mild to steep slopes.
  - Discharge outlets that carry continuous flows of water.
  - Outlets subject to short, intense flows of water, such as flash floods.
  - Points where lined conveyances discharge to unlined conveyances

Limitations

- Large storms or high flows can wash away the rock outlet protection and leave the area susceptible to erosion.

- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in velocity dissipation devices.

Implementation

General

Outlet protection is needed where discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the immediate downstream reach. This practice protects the outlet from developing small eroded pools (plange pools) and protects against gully erosion resulting from scouring at a culvert mouth.

Design and Layout

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate, and velocity should be considered in the outlet design. Compliance to local and state regulations should also be considered while working in environmentally sensitive streambeds. General recommendations for rock size and length of outlet protection mat are shown in the rock outlet protection figure in this BMP and should be considered minimums. The apron length and rock size gradation are determined using a combination of the discharge pipe diameter and estimate discharge rate: Select the longest apron length and largest rock size suggested by the pipe size and discharge rate. Where flows are conveyed in open channels such as ditches and swales, use the estimated discharge rate for selecting the apron length and rock size. Flows should be same as the culvert or channel design flow but never the less than the peak 5-year flow for temporary structures planned for one rainy season, or the 10-year peak flow for temporary structures planned for two or three rainy seasons.

- There are many types of energy dissipaters, with rock being the one that is represented in the attached figure.
- Best results are obtained when sound, durable, and angular rock is used.
- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction. Grouted or wired tied rock riprap can minimize maintenance requirements.
- Rock outlet protection is usually less expensive and easier to install than concrete aprons or energy dissipaters. It also serves to trap sediment and reduce flow velocities.
- Carefully place riprap to avoid damaging the filter fabric.

- Stone 4 in. to 6 in. may be carefully dumped onto filter fabric from a height not to exceed 12 in.
- Stone 8 in. to 12 in. must be hand placed onto filter fabric, or the filter fabric may be covered with 4 in. of gravel and the 8 in. to 12 in. rock may be dumped from a height not to exceed 16 in.
- Stone greater than 12 in. shall only be dumped onto filter fabric protected with a layer of gravel with a thickness equal to one half the D_{50} rock size, and the dump height limited to twice the depth of the gravel protection layer thickness.

- For proper operation of apron: Align apron with receiving stream and keep straight throughout its length. If a curve is needed to fit site conditions, place it in upper section of apron.
- Outlets on slopes steeper than 10 percent should have additional protection.

Costs

Costs are low if material is readily available. If material is imported, costs will be higher. Average installed cost is $250 per device.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur. Minimize areas of standing water by removing sediment blockages and filling scour depressions.
- Inspect apron for displacement of the riprap and damage to the underlying fabric. Repair fabric and replace riprap that has washed away. If riprap continues to wash away, consider using larger material.
- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.
- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.

References

County of Sacramento Improvement Standards, Sacramento County, May 1989.

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursztynsky, P.E., McGraw Hill Book Company, 1986.

Handbook of Steel Drainage & Highway Construction, American Iron and Steel Institute, 1983.

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

Metzger, M.E. 2004. Managing mosquitoes in stormwater treatment devices. University of California Division of Agriculture and Natural Resources, Publication 8125. On-line: http://anrcatalog.ucdavis.edu/pdf/8125.pdf

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

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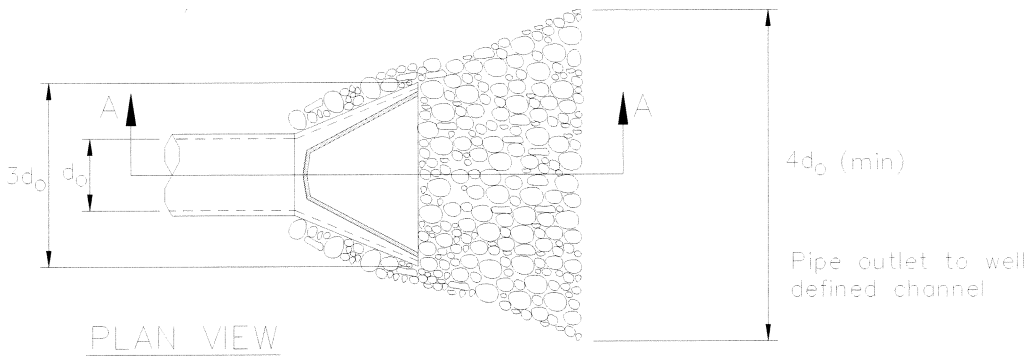
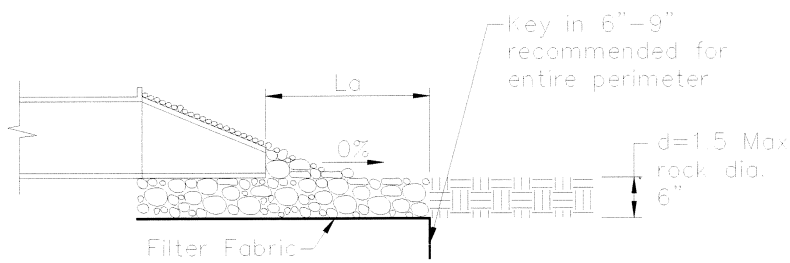
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.





Pipe Diameter inches	Discharge ft^3/s	Apron Length, La ft	Rip Rap D_{50} Diameter Min inches
12	5	10	4
	10	13	6
18	10	10	6
	20	16	8
	30	23	12
	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

For larger or higher flows consult a Registered Civil Engineer
Source: USDA - SCS

Non-Vegetative Stabilization EC-16

Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TR	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Description and Purpose

Non-vegetative stabilization methods are used for temporary or permanent stabilization of areas prone to erosion and should be used only where vegetative options are not feasible; examples include:

- Areas of vehicular or pedestrian traffic such as roads or paths;
- Arid environments where vegetation would not provide timely ground coverage, or would require excessive irrigation;
- Rocky substrate, infertile or droughty soils where vegetation would be difficult to establish; and
- Areas where vegetation will not grow adequately within the construction time frame.

There are several non-vegetative stabilization methods and selection should be based on site-specific conditions.

Decomposed Granite (DG) is a permanent erosion protection method that consists of a layer of stabilized decomposed granite placed over an erodible surface.

Degradable Mulches of various types (see EC-3, EC-6, EC-8) can be used for temporary non-vegetative stabilization; examples include straw mulch, compost, wood chips or hydraulic mulch.

Geotextiles and Mats can be used for temporary non-vegetative stabilization (see EC-7). These BMPs are typically manufactured from degradable or synthetic materials and are

designed and specified based on their functional longevity, i.e., how long they will persist and provide erosion protection. All geotextiles and mats should be replaced when they exceed their functional longevity or when permanent stabilization methods are instituted.

Gravel Mulch is a non-degradable erosion control product that is composed of washed and screened coarse to very coarse gravel, 16 mm to 64 mm (0.6" - 2.5"), similar to an AASHTO No. 3 coarse aggregate.

Rock Slope Protection consists of utilizing large rock or rip-rap (4"- 24") to stabilize slopes with a high erosion potential and those subject to scour along waterways.

Soil Binders can be used for temporary non-vegetative stabilization (see EC-5). The key to their use is functional longevity. In most cases, the soil binder will need to be routinely monitored and re-applied to maintain an erosion-resistant coverage.

Suitable Applications

Non-vegetated stabilization methods are suitable for use on disturbed soil areas and on material stockpiles that need to be temporarily or permanently protected from erosion by water and wind. Non-vegetated stabilization should only be utilized when vegetation cannot be established in the required timeframe, due to soil or climactic conditions, or where vegetation may be a potential fire hazard.

Decomposed Granite (DG) and Gravel Mulch are suitable for use in areas where vegetation establishment is difficult, on flat surfaces, trails and pathways, and when used in conjunction with a stabilizer or tackifier, on shallow slopes (i.e., 10:1 [H:V]). DG and gravel can also be used on shallow rocky slopes where vegetation cannot be established for permanent erosion control.

Degradable Mulches can be used to cover and protect soil surfaces from erosion both in temporary and permanent applications. In many cases, the use of mulches by themselves requires routine inspection and re-application. See EC-3 Hydraulic Mulch, EC-6 Straw Mulch, EC-8 Wood Mulch, or EC-14 Compost Blankets for more information.

Geotextiles and Mats can be used as a temporary stand-alone soil stabilization method. Depending on material selection, geotextiles and mats can be a short-term (3 mos – 1 year) or long-term (1-2 years) temporary stabilization method. For more information on geotextiles and mats see EC-7 Geotextiles and Mats.

Rock Slope Protection can be used when the slopes are subject to scour or have a high erosion potential, such as slopes adjacent to flowing waterways or slopes subject to overflow from detention facilities (spillways).

Soil Binders can be used for temporary stabilization of stockpiles and disturbed areas not subject to heavy traffic. See EC-5 Soil Binders for more information.

Limitations

General

- Refer to EC-3, EC-6, EC-8, and EC-14 for limitations on use of mulches. Refer to EC-7 for limitations on use of geotextiles and mats. Refer to EC-5 for limitations on use of Soil Binders.

Decomposed Granite

- Not available in some geographic regions.
- If not tackified, material may be susceptible to erosion even on slight slopes (e.g., 30:1 [H:V]).
- Installed costs may be more expensive than vegetative stabilization methods.

Gravel Mulch

- Availability is limited in some geographic regions.
- If not properly screened and washed, can contain fine material that can erode and/or create dust problems.
- If inadequately sized, material may be susceptible to erosion on sloped areas.
- Pore spaces fill with dirt and debris over time; may provide a growing medium for weeds.

Rock Slope Protection

- Installation is labor intensive.
- Installed costs can be significantly higher than vegetative stabilization methods.
- Rounded stones may not be used on slopes greater than 2:1 [H:V].

Implementation

General

Non-vegetated stabilization should be used in accordance with the following general guidance:

- Should be used in conjunction with other BMPs, including drainage, erosion controls and sediment controls.
- Refer to EC-3, EC-6, EC-8, and EC-14 for implementation details for mulches. Refer to EC-7 for implementation details for geotextiles and mats. Refer to EC-5 for implementation details for soil binders.
- Non-vegetated stabilization measures should be implemented as soon as the disturbance in the areas they are intended to protect has ceased.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Decomposed Granite Stabilization

- If used for a road or path should be installed on a prepared base.
- Should be mixed with a stabilizer if used for roads or pathways, or on slope applications.
- Though porous it is recommended to prevent standing water on or next to a decomposed granite road or pathway.

Gravel Mulch

- Should be sized based on slope, rainfall, and upgradient run-on conditions. Stone size should be increased as potential for erosion increases (steeper slopes, high intensity rainfall).
- If permanent, a weed control fabric should be placed prior to installation.
- Should be installed at a minimum 2" depth.
- Should completely cover all exposed surfaces.

Rock Slope Protection

- Rock slope protection installation should follow Caltrans Standard Specification 72-2: Rock Slope Protection. Refer to the specification for rock conformity requirements and installation methods.
- When using rock slope protection, rock size and installation method should be specified by an Engineer.
- A geotextile fabric should be placed prior to installation.

Costs

- Costs are highly variable depending not only on technique chosen, but also on materials chosen within specific techniques. In addition, availability of certain materials will vary by region/location, which will also affect the cost. Costs of mulches, geotextiles and mats, and soil binders are presented in their respective fact sheets. Costs for decomposed granite, gravel mulch stabilization and rock slope protection may be higher depending on location and availability of materials. Caltrans has provided an estimate for gravel mulch of \$13 - \$20/yd^2 in flat areas and \$14 - \$30/yd^2 on side slopes (adjusted for inflation, 2016 dollars).

Inspection and Maintenance

General

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- For permanent installation, require inspection periodically and after major storm events to look for signs of erosion or damage to the stabilization.
- All damage should be repaired immediately.
- Refer to EC-3, EC-6, EC-8, and EC-14 for inspection and maintenance requirements for mulches. Refer to EC-7 for inspection and maintenance requirements for geotextiles and mats. Refer to EC-5 for inspection and maintenance requirements for soil binders.

Decomposed Granite and Gravel Mulch Stabilization

- Rake out and add decomposed granite or gravel as needed to areas subject to rill erosion. Inspect upgradient drainage controls and repair/modify as necessary.

- Should remain stable under loose surface material. Any significant problem areas should be repaired to restore uniformity to the installation.

References

Arid Zone Forestry: A Guide for Field Technicians. Food and Agriculture Organization of the United Nations, 1989.

Design of Roadside Channels with Flexible Linings, Hydraulic Engineering Circular Number 15, Third Edition, Federal Highway Administration, 2007.

Design Standards for Urban Infrastructure - Soft Landscape Design, Department of Territory and Municipal Services - Australian Capital Territory http://www.tams.act.gov.au/work/standards_and_procedures/design_standards_for_urban_infrastructure

Erosion and Sediment Control Handbook: A Guide for Protection of State Waters through the use of Best Management Practices during Land Disturbing Activities, Tennessee Department of Environment and Conservation, 2002.

Gravel Mulch, Landscape Architecture Non-Standard Specification 10-2, California Department of Transportation (Caltrans), http://www.dot.ca.gov/hq/LandArch/roadside/detail-gm.htm

Maine Erosion and Sediment Control BMPs, DEPLW0588, Maine Department of Environmental Protection: Bureau of Land and Water Quality, 2003.

National Menu of Best Management Practices, US Environmental Protection Agency, 2006.

Standard Specification 72-2: Rock Slope Protection. California Department of Transportation, 2006.

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

Water Conservation Practices NS-1

Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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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.

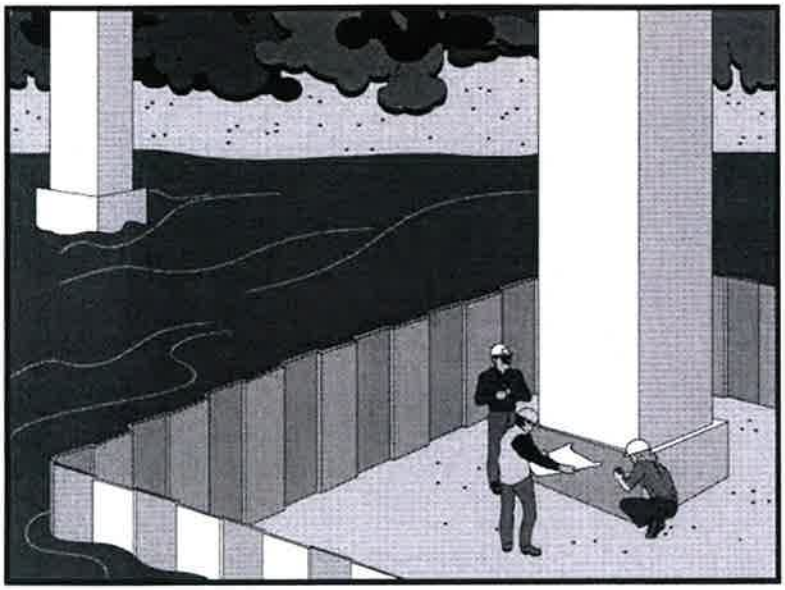
Inspection and Maintenance

- 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.

Clear Water Diversion NS-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

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Description and Purpose

Clear water diversion consists of a system of structures and measures that intercept clear surface water runoff upstream of a project, transport it around the work area, and discharge it downstream with minimal water quality degradation from either the project construction operations or the construction of the diversion. Clear water diversions are used in a waterway to enclose a construction area and reduce sediment pollution from construction work occurring in or adjacent to water. Structures commonly used as part of this system include diversion ditches, berms, dikes, slope drains, rock, gravel bags, wood, aqua barriers, cofferdams, filter fabric or turbidity curtains, drainage and interceptor swales, pipes, or flumes.

Suitable Applications

A clear water diversion is typically implemented where appropriate permits (1601 Agreement) have been secured and work must be performed in a flowing stream or water body.

- Clear water diversions are appropriate for isolating construction activities occurring within or near a water body such as streambank stabilization, or culvert, bridge, pier or abutment installation. They may also be used in combination with other methods, such as clear water bypasses and/or pumps.
- Pumped diversions are suitable for intermittent and low flow streams.
- Excavation of a temporary bypass channel or passing the flow through a heavy pipe (called a "flume") with a trench

excavated under it, is appropriate for the diversion of streams less than 20 ft wide, with flow rates less than 100 cfs.

- Clear water diversions incorporating clean washed gravel may be appropriate for use in salmonid spawning streams.

Limitations

- Diversion and encroachment activities will usually disturb the waterway during installation and removal of diversion structures.
- Installation may require Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game. If numerical-based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required.
- Diversion and encroachment activities may constrict the waterway, which can obstruct flood flows and cause flooding or washouts. Diversion structures should not be installed without identifying potential impacts to the stream channel.
- Diversion or isolation activities are not appropriate in channels where there is insufficient stream flow to support aquatic species in the area dewatered as a result of the diversion.
- Diversion or isolation activities are inappropriate in deep water unless designed or reviewed by an engineer registered in California.
- Diversion or isolation activities should not completely dam stream flow.
- Dewatering and removal may require additional sediment control or water treatment. See NS-2, Dewatering Operations.
- Not appropriate if installation, maintenance, and removal of the structures will disturb sensitive aquatic species of concern.

Implementation

General

- Implement guidelines presented in EC-12, Streambank Stabilization to minimize impacts to streambanks.
- Where working areas encroach on flowing streams, barriers adequate to prevent the flow of muddy water into streams should be constructed and maintained between working areas and streams. During construction of the barriers, muddying of streams should be held to a minimum.
- Diversion structures must be adequately designed to accommodate fluctuations in water depth or flow volume due to tides, storms, flash floods, etc.
- Heavy equipment driven in wet portions of a water body to accomplish work should be completely clean of petroleum residue, and water levels should be below the fuel tanks, gearboxes, and axles of the equipment unless lubricants and fuels are sealed such that inundation by water will not result in discharges of fuels, oils, greases, or hydraulic fluids.

- Excavation equipment buckets may reach out into the water for the purpose of removing or placing fill materials. Only the bucket of the crane/ excavator/backhoe may operate in a water body. The main body of the crane/excavator/backhoe should not enter the water body except as necessary to cross the stream to access the work site.
- Stationary equipment such as motors and pumps located within or adjacent to a water body, should be positioned over drip pans.
- When any artificial obstruction is being constructed, maintained, or placed in operation, sufficient water should, at all times, be allowed to pass downstream to maintain aquatic life.
- Equipment should not be parked below the high-water mark unless allowed by a permit.
- Disturbance or removal of vegetation should not exceed the minimum necessary to complete operations. Precautions should be taken to avoid damage to vegetation by people or equipment. Disturbed vegetation should be replaced with the appropriate erosion control measures.
- Riparian vegetation approved for trimming as part of the project should be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation should be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble should be removed upon completion of project activities.
- Drip pans should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- Where possible, avoid or minimize diversion and encroachment impacts by scheduling construction during periods of low flow or when the stream is dry. Scheduling should also consider seasonal releases of water from dams, fish migration and spawning seasons, and water demands due to crop irrigation.
- Construct diversion structures with materials free of potential pollutants such as soil, silt, sand, clay, grease, or oil.

Temporary Diversions and Encroachments

- Construct diversion channels in accordance with EC-9, Earth Dikes and Drainage Swales.
- In high flow velocity areas, stabilize slopes of embankments and diversion ditches using an appropriate liner, in accordance with EC-7, Geotextiles and Mats, or use rock slope protection.
- Where appropriate, use natural streambed materials such as large cobbles and boulders for temporary embankment and slope protection, or other temporary soil stabilization methods.
- Provide for velocity dissipation at transitions in the diversion, such as the point where the stream is diverted to the channel and the point where the diverted stream is returned to its natural channel. See also EC-10, Velocity Dissipation Devices.

Temporary Dry Construction Areas

- When dewatering behind temporary structures to create a temporary dry construction area, such as cofferdams, pass pumped water through a sediment-settling device, such as a portable tank or settling basin, before returning water to the water body. See also NS-2, Dewatering Operations.

- Any substance used to assemble or maintain diversion structures, such as form oil, should be non-toxic and non-hazardous.

- Any material used to minimize seepage underneath diversion structures, such as grout, should be non-toxic, non-hazardous, and as close to a neutral pH as possible.

Comparison of Diversion and Isolation Techniques:

- Gravel bags are relatively inexpensive, but installation and removal can be labor intensive. It is also difficult to dewater the isolated area. Sandbags should not be used for this technique in rivers or streams, as sand should never be put into or adjacent to a stream, even if encapsulated in geotextile.

- Gravel Bag Berms (SE-6) used in conjunction with an impermeable membrane are cost effective and can be dewatered relatively easily. If spawning gravel is used, the impermeable membrane can be removed from the stream, and the gravel can be spread out and left as salmonid spawning habitat if approved in the permit. Only clean, washed gravel should be used for both the gravel bag and gravel berm techniques.

- Cofferdams are relatively expensive, but frequently allow full dewatering. Also, many options now available are relatively easy to install.

- Sheet pile enclosures are a much more expensive solution but do allow full dewatering. This technique is not well suited to small streams, but can be effective on large rivers or lakes, and where staging and heavy equipment access areas are available.

- K-rails are an isolation method that does not allow full dewatering, but can be used in small to large watercourses, and in fast-water situations.

- A relatively inexpensive isolation method is filter fabric isolation. This method involves placement of gravel bags or continuous berms to 'key-in' the fabric, and subsequently staking the fabric in place. This method should be used in relatively calm water and can be used in smaller streams. Note that this is not a dewatering method, but rather a sediment isolation method.

- Turbidity curtains should be used where sediment discharge to a stream is unavoidable. They can also be used for in-stream construction, when dewatering an area is not required.

- When used in watercourses or streams, cofferdams must be used in accordance with permit requirements.

- Manufactured diversion structures should be installed following manufacturer's specifications.

- Filter fabric and turbidity curtain isolation installation methods can be found in the specific technique descriptions that follow.

Filter Fabric Isolation Technique

Definition and Purpose

A filter fabric isolation structure is a temporary structure built into a waterway to enclose a construction area and reduce sediment pollution from construction work in or adjacent to water. This structure is composed of filter fabric, gravel bags, and steel t-posts.

Appropriate Applications

- Filter fabric may be used for construction activities such as streambank stabilization, or culvert, bridge, pier or abutment installation. It may also be used in combination with other methods, such as clean water bypasses and/or pumps.
- Filter fabric isolation is relatively inexpensive. This method involves placement of gravel bags or continuous berms to 'key-in' the fabric, and subsequently staking the fabric in place.
- If spawning gravel is used, all other components of the isolation can be removed from the stream, and the gravel may be spread out and left as salmonid spawning habitat if approved in the permit. Whether spawning gravel or other types of gravel are used, only clean washed gravel should be used as infill for the gravel bags or continuous berm.
- This method should be used in relatively calm water and can be used in smaller streams. This is not a dewatering method, but rather a sediment isolation method.
- Water levels inside and outside the fabric curtain must be about the same, as differential heads will cause the curtain to collapse.

Limitations

- Do not use if the installation, maintenance and removal of the structures will disturb sensitive aquatic species of concern.
- Filter fabrics are not appropriate for projects where dewatering is necessary.
- Filter fabrics are not appropriate to completely dam stream flow.

Design and Installation

- For the filter fabric isolation method, a non-woven or heavy-duty fabric is recommended over standard silt fence. Using rolled geotextiles allows non-standard widths to be used.
- Anchor filter fabric with gravel bags filled with clean, washed gravel. Do not use sand. If a bag should split open, the gravel can be left in the stream, where it can provide aquatic habitat benefits. If a sandbag splits open in a watercourse, the sand could cause a decrease in water quality, and could bury sensitive aquatic habitat.
- Another anchor alternative is a continuous berm, made with the Continuous Berm Machine. This is a gravel-filled bag that can be made in very long segments. The length of the berms is usually limited to 18 ft for ease of handling (otherwise, it gets too heavy to move).

- Place the fabric on the bottom of the stream, and place either a bag of clean, washed gravel or a continuous berm over the bottom of the silt fence fabric, such that a bag-width of fabric lies on the stream bottom. The bag should be placed on what will be the outside of the isolation area.
- Pull the fabric up and place a metal t-post immediately behind the fabric, on the inside of the isolation area; attach the silt fence to the post with three diagonal nylon ties.
- Continue placing fabric as described above until the entire work area has been isolated, staking the fabric at least every 6 ft.

Inspection and Maintenance

- Immediately repair any gaps, holes or scour.
- Remove and properly dispose of sediment buildup.
- Remove BMP upon completion of construction activity. Recycle or reuse if applicable.
- Revegetate areas disturbed by BMP removal if needed.

Turbidity Curtain Isolation Technique

Definition and Purpose

A turbidity curtain is a fabric barrier used to isolate the near shore work area. The barriers are intended to confine the suspended sediment. The curtain is a floating barrier, and thus does not prevent water from entering the isolated area; rather, it prevents suspended sediment from getting out.

Appropriate Applications

Turbidity curtains should be used where sediment discharge to a stream is unavoidable. They are used when construction activities adjoin quiescent waters, such as lakes, ponds, and slow flowing rivers. The curtains are designed to deflect and contain sediment within a limited area and provide sufficient retention time so that the sediment particles will fall out of suspension.

Limitations

- Turbidity curtains should not be used in flowing water; they are best suited for use in ponds, lakes, and very slow-moving rivers.
- Turbidity curtains should not be placed across the width of a channel.
- Removing sediment that has been deflected and settled out by the curtain may create a discharge problem through the resuspension of particles and by accidental dumping by the removal equipment.

Design and Installation

- Turbidity curtains should be oriented parallel to the direction of flow.
- The curtain should extend the entire depth of the watercourse in calm-water situations.
- In wave conditions, the curtain should extend to within 1 ft of the bottom of the watercourse, such that the curtain does not stir up sediment by hitting the bottom repeatedly. If it is

desirable for the curtain to reach the bottom in an active-water situation, a pervious filter fabric may be used for the bottom 1 ft.

- The top of the curtain should consist of flexible flotation buoys, and the bottom should be held down by a load line incorporated into the curtain fabric. The fabric should be a brightly colored impervious mesh.
- The curtain should be held in place by anchors placed at least every 100 ft.
- First, place the anchors, then tow the fabric out in a furled condition, and connect to the anchors. The anchors should be connected to the flotation devices, and not to the bottom of the curtain. Once in place, cut the furling lines, and allow the bottom of the curtain to sink.
- Consideration must be given to the probable outcome of the removal procedure. It must be determined if it will create more of a sediment problem through re-suspension of the particles or by accidental dumping of material during removal. It is recommended that the soil particles trapped by the turbidity curtain only be removed if there has been a significant change in the original contours of the affected area in the watercourse.
- Particles should always be allowed to settle for a minimum of 6 to 12 hours prior to their removal or prior to removal of the turbidity curtain.

Maintenance and Inspection:

- The curtain should be inspected for holes or other problems, and any repairs needed should be made promptly.
- Allow sediment to settle for 6 to 12 hours prior to removal of sediment or curtain. This means that after removing sediment, wait an additional 6 to 12 hours before removing the curtain.
- To remove, install furling lines along the curtain, detach from anchors, and tow out of the water.

K-rail River Isolation

Definition and Purpose

This temporary sediment control or stream isolation method uses K-rails to form the sediment deposition area, or to isolate the in-stream or near-bank construction area.

Barriers are placed end-to-end in a pre-designed configuration and gravel-filled bags are used at the toe of the barrier and at their abutting ends to seal and prevent movement of sediment beneath or through the barrier walls.

Appropriate Applications

The K-rail isolation can be used in streams with higher water velocities than many other isolation techniques.

- This technique is also useful at the toe of embankments and cut or fill slopes.

Limitations

- The K-rail method should not be used to dewater a project site, as the barrier is not watertight.

Design and Installation

- To create a floor for the K-rail, move large rocks and obstructions. Place washed gravel and gravel-filled bags to create a level surface for K-rails to sit. Washed gravel should always be used.
- Place the bottom two K-rails adjacent to each other, and parallel to the direction of flow; fill the center portion with gravel bags. Then place the third K-rail on top of the bottom two. There should be sufficient gravel bags between the bottom K-rails such that the top rail is supported by the gravel. Place plastic sheeting around the K-rails, and secure at the bottom with gravel bags.
- Further support can be added by pinning and cabling the K-rails together. Also, large riprap and boulders can be used to support either side of the K-rail, especially where there is strong current.

Inspection and Maintenance:

- The barrier should be inspected, and any leaks, holes, or other problems should be addressed immediately.
- Sediment should be allowed to settle for at least 6 to 12 hours prior to removal of sediment, and for 6 to 12 hours prior to removal of the barrier.

Stream Diversions

The selection of which stream diversion technique to use will depend upon the type of work involved, physical characteristics of the site, and the volume of water flowing through the project.

Advantages of a Pumped Diversion

- Downstream sediment transport can be nearly eliminated.
- Dewatering of the work area is possible.
- Pipes can be moved around to allow construction operations.
- The dams can serve as temporary access to the site.
- Increased flows can be managed by adding more pumping capacity.

Disadvantages of a Pumped Diversion

- Flow volume is limited by pump capacity.
- A pumped diversion requires 24-hour monitoring of pumps.
- Sudden rain could overtop dams.
- Erosion at the outlet.

- Minor in-stream disturbance is required to install and remove dams.

Advantages of Excavated Channels and Flumes

- Excavated channels isolate work from water flow and allow dewatering.
- Excavated channels can handle larger flows than pumps.

Disadvantages of Excavated Channels and Flumes

- Bypass channel or flume must be sized to handle flows, including possible floods.
- Channels must be protected from erosion.
- Flow diversion and re-direction with small dams involves in-stream disturbance and mobilization of sediment.

Design and Installation

- Installation guidelines will vary based on existing site conditions and type of diversion used.
- Pump capacity must be sufficient for design flow.
- A standby pump is required in case a primary pump fails.
- Dam materials used to create dams upstream and downstream of diversion should be erosion resistant; materials such as steel plate, sheet pile, sandbags, continuous berms, inflatable water bladders, etc., would be acceptable.

When constructing a diversion channel, begin excavation of the channel at the proposed downstream end, and work upstream. Once the watercourse to be diverted is reached and the excavated channel is stable, breach the upstream end and allow water to flow down the new channel. Once flow has been established in the diversion channel, install the diversion weir in the main channel; this will force all water to be diverted from the main channel.

Inspection and Maintenance

- Pumped diversions require 24-hour monitoring of pumps.
- Inspect embankments and diversion channels for damage to the linings, accumulating debris, sediment buildup, and adequacy of the slope protection. Remove debris and repair linings and slope protection as required. Remove holes, gaps, or scour.
- Upon completion of work, the diversion or isolation structure should be removed, and flow should be redirected through the new culvert or back into the original stream channel. Recycle or reuse if applicable.
- Revegetate areas disturbed by BMP removal if needed.

Costs

Costs of clear water diversion vary considerably and can be very high.

Inspection and Maintenance

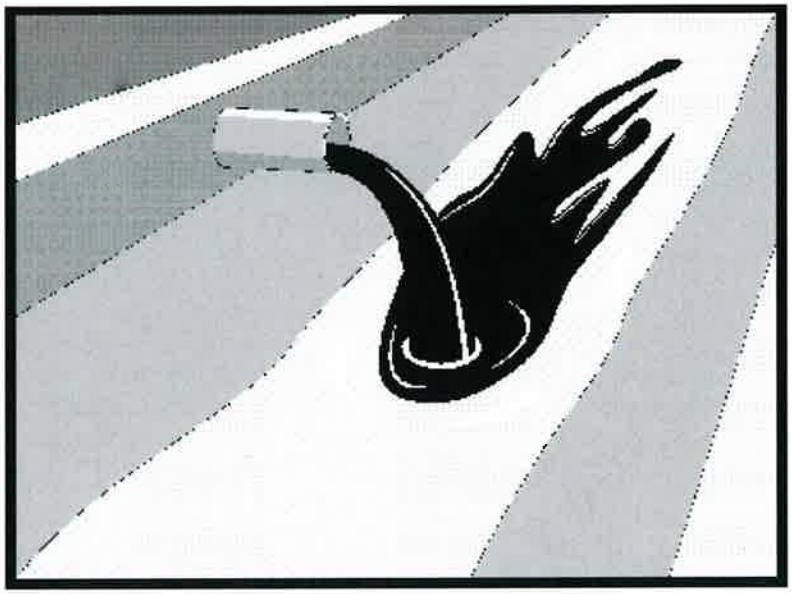
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Refer to BMP-specific inspection and maintenance requirements.

References

California Bank and Shore Rock Slope Protection Design – Practitioners Guide and Field Evaluations of Riprap Methods, Caltrans Study No. F90TL03, October 2000.

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

Illicit Connection/Discharge NS-6



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

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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.

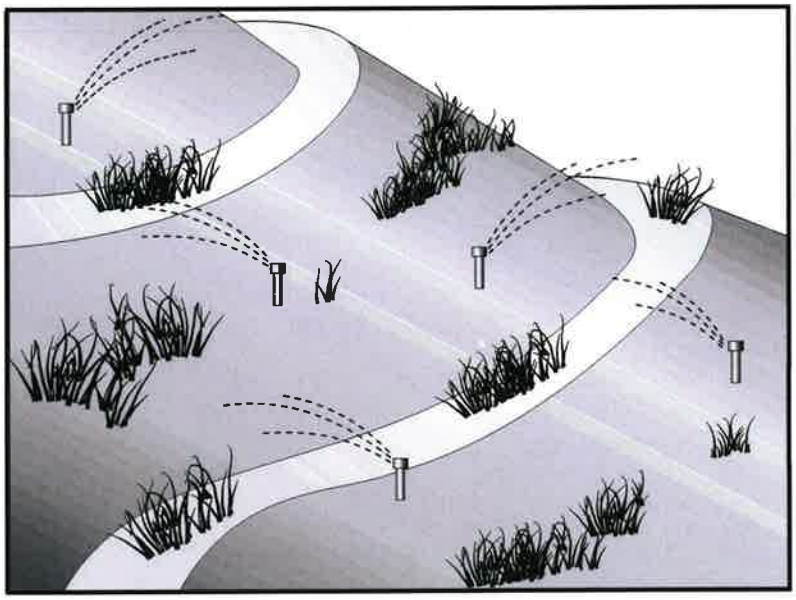
References

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	
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NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	☑

Potential Alternatives

None

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Description and Purpose

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.

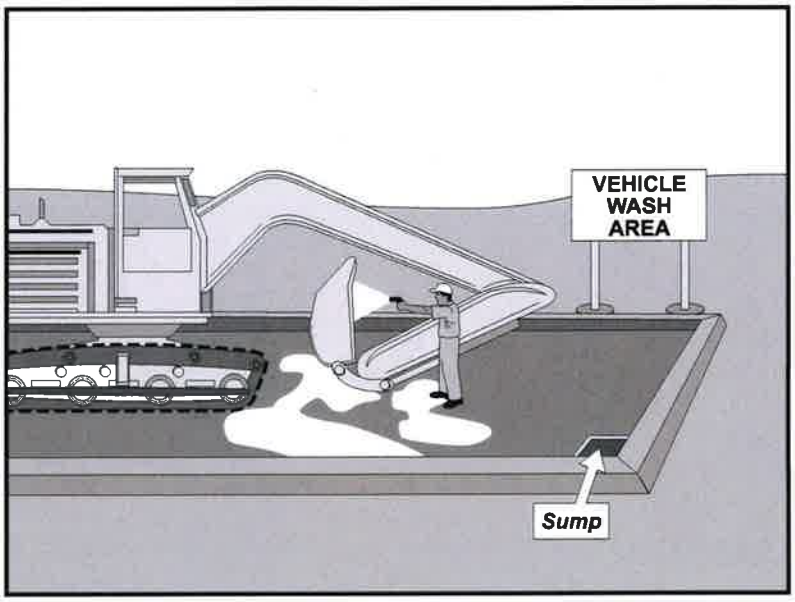
References

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 Cleaning NS-8



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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

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Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

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- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
  - Located away from storm drain inlets, drainage facilities, or watercourses
  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runon and runoff
  - Configured with a sump to allow collection and disposal of wash water
  - No discharge of wash waters to storm drains or watercourses
  - Used only when necessary
- When cleaning vehicles and equipment with water:
  - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
  - Use positive shutoff valve to minimize water usage
  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

Inspection and Maintenance

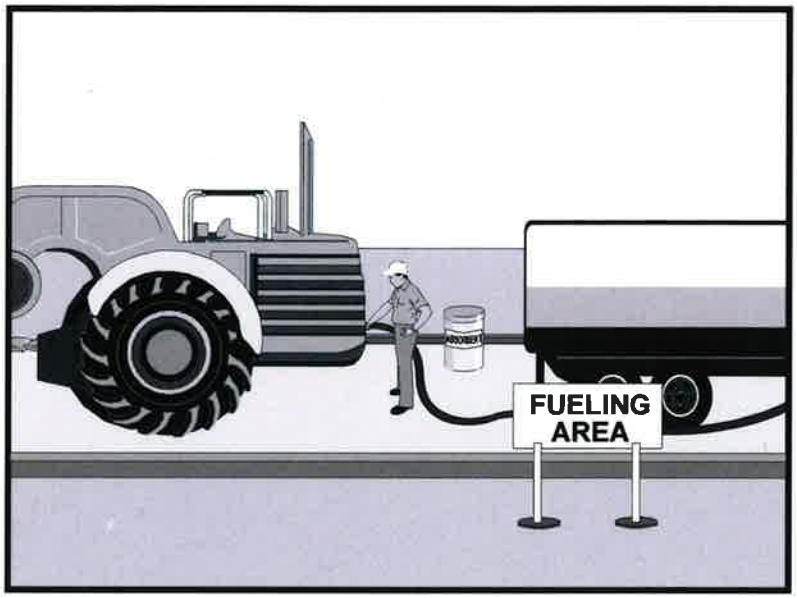
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspection and maintenance is minimal, although some berm repair may be necessary.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed.
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

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

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

Vehicle and Equipment Fueling NS-9



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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

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Description and Purpose

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.

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- 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

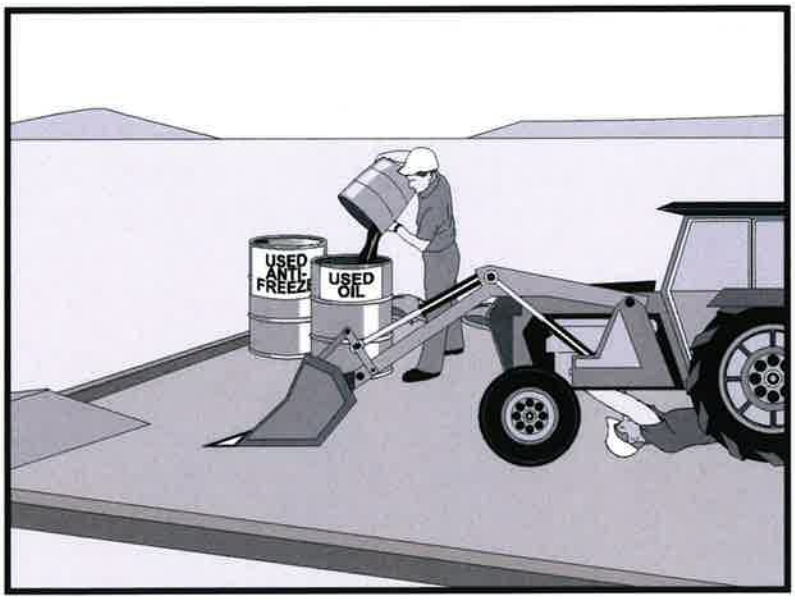
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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

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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.

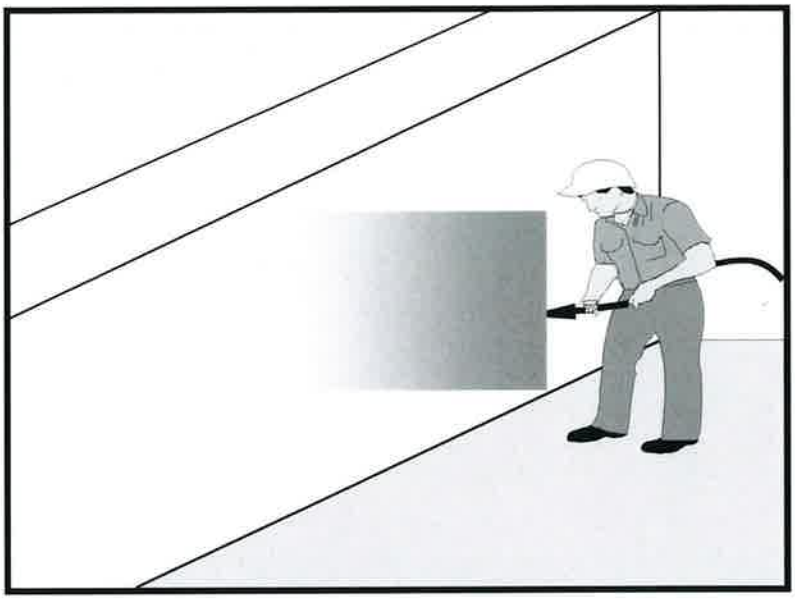
References

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

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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

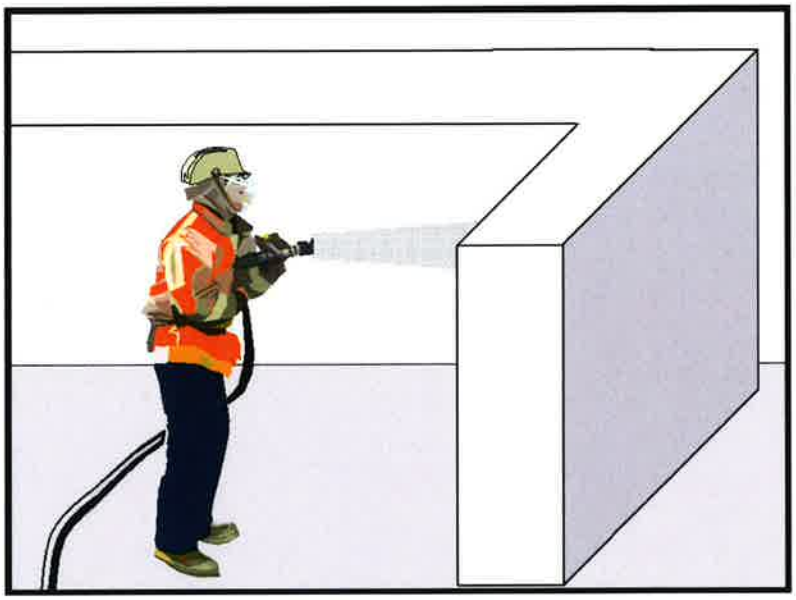
Blue Print for a Clean Bay-Construction-Related Industries: Best Management Practices for Stormwater Pollution Prevention; Santa Clara Valley Non-Point Source Pollution Control Program, 1992.

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.

Concrete Finishing NS-13



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	☑

Potential Alternatives

None

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Description and Purpose

Concrete finishing methods are used for bridge deck rehabilitation, paint removal, curing compound removal, and final surface finish appearances. Methods include sand blasting, shot blasting, grinding, or high-pressure water blasting. Stormwater and non-stormwater exposed to concrete finishing by-products may have a high pH and may contain chemicals, metals, and fines. Proper procedures and implementation of appropriate BMPs can minimize the impact that concrete-finishing methods may have on stormwater and non-stormwater discharges.

The General Permit incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Concrete and its associated curing materials have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures apply to all construction locations where concrete finishing operations are performed.

Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

- Collect and properly dispose of water from high-pressure water blasting operations.
- Collect contaminated water from blasting operations at the top of slopes. Transport or dispose of contaminated water while using BMPs such as those for erosion control. Refer to EC-9, Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Direct water from blasting operations away from inlets and watercourses to collection areas for infiltration or other means of removal (dewatering). Refer to NS-2 Dewatering Operations.
- Protect inlets during sandblasting operations. Refer to SE-10, Storm Drain Inlet Protection.
- Refer to WM-8, Concrete Waste Management for disposal of concrete debris.
- Minimize the drift of dust and blast material as much as possible by keeping the blasting nozzle close to the surface.
- When blast residue contains a potentially hazardous waste, refer to WM-6, Hazardous Waste Management.

Education

- Educate employees, subcontractors, and suppliers on proper concrete finishing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete finishing procedures.

Costs

These measures are generally of low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts concrete dust and debris as required by the General Permit.

- Sweep or vacuum up debris from sandblasting at the end of each shift.
- At the end of each work shift, remove and contain liquid and solid waste from containment structures, if any, and from the general work area.
- Inspect containment structures for damage prior to use and prior to onset of forecasted rain.

References

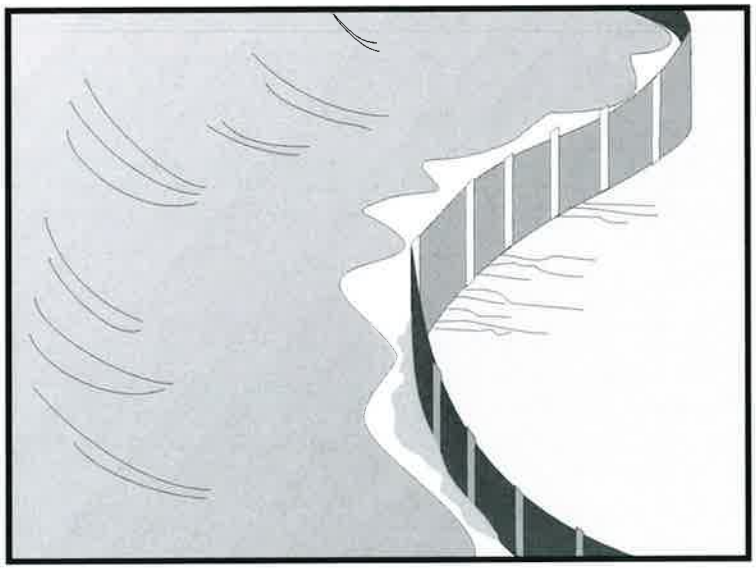
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Silt Fence

SE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment (coarse sediment)	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm SE-12 Manufactured Linear Sediment Controls

SE-13 Compost Socks and Berms

SE-14 Biofilter Bags

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Description and Purpose

A silt fence is made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains water, promoting sedimentation of coarse sediment behind the fence. Silt fence does not retain soil fine particles like clays or silts.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (Storm Drain Inlet Protection, SE-10). Silt fences should not be used in locations where the flow is concentrated. Silt fences should always be used in combination with erosion controls. Suitable applications include:

- At perimeter of a project (although they should not be installed up and down slopes).
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Around inlets.
- Below other small cleared areas.

Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard.
- Do not use silt fence to divert water flows or place across any contour line.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Must be trenched and keyed in.
- According to the State Water Board's *CGP Review, Issue #2* (2014), silt fences reinforced with metal or plastic mesh should be avoided due to plastic pollution and wildlife concerns.
- Not intended for use as a substitute for Fiber Rolls (SE-5), when fiber rolls are being used as a slope interruption device.
- Do not use on slopes subject to creeping, slumping, or landslides.

Implementation

General

A silt fence is a temporary sediment barrier consisting of woven geotextile stretched across and attached to supporting posts, trenched-in, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap coarse sediment by intercepting and detaining sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

The following layout and installation guidance can improve performance and should be followed:

- Silt fence should be used in combination with erosion controls up-slope in order to provide the most effective sediment control.
- Silt fence alone is not effective at reducing turbidity. (Barrett and Malina, 2004)
- Designers should consider diverting sediment laden water to a temporary sediment basin or trap. (EPA, 2012)
- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft. at any point along the silt fence.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft.^{2} of ponding area should be provided for every acre draining to the fence.
- Efficiency of silt fences is primarily dependent on the detention time of the runoff behind the control. (Barrett and Malina, 2004)

- The drainage area above any fence should not exceed a quarter of an acre. (Rule of Thumb-100-feet of silt fence per 10,000 ft.^{2} of disturbed area.) (EPA, 2012)
- The maximum length of slope draining to any point along the silt fence should be 100 ft. per ft of silt fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.
- Silt fences should remain in place until the disturbed area draining to the silt fence is permanently stabilized, after which, the silt fence fabric and posts should be removed and properly disposed.
- J-hooks, which have ends turning up the slope to break up long runs of fence and provide multiple storage areas that work like mini-retention areas, may be used to increase the effectiveness of silt fence.
- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

Design and Layout

In areas where high winds are anticipated the fence should be supported by a plastic or wire mesh. The geotextile fabric of the silt fence should contain ultraviolet inhibitors and stabilizers to provide longevity equivalent to the project life or replacement schedule.

- Layout in accordance with the attached figures.
- For slopes that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to protect silt fence from rocks (e.g., rockfall netting) ensure the integrity of the silt fence installation.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
  - Fabric is reinforced with wire backing or additional support.
  - Posts are spaced closer than pre-manufactured, standard silt fence products.
- Use is generally limited to areas affected by high winds.
- Area draining to fence produces moderate sediment loads.

Materials

Standard Silt Fence

- Silt fence material should be woven geotextile with a minimum width of 36 in. The fabric should conform to the requirements in ASTM designation D6461.

- Wooden stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15-gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

Heavy-Duty Silt Fence

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts instead of wood stakes.

Installation Guidelines – Traditional Method

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).

- Bottom of the silt fence should be keyed-in a minimum of 12 in.

- Posts should be spaced a maximum of 6 ft. apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.

- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench.

- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.

- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.

- The trench should be backfilled with native material and compacted.

- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.

- Cross barriers should be a minimum of 1/3 and a maximum of ½ the height of the linear barrier.

- See typical installation details at the end of this fact sheet.

Installation Guidelines - Static Slicing Method

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 in. into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the geotextile is installed, the soil is compacted using tractor tires.
- This method will not work with pre-fabricated, wire backed silt fence.
- Benefits:
  - Ease of installation (most often done with a 2-person crew).
  - Minimal soil disturbance.
  - Better level of compaction along fence, less susceptible to undercutting
  - Uniform installation.
- Limitations:
  - Does not work in shallow or rocky soils.
  - Complete removal of geotextile material after use is difficult.
  - Be cautious when digging near potential underground utilities.

Costs

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.
- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is $7 per linear foot based on vendor research. Range of cost is $3.50 - $9.10 per linear foot.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair undercut silt fences.
- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches 1/3 of the barrier height.

- Silt fences should be left in place until the upgradient area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.
- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

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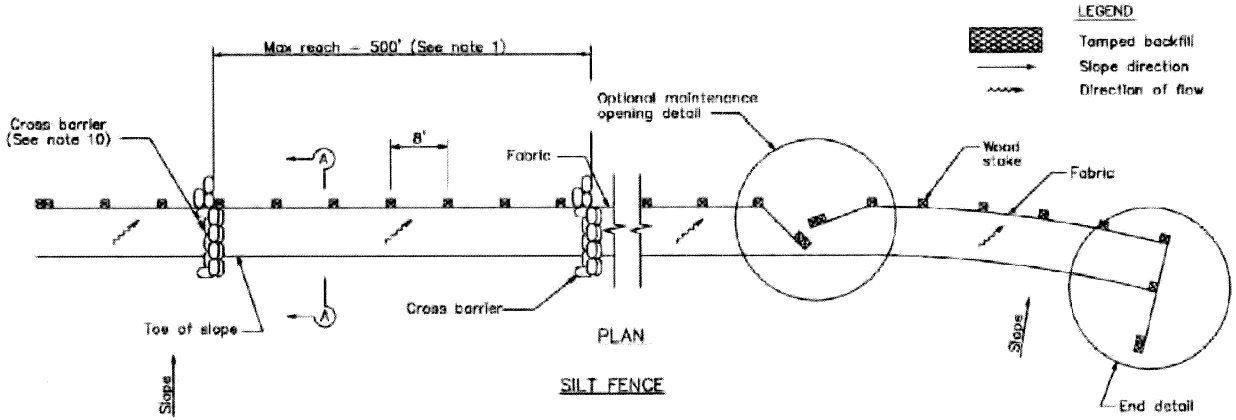
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

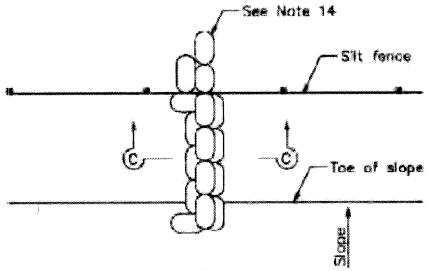


PLAN

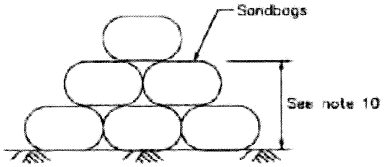
SILT FENCE

NOTES

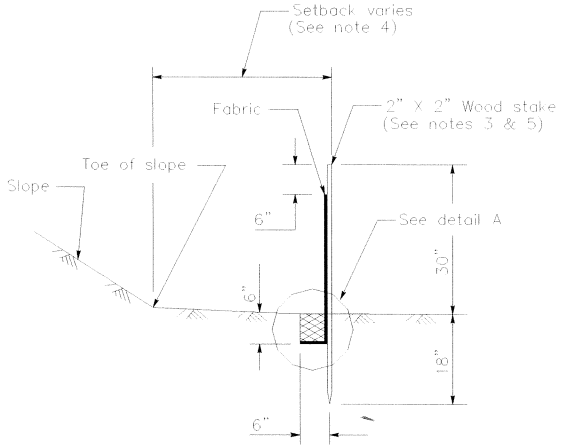
1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 500'.
2. The last 8'-0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'-0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow-through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.
14. Add 3-4 bags to cross barrier on downgradient side of silt fence as needed to prevent bypass or undermining and as allowable based on site limits of disturbance.



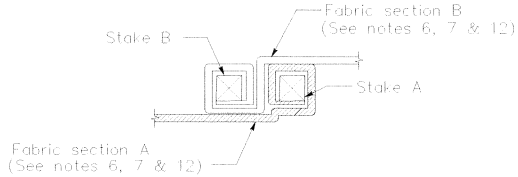
CROSS BARRIER DETAIL



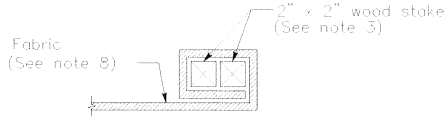
SECTION C-C



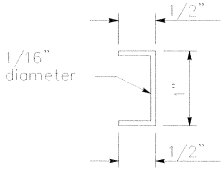
SECTION A–A



JOINING SECTION DETAIL (TOP VIEW)

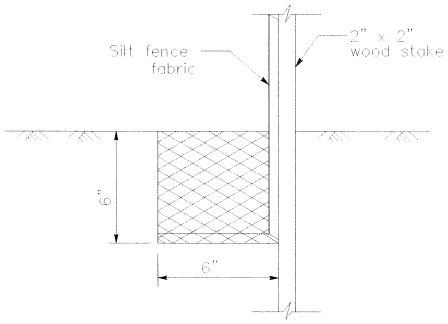


END STAKE DETAIL (TOP VIEW)

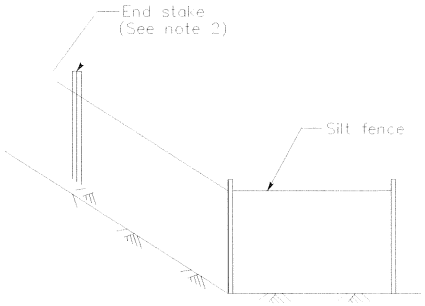


STAPLE DETAIL

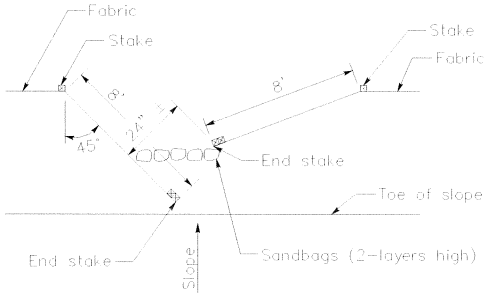
(SEE NOTE 9)



DETAIL A

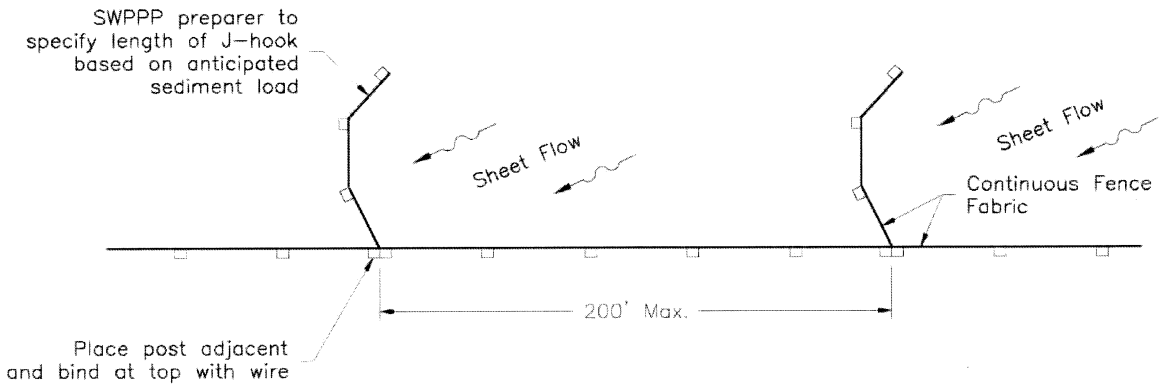


END DETAIL



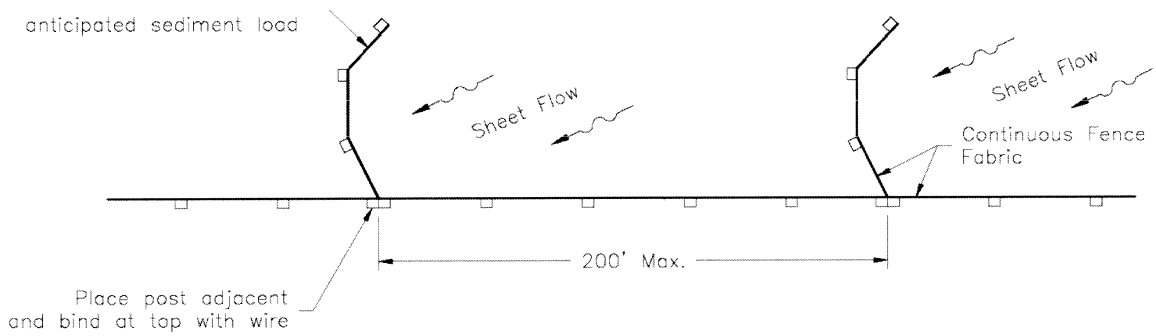
OPTIONAL MAINTENANCE OPENING DETAIL

(SEE NOTE 11)



Plan

J-HOOK

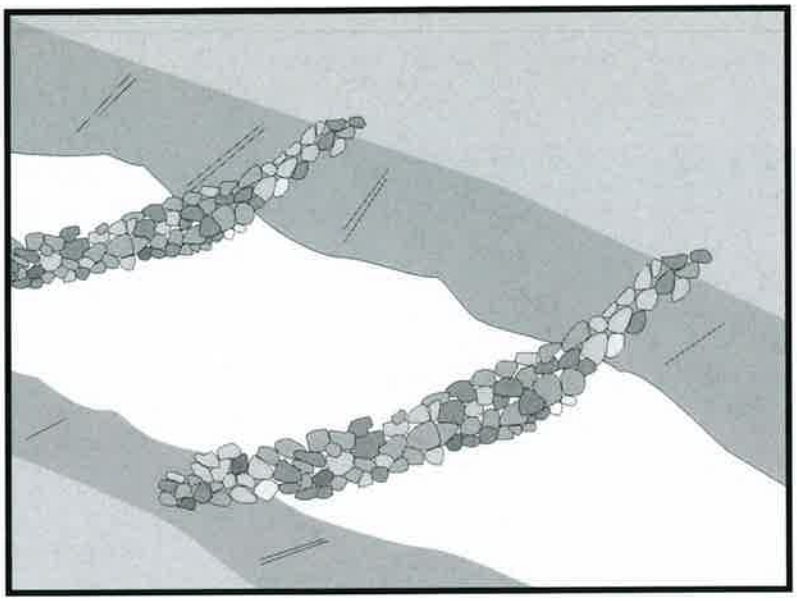


Plan

J-HOOK

Check Dams

SE-4



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-12 Manufactured Linear Sediment Controls

SE-14 Biofilter Bags

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Description and Purpose

A check dam is a small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or other proprietary products, placed across a constructed swale or drainage ditch. Check dams reduce the effective slope of the channel, thereby reducing scour and channel erosion by reducing flow velocity and increasing residence time within the channel, allowing sediment to settle.

Suitable Applications

Check dams may be appropriate in the following situations:

- To promote sedimentation behind the dam.
- To prevent erosion by reducing the velocity of channel flow in small intermittent channels and temporary swales.
- In small open channels that drain 10 acres or less.
- In steep channels where stormwater runoff velocities exceed 5 ft/s.
- During the establishment of grass linings in drainage ditches or channels.
- In temporary ditches where the short length of service does not warrant establishment of erosion-resistant linings.
- To act as a grade control structure.

Limitations

- Not to be used in live streams or in channels with extended base flows.
- Not appropriate in channels that drain areas greater than 10 acres.
- Not appropriate in channels that are already grass-lined unless erosion potential or sediment-laden flow is expected, as installation may damage vegetation.
- Require extensive maintenance following high velocity flows.
- Promotes sediment trapping which can be re-suspended during subsequent storms or removal of the check dam.
- Do not construct check dams with straw bales or silt fence.
- Water suitable for mosquito production may stand behind check dams, particularly if subjected to daily non-stormwater discharges.

Implementation

General

Check dams reduce the effective slope and create small pools in swales and ditches that drain 10 acres or less. Using check dams to reduce channel slope reduces the velocity of stormwater flows, thus reducing erosion of the swale or ditch and promoting sedimentation. Thus, check dams are dual-purpose and serve an important role as erosion controls as well as sediment controls. Note that use of 1-2 isolated check dams for sedimentation will likely result in little net removal of sediment because of the small detention time and probable scour during longer storms. Using a series of check dams will generally increase their effectiveness. A sediment trap (SE-3) may be placed immediately upstream of the check dam to increase sediment removal efficiency.

Design and Layout

Check dams work by decreasing the effective slope in ditches and swales. An important consequence of the reduced slope is a reduction in capacity of the ditch or swale. This reduction in capacity should be considered when using this BMP, as reduced capacity can result in overtopping of the ditch or swale and resultant consequences. In some cases, such as a "permanent" ditch or swale being constructed early and used as a "temporary" conveyance for construction flows, the ditch or swale may have sufficient capacity such that the temporary reduction in capacity due to check dams is acceptable. When check dams reduce capacities beyond acceptable limits, either:

- Don't use check dams. Consider alternative BMPs, or.
- Increase the size of the ditch or swale to restore capacity.

Maximum slope and velocity reduction is achieved when the toe of the upstream dam is at the same elevation as the top of the downstream dam (see "Spacing Between Check Dams" detail at the end of this fact sheet). The center section of the dam should be lower than the edge sections (at least 6 inches), acting as a spillway, so that the check dam will direct flows to the center of

the ditch or swale (see "Typical Rock Check Dam" detail at the end of this fact sheet). Bypass or side-cutting can occur if a sufficient spillway is not provided in the center of the dam.

Check dams are usually constructed of rock, gravel bags, sandbags, and fiber rolls. A number of products can also be used as check dams (e.g. HDPE check dams, temporary silt dikes (SE-12)), and some of these products can be removed and reused. Check dams can also be constructed of logs or lumber and have the advantage of a longer lifespan when compared to gravel bags, sandbags, and fiber rolls. Check dams should not be constructed from straw bales or silt fences, since concentrated flows quickly wash out these materials.

Rock check dams are usually constructed of 8 to 12 in. rock. The rock is placed either by hand or mechanically, but never just dumped into the channel. The dam should completely span the ditch or swale to prevent washout. The rock used should be large enough to stay in place given the expected design flow through the channel. It is recommended that abutments be extended 18 in. into the channel bank. Rock can be graded such that smaller diameter rock (e.g. 2-4 in) is located on the upstream side of larger rock (holding the smaller rock in place); increasing residence time.

Log check dams are usually constructed of 4 to 6 in. diameter logs, installed vertically. The logs should be embedded into the soil at least 18 in. Logs can be bolted or wired to vertical support logs that have been driven or buried into the soil.

See fiber rolls, SE-5, for installation of fiber roll check dams.

Gravel bag and sand bag check dams are constructed by stacking bags across the ditch or swale, shaped as shown in the drawings at the end of this fact sheet (see "Gravel Bag Check Dam" detail at the end of this fact sheet).

Manufactured products, such as temporary silt dikes (SE-12), should be installed in accordance with the manufacturer's instructions. Installation typically requires anchoring or trenching of products, as well as regular maintenance to remove accumulated sediment and debris.

If grass is planted to stabilize the ditch or swale, the check dam should be removed when the grass has matured (unless the slope of the swales is greater than 4%).

The following guidance should be followed for the design and layout of check dams:

- Install the first check dam approximately 16 ft from the outfall device and at regular intervals based on slope gradient and soil type.
- Check dams should be placed at a distance and height to allow small pools to form between each check dam.
- For multiple check dam installation, backwater from a downstream check dam should reach the toes of the upstream check dam.
- A sediment trap provided immediately upstream of the check dam will help capture sediment. Due to the potential for this sediment to be resuspended in subsequent storms, the sediment trap should be cleaned following each storm event.

- High flows (typically a 2-year storm or larger) should safely flow over the check dam without an increase in upstream flooding or damage to the check dam.
- Where grass is used to line ditches, check dams should be removed when grass has matured sufficiently to protect the ditch or swale.

Materials

- Rock used for check dams should typically be 8-12 in rock and be sufficiently sized to stay in place given expected design flows in the channel. Smaller diameter rock (e.g. 2 to 4 in) can be placed on the upstream side of larger rock to increase residence time.
- Gravel bags used for check dams should conform to the requirements of SE-6, Gravel Bag Berms.
- Sandbags used for check dams should conform to SE-8, Sandbag Barrier.
- Fiber rolls used for check dams should conform to SE-5, Fiber Rolls.
- Temporary silt dikes used for check dams should conform to SE-12, Temporary Silt Dikes.

Installation

- Rock should be placed individually by hand or by mechanical methods (no dumping of rock) to achieve complete ditch or swale coverage.
- Tightly abut bags and stack according to detail shown in the figure at the end of this section (pyramid approach). Gravel bags and sandbags should not be stacked any higher than 3 ft.
- Upper rows or gravel and sand bags shall overlap joints in lower rows.
- Fiber rolls should be trenched in, backfilled, and firmly staked in place.
- Install along a level contour.
- HDPE check dams, temporary silt dikes, and other manufactured products should be used and installed per manufacturer specifications.

Costs

Cost consists of labor costs if materials are readily available (such as gravel on-site). If material must be imported, costs will increase. For other material and installation costs, see SE-5, SE-6, SE-8, SE-12, and SE-14.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Replace missing rock, bags, rolls, etc. Replace bags or rolls that have degraded or have become damaged.

- If the check dam is used as a sediment capture device, sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- If the check dam is used as a grade control structure, sediment removal is not required as long as the system continues to control the grade.
- Inspect areas behind check dams for pools of standing water, especially if subjected to daily non-stormwater discharges.
- Remove accumulated sediment prior to permanent seeding or soil stabilization.
- Remove check dam and accumulated sediment when check dams are no longer needed.

References

Draft – Sedimentation and Erosion Control, and Inventory of Current Practices, USEPA, April 1990.

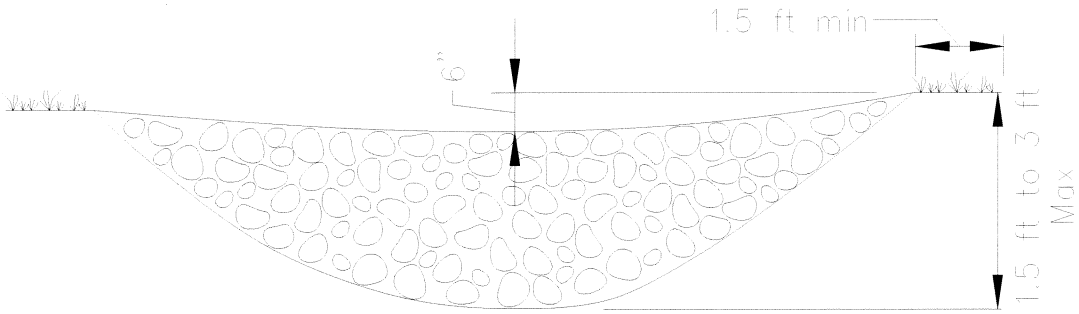
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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

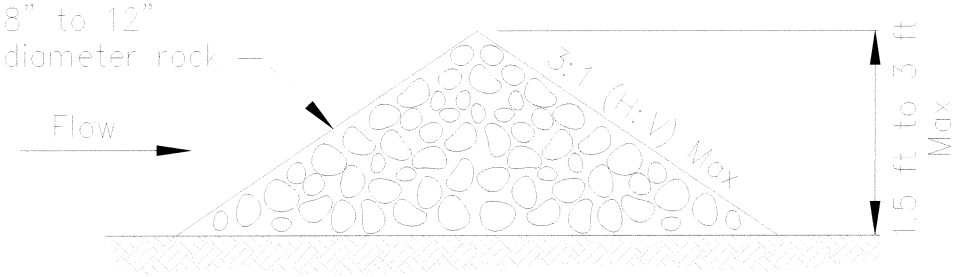
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

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

Metzger, M.E. 2004. Managing mosquitoes in stormwater treatment devices. University of California Division of Agriculture and Natural Resources, Publication 8125. On-line: http://anrcatalog.ucdavis.edu/pdf/8125.pdf

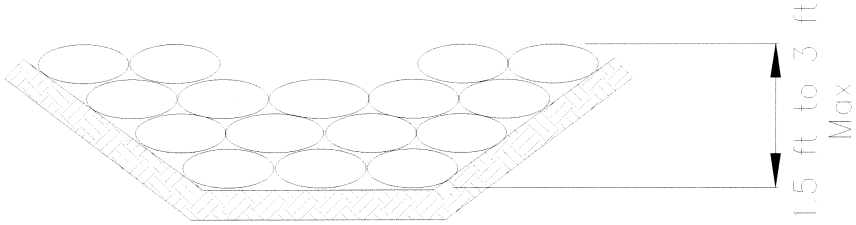


ELEVATION

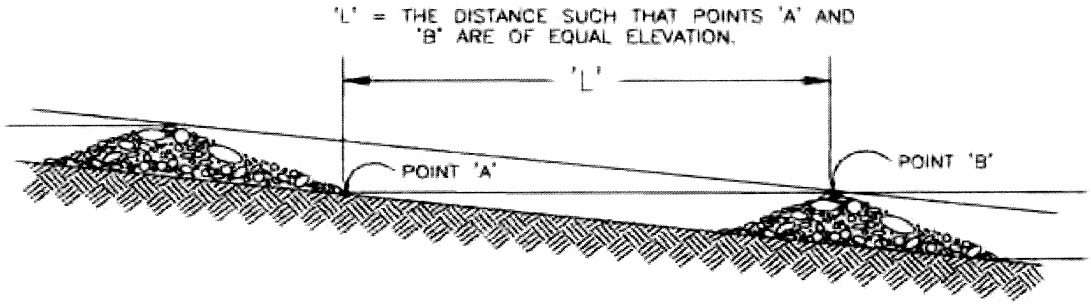


TYPICAL ROCK CHECK DAM SECTION

ROCK CHECK DAM
NOT TO SCALE



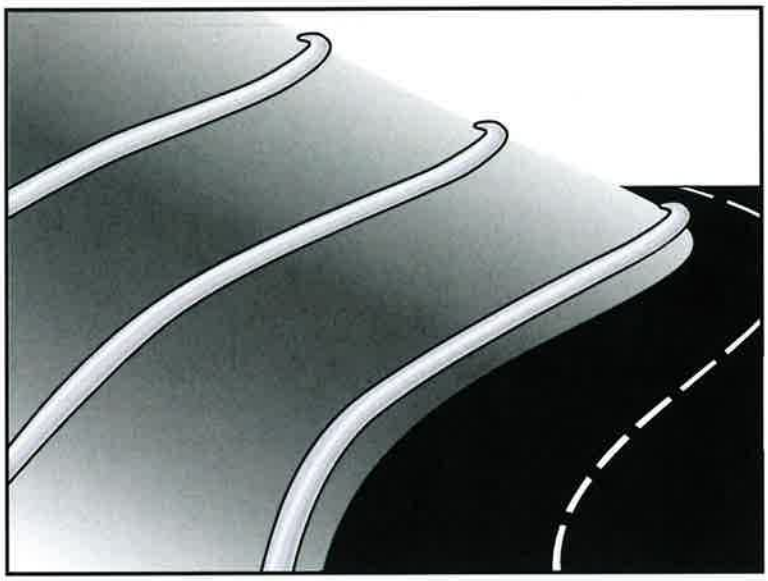
GRAVEL BAG CHECK DAM ELEVATION
NOT TO SCALE



SPACING BETWEEN CHECK DAMS

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.

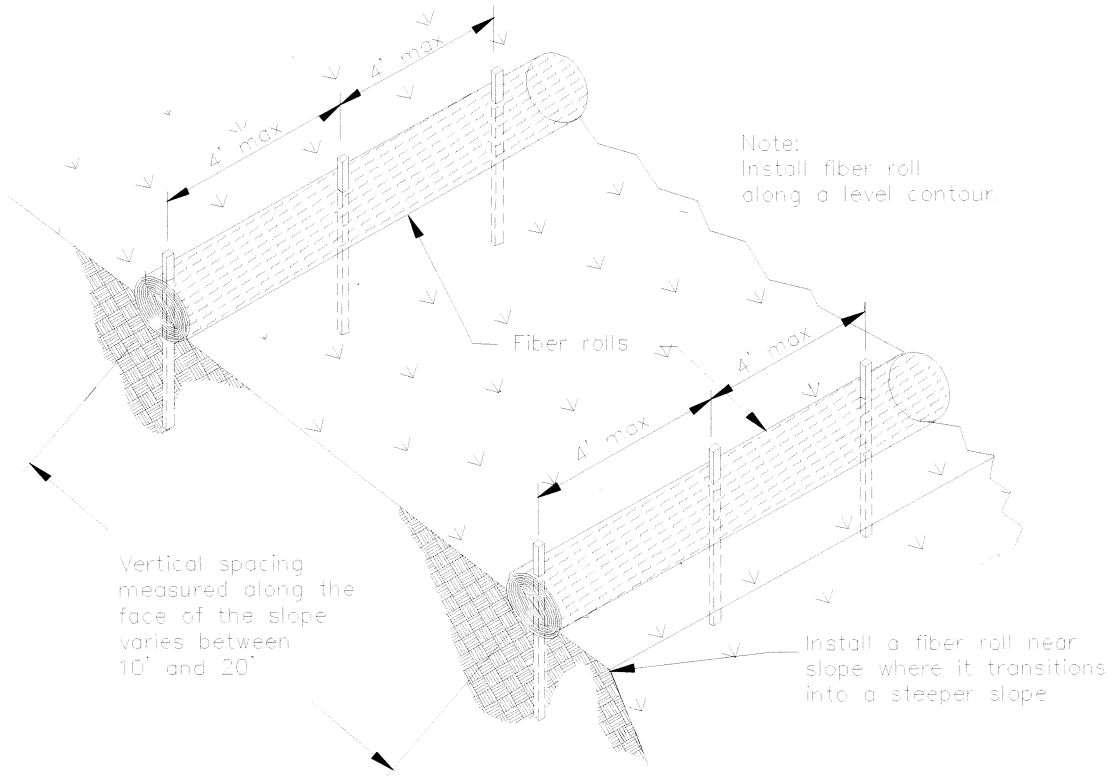
References

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

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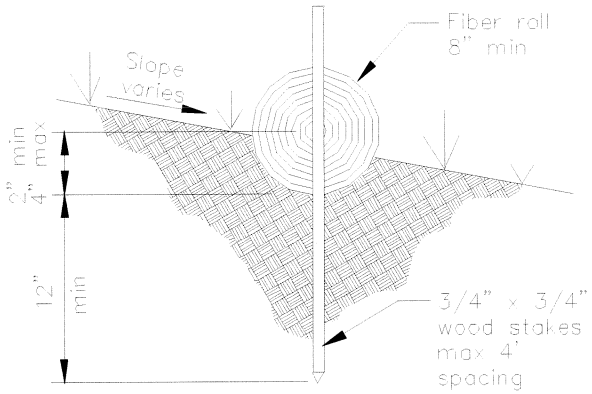
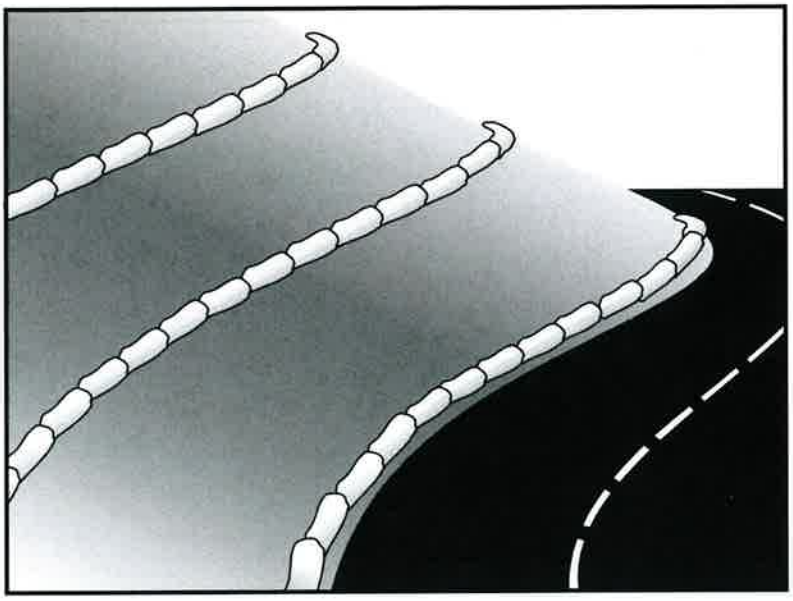


ENTRENCHMENT DETAIL

N.T.S.

Gravel Bag Berm

SE-6



Description and Purpose

A gravel bag berm is a series of gravel-filled bags placed on a level contour to intercept sheet flows. Gravel bags pond sheet flow runoff, allowing sediment to settle out, and release runoff slowly as sheet flow, preventing erosion.

Suitable Applications

Gravel bag berms may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As a linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

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Legend:

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Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-8 Sandbag Barrier

SE-12 Temporary Silt Dike

SE-14 Biofilter Bags

- At the top of slopes to divert runoff away from disturbed slopes.
- As chevrons (small check dams) across mildly sloped construction roads. For use check dam use in channels, see SE-4, Check Dams.

Limitations

- Gravel berms may be difficult to remove.
- Removal problems limit their usefulness in landscaped areas.
- Gravel bag berm may not be appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the berm, possibly causing flooding if sufficient space does not exist.
- Degraded gravel bags may rupture when removed, spilling contents.
- Installation can be labor intensive.
- Durability of gravel bags is somewhat limited, and bags may need to be replaced when installation is required for longer than 6 months.
- Easily damaged by construction equipment.
- When used to detain concentrated flows, maintenance requirements increase.

Implementation

General

A gravel bag berm consists of a row of open graded gravel-filled bags placed on a level contour. When appropriately placed, a gravel bag berm intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. The open graded gravel in the bags is porous, which allows the ponded runoff to flow slowly through the bags, releasing the runoff as sheet flows. Gravel bag berms also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils. Gravel bag berms are similar to sand bag barriers but are more porous. Generally, gravel bag berms should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate gravel bag berms on level contours.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Gravel bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Gravel bags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

Slope inclination 2:1 (H:V) or greater: Gravel bags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the gravel bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the gravel bag berm to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, gravel bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the gravel bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- In Non-Traffic Areas:
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more-layer construction
  - Top width = 12 in. minimum for one- or two-layer construction
  - Side slopes = 2:1 (H:V) or flatter
- In Construction Traffic Areas:
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more-layer construction.
  - Top width = 12 in. minimum for one- or two-layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- Butt ends of bags tightly.
- On multiple row, or multiple layer construction, overlap butt joints of adjacent row and row beneath.
- Use a pyramid approach when stacking bags.

Materials

- ***Bag Material:*** Bags should be woven polypropylene, polyethylene or polyamide fabric or burlap, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.

- ***Bag Size:*** Each gravel-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal and may vary based on locally available materials.

- ***Fill Material:*** Fill material should be 0.5 to 1 in. Crushed rock, clean and free from clay, organic matter, and other deleterious material, or other suitable open graded, non-cohesive, porous gravel.

Costs

Material costs for gravel bags are average and are dependent upon material availability. $3.20-$3.80 per filled gravel bag is standard based upon vendor research (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.

- Gravel bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.

- Reshape or replace gravel bags as needed.

- Repair washouts or other damage as needed.

- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.

- Remove gravel bag berms when no longer needed and recycle gravel fill whenever possible and properly dispose of bag material. Remove sediment accumulation and clean, re-grade, and stabilize the area.

References

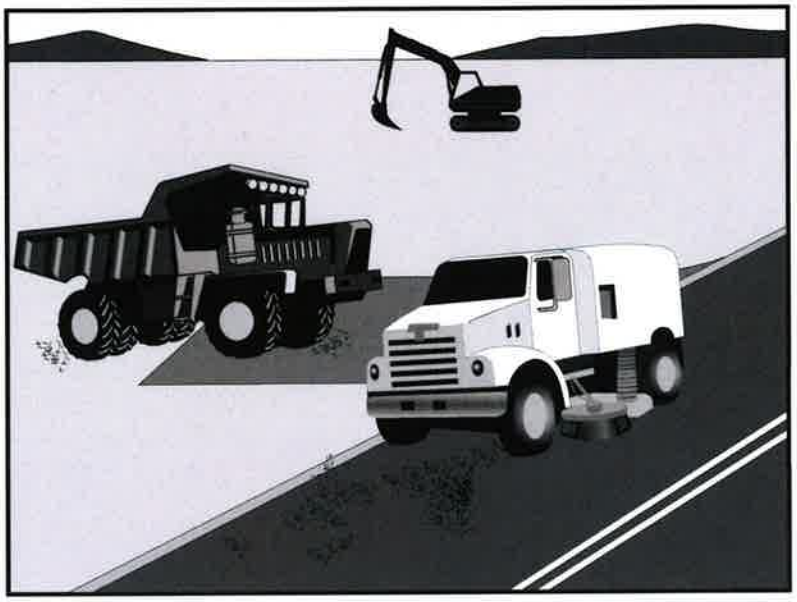
Handbook of Steel Drainage and Highway Construction, American Iron and Steel Institute, 1983.

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

Stormwater Pollution Plan Handbook, First Edition, State of California, Department of Transportation Division of New Technology, Materials and Research, October 1992.

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

Street Sweeping and Vacuuming SE-7



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

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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

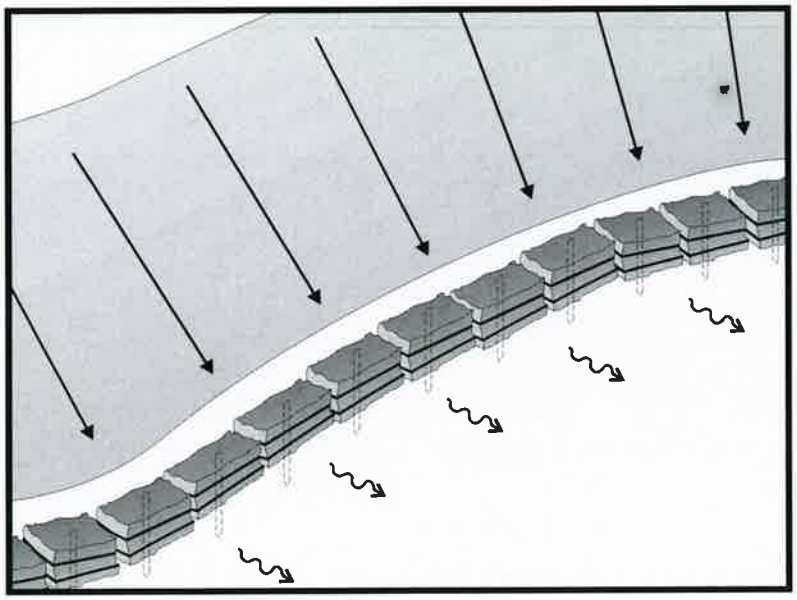
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in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

Straw Bale Barrier SE-9



Description and Purpose

A straw bale barrier is a series of straw bales placed on a level contour to intercept sheet flows. Straw bale barriers pond sheet-flow runoff, allowing sediment to settle out.

Suitable Applications

Straw bale barriers may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow

Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-12 Temporary Silt Dike

SE-14 Biofilter Bags

- At the top of slopes to divert runoff away from disturbed slopes
- As check dams across mildly sloped construction roads

Limitations

Straw bale barriers:

- Are not to be used for extended periods of time because they tend to rot and fall apart
- Are suitable only for sheet flow on slopes of 10 % or flatter
- Are not appropriate for large drainage areas, limit to one acre or less
- May require constant maintenance due to rotting
- Are not recommended for concentrated flow, inlet protection, channel flow, and live streams
- Cannot be made of bale bindings of jute or cotton
- Require labor-intensive installation and maintenance
- Cannot be used on paved surfaces
- Should not to be used for drain inlet protection
- Should not be used on lined ditches
- May introduce undesirable non-native plants to the area

Implementation

General

A straw bale barrier consists of a row of straw bales placed on a level contour. When appropriately placed, a straw bale barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. Straw bale barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils.

Straw bale barriers have not been as effective as expected due to improper use. These barriers have been placed in streams and drainage ways where runoff volumes and velocities have caused the barriers to wash out. In addition, failure to stake and entrench the straw bale has allowed undercutting and end flow. Use of straw bale barriers in accordance with this BMP should produce acceptable results.

Design and Layout

- Locate straw bale barriers on a level contour.
  - Slopes up to 10:1 (H:V): Straw bales should be placed at a maximum interval of 50 ft (a closer spacing is more effective), with the first row near the toe of slope.
  - Slopes greater than 10:1 (H:V): Not recommended.

- Turn the ends of the straw bale barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, consider moving the barrier away from the slope toe to facilitate cleaning. To prevent flow behind the barrier, sand bags can be placed perpendicular to the barrier to serve as cross barriers.
- Drainage area should not exceed 1 acre, or 0.25 acre per 100 ft of barrier.
- Maximum flow path to the barrier should be limited to 100 ft.
- Straw bale barriers should consist of two parallel rows.
  - Butt ends of bales tightly
  - Stagger butt joints between front and back row
  - Each row of bales must be trenched in and firmly staked
- Straw bale barriers are limited in height to one bale laid on its side.
- Anchor bales with either two wood stakes or four bars driven through the bale and into the soil. Drive the first stake towards the butt joint with the adjacent bale to force the bales together.
- See attached figure for installation details.

Materials

- ***Straw Bale Size:*** Each straw bale should be a minimum of 14 in. wide, 18 in. in height, 36 in. in length and should have a minimum mass of 50 lbs. The straw bale should be composed entirely of vegetative matter, except for the binding material.
- ***Bale Bindings:*** Bales should be bound by steel wire, nylon or polypropylene string placed horizontally. Jute and cotton binding should not be used. Baling wire should be a minimum diameter of 14 gauge. Nylon or polypropylene string should be approximately 12 gauge in diameter with a breaking strength of 80 lbs force.
- ***Stakes:*** Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake, or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable. Steel bar reinforcement should be equal to a #4 designation or greater. End protection should be provided for any exposed bar reinforcement.

Costs

Straw bales cost $5 - $7 each. Adequate labor should be budgeted for installation and maintenance.

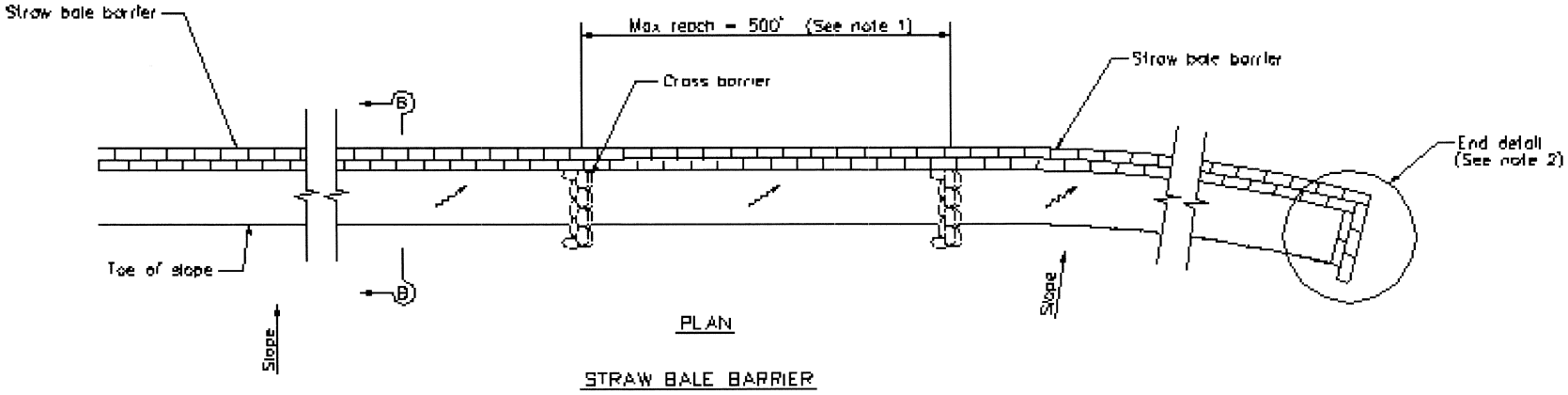
Inspection and Maintenance

Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Straw bales degrade, especially when exposed to moisture. Rotting bales will need to be replaced on a regular basis.
- Replace or repair damaged bales as needed.
- Repair washouts or other damages as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Remove straw bales when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area. Removed sediment should be incorporated in the project or disposed of.

References

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

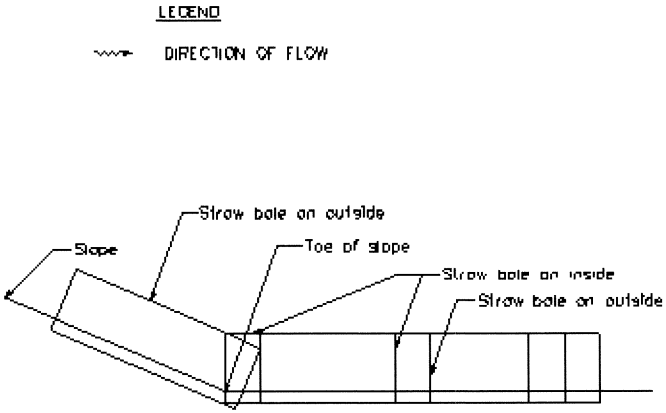


NOTES

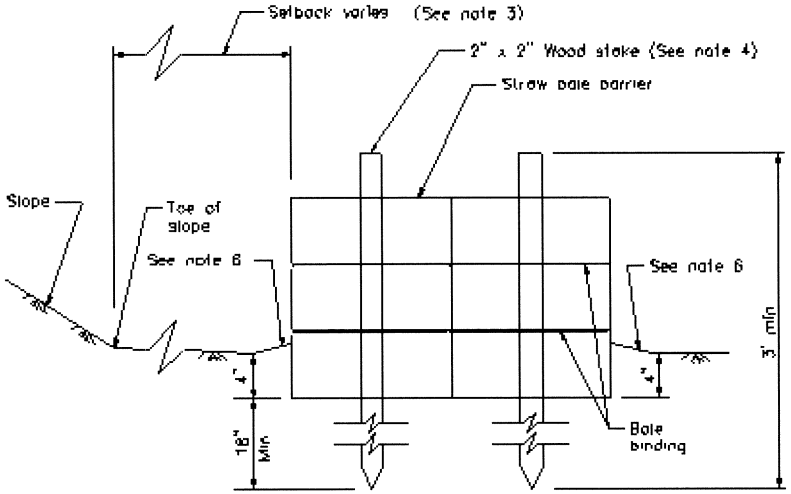
1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. The end of barrier shall be turned up slope.
3. Dimension may vary to fit field condition.
4. Stake dimensions are nominal.
5. Place straw bales tightly together.
6. Tamp embedment spoils against sides of installed bales
7. Drive angled wood stake before vertical stake to ensure tight abutment to adjacent bale.
8. Sandbag cross barriers should be a min of 1/2 and a max of 2/3 the height of the linear barrier.
9. Sandbag rows and layers should be offset to eliminate gaps.

LEGEND

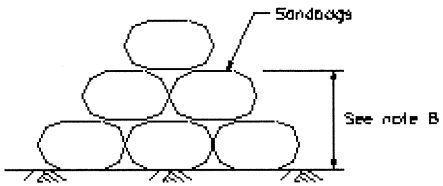
DIRECTION OF FLOW



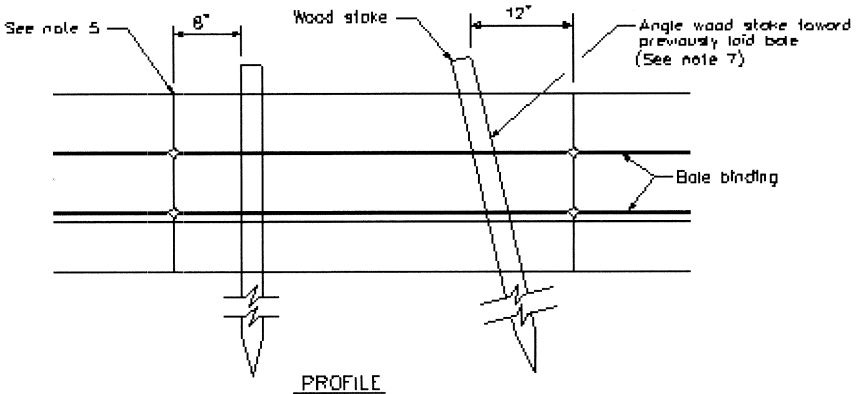
END DETAIL



SECTION B-B

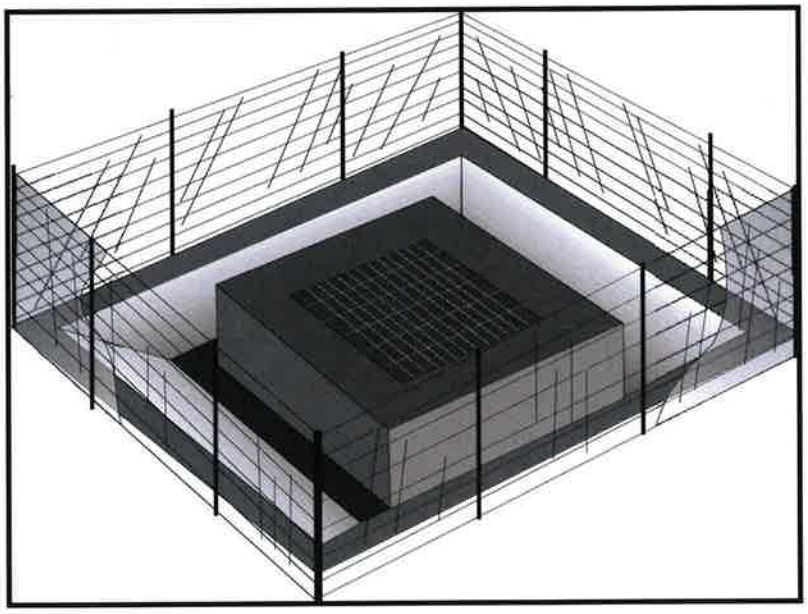


SANDBAG CROSS BARRIER



PROFILE

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

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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.

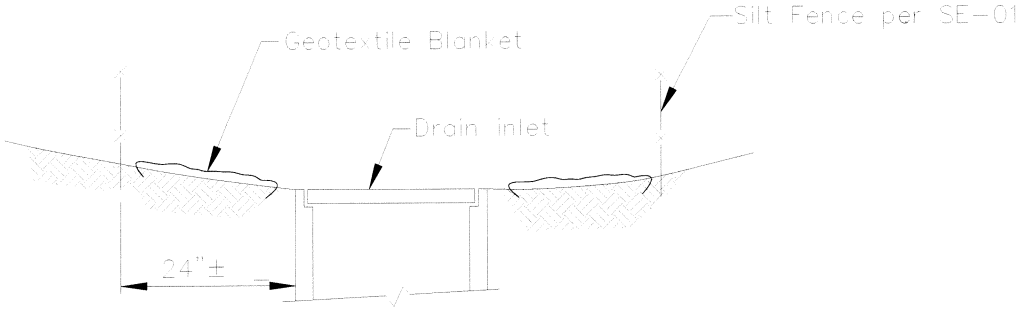
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Inspect and maintain temporary geotextile insert devices according to manufacturer's specifications.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

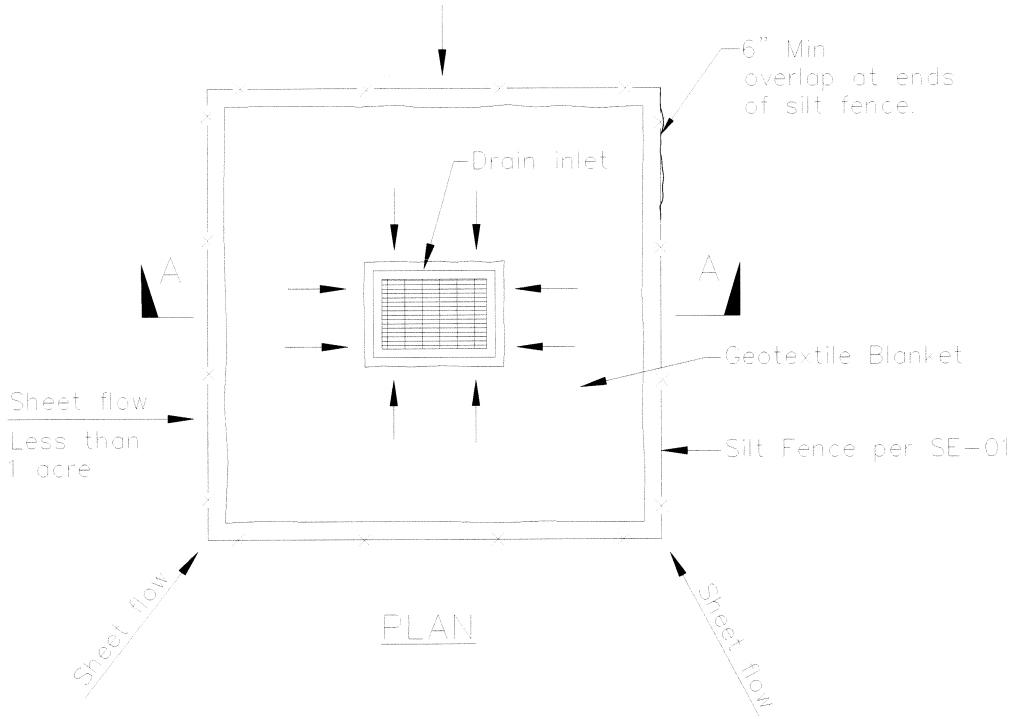
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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

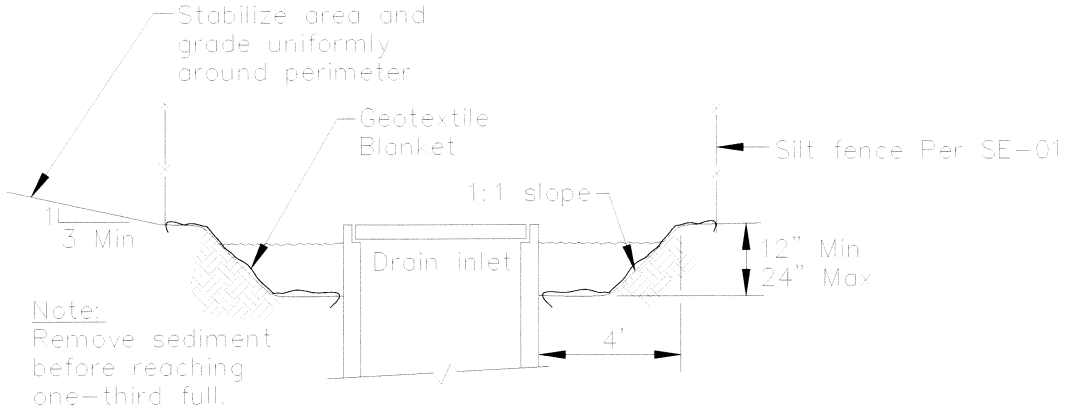


PLAN

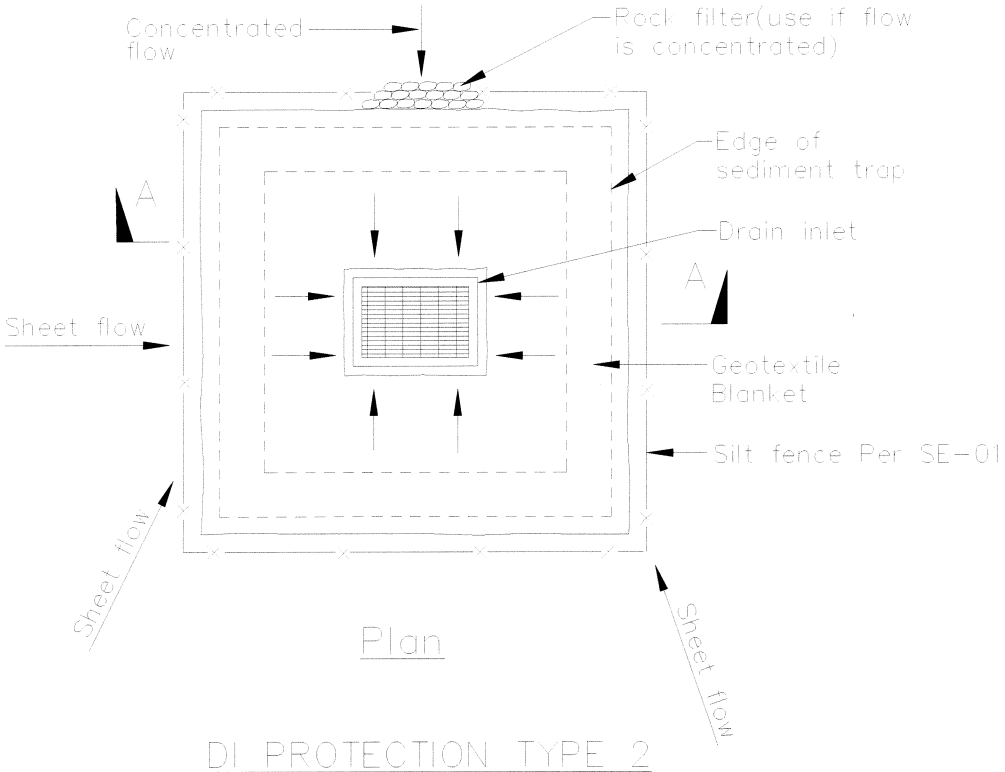
DI PROTECTION TYPE 1
NOT TO SCALE

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.



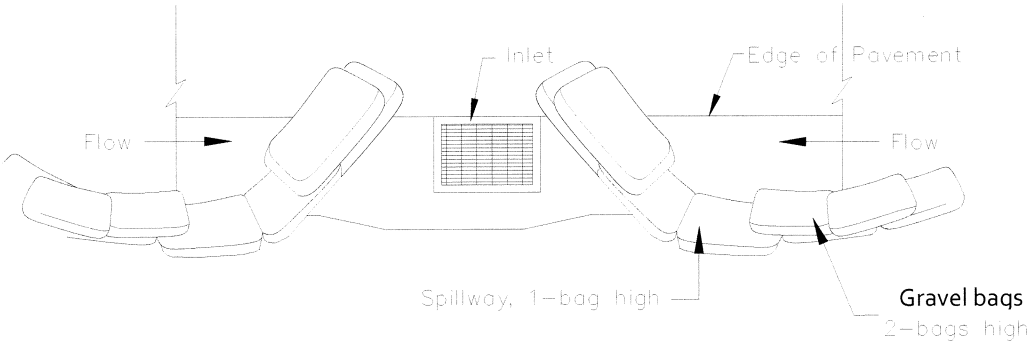
Section A-A



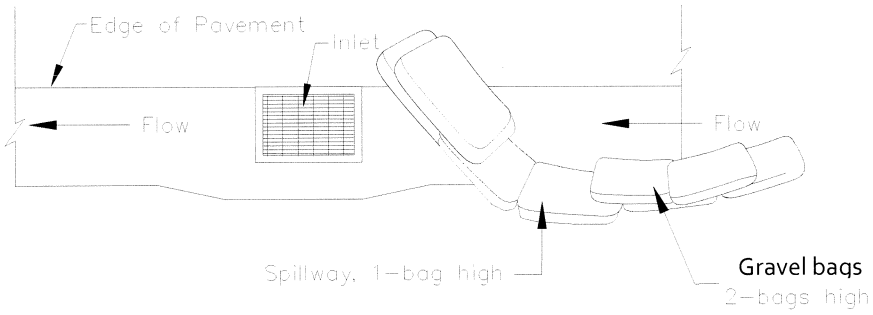
Plan

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

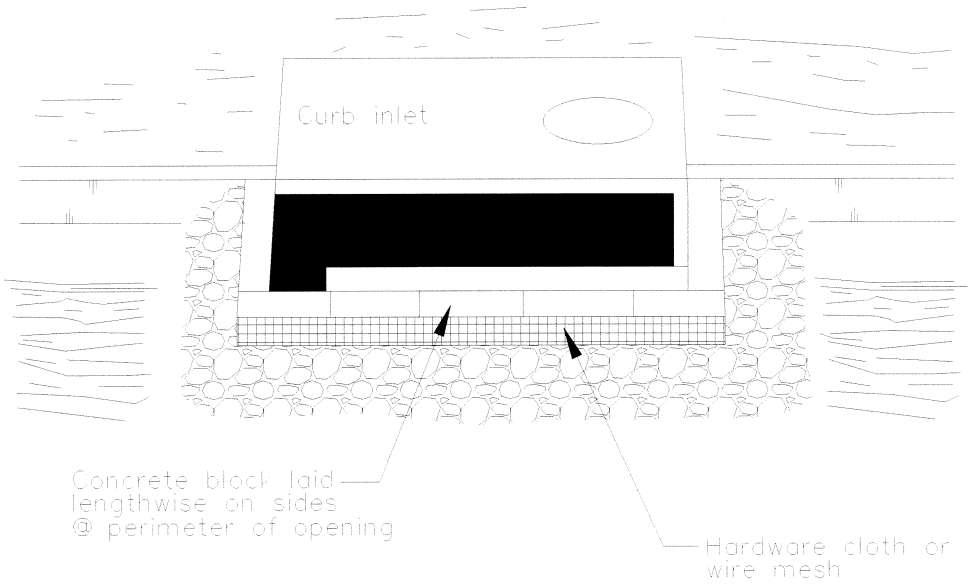


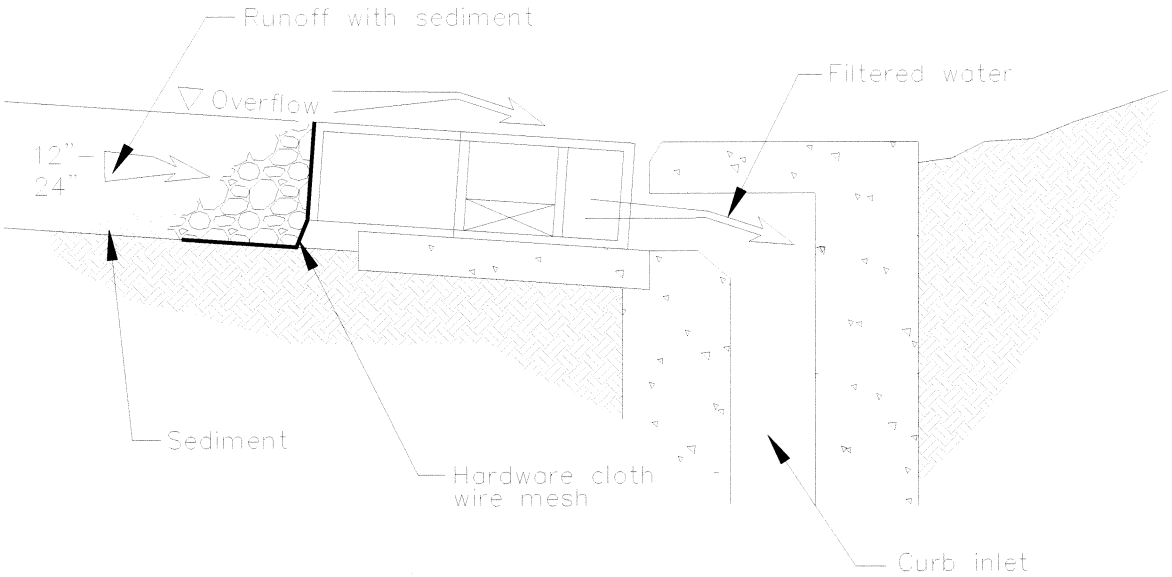
TYPICAL PROTECTION FOR INLET ON GRADE

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

Manufactured Linear Sediment Controls (MLSC) SE-12




Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

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Description and Purpose

Manufactured linear sediment controls (MLSC) are pre-manufactured devices that are typically specified and installed for drainage and sediment control on the perimeter of disturbed sites or stockpiles and as check dams within channels. Typically, MLSCs can be reused.

This fact sheet is intended to provide guidance on BMP selection and implementation of proprietary or vendor-supplied products, for sediment control. Products should be evaluated for project-specific implementation and used if determined to be appropriate by the SWPPP Preparer.

Suitable Applications

MLSCs are generally used in areas as a substitute for fiber rolls and silt fences in sediment control applications to slow down runoff water, divert drainage or contain fines and sediment. MLSCs are a linear control and application suitability varies based on the specific product type. They may be suitable:

- On paved surfaces for perimeter protection.
- As check structures in channels.
- Along the perimeter of disturbed sites in lieu of silt fence.

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- At operational storm drains as a form of inlet protection.
- Around temporary stockpiles or material/equipment storage areas.
- At the interface between graveled driveways and pavement.
- Along the toe of exposed and erodible slopes.

Limitations

- Limitations vary by product. Product manufacturer's printed product use instructions should be reviewed by the SWPPP Preparer to determine the project-specific applicability of MLSCs.

Implementation

General

When appropriately placed, MLSCs intercept and slow sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. The device is porous, which allows the ponded runoff to flow slowly through the device, releasing the runoff as sheet flows. Generally, MLSCs should be used in conjunction with temporary soil stabilization controls up-slope to provide an effective combination of erosion and sediment control.

Design and Layout

- MLSCs used on soil should be trenched or attached to the ground per manufacturer specifications in a manner that precludes runoff or ponded water from flowing around or under the device.
- MLSCs designed for use on asphalt or concrete may be attached using a variety of methods, including nailing the device to the pavement, or using a high strength adhesive.
- Follow manufacturer written specifications when installing MLSCs.
- Allow sufficient space up-slope from the silt dike to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, MLSCs should be set back 3 feet from the slope toe to facilitate cleaning. Where site conditions do not allow set back, the sediment control may be constructed on the toe of the slope. To prevent flows behind the barrier, sand or gravel bags can be placed perpendicular and between the sediment control and slope to serve as a barrier to parallel flow.
- Drainage area should not exceed 5 acres.

Materials

- Several manufactured products are available. The following search terms or combination of terms can be used with an internet search engine to find manufactured linear sediment controls:

- "silt barrier"
- "reusable silt fence"
- "silt fence alternative" or
- "perimeter sediment control"

Costs

Manufacturers should be contacted directly for current pricing.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Reshape or replace sections of damaged MLSCs as needed.
- Repair washouts or other damage as needed.
- Sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove MLSCs when no longer needed. Remove sediment accumulation and clean, re-grade, and stabilize the area. Removed sediment should be incorporated in the project or disposed of properly.

References

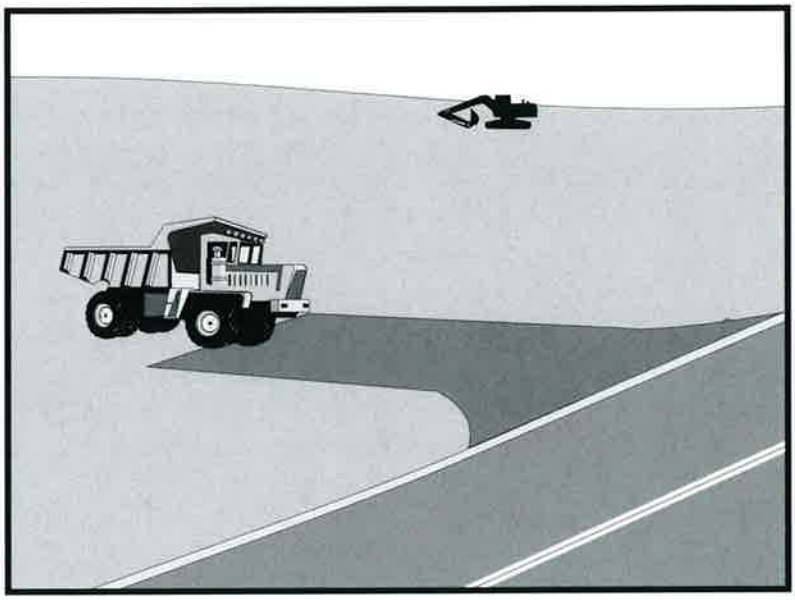
City of Elko Construction Site Best Management Practices Handbook, December 2005.

Construction Site Best Management Practices Handbook, June 2008 Update, Truckee Meadows Regional Stormwater Quality Management Program, June 2008.

Complying with the Edwards Aquifer Rules Technical Guidance on Best Management Practices, Texas Commission on Environmental Quality, Revised July 2005, Addendum Sheet, January26, 2011.

Stormwater Management Manual for Western Washington Volume II, Construction Stormwater Pollution Prevention, Washington State Department of Ecology, February 2005.

Stabilized Construction Entrance/Exit TC-1



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.

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.

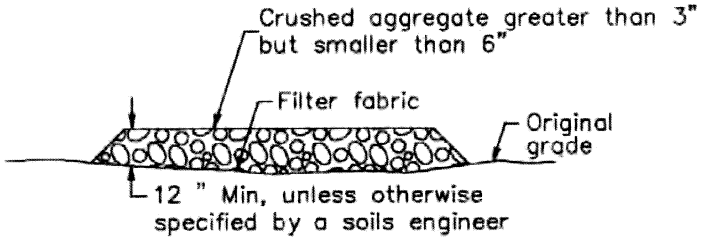
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

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

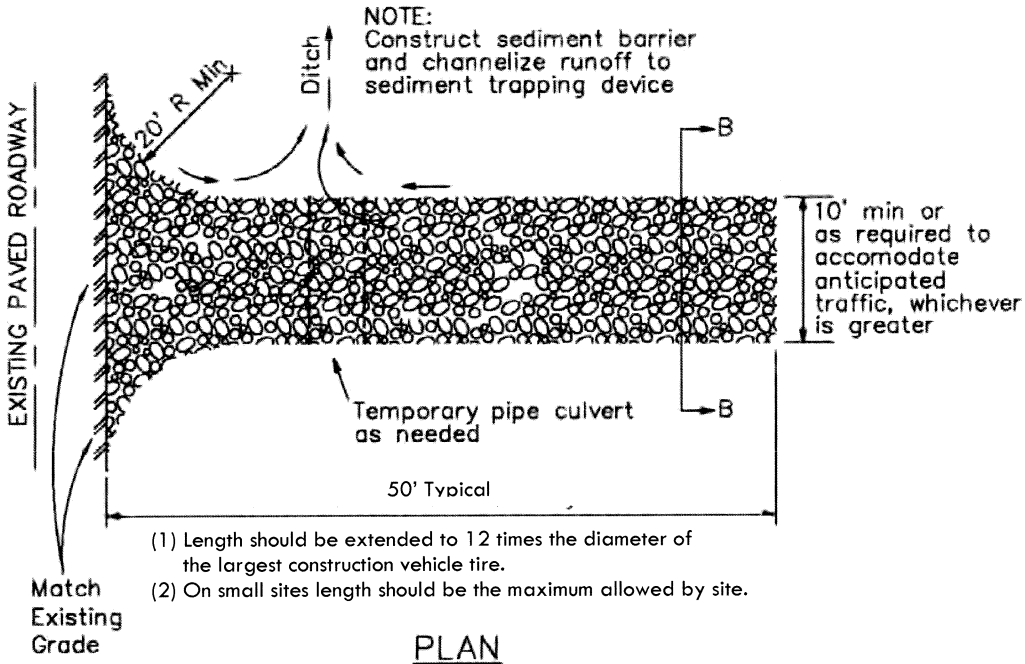
Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

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.



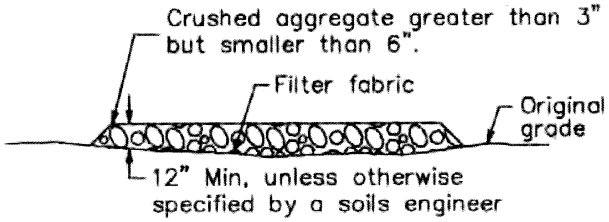
SECTION B–B
NTS



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

PLAN
NTS

Stabilized Construction Entrance/Exit TC-1



SECTION B–B
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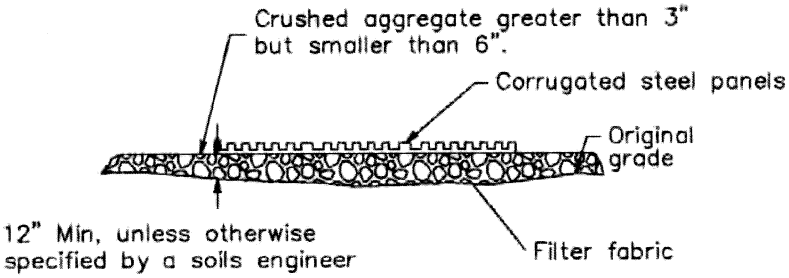
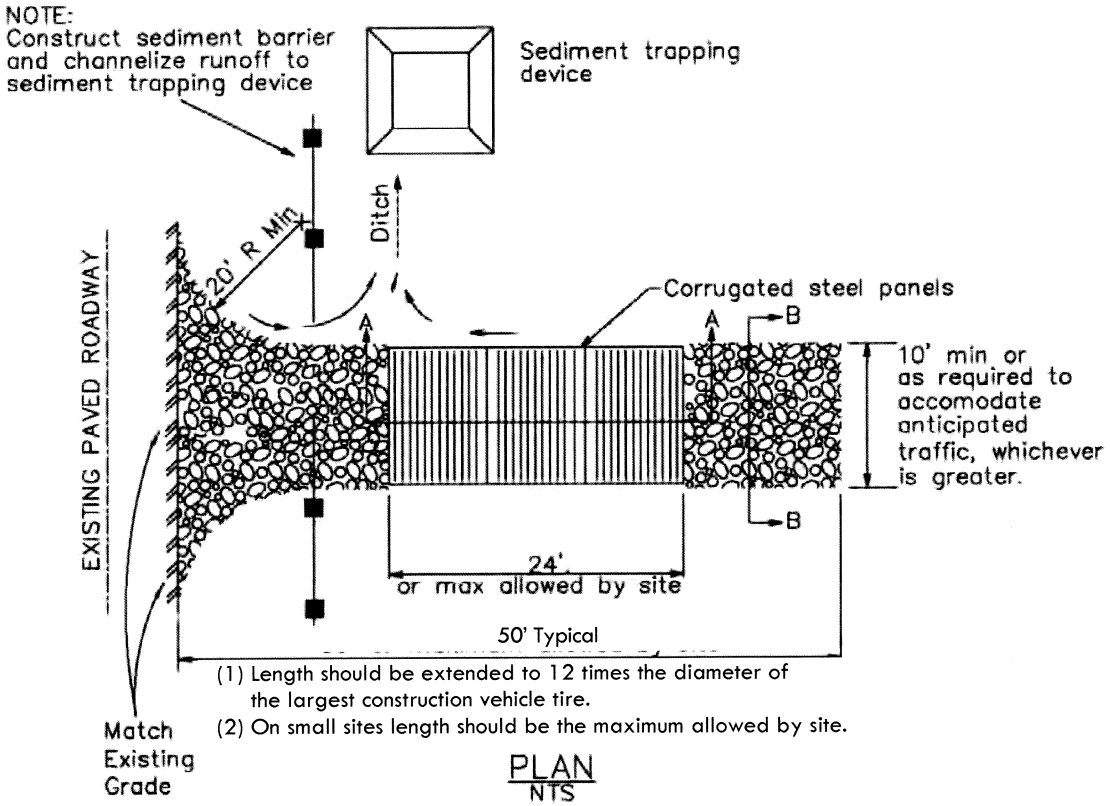
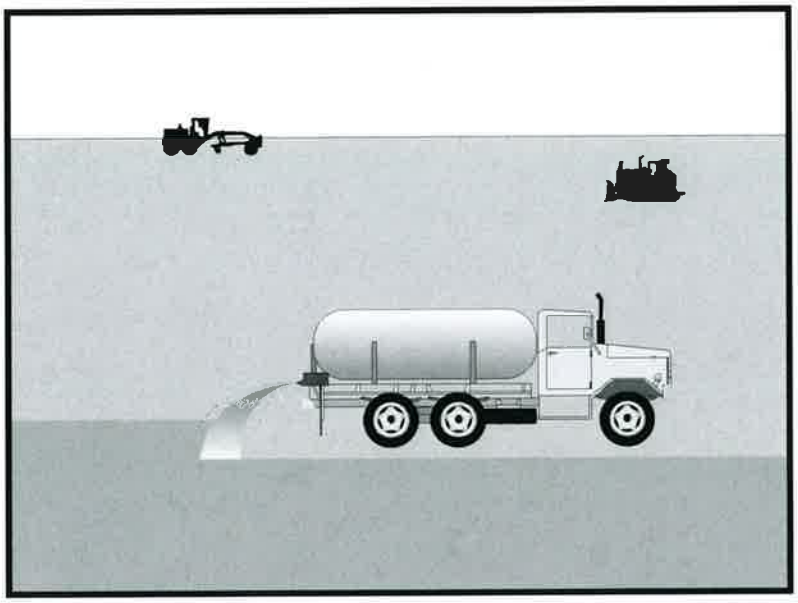


SECTION A–A
NOT TO SCALE



PLAN
NTS

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

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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.

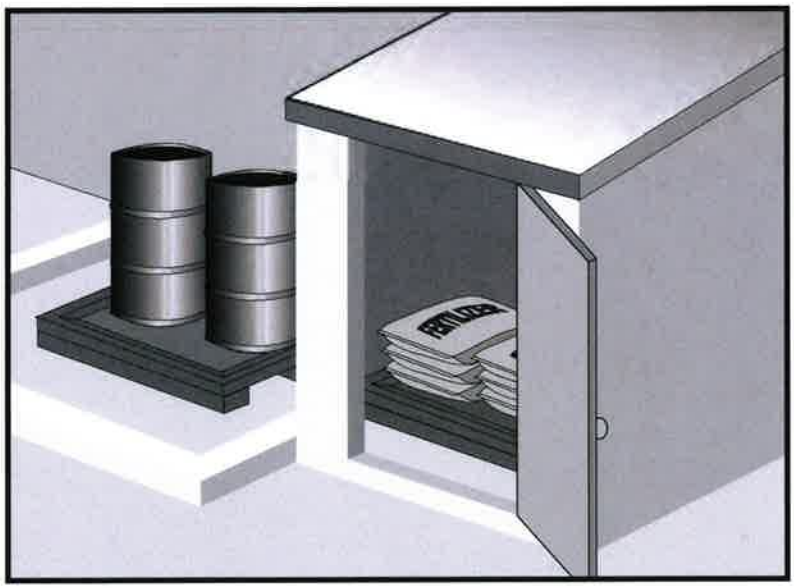
California Air Pollution Control Laws, California Air Resources Board, updated annually.

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.

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

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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.

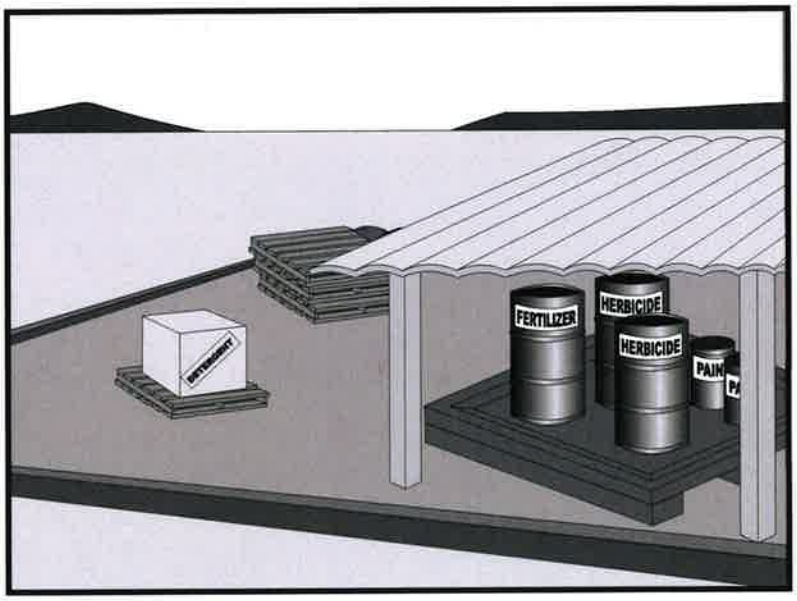
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

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.

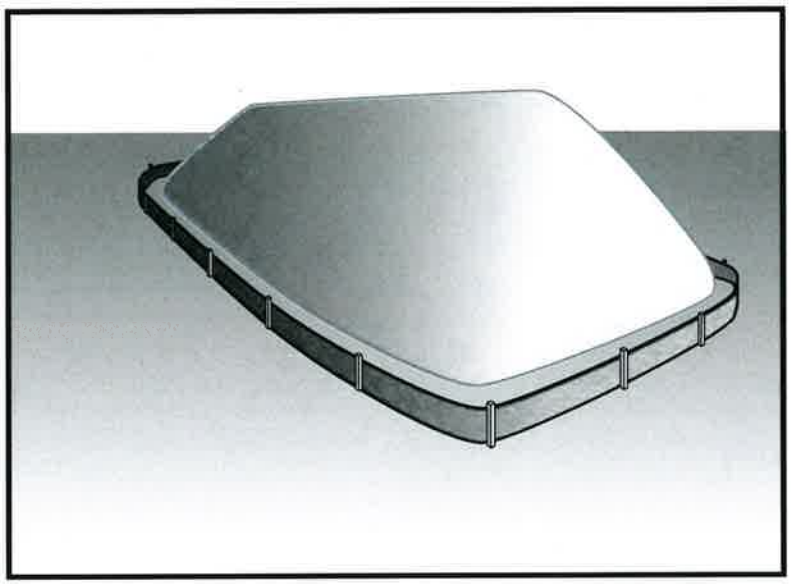
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

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**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

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:

- 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.)

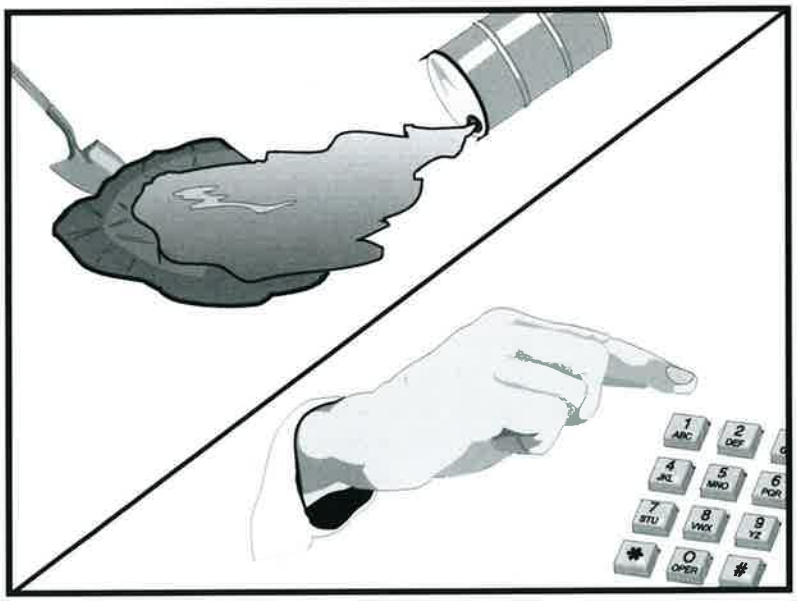
Inspection and Maintenance

- 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



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

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Description and Purpose

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

- 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.

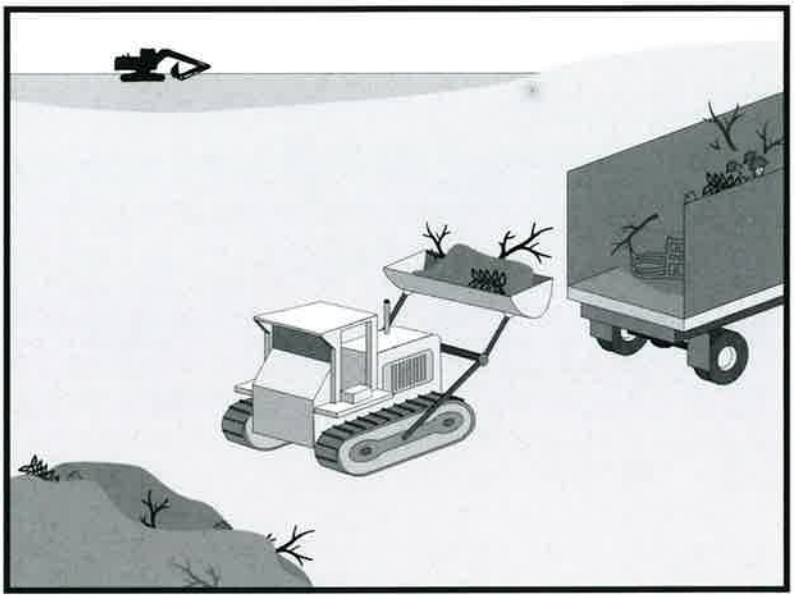
References

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

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Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces, and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials

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- 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.

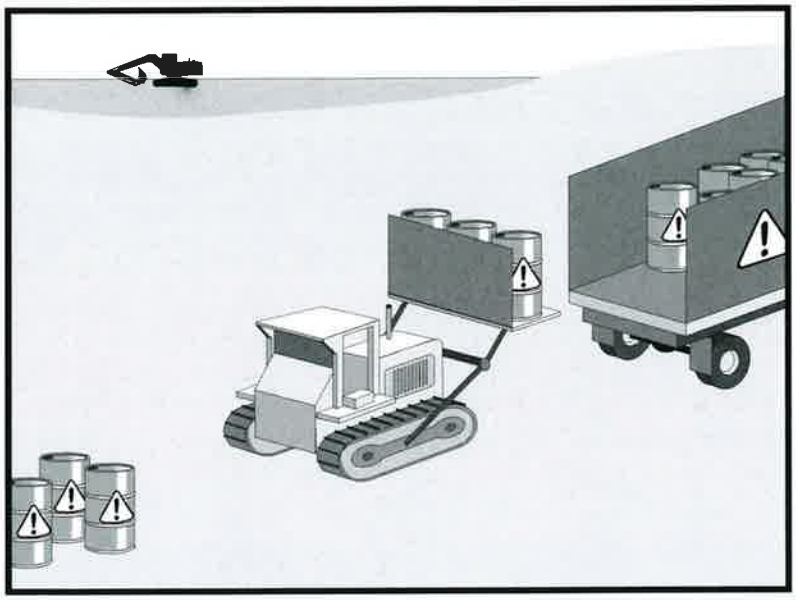
References

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

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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
- Concrete Curing Compounds
- Palliatives
- Septic Wastes
- Stains
- Wood Preservatives
- Asphalt Products
- Pesticides
- Acids
- Paints
- Solvents
- 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

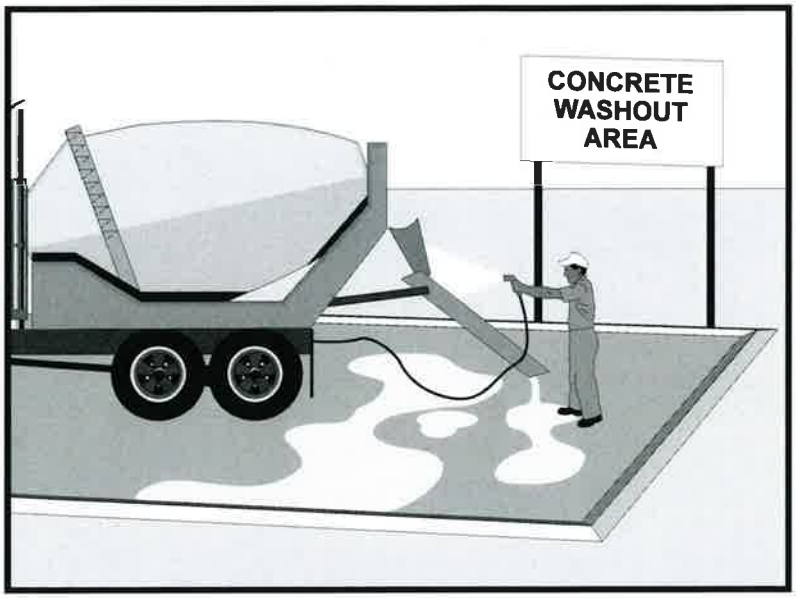
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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

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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-Off 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.

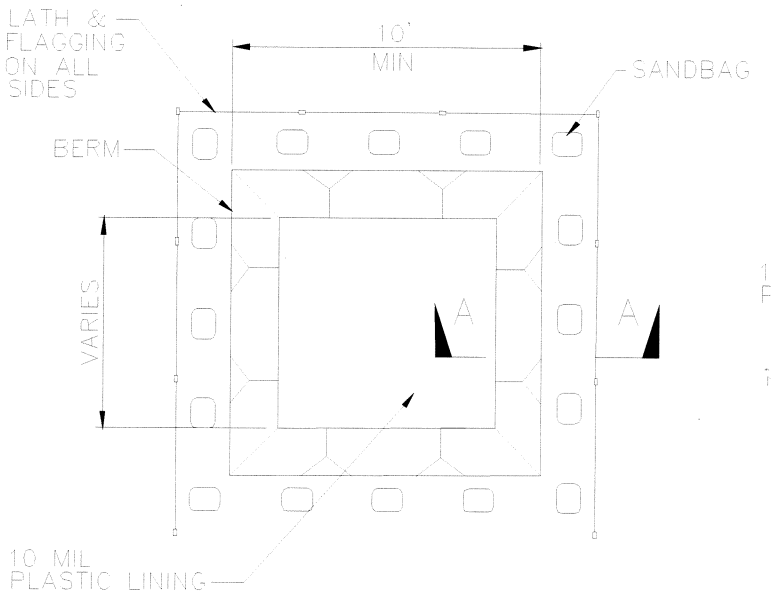
- Inspect washout facilities for damage (e.g. torn liner, evidence of leaks, signage, etc.). Repair all identified damage.

References

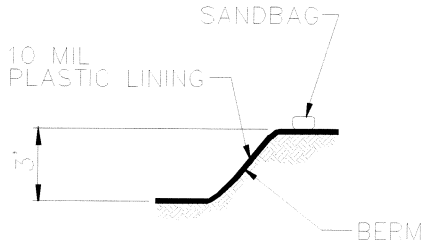
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000, Updated March 2003.

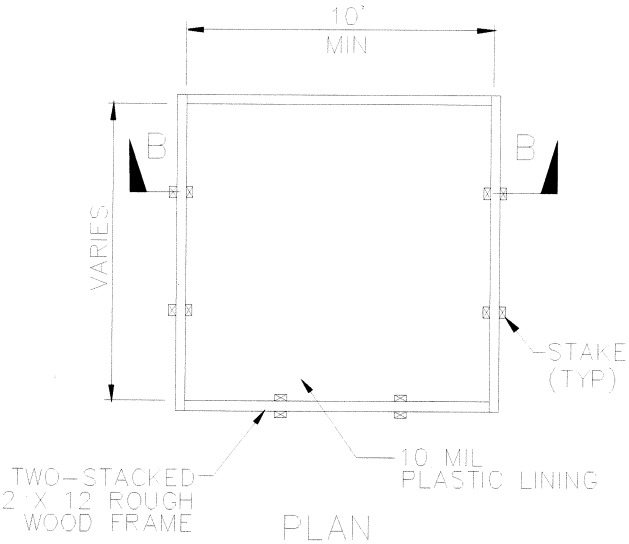
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



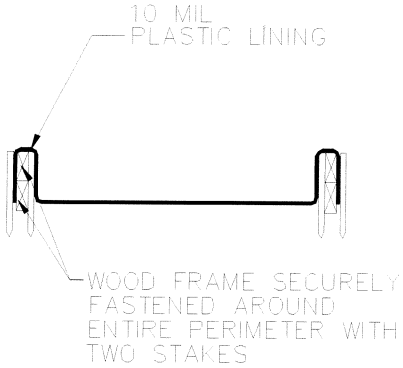
PLAN
NOT TO SCALE
TYPE "BELOW GRADE"



SECTION A–A
NOT TO SCALE



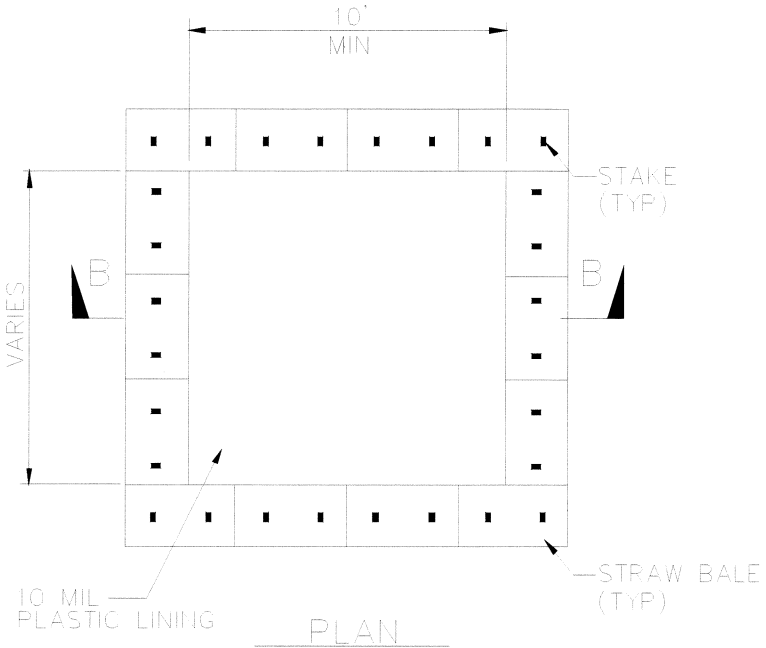
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"



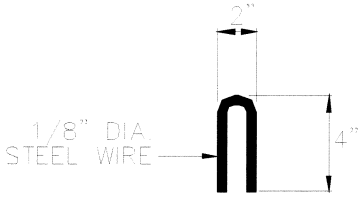
SECTION B–B
NOT TO SCALE

NOTES

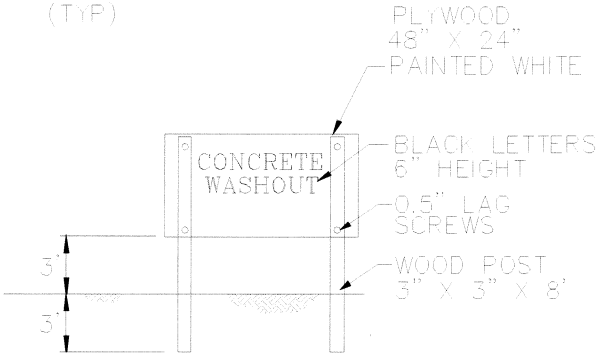
1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



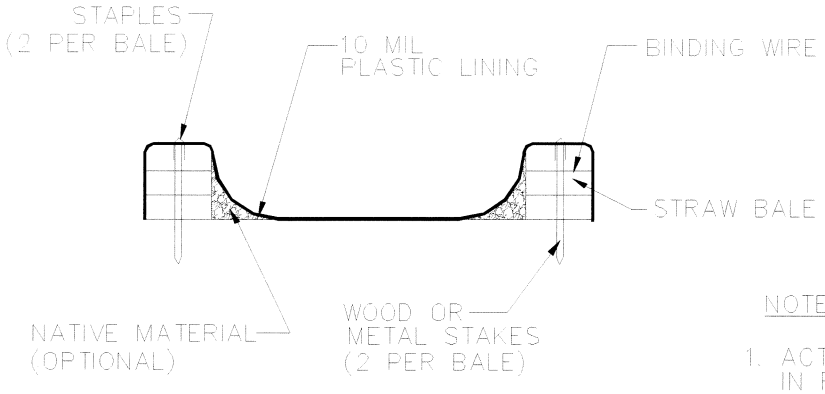
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"
WITH STRAW BALES



STAPLE DETAIL



CONCRETE WASHOUT
SIGN DETAIL
(OR EQUIVALENT)

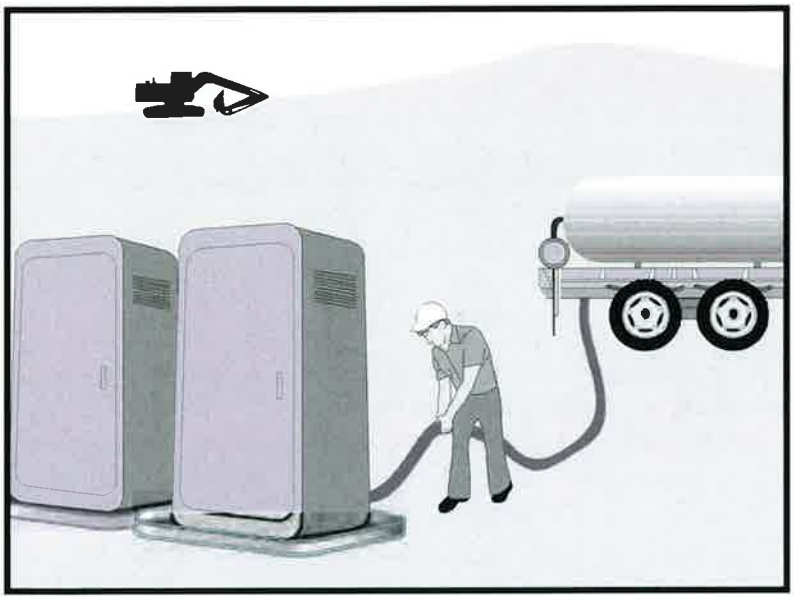


SECTION B–B
NOT TO SCALE

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

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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.

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- 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

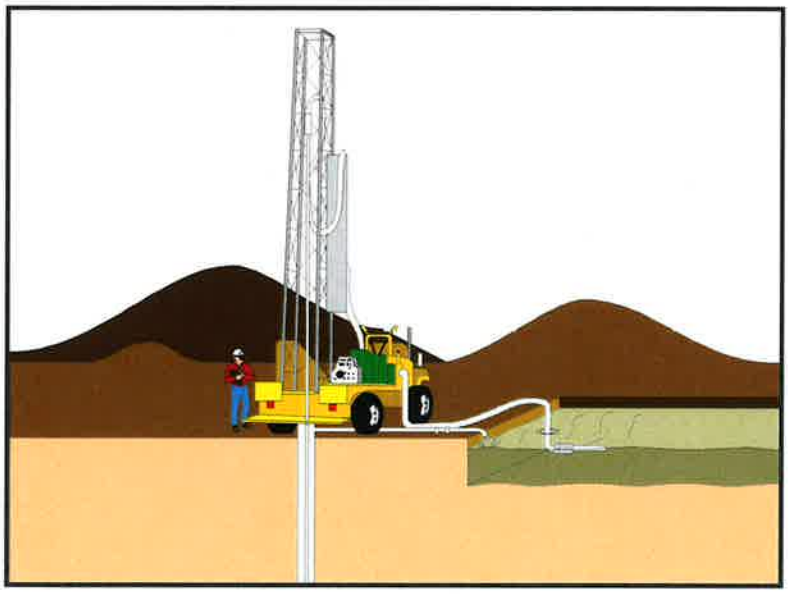
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange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

Liquid Waste Management WM-10



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

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Description and Purpose

Liquid waste management includes procedures and practices to prevent discharge of pollutants to the storm drain system or to watercourses as a result of the creation, collection, and disposal of non-hazardous liquid wastes.

Suitable Applications

Liquid waste management is applicable to construction projects that generate any of the following non-hazardous by-products, residuals, or wastes:

- Drilling slurries and drilling fluids
- Grease-free and oil-free wastewater and rinse water
- Dredgings
- Other non-stormwater liquid discharges not permitted by separate permits

Limitations

- Disposal of some liquid wastes may be subject to specific laws and regulations or to requirements of other permits secured for the construction project (e.g., NPDES permits, Army Corps permits, Coastal Commission permits, etc.).
- Liquid waste management does not apply to dewatering operations (NS-2 Dewatering Operations), solid waste management (WM-5, Solid Waste Management), hazardous wastes (WM-6, Hazardous Waste Management), or

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concrete slurry residue (WM-8, Concrete Waste Management).

- Typical permitted non-stormwater discharges can include: water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; flows from riparian habitats and wetlands; and discharges or flows from emergency fire fighting activities.

Implementation

General Practices

- Instruct employees and subcontractors how to safely differentiate between non-hazardous liquid waste and potential or known hazardous liquid waste.
- Instruct employees, subcontractors, and suppliers that it is unacceptable for any liquid waste to enter any storm drainage device, waterway, or receiving water.
- Educate employees and subcontractors on liquid waste generating activities and liquid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Verify which non-stormwater discharges are permitted by the statewide NPDES permit; different regions might have different requirements not outlined in this permit.
- Apply NS-8, Vehicle and Equipment Cleaning for managing wash water and rinse water from vehicle and equipment cleaning operations.

Containing Liquid Wastes

- Drilling residue and drilling fluids should not be allowed to enter storm drains and watercourses and should be disposed of.
- If an appropriate location is available, drilling residue and drilling fluids that are exempt under Title 23, CCR § 2511(g) may be dried by infiltration and evaporation in a containment facility constructed in conformance with the provisions concerning the Temporary Concrete Washout Facilities detailed in WM-8, Concrete Waste Management.
- Liquid wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud, should be contained and not allowed to flow into drainage channels or receiving waters prior to treatment.
- Liquid wastes should be contained in a controlled area such as a holding pit, sediment basin, roll-off bin, or portable tank.
- Containment devices must be structurally sound and leak free.
- Containment devices must be of sufficient quantity or volume to completely contain the liquid wastes generated.

- Precautions should be taken to avoid spills or accidental releases of contained liquid wastes. Apply the education measures and spill response procedures outlined in WM-4, Spill Prevention and Control.

- Containment areas or devices should not be located where accidental release of the contained liquid can threaten health or safety or discharge to water bodies, channels, or storm drains.

Capturing Liquid Wastes

- Capture all liquid wastes that have the potential to affect the storm drainage system (such as wash water and rinse water from cleaning walls or pavement), before they run off a surface.

- Do not allow liquid wastes to flow or discharge uncontrolled. Use temporary dikes or berms to intercept flows and direct them to a containment area or device for capture.

- Use a sediment trap (SE-3, Sediment Trap) for capturing and treating sediment laden liquid waste or capture in a containment device and allow sediment to settle.

Disposing of Liquid Wastes

- A typical method to handle liquid waste is to dewater the contained liquid waste, using procedures such as described in NS-2, Dewatering Operations, and SE-2, Sediment Basin, and dispose of resulting solids per WM-5, Solid Waste Management.

- Methods of disposal for some liquid wastes may be prescribed in Water Quality Reports, NPDES permits, Environmental Impact Reports, 401 or 404 permits, and local agency discharge permits, etc. Review the SWPPP to see if disposal methods are identified.

- Liquid wastes, such as from dredged material, may require testing and certification whether it is hazardous or not before a disposal method can be determined.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management.

- If necessary, further treat liquid wastes prior to disposal. Treatment may include, though is not limited to, sedimentation, filtration, and chemical neutralization.

Costs

Prevention costs for liquid waste management are minimal. Costs increase if cleanup or fines are involved.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Remove deposited solids in containment areas and capturing devices as needed and at the completion of the task. Dispose of any solids as described in WM-5, Solid Waste Management.
- Inspect containment areas and capturing devices and repair as needed.

References

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

Appendix H: BMP Inspection Forms

BMP INSPECTION REPORT

Date and Time of Inspection:	Date Report Written:

Inspection Type: (Circle one)	Weekly *Complete Parts I,II,III and VII*	Pre-Qualifying Precipitation Event (QPE) *Complete Parts I,II,III,IV and VII*	During QPE *Complete Parts I, II, III, V, and VII*	Post-QPE *Complete Parts I,II,III,VI and VII*	*Inactive Project Complete Parts I,II,III and VII*

Part I. General Information

Site Information

Construction Site Name: Garberville Sanitary District Water System Improvements

Construction stage and completed activities:	Approximate area of site that is exposed:

Photos Taken: (Circle one)	Yes	No	Photo Reference IDs:

Weather

Estimate storm beginning: (date and time)	Estimate storm duration: (hours)
Estimate time since last storm: (days or hours)	Rain gauge reading and location: (in)

Is a "Qualifying Precipitation Event" predicted or did one occur (i.e., any weather pattern with a 50% chance of 0.5" or more within a 24-hr period when 0.5" has been forecast and continues on subsequent 24-hour periods when 0.25" of precipitation or more is forecast)? ☐ Yes ☐ No
If yes, summarize forecast:

Exception Documentation (explanation required if inspection could not be conducted). Visual inspections are not required outside of business hours or during dangerous weather conditions such as electrical storms, flooding, and high winds above 40 miles per hour.

Inspector Information

Inspector Name:	Inspector Title:
Inspector Certification:	Date:

Part II. BMP Observations. Describe deficiencies in Part III.			
Minimum BMPs for Risk Level ____ Sites	Adequately designed, implemented and effective (Yes, No, N/A)	Action Required (Yes/No)	Action Implemented (Date)
Good Housekeeping for Construction Materials			
Inventory of products (excluding materials designed to be outdoors)			
Stockpiled construction materials not actively in use are covered and bermed			
All chemicals are stored in watertight containers with appropriate secondary containment, or in a completely enclosed storage shed			
Construction materials are minimally exposed to precipitation			
BMPs preventing the off-site tracking of materials are implemented and properly effective			
Good Housekeeping for Waste Management			
Wash/rinse water and materials are prevented from being disposed into the storm drain system			
Portable toilets are contained to prevent discharges of waste			
Sanitation facilities are clean and with no apparent for leaks and spills			
Equipment is in place to cover waste disposal containers at the end of business day and during rain events			
Discharges from waste disposal containers are prevented from discharging to the storm drain system / receiving water			
Stockpiled waste material is securely protected from wind and rain if not actively in use			
Procedures are in place for addressing hazardous and non-hazardous spills			
Appropriate spill response personnel are assigned and trained			
Equipment and materials for cleanup of spills is available onsite			
Washout areas (e.g., concrete) are contained appropriately to prevent discharge or infiltration into the underlying soil			
Good Housekeeping for Vehicle Storage and Maintenance			
Measures are in place to prevent oil, grease, or fuel from leaking into the ground, storm drains, or surface waters			
All equipment or vehicles are fueled, maintained, and stored in a designated area with appropriate BMPs			
Vehicle and equipment leaks are cleaned immediately and disposed of properly			

Part II. BMP Observations Continued. Describe deficiencies in Part III.			
Minimum BMPs for Risk Level ____ Sites	Adequately designed, implemented and effective (Yes, No, N/A)	Action Required (Yes/No)	Action Implemented (Date)
Good Housekeeping for Landscape Materials			
Stockpiled landscape materials such as mulches and topsoil are contained and covered when not actively in use			
Erodible landscape material has not been applied 2 days before a forecasted rain event or during an event			
Erodible landscape materials are applied at quantities and rates in accordance with manufacturer recommendations			
Bagged erodible landscape materials are stored on pallets and covered			
Good Housekeeping for Air Deposition of Site Materials			
Good housekeeping measures are implemented onsite to control the air deposition of site materials and from site operations			
Non-Stormwater Management			
Non-Stormwater discharges are properly controlled			
Vehicles are washed in a manner to prevent non-stormwater discharges to surface waters or drainage systems			
Streets are cleaned in a manner to prevent unauthorized non-stormwater discharges to surface waters or drainage systems.			
Erosion Controls			
Wind erosion controls are effectively implemented			
Effective soil cover is provided for disturbed areas inactive (i.e., not scheduled to be disturbed for 14 days) as well as finished slopes, open space, utility backfill, and completed lots			
The use of plastic materials is limited in cases when a more sustainable, environmentally friendly alternative exists.			
Sediment Controls			
Perimeter controls are established and effective at controlling erosion and sediment discharges from the site			
Entrances and exits are stabilized to control erosion and sediment discharges from the site			
Sediment basins are properly maintained			
Inspect immediate access roads prior to forecasted precipitation			
Linear sediment control along toe of slope, face of slope an at grade breaks (Risk Level 2 & 3 Only)			
Limit construction activity to and from site to entrances and exits that employ effective controls to prevent offsite tracking (Risk Level 2 & 3 Only)			
Ensure all storm, drain inlets and perimeter controls, runoff control BMPs and pollutants controls at entrances and exits are maintained and protected from activities the reduce their effectiveness (Risk Level 2 & 3 Only)			

Part II. BMP Observations Continued. Describe deficiencies in Part III.			
Minimum BMPs for Risk Level ____ Sites	Adequately designed, implemented and effective (Yes, No, N/A)	Action Required (Yes/No)	Action Implemented (Date)
Runon and Runoff Controls			
Runon to the site is effectively managed and directed away from all disturbed areas.			
Other			
Are the project SWPPP and BMP plan up to date, available onsite and being properly implemented?			
Is the posting of the project's unique WDID number, waiver identification number, and site and project contact information publicly accessible?			

Part III. Descriptions of BMP Deficiencies		
Deficiency	**Repairs Implemented:** **Note -** Repairs must begin within 72 hours of identification and, complete repairs as soon as possible.	
	Start Date	**Action**
1.		
2.		
3.		
4.		

Part IV. Additional Pre-QPE Observations. Note the presence or absence of floating and suspended materials, sheen, discoloration, turbidity, odors, and source(s) of pollutants(s).	
	Yes, No, N/A
Do stormwater storage and containment areas have adequate freeboard? If no, complete Part III.	
Are drainage areas free of spills, leaks, or uncontrolled pollutant sources? If no, complete Part VII and describe below.	
Notes:	
Are stormwater storage and containment areas free of leaks? If no, complete Parts III and/or VII and describe below.	
Notes:	

Part V. Additional During-QPE Observations. If BMPs cannot be inspected during inclement weather, list the results of visual inspections at all relevant outfalls, discharge points, and downstream locations. Note odors or visible sheen on the surface of discharges. Complete Part VII (Corrective Actions) as needed.	
Outfall, Discharge Point, or Other Downstream Location	
Location	Description
Location	Description
Location	Description
Location	Description

Part VI. Additional Post-QPE Observations. Visually observe (inspect) stormwater discharges at all discharge locations within 96 hours after each qualifying precipitation event, and observe (inspect) the discharge of stored or contained stormwater that is derived from and discharged subsequent to a qualifying precipitation event producing precipitation of ½ inch or more at the time of discharge. Complete Part VII (Corrective Actions) as needed.	
Discharge Location, Storage or Containment Area	**Visual Observation**

Part VII. Additional Corrective Actions Required. Identify additional corrective actions not included with BMP Deficiencies (Part III) above. Note if SWPPP change is required.	
Required Actions	**Implementation Date**

Risk Level 1, 2, 3 ***Visual Inspection Field Log Sheet***					
Date and Time of Inspection:			Report Date:		
Inspection Type:	☐ Weekly	☐ Pre-Qualifying Precipitation Event (QPE)	☐ During QPE	☐ Post-QPE	☐ Dewatering Discharge
Site Information					
Construction Site Name: Garberville Sanitary District Water System Improvements					
Construction stage and completed activities:				Approximate area of exposed site:	
Weather and Observations					
Date Rain Predicted to Occur:			Predicted % chance of precipitation (PoP): Predicted quantity of precipitation (QPF):		
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 1, 2, 3 ***"Effluent Sampling Field Log Sheets"***			
Construction Site Name: Garberville Sanitary District Water System Improvements		Date:	Time Start:
Sampler:			
Sampling Event Type:	☐ Stormwater	☐ Dewatering Discharge	☐ Non-visible pollutant

Field Meter Calibration	
pH Meter ID No./Desc.: Calibration Date/Time:	Turbidity Meter ID No./Desc.: Calibration Date/Time:

Field pH and Turbidity Measurements			
Discharge Location Description	pH	Turbidity	Time

Grab Samples Collected		
Discharge Location Description	Sample Type	Time

Additional Sampling Notes:
Time End:

Risk Level 3 ***Receiving Water Sampling Field Log Sheets***		
Construction Site Name: Garberville Sanitary District Water System Improvements	Date:	Time Start:
Sampler:		
Receiving Water Description and Observations		
Receiving Water Name/ID:		
Observations:		
Odors	Yes ☐	No ☐
Floating material	Yes ☐	No ☐
Suspended Material	Yes ☐	No ☐
Sheen	Yes ☐	No ☐
Discolorations	Yes ☐	No ☐
Turbidity	Yes ☐	No ☐
Field Meter Calibration		
pH Meter ID No./Desc.: Calibration Date/Time:	Turbidity Meter ID No./Desc.: Calibration Date/Time:	

Field pH and Turbidity Measurements			
Upstream Location			
Type	Result	Time	Notes
pH			
Turbidity			
Downstream Location			
Type	Result	Time	Notes
pH			
Turbidity			
Additional Sampling Notes:			
Time End:			

NAL Exceedance Evaluation Summary Report	Page __ of __
Project Name	**Garberville Sanitary District Water System Improvements**
Project WDID	
Project Location	
Date of Exceedance	
Type of Exceedance	**NAL ☐ pH ☐ Turbidity** **☐ Other (specify) _____**
Measurement or Analytical Method	**☐ Field meter** **(Sensitivity: _____)** **☐ Lab method (specify) _____** **(Minimum Level: _____)** **(MDL: _____)**
Calculated Daily Average	**☐ pH _____ pH units** **☐ Turbidity _____ NTU**
Rain Gauge Measurement	**_____ inches**
Visual Observations on Day of Exceedance	
Description of BMPs in Place at Time of Event	
Initial Assessment of Cause	
Corrective Actions Taken (deployed after exceedance)	
Additional Corrective Actions Proposed	
Report Completed By	_____ **(Print Name, Title)**
Signature	_____

CHAIN-OF-CUSTODY **DATE:** **Lab ID:**

DESTINATION LAB:							REQUESTED ANALYSIS				Notes:
ATTN:											
ADDRESS:											
Office Phone:											
Cell Phone:											
SAMPLED BY:											
Contact:											
Project Name											
Client Sample ID	**Sample Date**	**Sample Time**	**Sample Matrix**	**Container #**	**Container Type**	**Container Pres.**					

SENDER COMMENTS:	**RELINQUISHED BY**	
	Signature:	
	Print:	
	Company:	
	Date:	TIME:
LABORATORY COMMENTS:	**RECEIVED BY**	
	Signature:	
	Print:	
	Company:	
	Date:	TIME:

Appendix I: Training Reporting Form

Contractor Personnel Training Log
Stormwater Management Training Log and Documentation

Project Name: **Garberville Sanitary District Water System Improvements**

WDID #: _____

Stormwater Management Topic: (check as appropriate)

☐ Good Housekeeping BMPs
☐ Sediment Control BMPs
☐ Non-Stormwater Management BMPs
☐ BMP Implementation Activities
☐ Identification of QSPs and QSP Delegates
☐ Erosion Control BMPs
☐ Tracking Control
☐ Waste Management & Pollution Control BMPs
☐ Advanced BMPs

Training Objective: _____

Date: _____ Instructor: _____

Training Length (hours): _____

Attendee Roster (Attach additional forms if necessary)

Name	Company	Phone

QSP Delegate Training Log
Stormwater Management Training Log and Documentation

Project Name: **Garberville Sanitary District Water System Improvements**

WDID #: _____

QSP Delegate Name: _____

Delegated Responsibilities:
☐ Stormwater Visual Inspections
☐ Sampling
☐ BMP Inspections
☐ BMP Maintenance and Repair

Foundational Training

Topic	Date Completed	QSP Trainer
☐ Roles and Responsibilities		
☐ Forecast Information		
☐ Documentation and Reporting Procedures		

Site-Specific Training

Topic	Date Completed	QSP Trainer
☐ Visual Inspections		
☐ Sample Collection Procedures		
☐ Sample Reporting Procedures		
☐ BMP Implementation		

As needed, attach proof of external training (e.g., course completion certificates, credentials for the QSP Delegate).

Appendix J: Responsible Parties

Identification of QSP and QSP Delegates

Project Name: **Garberville Sanitary District Water System Improvements**

WDID #: **TBD**

The following are QSPs and QSP Delegates associated with this project

Name of Personnel[a]	QSP[b] Number, or state "Delegate"	Company	Date
Peter Dunn	23862	SHN	3/11/2024
Max Kaufman	26190	SHN	3/11/2024
Roger Klakken	27420	SHN	3/11/2024
Whitney Brown	Delegate	SHN	3/11/2024
Jacob Aguilera	Delegate	SHN	3/11/2024

a. If additional QSPs or QSP Delegates are required on the job site add additional lines

b. QSP: Qualified SWPPP Practitioner

Role	Name	Phone Number	License or Certification Number, if Applicable
Legally Responsible Person	TBD		
Duly Authorized representative	TBD		
Qualified SWPPP Developer (QSD)	Peter Dunn	707-441-8855	P.E. 78956; QSD #23862
Qualified SWPPP Practitioner (QSP)	Max Kaufman	707-441-8855	QSP #26190
Qualified SWPPP Practitioner (QSP)	Roger Klakken	707-441-8855	QSP #27420
QSP Delegate	Whitney Brown	707-441-8855	
QSP Delegate	Jacob Aguilera	707-441-8855	

CERTIFICATE OF TRAINING

CALIFORNIA CONSTRUCTION GENERAL PERMIT

QUALIFIED SWPPP DEVELOPER (QSD)
AND
QUALIFIED SWPPP PRACTITIONER (QSP)

Peter Dunn

Jan 31, 2023 - Mar 29, 2025

Certificate # 23862

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California Construction General Permit Training Team

CERTIFICATE OF TRAINING

CALIFORNIA CONSTRUCTION GENERAL PERMIT

QUALIFIED SWPPP PRACTITIONER (QSP)

Max Kaufman

Jan 06, 2023 - Jan 06, 2025

Certificate # 26190

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California Stormwater Quality Association and
California Construction General Permit Training Team

CERTIFICATE OF TRAINING

CALIFORNIA CONSTRUCTION GENERAL PERMIT

QUALIFIED SWPPP PRACTITIONER (QSP)

Roger Klakken

Nov 15, 2023 - Jan 14, 2026

Certificate # 27420

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California Stormwater Quality Association and
California Construction General Permit Training Team

Appendix K: Rain Gauge Log Sheet

Rain Gauge Log Sheet				
Construction Site Name:	**Garberville Sanitary District Water System Improvements**			
WDID #:				
Date (mm/dd/yy)	**Time (24-hr)**	**Initials**	**Rainfall Depth (Inches)**	**Notes:**

Appendix L: Field Meter Instructions

Instruction Manual

TN-100/T-100

Portable Turbidimeter

OAKTON®

EUTECH INSTRUMENTS

Technology Made Easy...

ISO 9001 CERTIFIED

68X357701 Rev. 4 Apr 06

Certificate of Compliance

This is to certify that the TN100 Portable Turbidimeter complies with the specifications established by the ISO 7027 International Standard for Water Quality - Determination of Turbidity, Section 3: Quantitative Methods using Optical Turbidimeters.

EUTECH INSTRUMENTS

Technology Made Easy...

Preface

This manual functions in two ways: first as a step by step guide to help you operate the waterproof TN-100/ T-100 turbidimeter; second, it serves as a handy reference guide.

It contains basic instructions that you must follow during the operation, care and maintenance of the instrument. The safety protection provided by this equipment may be impaired if it is used in a manner not described in this manual. It is recommended that all operators should read this manual prior to working with this instrument.

Eutech Instruments/ Oakton Instruments cannot accept any responsibility for damage or malfunction to the meter caused by improper use of the instrument.

The information presented in this manual is subject to change without notice as improvements are made, and does not represent a commitment on the part of Eutech Instruments Pte Ltd/ Oakton Instruments.

Note: Eutech Instruments Pte Ltd/ Oakton Instruments reserves the right to make improvements in design, construction, and appearance of products without notice.

Table of Contents

1. Overview

Thank you for selecting the waterproof portable TN-100/ T-100 turbidimeter. The TN-100/ T-100 allows you to measure turbidity of an aqueous sample in the field. This instrument operates on the nephelometric principle of turbidity measurement and is designed to meet the criteria specified in ISO 7027 and DIN 27027 standards (see Measurement Principle on page 19).

1.1 Unpacking TN-100/ T-100 Meter and Accessories

The table below indicates the items that you should find in your turbidimeter shipment.

Item	Quantity
1. Portable TN-100/ T-100 Turbidimeter with 4 “AAA” batteries	1
2. Instruction Manual	1
3. Instrument Carrying Case	1
4. Light Shield Cap	1
5. Calibration Set (0.02, 20.0,100, 800 NTU Standards)	1
6. Empty Vials	3
7. Plastic bottle (empty – for collecting sample)	1
8. Silicone Oil	1
9. Lint free cloth	1

Remove TN-100/ T-100 turbidimeter from the packing carton. Carefully inspect all items to ensure that no visible damage has occurred during shipment. If the items you received do not match your order, please contact your nearest distributor immediately.

***WARNING**: Extra care should be taken when unpacking, opening, and handling the calibration standards and sample vials. Surface scratches or finger smudges on the vial surface may cause measurement errors. Handle these items by their caps only.*

Batteries provided with the meter package are to be installed prior to use. See Section 1.4 - Battery Installation on page 4.

Figure 1 depicts the meter. The three main components of the instrument are the sample well, the display, and the keypad. The following sections describe the functionality of the display and the keypad. The proper use of the instrument and the sample well are discussed in later sections.

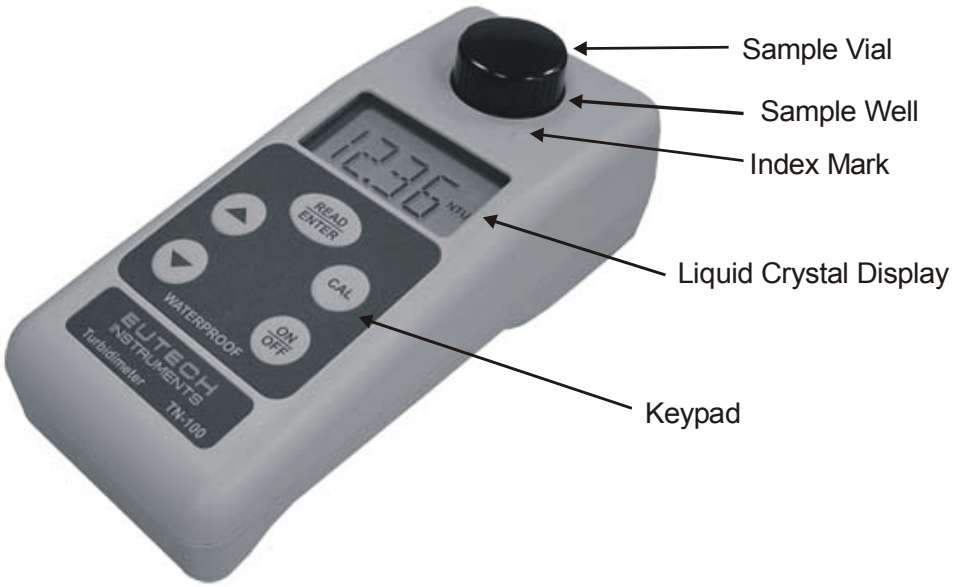


Figure 1: Parts of TN-100/T-100 Turbidimeter

1.2 Display

All the LCD segments and annunciators that can appear on the display are shown in Figure 2. The display is used for reporting the turbidity reading and to provide guidance for the operation of the instrument. In addition, the display has several other annunciators that are used to communicate error messages and provide user guidance.

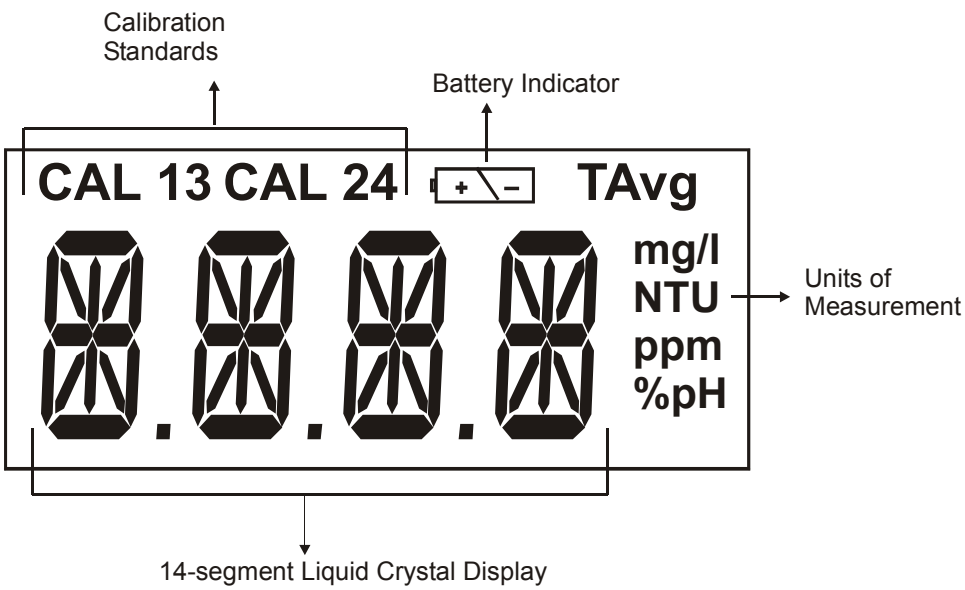


Figure 2: Customized LCD with all annunciators

1.3 Keys and Functions

The keypad has five keys: ON/OFF, CAL, ▲, ▼, and READ/ENTER.

Key	Functions
ON/OFF	Powers on and shuts off the meter. With the auto switch-off feature the meter automatically shuts off 20 minutes after last key press.
CAL	Initiates the calibration mode of the meter. When pressed, the meter is set to accept the first calibration standard. It is also used to exit the calibration mode if the user does not want to follow the complete calibration procedure.
READ/ENTER	When in measurement mode, the READ/ENTER key is used to perform a measurement. *Single-shot measurements*: When the key is pressed and released immediately (a quick key stroke of less than 0.3 seconds), the display will blink [-Rd-] for 10 times and then display the measured value. *Continuous measurements*: If the READ/ENTER key is pressed and held, the instrument will perform a continuous measurement during which the display is updated every 2 seconds. This can be used for indexing vials. (This function is not available in calibration mode). After the READ/ENTER key is released, the instrument will automatically perform a single-shot measurement.
▲ ▼	Active only during calibration mode. These keys are used to select the calibration point in an incremental/ decremental manner. *NOTE: This meter is fitted with an auto incrementing feature, i.e. after the successful calibration of one point it auto selects the next calibration point, or automatically exits the calibration mode after the fourth calibration point.*

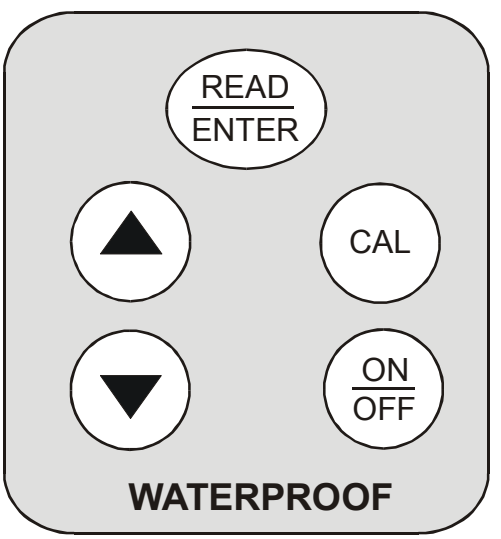


Figure 3: Keypad

1.4 Battery Installation

Four AAA-sized batteries are included in the packaging:

1. Use a Philips screwdriver to remove the two screws holding the battery cover. See Figure 4.
2. Remove the battery cover.
3. Insert the batteries. Follow the diagram inside the cover for correct polarity.
4. Replace the battery cover onto its original position using the two screws removed earlier.
5. The meter is now ready to operate.

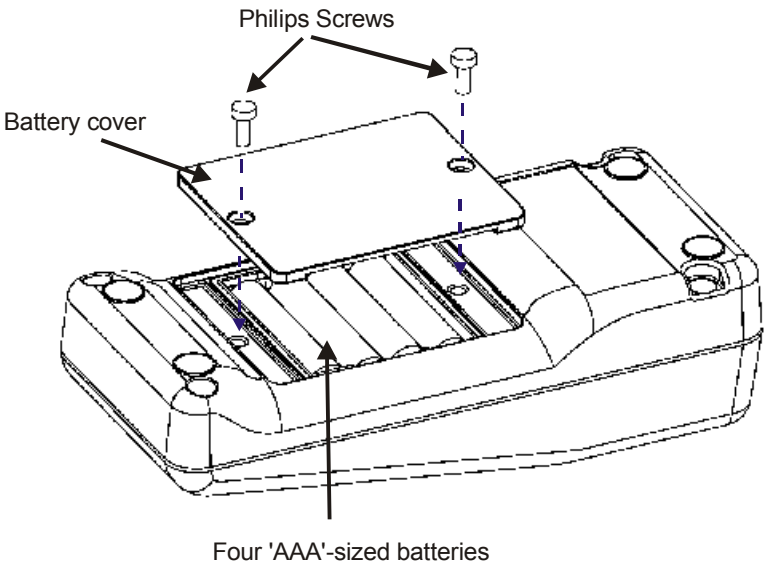


Figure 4: Battery Installation

NOTE: *Dispose used batteries in accordance with your local regulations.*

2. Turbidity Calibration

The TN-100/ T-100 turbidimeter was calibrated and tested prior to leaving the factory. Therefore, it is possible to use the instrument directly out of the box. However, re-calibration of the instrument is recommended to help you become familiar with the operation of the instrument and the calibration procedures. In addition, re-calibration is recommended at least once every month for optimum accuracy.

It is recommended that you perform a full calibration using all 4 standards provided to ensure full-range accuracy. However, the TN-100/ T-100 turbidimeter provides flexibility for you to calibrate at selected ranges suitable for your application.

In addition, the instrument comes with a light shield cap to shield off stray light during calibration and measurements.

2.1 Calibration Standards

We recommend that you use the following materials during calibration to achieve the accuracy stated in this manual:

- **CAL 1**: 800 NTU Calibration Standard
- **CAL 2**: 100 NTU Calibration Standard
- **CAL 3**: 20.0 NTU Calibration Standard
- **CAL 4**: 0.02 NTU Calibration Standard

It is well known that diluted Formazin is unstable. If you choose to use Formazin to calibrate the instrument, ensure that you are using a fresh stock suspension of Formazin to achieve the accuracy quoted for the instrument. Calibration standards offered are more stable than Formazin and have a limited shelf life of 12 months. If you use the supplied calibration standards to calibrate the instrument, review the expiration date (indicated on cap label) to ensure that the standards have not expired.

It is important that the calibration standards are not violently shaken or agitated because air entrapment in the fluid introduces an error factor during calibration which subsequently will lead to an inaccurate measurement. Also, do not store in freezing temperatures which causes irreversible shrinkage of the standards' particles thus resulting to inaccurate calibration and measurement.

2.2 Indexing

Due to the high quality of the glass vials provided, indexing is not required. You only need to align the mark on the vial with the mark on the meter. However, in order to achieve a better accuracy of the measurement, you can proceed with indexing of the vials. See Section 8.5 - Indexing a Vial on page 20 for more information.

2.3 Calibration Procedure

1. Place TN-100/ T-100 turbidimeter on a flat and level surface.
2. Insert the CAL 1 standard (800 NTU) into the sample well, aligning the mark on the vial with the mark on the meter. See **Figure 10** on page 12.
3. Press down vial until it snaps fully into the instrument.
4. Cover the vial using the light shield cap.
5. Press **ON/OFF** key to switch the on the meter. The meter goes to measurement mode after the power-up sequence.
6. Select the calibration function of the instrument by pressing the **CAL** key once. The “CAL” annunciator blinks momentarily and the meter prompt for the first calibration standard “CAL 1 800 NTU”.
7. Press **READ/ENTER** key.
8. The “CAL 1 800 NTU” annunciator blinks for about 12 seconds while the instrument performs calibration of CAL 1 point. When the instrument has completed calibration for this point, it prompts you to insert the next calibration standard into the sample well “CAL 2 100 NTU”.
9. Repeat the calibration for CAL 2, CAL 3 & CAL 4 calibration standards.
10. After you successfully calibrate the CAL 4 standard (0.02 NTU), the display shows “STbY”.
11. The meter is now ready for measurement.

Figure 5 shows the complete calibration sequence.

NOTES:

1. *If you wish to exit the calibration mode you may do so at the end of any step by pressing the **CAL** key. The meter accepts only the values calibrated prior to exiting.*

2. *You can skip a calibration point by pressing ▲ or ▼ keys and move on to the next calibration point.*

3. *After a successful calibration of one point, the meter automatically selects the next calibration point. The meter automatically exits calibration mode after the fourth calibration point.*

4. *If an error occurs during calibration, the display shows an error message. The meter aborts calibration and returns to the measurement mode without saving the last calibration value.*

5. *For a list of error messages, refer to Section 4: Troubleshooting Guide on page 15.*

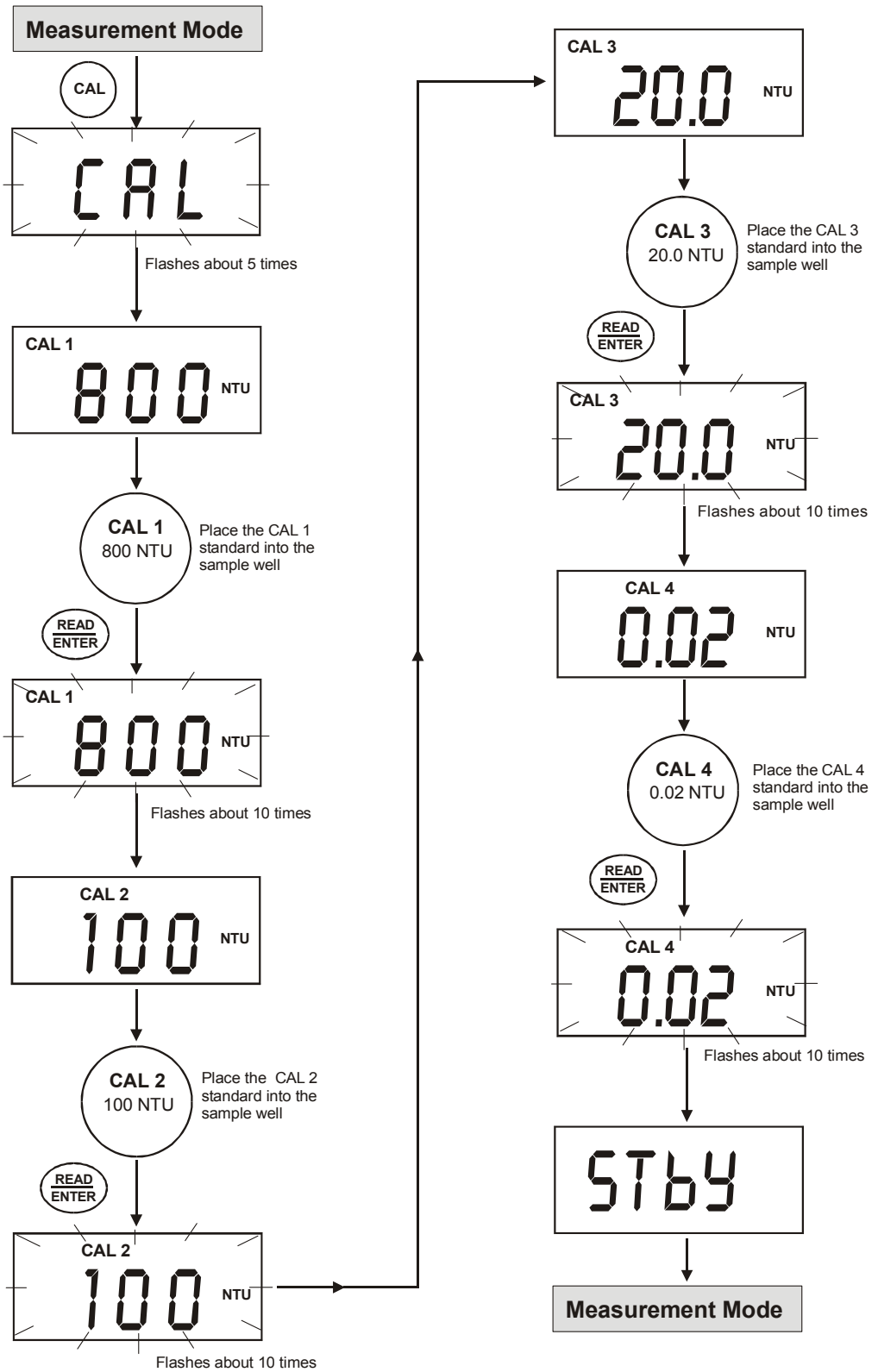


Figure 5: Calibration Sequence

2.4 Restoring Factory Calibration

The TN-100/ T-100 turbidimeter allows you to reset the meter back to the factory default calibration values. This feature is extremely useful when there are errors in calibration or when you have new calibration standards.

1. With the meter switched off, press and hold ▲ key.
2. Switch on the meter using **ON/OFF**. Release ▲ key when “URST” (User-Reset) appears in the display.
3. The display shows “URST” for about 2 seconds and then shows “No”.
4. Use ▲ or ▼ key to select between “YES” or “No”.
   - **YES** = To restore meter back to factory calibration values
   - **No** = To retain last calibrated values
5. Press **READ/ENTER** key to confirm your selection. The meter performs the reset if “YES” is selected.
6. The display flashes “--Rd—“about 10 times indicating that the meter goes to measurement mode.

Figure 6 shows the sequence for restoring factory calibration values.

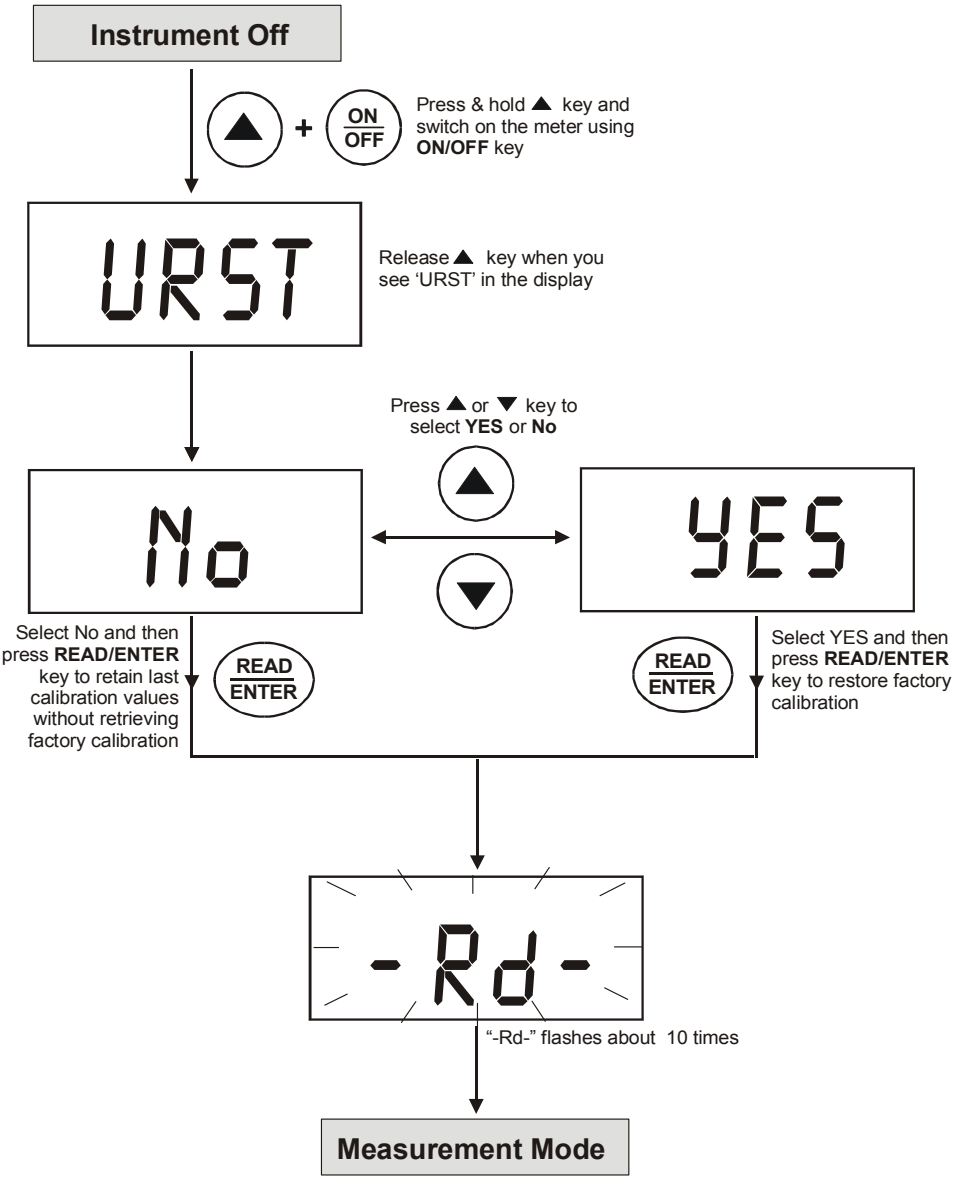


Figure 6: Restoring Factory Calibration

3. Turbidity Measurement

3.1 General Information

The waterproof TN-100/ T-100 turbidimeter allows you to measure the turbidity of a grab sample. The turbidity is reported in Nephelometric Turbidity Units (NTU). Readings above 1000 NTU are outside the range of this instrument.

> ***NOTE:*** *Before switching on the TN-100/ T-100 turbidimeter, a sample vial MUST be placed in the sample well. You can use any of the calibration standards for this purpose.*
>
> *The light shield cap provided could be used to cover the vial during measurements.*

When the **ON/FF** key is pressed to switch on the meter, it goes through the power-up sequence as shown in Figure 7 below.

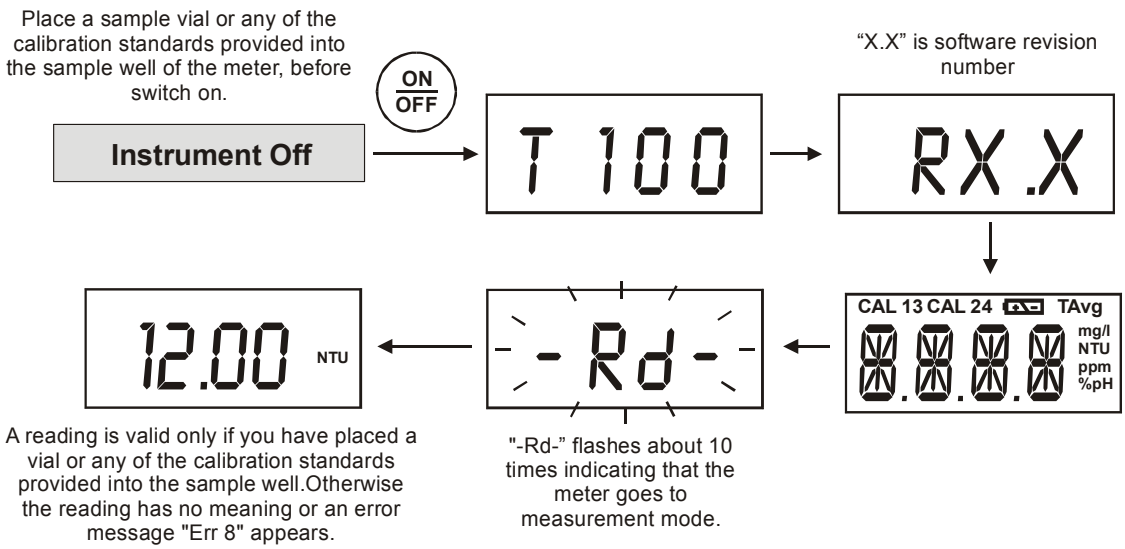


Figure 7: Power-up Sequence

3.2 Turbidity Measurement Procedure

An accurate turbidity measurement depends on good measurement techniques. Factors such as clean sample vials, positioning of vial in the sample well, covering the vial with the light shield cap, meter calibration, handling of meter, and others, have to be taken into consideration. Please see the following sections for more information.

Section 5.1: Vials – Handling, Cleaning and Care (page 16)

Section 9: Addendum 2:
Guide to Good Measurement Technique (page 21)

Preparation of Sample Vial

1. Obtain a clean and dry sample vial
2. Take care to handle the sample vial by the top.
3. Rinse the vial with approximately 10 ml of the sample water, capping the vial with the black screw cap and gently inverting it several times. Discard the used sample and repeat the rinsing procedure two more times.
4. Fill the rinsed vial with the remaining portion (approximately 10 ml) of the grab sample up to the mark indicated in the vial. Cap the vial with the supplied black screw cap.
5. Wipe the vial with the soft, lint-free cloth supplied. Ensure that the outside of the vial is dry, clean and free from smudges.

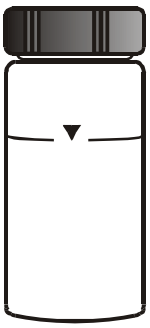


Figure 8: Sample Vial

6. Apply a thin film of silicone oil (supplied) on the sample vial (see Figure 9).
7. Wipe with a soft cloth to obtain an even distribution over the entire vial's surface.

NOTES:

1. *The purpose of oiling the vial is to fill small scratches and to mask the imperfection in the glass.*
2. *Do not apply large quantity of oil as this may collect dirt and dust*

8. The sample vial is now ready to be inserted into the sample well of the meter for measurement.

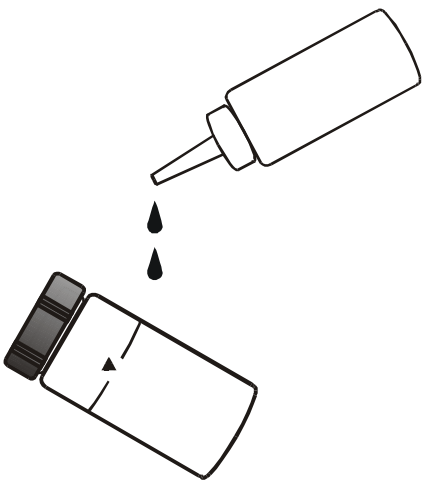


Figure 9: Apply a thin film of silicon oil

Measurement Procedure

1. Place TN-100/ T-100 turbidimeter on a flat and level surface.
2. Place the sample vial inside the sample well and align the vial's index mark with the meter's index mark. See **Figure 10**.

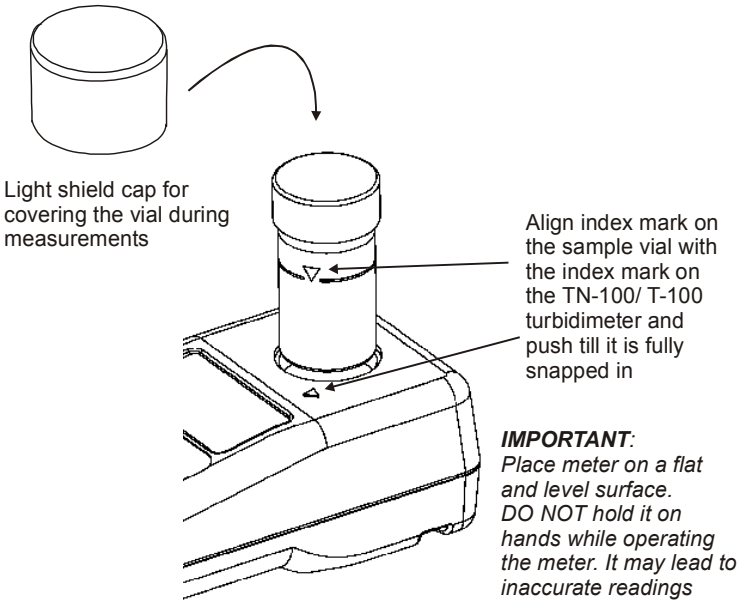


Figure 10: Align sample vial's index mark with meter's index mark

3. Push the vial until it is fully snapped in.
4. Cover the vial with the light shield cap.
5. Turn on the meter by pressing the **ON/OFF** key.
6. After the power-up sequence, the meter goes to measurement mode and the display blinks "--Rd--" for about 10 times. See Figure 11.
7. The measured reading appears in the display.
8. If necessary, place the second sample vial into the sample well. Remember to align the vial's mark with the meter's index mark.
9. Press **READ/ENTER** key. The display blinks "--Rd--" for several times and measured reading appears.
10. Repeat steps 2 through 9 for all of your samples.

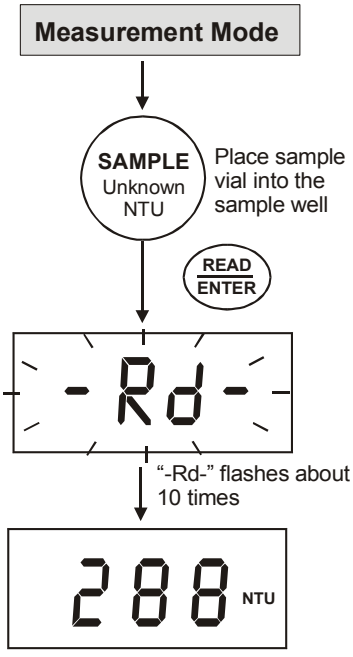


Figure 11: Reading Turbidity Value

NOTES:

1. *NEVER pour liquid directly into the sample well of the instrument. Always use a vial. The instrument will only accurately measure the turbidity of a sample when vials sealed with the black caps are used. The black cap serves as both seal and a light shield.*

2. *NEVER attempt to clean the sample well. The optics may be damaged.*

3. *For battery conservation, the instrument automatically powers off 20 minutes after the last key pressed.*

3.3 Single-Shot or Continuous Measurement

You can use TN-100/ T-100 turbidimeter to take a single reading or perform continuous measurement. The latter is only used for indexing the vials. See **Section 8.5** - Indexing a Vial on page 20 for more information.

For Single-shot Measurement:

1. Make sure the meter is sitting on a flat and level surface and is in measurement mode. The display shows the last measured value or “STbY” after exiting calibration mode.
2. Place sample vial in the sample well.
3. Cover the vial with the light shield cap.
4. Press **READ/ENTER** key and release immediately (<0.3 seconds). See Figure 12.
5. The display blinks “--Rd--“ for about 10 times and then display the measured value.

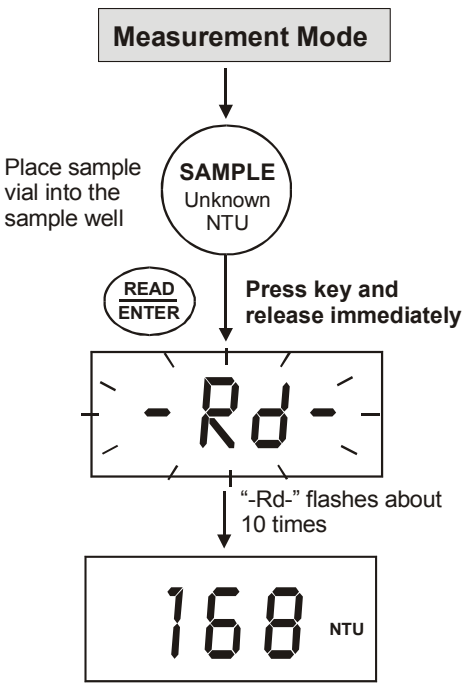


Figure 12: Single-shot Measurement

For Continuous Measurement:

1. Make sure the meter is sitting on a flat and level surface and is in measurement mode. The display shows the last measured value or “STbY”
2. Place the sample vial in the sample well.
3. Press **READ/ENTER** key and hold. See Figure 13
4. Wait for the reading to stabilize before rotating the sample vial.

> ***NOTE:*** *During continuous measurement, the display is updated every 2 seconds. The displayed reading may not be the actual turbidity value. For accurate measurement, use single-shot measurement.*

You can rotate the sample vial for indexing purpose. See **Section 8.5** - Indexing a Vial on page 20 for more information.

5. Once you release **READ/ENTER** key, the meter automatically performs a single-shot measurement.

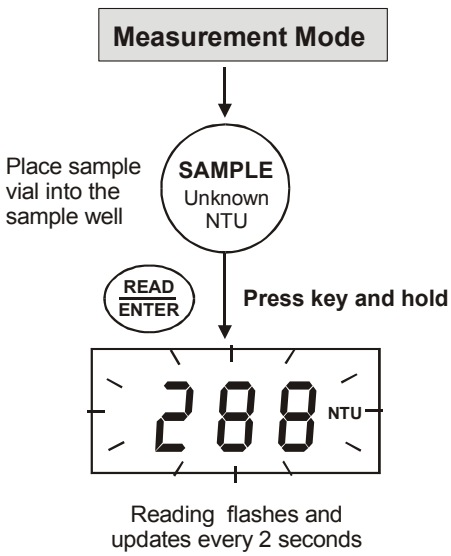


Figure 13: Continuous Measurement

> ***NOTES:***
>
> 1. *After a measurement is completed and the display is updated, a 4-second recovery time occurs before the meter can perform another function. If any key is pressed during the recovery time, the meter will perform the corresponding action at the end of the recovery period.*
>
> 2. *When performing a measurement, if the meter detects stray light exceeding the amount equivalent to 0.02 NTU in the low range, the measurement is immediately aborted and an error message [ERR 8] is displayed. Ensure the vial sits properly into the sample well. Press the ENTER/READ key to re-do the measurement.*

4. Troubleshooting Guide

The TN-100/ T-100 turbidimeter routinely performs self-diagnostics, and will automatically generate messages to provide you with specific diagnostic information. These messages are for your use and do not indicate a reduction in the performance of the instrument or a failure of any component in the instrument, unless otherwise stated in this list.

LCD Message	Description	Corrective Actions
ERR 1	Calibration Error. The meter is unable to recognize the 800 NTU Calibration Standard.	Ensure to use the correct 800 NTU calibration standard. *
ERR 2	Calibration Error. The meter is unable to recognize the 100 NTU Calibration Standard.	Ensure to use the correct 100 NTU calibration standard. *
ERR 3	Calibration Error. The meter is unable to recognize the 20.0 NTU Calibration Standard.	Ensure to use the correct 20.0 NTU calibration standard. *
ERR 4	Calibration Error. The meter is unable to recognize the 0.02 NTU Calibration Standard.	Ensure to use the correct 0.02 NTU calibration standard. *
ERR 5	Calibration Error. There is not sufficient signal to achieve the appropriate resolution in the 0-1000NTU range.	Re-do calibration with all 4 standards provided. *
ERR 6	General Calibration Failure. There is not sufficient signal to achieve the appropriate resolution in the 0-100NTU range.	Re-do calibration with all 4 standards provided. *
ERR 7	General Calibration Failure. There is not sufficient signal to achieve the appropriate resolution in the 0-20 NTU range.	Re-do calibration with all 4 standards provided. *
ERR 8	Excessive stray light detected.	Ensure the vial is fully snapped in the sample well.
	Attempting a measurement when low battery indicator is on.	Replace batteries.
ERR 9	Lamp Failure.	Return unit.
Or	When Turbidity value is above the measurement range(>1000NTU)	Dilute sample. See Section 9.7 on page 23.
+ −	Low battery indication. The batteries need to be replaced.	Replace batteries.

* If an error message appears, take the appropriate corrective action and re-do the desired procedure. If the problem persists, contact Eutech Instruments or your dealer. See Sections on Warranty and Return of Items on page 24.

5. Routine Maintenance

The supplied carrying case is optimal for protecting the instrument. If you do not plan on leaving the instrument in the supplied carrying case, when not in use, ensure that the instrument has been turned off and that a clean sample vial fitted with a black cap has been placed in the sample well. This will ensure that a minimal amount of dust and/or debris will be able to settle on the optics of the instrument.

5.1 Vials – Handling, Cleaning and Care

Proper measurement of the turbidity of a sample requires the use of a vial that is free of marks, smudges, scratches and any bacterial growth.

Therefore, sample vials must be handled with absolute care to avoid contamination or damage, which might change the optical characteristics of the glass. Scratches, fingerprints, and water droplets on the sample vial or inside the sample well can cause stray light interference leading to inaccurate readings.

Cleaning the vial is accomplished by washing the interior and exterior of the vial in a detergent solution. Once cleaned, the vial should be rinsed thoroughly 8 to 10 times with clean distilled water to eliminate the possibility of detergent buildup and streaking.

Vials can also be acid washed periodically and coated with a special silicone oil to fill small scratches and mask the imperfections in the glass. Since the silicone oil required for this application should have the same refractive characteristics as glass, it is recommended that the oil be obtained from us. Care should be taken not to apply excessive oil that could attract dirt or contaminate the sample well of the meter. Once the oil has been applied to the vial, the excess oil should be removed with a lint-free cloth. The result should be a sample vial surface with a dry appearance, but with all imperfections filled with oil.

Sample vials should always be handled from the top or by the cap to avoid fingerprints or smudges. After a vial has been filled with a sample and capped, the outside surface should be wiped with a clean, lint-free absorbent cloth until it is dry. Cleaned and dried vials should be stored with the black caps on. The vials can be stored in the carrying case. During normal operation you may use any typical glass cleaner along with a lint free cloth or tissue (Kimwipes®), to clean the outside of the vials.

Condensation may appear on the vial when your sample is very cold and the relative air humidity is high. When this happens, the turbidity that you read may be higher than the actual turbidity due to the light scattered by the condensate on the vial. If you find yourself in this circumstance, you can alleviate the problem by either coating the vial with an anti-fogging agent, or by running warm water over the vial for a short period of time to warm the sample prior to measurement.

6. Accessories

The items shown below are recommended accessories and replacement parts for the instrument.

Item Description	Eutech Instruments Order Code	Oakton Instruments Order Code
Waterproof TN-100/ T-100 portable turbidimeter with set of 4 calibration standards (800, 100, 20.0 & 0.02 NTU), set of 3 sample vials, lint-free cloth, silicone oil, batteries – all in a rugged carrying case.	EC-TN100	35635-00
Calibration Set for normal operation (includes 800, 100, 20.0 & 0.02 NTU Standards)	ECTN100CALKT	35635-50
Sample Vials – pack of 3 vials	ECTN100CUVKT	35653-55
Silicone Oil – 10ml	ECSILICONEOIL	~

To order any accessory or replacement part, please contact the nearest distributor or Eutech Instruments/ Oakton Instruments.

7. Specifications

Parameter	Specification
Measurement Method	ISO 7027 compliant nephelometric method (90°)
Measurement Range	0 to 1000 NTU
Automatic Range Selection	0.01 – 19.99 NTU 20.0 – 99.9 NTU 100 – 1000 NTU
Resolution	0.01 NTU (0 – 19.99 NTU) 0.1 NTU (20 – 99.9 NTU) 1 NTU (100 – 1000 NU)
Accuracy	±2% of reading ± 1 LSD for 0 to 500 NTU; ±3% of reading ± 1 LSD for 501 to 1000 NTU.
Repeatability	± 0.01 NTU or ± 1% of reading, whichever is greater with gel samples
Response Time	< 6 seconds for full step change
Calibration Standards	0.02 NTU; 20 NTU; 100 NTU; 800 NTU
Standardization	EPA-approved polymer-based primary standards
Light Source	Infrared-emitting diode (850 nm wavelength)
Light Source Life	> 1,000,000 tests
Detector	Silicon photovoltaic
Stray Light	< 0.02 NTU
Display	4-digit 14-segments customized liquid crystal display with annunciators
Sample Cells (Vials)	Borosilicate glass with screw caps, fill line and indexing mark. 51 (H) x 25 (Dia) mm (2 x 1 in)
Sample Volume Required	10 ml (0.33 oz)
Operating Temperature Range	0°C to 50°C (32°F to 122°F)
Sample Temperature Range	0°C to 50°C (32°F to 122°F)
Operating Humidity Range	0-90% RH, non-condensing at 30°C (86°F)
Power Supply	4 x “AAA” Alkaline Batteries
Battery Life	> 1200 readings
Enclosure Type & Rating:	ABS Plastic / IP67 rated
Insulation Rating	Pollution Degree 2
Weight:	Meter: 200 g (7 oz) Meter with case: 1.25 kg (2.75 lb)
Dimensions	Meter: 6.8 (W) x 15.5 (L) x 4.6 (H) cm; (2.7 x 6.1 x 1.8 in) Meter with Case: 16 (W) x 35 (L) x 12 (H) cm; (6.3 x 13.8 x 4.7 in)

8. Addendum 1: Turbidity

8.1 Definition

Turbidity is defined as an "*expression of the optical property that causes light to be scattered and absorbed rather than transmitted in straight lines through the sample.*"[1] That is, turbidity is the measure of relative sample clarity, not colour.

Water with cloudy or opaque appearance will have high turbidity, while water that is clear or translucent will have low turbidity. High turbidity value is caused by particles such as slit, clay, microorganisms, and organic matter. By definition, turbidity is not a direct measure of these particles but rather a measure of how these particles scatter light.

8.2 Why Is It Important?

For drinking water application, a turbidity value may give an indication of presence of bacteria, pathogens, or particles that can shelter harmful organisms from disinfection process. Therefore, turbidity measurement is particularly useful for water treatment plants to ensure cleanliness.

In industrial processes, turbidity can be part of quality control measure to ensure efficiency in treatment or manufacturing process.

8.3 Measurement Principle

There are two internationally accepted standard specifications for turbidity measurement. These are the international standard ISO 7027 and the US EPA method 180.1.

Basically the ISO 7027 is a more stringent standard and requires the use of a monochromatic light source. It also governs the design of a turbidimeter in the following areas: (1) Light source's wavelength; (2) Light sources' spectral bandwidth; (3) Measuring angle; (4) Aperture angle in water sample; (5) Distance traversed by incident light and scattered light within the sample; (6) Calibration standard.

The TN-100/ T-100 turbidimeter follows the ISO 7027 standard whose specification allows for greater reproducibility of the measured values and greater agreement between other measuring instruments.

[1] Provided by "Standard Methods for the Examination of Water and Wastewater, APHA, AWWA and WPCF, 16th Edition, 1985.

Figure 14 shows the waterproof TN-100/ T-100 turbidimeter basic optical system. It includes a light source and a detector to monitor the light scattered at 90° with respect to the incident beam.

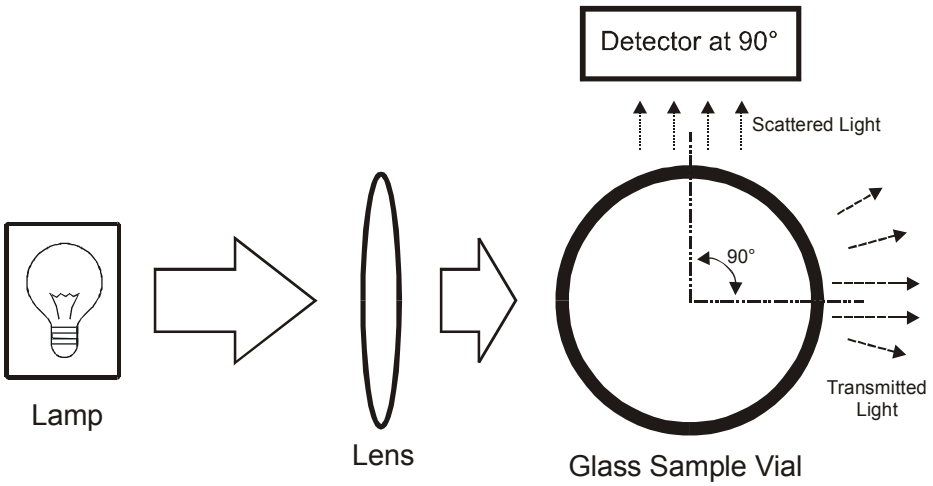


Figure 14: Basic Nephelometric arrangement for turbidity measurement

8.4 Nephelometric Turbidity Units (NTU)

Nephelometric Turbidity Units (NTU): Unit of measure used when relating the light scattered by a liquid media to the light scattered by a known concentration of a standard solution. This unit of measure is recognized as a measure of the optical clarity of an aqueous sample. NTU is the accepted unit of measurement for turbidity.

Another unit commonly used to measure turbidity is Formazin Turbidity Unit (FTU). The two units of measure of turbidity are equivalent: 1 NTU = 1 FTU.

8.5 Indexing a Vial

The United States Environmental Protection Agency (US EPA) recommends that vials used for turbidimeter calibration or sample measurement be indexed.

To index a sample vial, slowly rotate the vial throughout one complete revolution (360°). While rotating the sample vial, observe the display and locate the position that the vial is in which provides the lowest turbidity reading. This position is the indexed position of the vial.

Mark this position on the vial (not on the cap) against the mark on the meter.

After indexing a vial, make sure the vial will always be placed inside the sample well in the indexed position.

9. Addendum 2: Guide to Good Measurement Technique

Turbidity is a very complex analytical measurement which can be affected by many factors. Some are inherent in the instrument's design such as angle of detection, light beam aperture, incident beam wavelength and color sensitivity of the photocell.

However, there are other factors such as stray light, air bubbles and care of vial, which can be prevented through proper care of equipment and accessories, and in the operating procedure for measurement. Here are some points you may want to note:

9.1 Maintain sample vials in good condition

Sample vials must be meticulously clean and free from significant scratches. It should be treated on the outside with a thin coat of silicone oil. This is to mask minor imperfections and scratches that may contribute to stray light. Sample vials should be handled only by the top to avoid dirt accumulation (or deposits) and fingerprints that might interfere with the light path.

More information is found in Section 5.1 - Vials – Handling, Cleaning and Care on page 16.

9.2 Match Sample Vials

Best accuracy and repeatability of turbidity measurement are achieved using a single, indexed vial. However, for more convenience, different vials can be used for measurement provided their readings with the same solution are matched. That is, the meter gives identical readings or within the specified repeatability and accuracy of the meter.

Select a few vials. After the sample vials are cleaned, fill them with ultra-low turbidity water. Allow the sample vials to stand and for air bubbles to rise. Polish sample vials with silicone oil and take turbidity measurement at several points while rotating it in the sample well. Find the position where turbidity reading is the lowest and index it for each vial. Whenever these sample vials are used, use the indexed mark to position each vial into the sample well. Choose those vials that match the readings.

NOTE: *Not all vials can be matched because of some manufacturing variations.*

9.3 Degassing

Air or other trapped gases should be removed before measurement. Degassing is recommended even if no bubbles are visible. There are three methods commonly used for degassing:

- Addition of a surfactant: This involves adding a surfactant to the water samples to lower the surface tension of the water, thereby releasing trapped gasses.
- Application of a partial vacuum: Partial vacuum can be created by using simple syringe or vacuum pump. (This is only recommended for ultra-low turbidity measurement).
- Use of an ultrasonic bath: This may be effective in severe conditions or in viscous samples, but not recommended for ultra-low measurements.

Each of the method above has its own advantages and disadvantages. For instance, under certain sample conditions, the use of vacuum pump or ultrasonic bath may actually increase the presence of gas bubbles.

9.4 Timeliness of Sample

Samples should be measured immediately to prevent changes in particle characteristics due to temperature and settling. Temperature can affect particles by changing their behavior or creating new particles if precipitates are formed. Dilution water may dissolve particles or change their characteristics. It is recommended to take samples only when the turbidimeter is ready to be operated. Samples should not be drawn and allowed to sit while the instrument warms up or is being readied.

9.5 Other Important Sampling Techniques

1. Samples should not be violently shaken or agitated as particles can be broken apart or air may be entrapped into the fluid. Gentle agitation such as swirling the sample vial is advisable to reduce particle settling.
2. Sample vials should be used only with the instruments for which they were intended. Do not mix and match.
3. Perform a visual observation of the sample vial every time a measurement is made. Ensure that there are no visible bubbles in the sample and the vial is clean and free of scratches.
4. Samples entering the turbidimeter should be at the same temperature as the process flow samples. Changes in temperature can cause precipitation of soluble compounds and affect readings.
5. Sample vials should be evaluated with a low turbidity water (after cleaning) to determine if cells remain matched. If the evaluation determines that a cell is corrupted, discard the vial. It is recommended to conduct this evaluation weekly.
6. When in doubt or question about whether a sample vial is too scratched or stained, throw it away.

9.6 Calibration

1. Do not open the vials with calibration standards.
2. Check that the standards have not expired.
3. Make sure the calibration vials are free of dust, smudges and scratches before use.
4. Conduct the calibration in the same manner each time. Variations in how calibration is performed could yield inaccurate measurements.
5. It is very important that the user(s) who perform calibration have been trained to do so. Creating a Standard Operating Procedure (SOP) for the user(s) to read, learn, and practice may help to ensure accuracy.

9.7 Dilution

This dilution procedure is necessary only when your turbidity measurement is above 1000 NTU.

1. To measure the turbidity above 1000 NTU, dilute the sample with turbidity-free water.
2. Turbidity-free water can be obtained by filtering deionized water through a < 0.2μm filter membrane with precision-sized pores.
3. Measure the volume of the sample before dilution and record the value in ml (Vs).
4. Take a known volume (Vd) of dilution water and add it to the sample.
5. Pour 10 ml of the diluted sample in a clean vial and measure the turbidity of the diluted sample. Record this value in NTU (Td).
6. Calculate the true turbidity (T) of the original sample - in NTU - using the following formula:

$$T = Td * (Vs + Vd) / Vs$$

Example:

- Dilute 20 ml of the original sample (whose turbidity is above 1000NTU) with 50 ml of dilution water.
- Measure the turbidity of the diluted sample.
- If the reading is 300 NTU, the turbidity of the original sample is 1050 NTU. (In this case: Td=300NTU, Vs=20ml, Vd=50ml, so T = 300 * (20+50) / 20 = 300*70/20 = 21000/20 = 1050)

10. Warranty

The TN-100/ T-100 meter is supplied with a **2-year** warranty from manufacturing defects and calibration standards for **6 months**.

If repair or adjustment is necessary and has not been the result of abuse or misuse within the designated period, please return – freight pre-paid – and correction will be made without charge. Eutech Instruments/ Oakton Instruments will determine if the product problem is due to deviations or customer misuse.

Out of warranty products will be repaired on a charged basis.

Exclusions

The warranty on your instrument shall not apply to defects resulting from:

- Improper or inadequate maintenance by customer
- Unauthorized modification or misuse
- Operation outside of the environment specifications of the products

Waterproof Seal: Opening the instrument enclosure (excluding the battery compartment) may void the warranty.

11. Return of Items

Authorization must be obtained from our Customer Service Department or authorized distributor before returning items for any reason. A “Return Goods Authorization” (RGA) form is available through our Authorized Distributor. Please include data regarding the reason the items are to be returned. For your protection, items must be carefully packed to prevent damage in shipment and insured against possible damage or loss. Eutech Instruments/ Oakton Instruments will not be responsible for damage resulting from careless or insufficient packing. A restocking charge will be made on all unauthorized returns.

NOTE: *Eutech Instruments Pte Ltd/ Oakton Instruments reserve the right to make improvements in design, construction, and appearance of products without notice.*

For more information on Eutech Instruments/ Oakton Instruments' products, contact your nearest distributor or visit our website listed below:

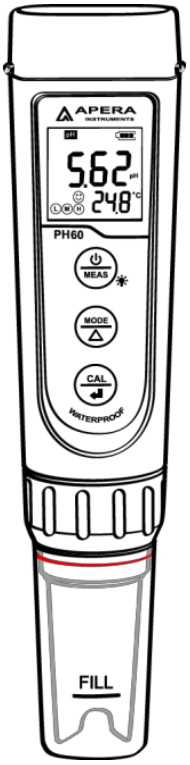
Oakton Instruments P.O Box 5136, Vernon Hills, IL60061, USA Tel: (1) 888-462-5866 Fax: (1) 847-247-2984 E-mail: info@4oakton.com Web-site: www.4oakton.com	**Eutech Instruments Pte Ltd** Blk 55, Ayer Rajah Crescent, #04-16/24 Singapore 139949 Tel: (65) 6778 6876 Fax: (65) 6773 0836 E-mail: marketing@eutechinst.com Web-site: www.eutechinst.com	**Distributed by:**

APERA INSTRUMENTS®

Fluid Precision since 1991

Premium Series PH60 pH Tester

User Manual



RoHS compliant ISO 9001: 2015 CE IP67 WATERPROOF

APERA INSTRUMENTS, LLC

aperainst.com

v7.7

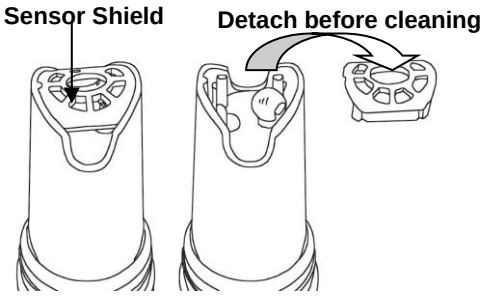
Thank you for purchasing Apera Instruments PH60 Premium pH Tester. Please read this manual before use in order to properly use and maintain the product.

For video tutorials, please go to support.aperainst.com

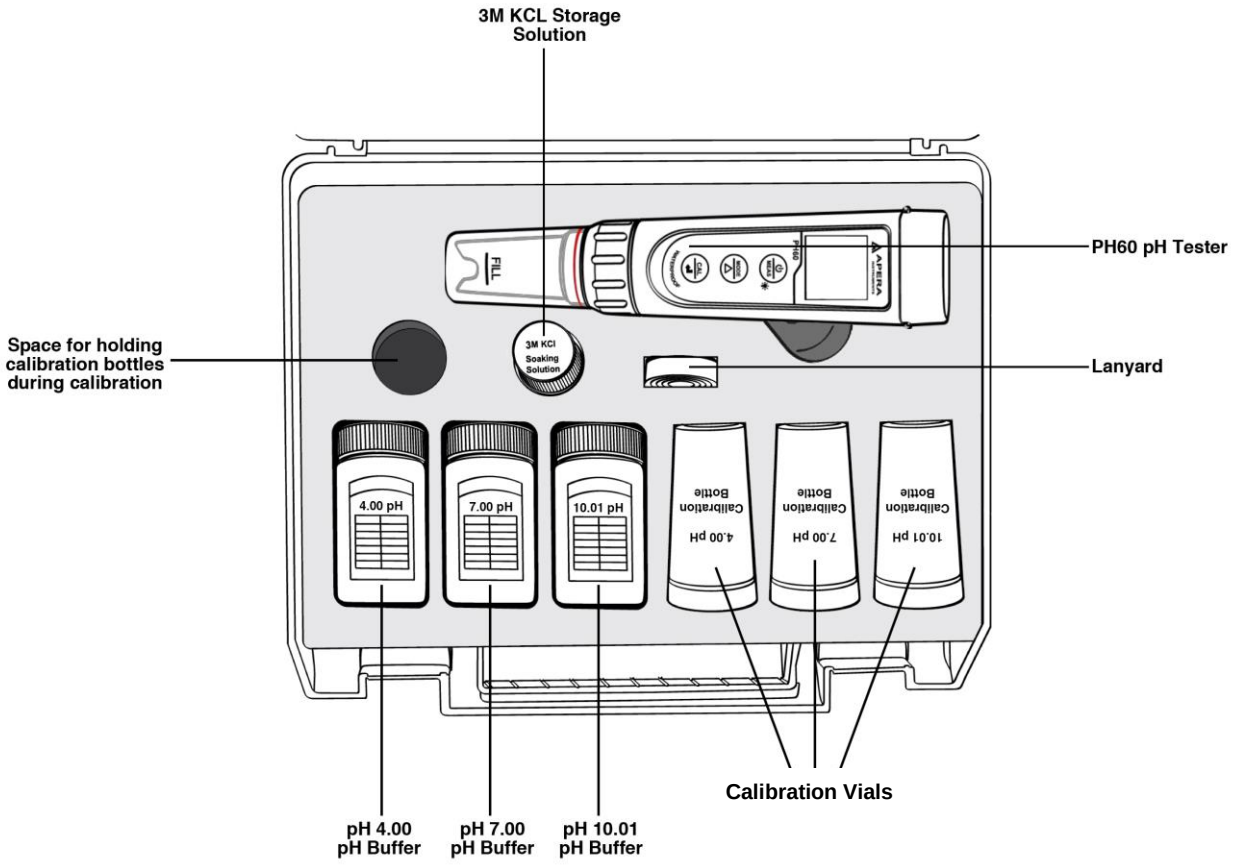
TABLE OF CONTENTS

ATTENTION

- Water droplets are added during production to maintain the moisture of the probe. This is normal practice and should not be attributed to used product.
- **Never** use the product when it's freezing cold. Let it warm to room temperature before using.
- There is a **sensor shield** on top of the pH sensor, protecting the glass bulb sensor from accidental damage. You can detach the sensor shield when rinsing and cleaning the sensor as shown in the graph below. Put back the sensor shield after cleaning.



1 What's in the Kit

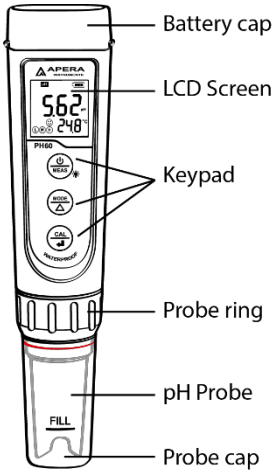


2 Keypad Functions

Short press: < 2 seconds

Long press: > 2 seconds

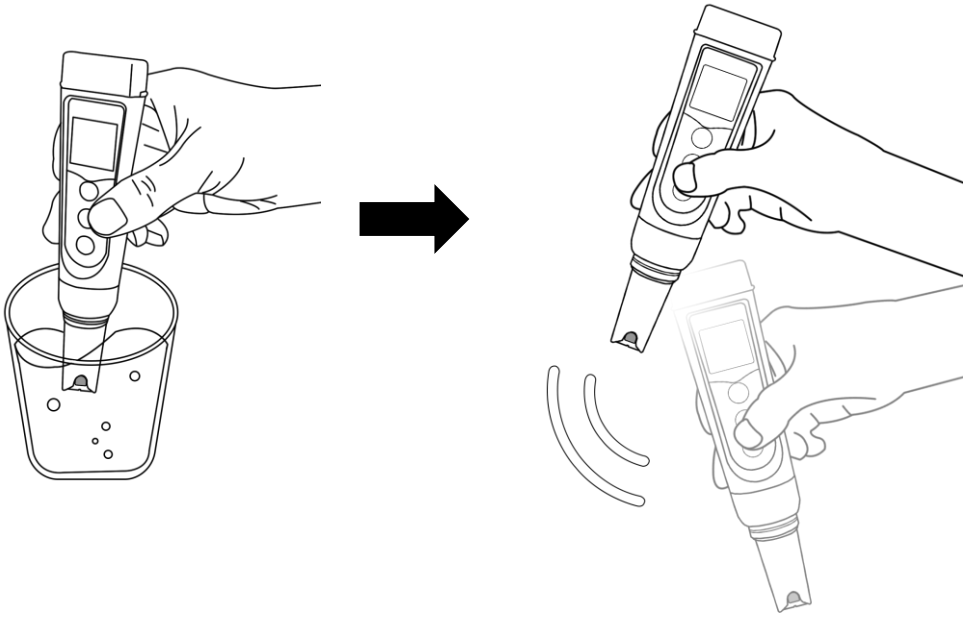
MEAS	1. Short press to turn on the tester and long press to turn off the tester. 2. When turned off, long press to enter parameter setting. 3. In measurement mode, short press to turn on backlight. 4. In calibration mode, short press to cancel calibration.
MODE	1. In measurement mode, short press to switch between **pH** and **mV.** 2. In settings, short press to change parameters (Unidirectional).
CAL	1. Long press to enter calibration mode; 2. In calibration mode, short press to confirm calibration; 3. When reading is locked, short press to unlock.



3 Preparation Before Use

3.1 Pull out the battery insulation slip, and take off the probe cap.

3.2 Rinse off the probe in pure water (preferably distilled or deionized water. RO water or tap water is the alternative) , then shake off excess water.



3.3 Perform at least a 2-point calibration at pH 7.00 and pH 4.00. For tutorial, refer to Section 5.

3.4 If the tester hasn't been used for a long time (over 1 month), please soak the probe in the 3M KCL soaking solution for at least 30 minutes, then calibrate it before test.

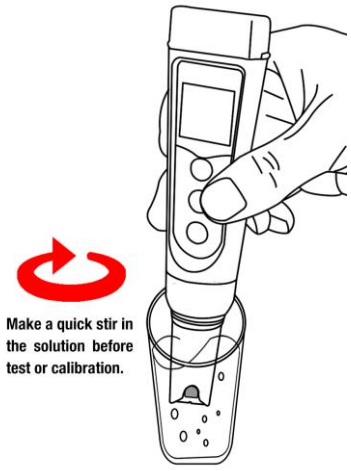
4 pH Calibration

4.1 How to Calibrate

4.1.1 Short press (MEAS) to power on.

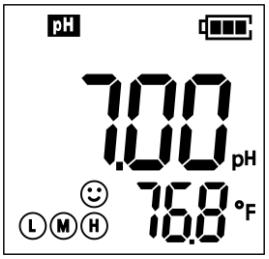
4.1.2 Pour pH buffer solutions in the correspondent calibration vials to about half volume.

4.1.3 Rinse the probe in pure water; Shake off excess water. Dip the probe in the pH 7.00 buffer solution first, and make a quick stir in the solution, then hold still.



4.1.4 Long press (CAL) to enter calibration mode, screen will turn green (Short press (MEAS) if you decide to quit calibration and return to measurement mode).

4.1.5 Wait for the reading to stabilize (when ☺ stays on the screen), then short press (CAL) to start the 1st point calibration. After calibration is completed, the tester will return to measurement mode. Icon (M) will appear at the bottom left of the screen, indicating a successful 1-point calibration (middle point).



4.1.6 To calibrate 2nd point, use 4.00 pH buffer and repeat Step 5.1.3 to 5.1.5 (Do NOT turn off the tester after you finish pH 7 calibration). (L) will display next to (M), indicating a successful 2-point calibration (low and middle points).

4.1.7 If necessary (target pH>8.00), calibrate 3rd point using 10.01 standard pH buffer and repeat Step 5.1.3 to 5.1.5, (H) will show up next to (L) and (M), indicating a successful 3-point calibration (high, low, and middle points).

4.2 Notes about Calibration

a) ***The 1st point calibration must be 7.00 pH.*** *Perform the 2nd and 3rd point calibrations (4.00, 10.01, 1.68, or 12.45)* ***immediately after*** *the 1st point calibration is finished.* ***Do NOT turn off the meter before you calibrate 2nd or 3rd point.*** *Otherwise, you will need to restart the calibration process with 7.00 pH first.*

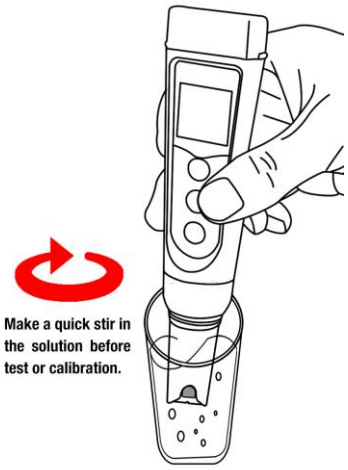
b) *The pH 4.00 and 7.00 buffer solutions poured into the calibration vials can be used for* ***up to 10 times*** *as long as they are not contaminated and the bottles are capped when not in use. pH 10.01 can only be used for* ***up to 5 times*** *as it will lose its accuracy much faster. After that, replace the buffer solutions in the calibration vials with new ones to keep the accuracy. Keeping the freshness and cleanliness of calibration buffers is essential for accurate pH measurement.*

c) *The tester can perform 1 to 3 points of automatic calibration and can recognize 5 types of pH standard solutions. For details, please refer to the following table:*

Calibration	USA Series		NIST Series		Indication icon	Recommended
1-pt	7.00 pH		6.86 pH		(M)	Accuracy requirement ≥ 0.1 pH
2-pt	Option A	1st pt: 7.00 pH 2nd pt: 4.00 pH or 1.68 pH	Option A	1st pt: 6.86 pH 2nd pt: 4.01 pH or 1.68 pH	(L) (M)	Range < 7.00 pH
	Option B	1st pt: 7.00 pH 2nd pt: 10.01 pH or 12.45 pH	Option B	1st pt: 6.86 pH 2nd pt: 9.18 pH or 12.45 pH	(M) (H)	Range >7.00 pH
3-pt	1st pt: 7.00 pH 2nd pt: 4.00 or 1.68 pH 3rd pt: 10.01 or 12.45 pH		1st pt: 6.86 pH 2nd pt: 4.01 or 1.68 pH 3rd pt: 9.18 pH or 12.45 pH		(L) (M) (H)	Range: 0 to 14.00 pH

5 pH Measurement

5.1 How to take pH measurements



Short press (MEAS) to power on the tester. Rinse the probe in pure water, shake off excess water. Dip the probe in your sample solution and make a quick stir, then hold still. Record the reading after it is stabilized (☺ appears and stays on the screen).

5.2 Pure Water pH Measurement

When testing pure water like tap water, drinking water, RO water and distilled water, it will take longer for the readings to get fully stabilized (typically 1-5 minutes). Please be patient. If still not working, add Apera 3M KCL (AI1107) to your pure water at the ratio of 1:1000 (e.g. 1 ml KCL to 1000 ml water) to accelerate stabilization while minimizing pH change. If the accuracy is not meeting your requirement, please contact us at info@aperainst.com to find the specialized meter designed for pure water pH test.

6 Probe Cleaning

6.1 The tester is only as accurate as the probe is clean. Always thoroughly rinse off the probe before and after each measurement with pure water in a container or with a wash bottle.

6.2 For tough contaminants, detach the sensor shield, soak the probe in Apera probe cleaning solution (AI1166) or detergent water for 30 minutes. Then use a soft brush to remove the contaminants. Afterwards, soak the probe in 3M KCL soaking solution for at least 1 hour. Rinse it off, then re-calibrate the tester before using again.

7 Probe Storage

7.1 Under regular usage (daily or weekly use), make sure the probe cap is wet, and tightly close the cap with the O-ring.

7.2 For long-term storage (you are not going to use the product for a while), add 3M KCL soaking solution to the Fill line in the probe cap and store the probe in it. Close on the probe cap tightly with the O-ring.

7.3 If you find white crystals inside or outside the probe cap, it is perfectly normal. It is the 3M KCL soaking solution that crystalizes over time by its nature. Just rinse them off and add in new soaking solution. This chemical is not poisonous nor dangerous, and the probe's performance will not be affected at all.

7.4 **NEVER** store the probe **in pure water** like tap, RO, distilled, or deionized water as they could damage the pH probe. Pure water is only for rinsing the probe.

8 Parameter Setting

8.1 Setup Menu

Symbol	Contents	Parameter	Factory Default
P1	Select pH buffer solution	USA – NIST	USA
P2	Low value measurement alarm setting	0 to 14.00pH	0
P3	High value measurement alarm setting	0 to 14.00pH	14.00
P4	Select automatic lock	Off – On	Off
P5	Select backlight	Off - 1 - On	1
P6	Select temperature unit	℃ - ℉	℉
P7	Restore to factory default	No – Yes	No

8.2 Parameter Setup

When turned off, long press (MEAS) to enter parameter settings → Short press (MODE) to switch P1-P2-P3 …P7 → Short press (CAL) to select parameter (selected parameter starts flickering) → Short press (MODE) to change parameter → Short press (CAL) to confirm the change → Long press (MEAS) to go back to measurement mode.

8.3 Parameter Setting Instruction

8.3.1 Select standard pH buffer solution (P1):

There are two options of standard buffer solutions: USA series and NIST series. Factory default is USA series, for details see clause 5.2.

8.3.2 Alarm Function (P2&P3)

Examples:

- Alarm triggered when measurement ≤ 3.20 pH:

  Preset lowest value (P2) = 3.20 pH, highest value (P3) = 14.00 pH, when measured value ≤ 3.20 pH (stable ☺ displays on screen); screen turns red.

- Alarm triggered when measurement ≥ 8.60 pH:

  Preset highest value (P3) = 8.60 pH, lowest value (P2) = 0.00 pH, when measured value ≥ 8.60 pH (stable ☺ displays on screen); screen turns red.

- Alarm triggered when measurement ≤ 3.20 pH or ≥ 8.60 pH

  Preset lowest value (P2) = 3.20 pH, highest value (P3) = 8.60 pH, when measured value is lower than 3.20 pH or higher than 8.60 pH (stable ☺ displays on screen), screen turns red.

8.3.3 Automatic Lock (P4)

Select “On” to activate auto lock function. When reading is stable for more than 10 seconds, the tester will lock the value automatically, and **HOLD** icon will display on LCD. Short press (CAL) key again to cancel the lock.

8.3.4 Backlight (P5)

“Off”-turn off backlight, “On”-always turn on backlight, “1”- backlight will last for 1 minute.

8.3.5 Temperature Unit (P6)

Select between C˚ and F˚.

8.3.6 Factory default setting (P7)

Select “Yes” to recover instrument calibration to the theoretical value (pH value in zero potential is 7.00pH, slope is 100%), parameter setting return to initial value. This function can be used when instrument does not work properly in calibration or measurement. Calibrate and measure again after recovering the instrument to factory default status.

9 ORP Measurement

ORP stands for Oxidation-Reduction Potential. ORP is a measure of the cleanliness of the water & its ability to break down contaminants. An ORP probe is needed to test ORP (sold separately, SKU: AI1207). After powering on the tester, press (MODE) to enter ORP mode (mV). Rinse the probe in distilled water and dry it. Dip the probe in your sample solution, make a quick stir, and hold still. Record the reading after it is fully stabilized.

10 Technical Specifications

pH	Measuring Range	-2.00 – 16.00 pH
	Resolution	0.01pH
	Accuracy	±0.01pH ±1 digit
	Calibration Points	1 – 3 points
	Automatic Temperature Compensation (ATC)	0 – 50˚C (32 – 122˚F)
ORP (mV)	Measuring Range	± 1000mV
	Resolution	1mV
	Accuracy	±0.2% F.S
Temp.	Measuring Range	0 – 50˚C (32 – 122˚F)
	Resolution	0.1˚C
	Accuracy	±0.5˚C

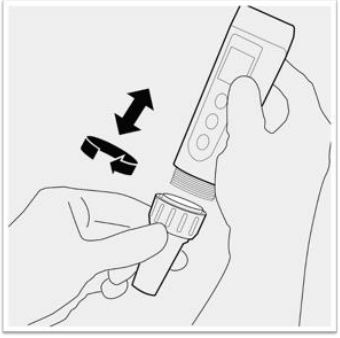
11 Other Specifications

Screen	3-color LCD screen, Blue: Measurement; Green: Calibration; Red: Alarm
Reading Lock	HOLD
Low-Voltage Warning	flashing, reminder of battery replacement needed
Auto. Power-Off	In 8 minutes without operation
Waterproof Rating	IP67
Power	DC3V, AAA alkaline batteries×4
Battery Life	Operation up to 2000 hours
Dimension& weight	Tester: 40×40×178mm/133g; Case: 255×210×50mm/700g;

12 Probe Replacement

12.1 Every pH probe gradually loses its sensitivity and will eventually fail. A typical service life of a pH probe is 1-2 years depending on many factors such as frequency of use, nature of test samples, and how well it is maintained, etc. Apera Instruments recommends replacing the pH probe every 1 to 2 years to guarantee the optimal performance.

12.2 To replace a probe: 1) Take off the probe cap; 2) Screw off the probe ring 3) Unplug the probe; 4) Plug in the new replacement probe (pay attention to the probe's position); 5) Screw on the probe ring tightly. Soak the probe in 3M KCL for 5-15 minutes. Then perform calibration before testing.



12.3 The replacement probes compatible with PH60:

- AI1201 PH60-E (Regular pH glass bulb probe for general water solutions)
- AI3711-E PH60-DE (Double-junction pH glass bulb probe for complex solutions)
- AI1205 PH60S-E (Spear pH probe for soft-solids pH testing)
- AI1203 PH60F-E (Flat pH probe for surface pH testing)
- AI1207 ORP60-E (ORP probe)

13 Notes

a) *Avoid testing in very high (>113°F) or very low (<41°F) temperature solutions as it will cause greater measurement error and potential damage to the probe. Test your samples and perform calibration close to room temperature as much as possible.*

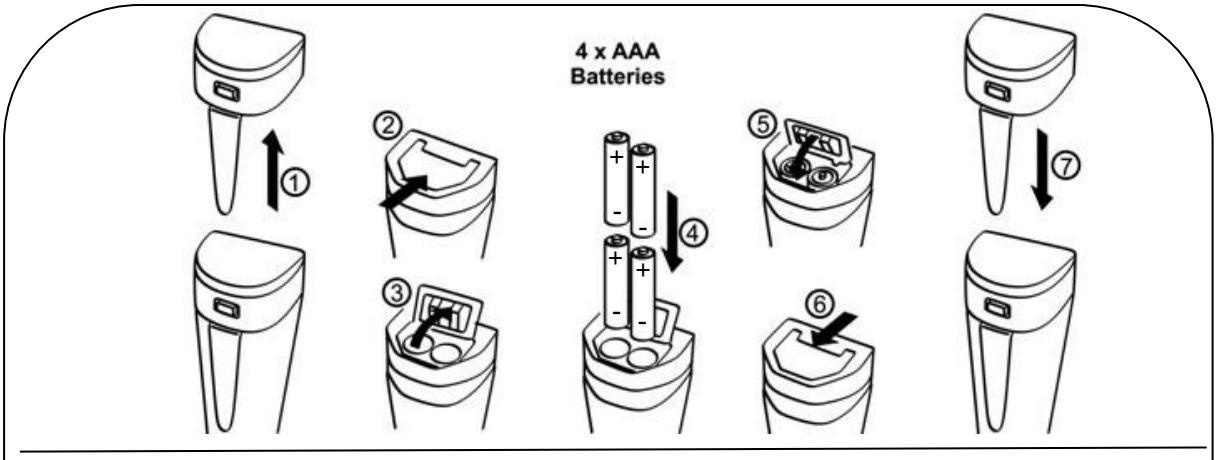
b) ***NEVER** store the probe in pure water like tap, RO, distilled, or deionized water as they could damage the pH probe. If this happens, immediately soak the pH probe Apera 3M KCL soaking solution overnight, then re-calibrate it before using. Pure water is only for rinsing the probe.*

c) ***Never** use your finger to touch the glass membrane or use other material to rub it. Doing so could generate static electricity and cause measurement errors. **Never** test oily liquids.*

d) *Make sure the battery cap is completely closed with the red O-ring. Otherwise, the waterproof rating could be compromised.*

14 Battery Installation

Please install batteries according to the following steps. *Please note direction of batteries: **All POSITIVE SIDES ("+") FACING UP. (Wrong installation of batteries will cause damage to the tester and potential hazards)**



① Pull the battery cap up
② Slide the battery cap along to the direction of arrow
③ Open the battery cap
④ Insert the batteries **(ALL POSITIVE SIDES FACING UP)** (see graph)
⑤ Close the battery cap
⑥ Slide and lock the battery cap along to the direction of arrow
⑦ Fit the tester's cap while making sure to push all the way down. The tester's waterproof design may be compromised if the cap is not fitted

15 Troubleshooting Guide

Trouble	Reason	How to fix
Cannot calibrate	Pressing CAL ⏎ too soon (showing Er2)	Wait for ☺ to stay on the screen before pressing CAL ⏎
	Incorrect standard solutions (showing Er 1)	Reboot tester, calibrate pH 7 first, then pH 4. For details refer to Section 5.2 (a)
	Poor quality standard solutions (showing Er 1)	Replace with fresh and clean standard calibration solutions made by legitimate scientific instrument manufacturers.
	Contaminated probe (showing Er 1)	Use a soft brush to clean the probe with Apera probe cleaning solution or detergent water.
	Aged probe (showing Er 1)	Replace the probe.
	Dried-out probe (showing Er 1)	Soak in Apera 3M KCL soaking solution for at least 30 minutes.
	Probe is not fully submerged (showing Er 1)	Make sure the probe is immersed in the solution at least 1 inch.
	Air bubbles around the sensor shield (showing Er 1)	Make a quick stir in the solution to remove air bubbles.
Reading is always slowly changing, won't stabilize.	Contaminated probe	Use a soft brush to clean the probe with Apera probe cleaning solution or detergent water.
	Clogged junction	Use a soft brush to clean the probe with Apera probe cleaning solution or detergent water, then soak it in Apera 3M KCL soaking solution overnight.
	Aged probe	Replace the probe.
	Testing pure water like tap/drinking/RO/distilled water	Be patient, wait for 1-5 minutes to reach a fully stabilized reading. If still not stabilizing, add Apera 3M KCL solution to test water at 1:1000 ratio.
Display similar readings in any solutions or always display 7.0 pH	Broken probe	If you don't find any visible damage of the probe, contact us for warranty fulfillment; If there is visible damage, replace the probe.
	Instrument defect	Contact us for warranty fulfillment
Reading keeps jumping	Probe is not fully submerged in the solution	Make sure the probe is immersed into solution at least 1 inch.
	Air bubbles around the sensor shield	Make a quick stir in the solution to remove air bubbles.
	Probe is not properly connected or the connector is broken.	Check the probe's connector, make sure it's not broken and is correctly connected. Align the probe and instrument correctly before plugging in. Never force it. Ensure that the probe connector is not exposed to the air too long.
Calibration is successful, but reading is not accurate	Aged probe	Replace the probe.
	Air bubbles around the sensor shield	Make a quick stir in the solution to remove air bubbles.
	Clogged junction	Clean the probe with cleaning solution, then soak it in 3M KCL storage solution overnight
	Comparison with other testers, test strips, or drop tests	To compare accuracy with other testers, make sure to perform calibration for all testers in the same standard, then test another standard. Whichever gives more accurate reading is the more accurate one. Test strips or drop tests' accuracy is not comparable to pH meters'.
	Poor quality standard solutions	Replace with fresh and clean standard calibration solutions made by legitimate scientific instrument manufacturers.
	The probe is not suitable for your appliacation.	Contact us to find the most appropriate product for your specific application.

16 Warranty

We warrant this instrument to be free from defects in material and workmanship and agree to repair or replace free of charge, at option of APERA INSTRUMENTS, LLC, any malfunctioned or damaged product attributable to responsibility of APERA INSTRUMENTS, LLC for a period of TWO YEARS (SIX MONTHS for the probe) from the delivery.

This limited warranty does NOT cover any damages due to:
Accidental damage, transportation, storage, improper use, failure to follow the product instructions or to perform any preventive maintenance, unauthorized repair or modifications, normal wear and tear, or other external causes or actions beyond our reasonable control.

To get the fastest warranty fulfillment, go to **support.aperainst.com** and click **"New Support Ticket"** on the upper right corner. Type your email in the requester field, "Warranty" in the Subject field, and then input the following information in the description field:

- Your full name
- Product model that needs warranty fulfillment
- Serial number of the product (can be found on the back sticker of the tester body)
- What problem or issue you had experienced with the product
- Attach a photo of your proof of purchase
- Attach a photo of the problematic product

Then click Submit. One of our customer care specialists will help you fulfill the warranty within one business day.

APERA INSTRUMENTS, LLC
Address: 6656 Busch Blvd, Columbus Ohio 43229
Tel: 1-614-285-3080
Email: info@aperainst.com
Website: aperainst.com

Appendix M: Weather Reports

Appendix N: Construction General Permit

Copies of the Construction Stormwater General Permit may be downloaded from the SWRCB website at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml.

Copy of the CGP will be included only in the hard copy of the SWPPP.

Eureka, CA | Arcata, CA | Redding, CA | Willits, CA | Fort Bragg, CA | Coos Bay, OR | Klamath Falls, OR

Software Requirements

H

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EXHIBIT H – SOFTWARE REQUIREMENTS FOR ELECTRONIC DOCUMENT EXCHANGE

Item	Electronic Documents	Transmittal Means	Data Format	Note (1)
1	General communications, transmittal covers, meeting notices and responses to general information requests for which there is no specific prescribed form.	Email	Email	
2	Meeting agendas, meeting minutes, RFI's and responses to RFI's, and Contract forms.	Email w/ Attachment	PDF	(2)
3	Contactors Submittals (Shop Drawings, "or equal" requests, substitution requests, documentation accompanying Sample submittals and other submittals) to Owner and Engineer, and Owner's and Engineer's responses to Contractor's Submittals, Shop Drawings, correspondence, and Applications for Payment.	Email w/ Attachment or LFE	PDF	
4	Correspondence; milestone and final version Submittals of reports, layouts, Drawings, maps, calculations and spreadsheets, Specifications, Drawings and other Submittals from Contractor to Owner or Engineer and for responses from Engineer and Owner to Contractor regarding Submittals.	Email w/ Attachment or LFE	PDF	
5	Layouts and drawings to be submitted to Owner for future use and modification.	Email w/ Attachment or LFE	DWG	
6	Correspondence, reports and Specifications to be submitted to Owner for future word processing use and modification.	Email w/ Attachment or LFE	DOC	
7	Spreadsheets and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	EXC	
8	Database files and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	DB	

Notes	
(1)	All exchanges and uses of transmitted data are subject to the appropriate provisions of Contract Documents.
(2)	Transmittal of written notices is governed by Paragraph 18.01 of the General Conditions.

Key	
Email	Standard Email formats (.htm, .rtf, or .txt). Do not use stationery formatting or other features that impair legibility of content on screen or in printed copies
LFE	Agreed upon Large File Exchange method (Microsoft 365, Google Documents, Procore, Dropbox)
PDF	Portable Document Format readable by Adobe® Acrobat Reader Version 9 or later
DWG	Autodesk® AutoCAD .dwg format Version 2020 or later
DOC	Microsoft® Word .docx format Version 2016 or later
EXC	Microsoft® Excel .xls or .xml format Version 2016 or later
DB	Microsoft® Access .mdb format Version 2016 or later

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Foreseeable Bad Weather Days

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EXHIBIT I – FORESEEABLE BAD WEATHER DAYS

Month	Number of Foreseeable Bad Weather Days in Month Based on Precipitation as Rain Equivalent Equal to or Greater Than 1/2 inch (1)
January	8
February	5
March	7
April	3
May	2
June	0
July	0
August	0
September	1
October	1
November	3
December	7
Total	**37**

Notes:
1. Two inches of sleet equal one inch of rain. Five inches of wet, heavy snow equal one inch of rain. Fifteen inches of "dry" powder snow equals one inch of rain.

Prevailing Wage Determination [Placeholder]

J

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Contractor’s Bid [Placeholder]

K

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