La Doo Meadow MND Attachment A

Basis of Design Report

(Stillwater Sciences, May 2023)

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65% Basis of Design Report & Feasibility Analysis for La Doo Meadow Streamflow Enhancement Project

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Cover photo: Location of proposed off-channel pond.

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1 INTRODUCTION

This report provides the basis of design for a large-scale streamflow enhancement project. Current design work is being funded through the California Wildlife Conservation Board's Streamflow Enhancement Program. This Basis of Design (BOD) Report presents 65% design plans for the La Doo Meadow Flow Enhancement Project (Project). The Project will capture and store winter runoff in a 5 million gallon off-channel pond and release the stored water into La Doo Creek, tributary to Sproul Creek, during the dry season at a rate of approximately 15 gallons per minute. This Project seeks to improve habitat for coho salmon (*Oncorhynchus kisutch*) and steelhead (*Oncorhynchus mykiss*) in Sproul Creek, an important salmon bearing tributary to the South Fork Eel River, by addressing the limiting factor of low summer streamflows. The South Fork Eel River is one of five priority watersheds selected for flow enhancement projects in California by the State Water Resources Control Board (SWRCB) and California Department of Fish and Wildlife (CDFW) as part of the California Water Action Plan effort (SWRCB 2019). Sproul Creek is a critical tributary to the South Fork Eel River that historically supported coho and Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead.

Salmonid Restoration Federation (SRF) is the project lead and Stillwater Sciences (Stillwater) is the technical lead with support from William Rich and Associates (Cultural Resources), and Hicks Law (Water Rights and Legal Consulting). The project is located on the 3,348-acre (ac) Wagner Land Company ownership located between the towns of Whitethorn and Garberville, in Southern Humboldt County, CA (Figure 1).

The Project was identified as the highest priority large-scale action based on a flow enhancement feasibility study conducted by SRF and Stillwater for the Sproul Creek watershed. Opportunities for large scale flow enhancement are limited in Sproul Creek due to topographic constraints—most of the watershed is steep and there aren't many opportunities for large-scale surface water and/or groundwater storage. The final results from the feasibility study will be summarized in the Sproul Creek Flow Enhancement Implementation Plan which will be finalized by June 2023.

The 65% designs for the Project are based on field and office-based analyses and general guidance from the landowner and Technical Advisory Committee (TAC) regarding the types of projects that can be permitted, and the project team's experience designing and permitting similar projects in Redwood Creek, the neighboring sub-watershed to the north. TAC members for this project include representatives from CDFW, the National Marine Fisheries Service (NMFS), North Coast Regional Water Quality Control Board, and California Wildlife Conservation Board.

Recent flow enhancement initiatives in lower Russian River tributaries are analogous to this Project and have displayed that direct augment is one of the most successful approaches to date for enhancing dry-season streamflow. Flow releases from agricultural ponds in Green Valley Creek and Porter Creek have resulted in significant instream benefits (Grantham et.al. 2018, RRCWRP 2019). As described in Ruiz et al. (2018) of California Sea Grant, the project began in 2015 and is ongoing. Data shows that flow augmentations in all years from 2015–2018 were able to appreciably increase wetted channel habitat, increase dissolved oxygen in the stream, and decrease water temperature downstream from the flow augmentation release points. For example, releases into Dutch Bill Creek averaging 36 gpm beginning in late August of 2015 and were able to cumulatively re-wet more than 2,300 feet of stream channel with effects measurable up to 1.8 miles downstream.

While modest compared to winter flows, these augmentations have the potential to increase pool connectivity and water quality. A foundational hypothesis for this Project, that increased pool connectivity will bolster over-summer salmonid survival, is strongly supported by the work of Obedzinski et al. (2018). Their study found that days of disconnected surface flow showed a strong negative correlation with juvenile coho salmon survival rate in four tributaries to the Russian River. Provided with this evidence, it is anticipated that the Project's release of approximately 15 gallons per minute into Sproul Creek throughout the dry season can result in significant aquatic habitat benefit.

2 PROJECT DESCRIPTION

The primary objective of this project is construction a 5 million gallon of off-channel pond and associated plumbing infrastructure designed to deliver approximately 15 gallons per minute of flow augmentation to Sproul Creek during the 5-month dry season to improve instream aquatic habitat. Storage will be filled with wet-season runoff including rainwater catchment and water pumped from a small Sproul Creek tributary. In addition to the instream flow benefits, this project will also significantly improve the community's resilience to wildfire by providing a large dry-season water source. 65% Design Plans for the project are included in Appendix A. Other ancillary project components include:

- Construction of a grid-intertie solar power system to offset the energy use and a backup power supply including battery bank, inverter, internet connection, and small control center building to support operations and monitoring capabilities.
- Upgrading access roads within the project area including road/stream crossing upgrades and gravel surfacing to provide year-round access.

3 PROBLEM STATEMENT

Aquatic habitat in Sproul Creek is impaired due to a variety of factors including low dry-season flows, high water temperatures, excessive fine sediment, and lack of habitat complexity (CDFW 2014). There are two fish species with threatened status that are expected to benefit from this project: (1) southern Oregon/northern California coho salmon (*Oncorhynchus kisutch*) (SONCC) which are designated as state and federally threatened and (2) Northern California steelhead (*Oncorhynchus mykiss*) which are federally threatened and are a CDFW species of special concern. Historically, these fish flourished in Sproul Creek.

Dry season flows (i.e., June–October) in north coastal California watersheds have decreased over the past half century (Sawaske and Freyberg 2014, Asarian 2014) likely due to a combination of changes in climate, land use and associated consumptive water demand, and vegetative cover. In watersheds most impacted by industrial and non-industrial timber harvest, homesteading, and cannabis cultivation, diminished streamflow is having lethal or sub-lethal effects on juvenile salmon and steelhead and is also negatively impacting sensitive amphibian species (S. Bauer, CDFW, pers. comm., 5 February 2013).

Today, remnant fish populations survive in Sproul Creek (NMFS 2014), but despite considerable expenditures in habitat restoration projects (i.e., ongoing sediment reduction and placement of large wood habitat structures), based on SRF's flow monitoring and observations throughout the watershed, many stream reaches don't have sufficient flow to maintain the diminishing populations. This project will address this key limiting factor by storing runoff during the wet season and strategically releasing the stored water to enhance flows in a critical reach of Sproul Creek during the dry season.

The Sproul Creek watershed is located within the South Fork Eel River ESU, which the National Oceanic and Atmospheric Administration (NOAA) identifies as a core population vital to the preservation of Southern Oregon Northern California Coast (SONCC) coho salmon (NMFS 2014). The SONCC coho recovery plan indicates the need for "improving flow timing or volume" in each of the first ten action items in the SONCC Coho Recovery Plan (NMFS 2014).

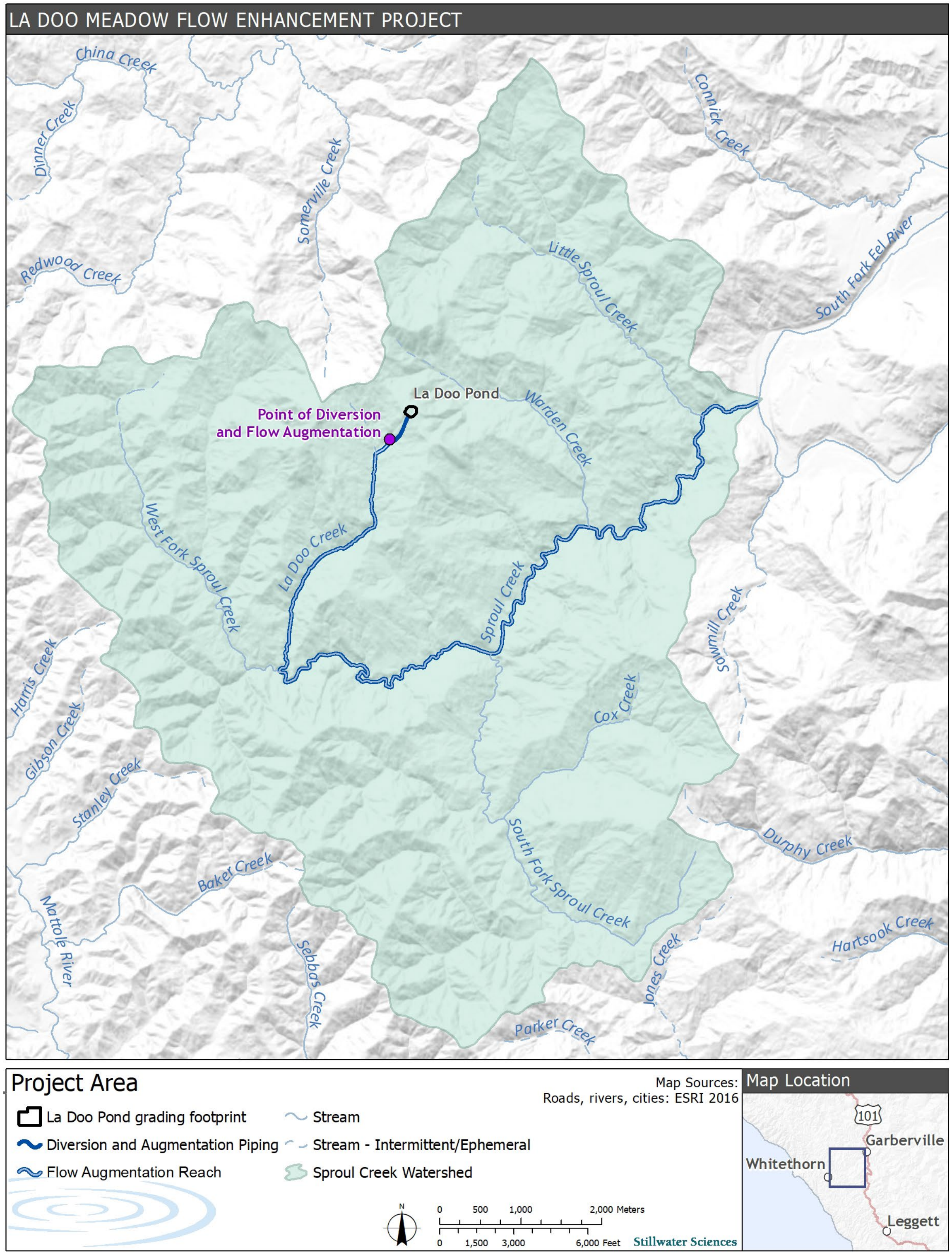

Figure 1. Vicinity map.

4 GEOLOGY AND TECTONICS

The Sproul Creek watershed is in a tectonically active plate-boundary deformation zone, defined by right-lateral movement along the San Andreas Fault Zone that separates the Pacific plate to the west from the North American plate to the east (Kelsey and Carver 1988). Northward progression of the San Andreas Fault Zone is characterized by lateral shearing and vertical compression due to the major westward turn in the fault zone upon reaching the Mendocino Triple Junction near Cape Mendocino. These primary deformation styles are what create the dominant NNW-SSE trending topographic and structural grain in the region (Kelsey and Carver 1988). The evolution of this regional topographic and structural grain has developed pervasive shearing, fracturing, and faulting throughout the north coast of California.

The Garberville-Briceland fault zone trends NNW-SSE across the watershed (Figure 2) (McLaughlin et al. 2000). The fault zone consists of multiple named and unnamed fault traces with varying orientations of displacement. Although recent displacement along the fault zone is undifferentiated, it is considered Quaternary in age (i.e., active within the last 1.6 million years). The Briceland Fault trace is approximately 8,000 feet northeast of the project site and the Garberville Fault trace is approximately 3 miles to the northeast (Figure 2).

The Sproul Creek watershed is primarily underlain by the diverse Coastal Belt of the Franciscan Complex (Figure 2). The project site is located along a ridge dividing the La Doo and Warden Creek sub-sheds. This ridge also represents a mapped geologic contact between the Yager terrane to the northeast and Coastal Belt Melange to the southwest. The Eocene to Paleocene Yager terrane primarily consists of sheared and highly folded mudstone (McLaughlin et al. 2000). The mudstone includes minor rhythmically interbedded arkosic sandstone and local lenses of conglomerate. The Coastal Belt Melange is similar to the Yager terrane and generally represents a transition to the Coastal Belt Sandstone geologic unit lying to the southwest. Both lithologies produce terrain with relatively irregular topography lacking a well-incised system of sidehill drainages when compared to other subunits of the Franciscan Complex Coast Belt.

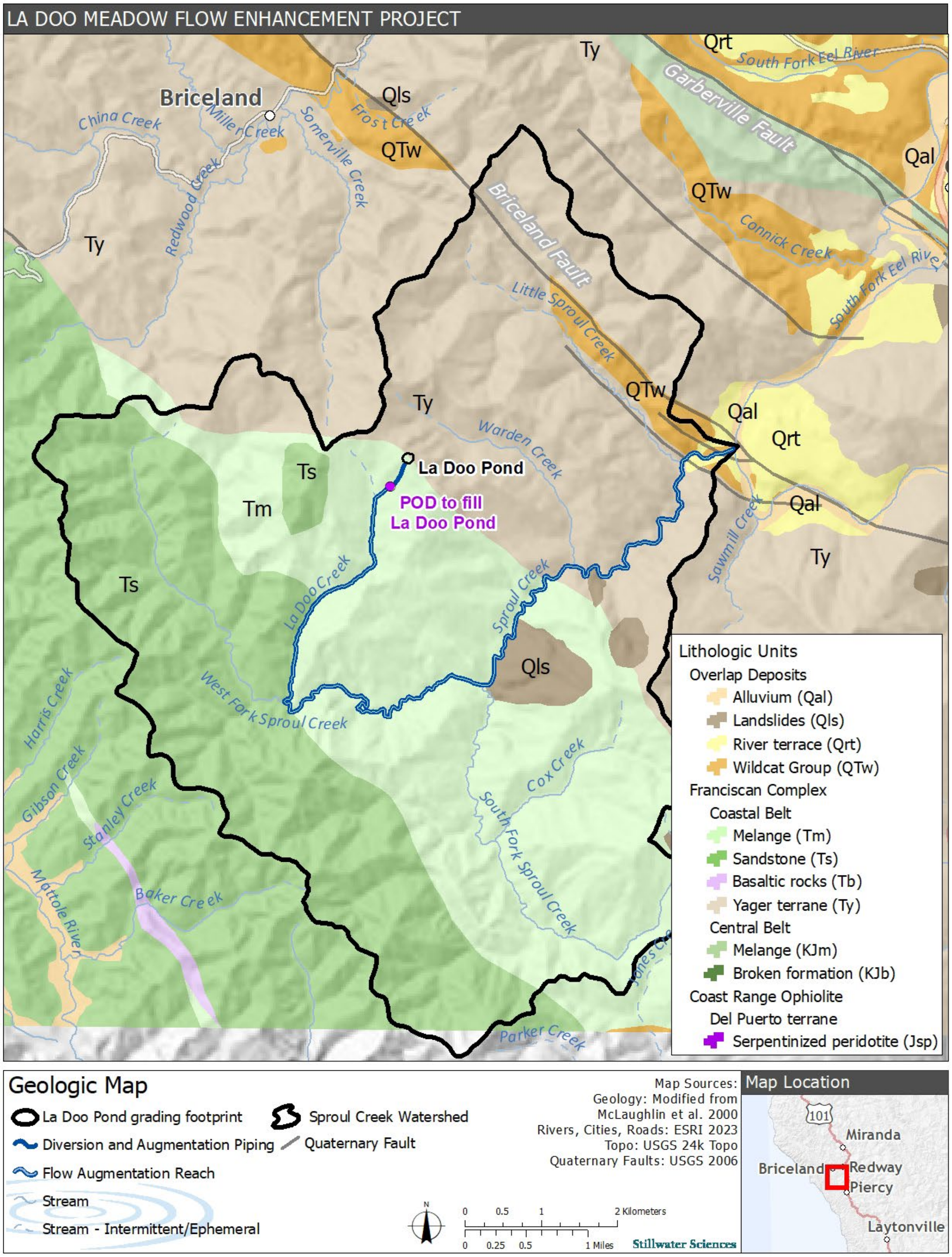

Figure 2. Geologic map of the Sproul Creek watershed and project vicinity.

5 GEOMORPHIC ASSESSMENT

A geomorphic assessment was conducted to characterize the existing geomorphology of the project area, assess risks associated with potential hazards, support the opportunities and constraints assessment, and inform project designs. Specifically, the geomorphic assessment included an analysis of 2018 USGS LiDAR data, review of existing geomorphic and landslide mapping (Spittler 1984), and a field assessment.

Hillslope and stream channel morphologies in the Sproul Creek watershed are similar to those found throughout the western side of the South Fork Eel River basin, due to the prevalence of the underlying Franciscan Coastal Belt terranes. Although there is variability among the terranes, the rock strength in Coastal Belt rocks typically leads to steeper, ridge-and-valley topography with organized drainage networks. Small to large-scale landslides are still common in the basins that drain the Coastal Belt terranes, particularly where sedimentary rocks are less competent and in mélange units.

Sproul Creek tributaries, including Warden and La Doo Creeks to the northeast and southwest of the Project respectively, are typically characterized by narrow, steep-walled canyon slopes that are covered by relatively thin soils and dense conifer and hardwood stands and drained by perennial and intermittent streams. The Project site is located along a broad ridgetop with prairie and oak woodland vegetation, a unique geomorphic feature that is flanked by the steeper slopes.

5.1 Field Assessment

The geomorphic field assessment of the project area consisted of evaluating the site topography and surficial drainage features, identifying bedrock outcrops, and further characterizing features related to landsliding.

5.1.1 Proposed pond and fill placement sites

The proposed pond and fill placement sites are located along a broad ridgetop representing one of the most gently sloped topographic features in the Sproul Creek watershed. The proposed pond site is sloping gently to the southwest and the two fill placement locations are both on the crest of the ridge. Vegetation within the proposed project areas are prairie with conifer encroachment. There are multiple bedrock outcrops consisting of piles of broken sandstone to the east of the site near the hunting cabin and extending along the crest of the ridge to the northeast. Slopes drop steeply into the Warden Creek sub-shed to the northeast.

There are no watercourses within the grading footprint of the Project with concentrated runoff beginning approximately 100 feet downslope from the proposed pond berm.

5.1.2 Proposed piping and point of diversion

The sloped terrain to the southwest is more irregular and gentler than the terrain to the northeast of the proposed pond. The proposed water piping infrastructure will be trenched along a ridgeline bisecting two steep tributaries. These tributaries originate near the ridge and descend through steep forested hillslopes. Flow in these tributaries is mostly ephemeral signifying relatively porous underlying bedrock. Access to the POD will be along an existing road currently used for land management activities. Numerous crossings along the road will be upgraded including installation of properly sized drainage structures as part of the project to improve access to the proposed POD. Localized erosion resulting from existing road runoff and aged drainage structures is evident on the access road.

The proposed POD (Figure 4) is located just downstream from an existing 36-inch diameter culvert crossing along the existing access road. This location is forested with a heavy understory of huckleberry. At this location, the intermittent creek has an active channel width of approximately 3 feet and slope of approximately 20%. The tributary flows into La Doo Creek approximately 800 feet downstream from the proposed POD.

Figure 3. Proposed pond site looking west.

Figure 4. Outlet of existing culvert at proposed POD location.

5.1.3 Features related to landsliding

Geomorphic features related to landsliding were investigated using the LiDAR-derived topography and field assessment. There are no landslides within the vicinity of the proposed pond or fill placement areas. Spittler (1984) did map several historic landslides along the slope to the northeast of the pond, but these features appear to be very old, do not extend to the ridgetop, and pose no risk to the project. No landslide features were mapped on the slopes to the southwest of the project, although one landslide feature was identified during the field assessment approximately 600 feet to the south of the proposed POD along the access road. The road has been realigned upslope to avoid the landslide and there does not appear to be any recent movement. This unstable area should be considered during final design and implementation of the road upgrade treatments. Mapped and identified landslides are shown on Figure 5.

5.1.4 Summary

This project site was selected based on its geomorphic stability. There are no features within the project vicinity that are anticipated to adversely impact the pond or fill placement areas. Considering that the POD is located along a relatively steep seasonal tributary, there is potential for impacts associated with heightened sediment loads and/or debris torrents during large storm events. However, impacts to the POD could require repair and/or maintenance, but would not be catastrophic failures.

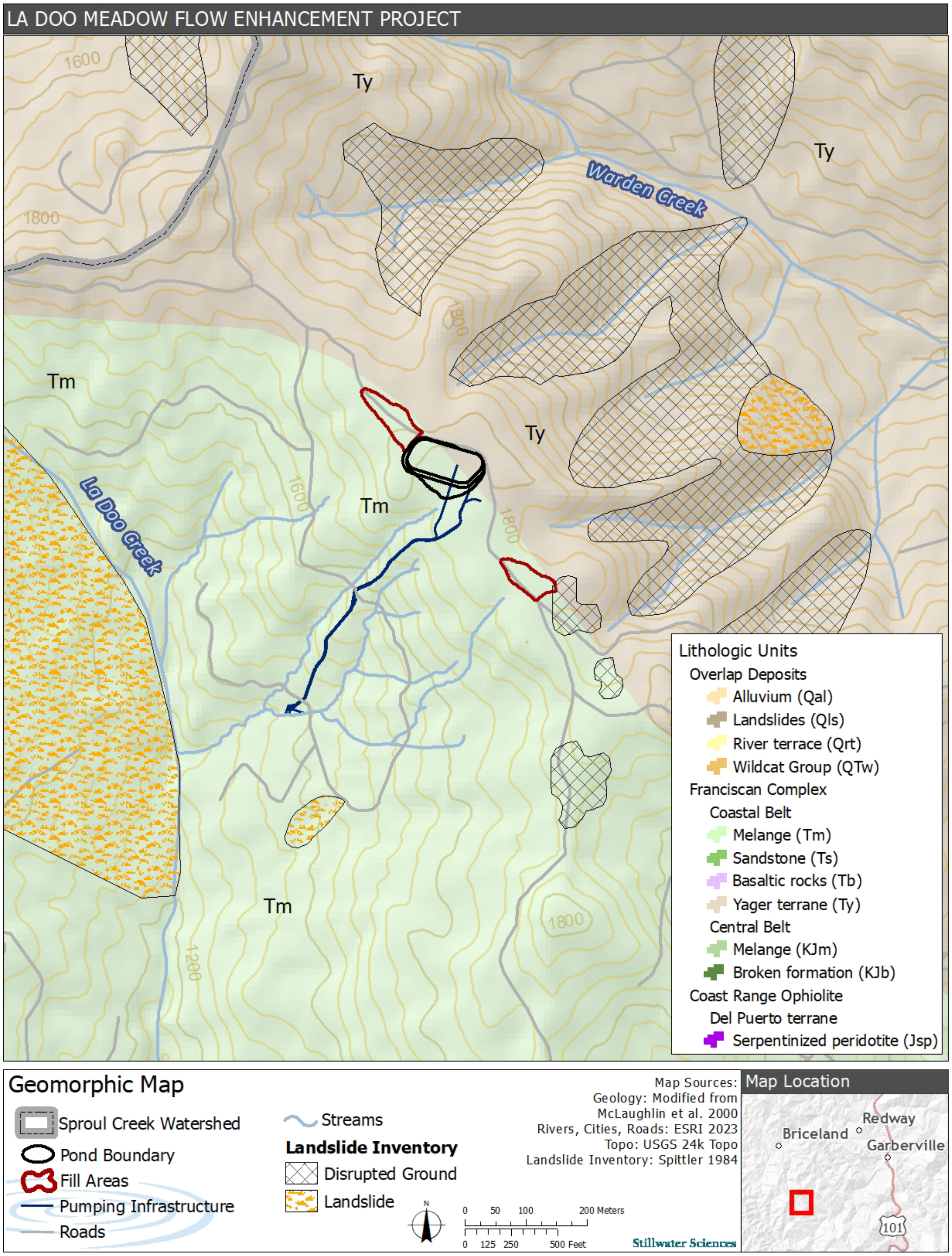

Figure 5. Geomorphic map of area surrounding the La Doo pond site.

6 GEOPHYSICAL INVESTIGATION

ARGO-E LLC conducted the geophysical investigation for the site including subsurface investigations at three locations with a full Geophysical Report included in Appendix B. The geophysical investigation results showed soil becoming more competent with depth. No obvious hazards in subsurface stratigraphy were identified, although the variation between the different locations was noticeable and does warrant further subsurface investigation during final design phases.

The geophysical analysis also identified the approximate depth to bedrock to support the pond construction feasibility. Based on the geotechnical and geophysical analysis conducted for the nearby Marshall Ranch (Stillwater Sciences 2021) and North Fork Lost River projects, competent soil is expected to have shear wave velocities within the range of 600 to 900 ft/s, saprolite (decomposed bedrock) is expected to have shear wave velocities within the range of 900 to 1200 feet per second (ft/s), and hard bedrock is expected to have shear wave velocities within the range of 1200 to 1500 ft/s. Therefore, the depth to bedrock for the pond site ranges from 30 to 40 feet overlayed by competent soils and saprolite.

A detailed Engineering Geologic Soils Report including analyses of boreholes will be prepared by Stillwater Sciences to support the County Grading Permit application at the 100% design level.

7 TOPOGRAPHIC DATA

Topographic data for this project was generated from 2018 USGS LiDAR which is highly accurate in the ridgetop area within the vicinity of the proposed pond. Local survey control points will be set prior to construction.

8 HYDROLOGIC ANALYSIS

An assessment of site hydrology has been conducted to inform the design process. There are five key components of the hydrologic assessment:

1. Determine key regulatory considerations that influence pond size and the ability to fill pond from surface water diversion;
2. Determining the best approach to fill the ponds through a combination of direct rainfall input, sheet flow from the hillside, and diversions from surface water;
3. Utilize existing flow monitoring data to determine a realistic/desirable flow enhancement benefit that the project can achieve;
4. Assess 100-yr storm flows to provide the basis for the design of the pond spillway and point of diversion (POD); and
5. Assess groundwater data and how groundwater dynamics are expected to affect the project.

Each of these components are discussed below.

8.1 Regulatory Considerations

There are three primary state agencies that could have jurisdiction over this project. These include:

1. CA Department of Water Resources – Division of Safety of Dams (DSOD) regulates dams above a certain size;
2. CA SWRCB requires an Appropriative Water Right for diverting water from a stream and storing it for more than 30 days; and
3. CDFW requires a Lake and Streambed Alteration Agreement (LSAA) for installing infrastructure and diverting water from a stream.

8.1.1 DSOD jurisdiction

Jurisdictional dams are dams that are under the regulatory powers of the State of California. A "dam" is any artificial barrier, together with appurtenant works as described in the California Water Code. If the dam height is more than 6 feet and it impounds 50 acre-feet or more of water, or if the dam is 25 feet or higher and impounds more than 15 acre-feet of water, it will be under DSOD jurisdictional oversight, unless it is exempted. The DSOD Jurisdictional Size Chart (Figure 6) summarizes the above criteria. Jurisdictional height of a dam, as determined by DSOD, is the vertical distance measured from the lowest point at the downstream toe of the dam to its maximum storage elevation, which is typically the spillway crest.

There are significant annual reporting requirements and fees associated with jurisdictional dams, so from a long-term operations perspective, falling outside of DSOD is desirable. Therefore, a strong consideration in sizing the pond was to stay below a 25-foot dam height and 15 acre-feet (16.3 million gallons) of water storage.

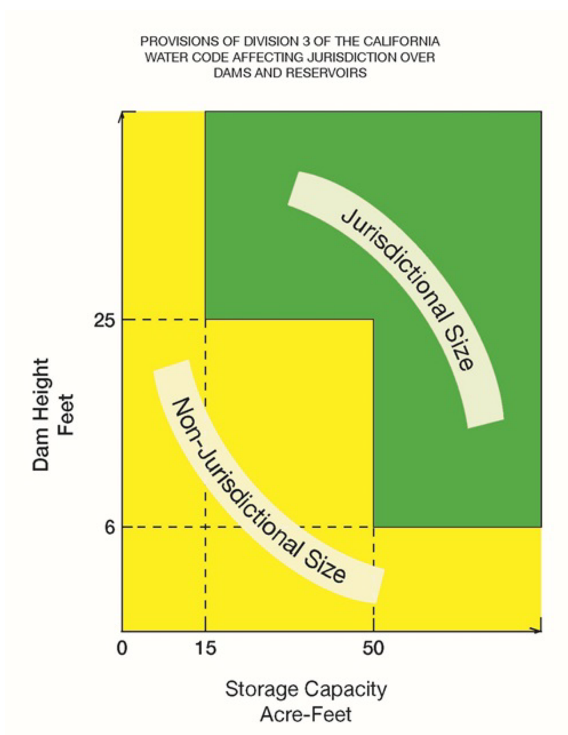

Figure 6. DSOD jurisdictional chart.

8.1.2 SWRCB water rights registrations or permits

Based on site geometry and the desired project outcome of maximizing flow enhancement inputs, it is not feasible to design this project to capture rainwater and sheet flow only. Therefore, it is anticipated that the Project will require either an Appropriative Water Right or Small Domestic Use Registration to divert surface water from a stream and store that water for more than 30 days.

8.1.3 CDFW LSAA

Based on preliminary input from local staff, CDFW is generally supportive of diverting winter time runoff to support dry-season flow augmentation. However, based on the project team's experience permitting water diversions on other projects, CDFW is likely to impose limitations on the diversion season and percentage of flow that can be taken from a stream.

8.1.4 Other regulatory requirements

Other permits will be required for the Project but the conditions/stipulations of those permits are not anticipated to govern the project design. These additional permits include:

1. Special Permit from Humboldt County for work within the Streamside Management Areas;
2. Grading and Building Permits from Humboldt County for construction of project infrastructure;
3. 401 Certification from SWRCB for instream work; and
4. 404 Permit from US Army Corps of Engineers.

8.2 Filling the Ponds During the Wet Season

Three different sources for filling the pond were analyzed:

1. Direct precipitation falling into the ponds;
2. Sheet flow from the hillslopes that drain into the ponds; and
3. Surface water diversion from a tributary to the southwest.

8.2.1 Water availability from upslope sources

To assess the water availability from Sources 1-3 listed above, the Rational Method (also known as the Rational Formula) was used to calculate expected seasonal runoff. The Rational Formula incorporates a combination of rainfall intensity, drainage area and runoff coefficient to estimate maximum flows and is defined as follows:

$$Q = CIA$$

Where:

Q = Flow Discharge
C = Runoff Coefficient
I = Rainfall Intensity
A = Area

This application of the Rational Method varies from the typical application in that here it is being used to estimate total runoff generated over the entire wet season, so the "annual design rainfall" is substituted for "rainfall intensity" in these calculations.

8.2.2 Expected annual rainfall

Two methods were applied to determine an appropriate annual rainfall to utilize for project design considerations:

1. Local rain gage data compiled by the Mattole Restoration Council (Figure 7); and
2. Annual rainfall for Briceland, CA based on PRISM Climate Group interpolations (Figure 8).

Based on these two data sources, an annual rainfall amount of 48 inches represents a dry year with precipitation between the 5th and 10th percentile. However, based on recent climate change trends and specifically the very low precipitation years from 2019–2021, the "design precipitation" was reduced from 48 inches to 40 inches.

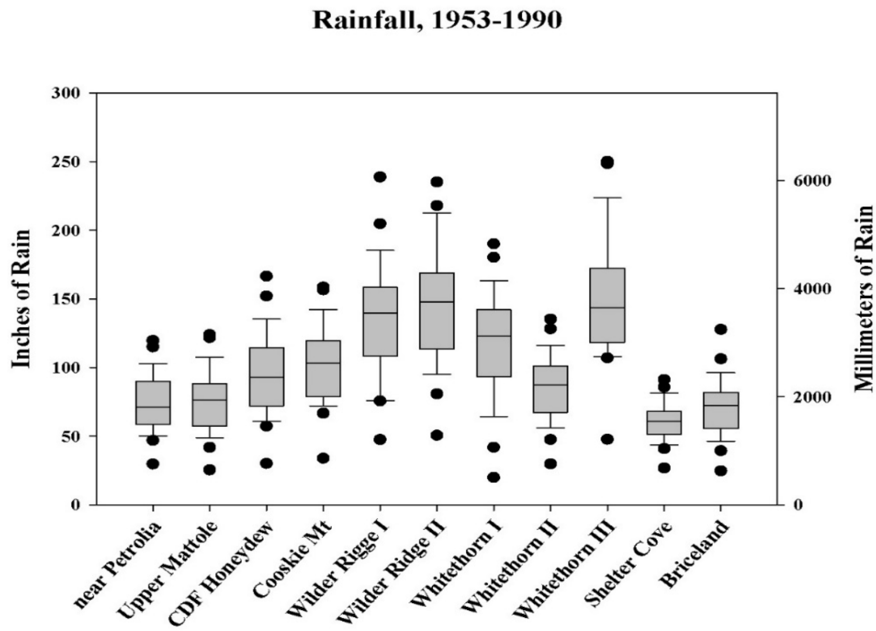

Figure 7. Local rain gage data (Mattole Restoration Council).

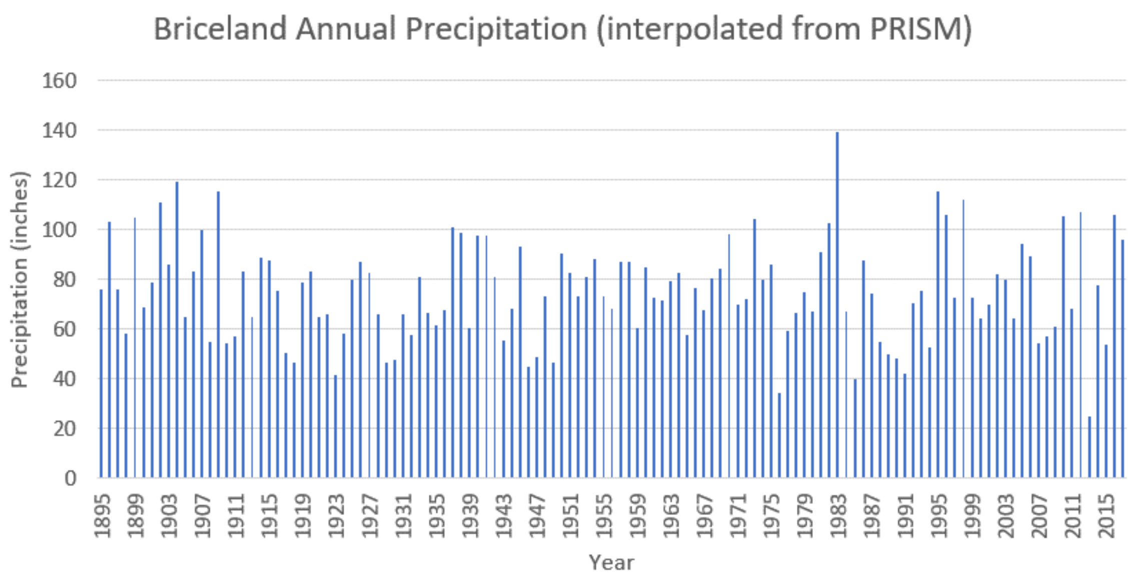

Figure 8. Briceland Annual Precipitation (PRISM).

8.2.3 Calculations

Table 1 below summarizes each of the three potential water sources for the pond and calculates total expected water volume input based on 40 inches of annual precipitation. Note that for the POD the runoff coefficient has been reduced to 0.2 (from typical 0.4) assuming that bypass flow would be required for CDFW LSAA permit conditions.

Table 1. Summary of rational method calculations for water sources.

Source	Area (acres)	Runoff coefficient	Intensity/Annual precipitation (inches)	Volume (gallons)
Pond (direct precipitation)	1.7	1.0	40	1,851,00
Hillslope draining into pond (assumes pond liner underlay)	0.8	0.9	40	616,000
POD	28.7	0.2	40	6,234,000
Total				**8,701,000**

Based on the results shown in Table 1, the three sources have the capacity to deliver approximately 8.7 million gallons to the ponds based on 40 inches of annual precipitation. The total proposed volume of the pond is 4.9 million gallons, so these sources provide sufficient annual water supply.

For the POD, further analysis was conducted to refine anticipated monthly averaged daily discharges utilizing The Nature Conservancy's (TNC) California Natural Flows Database (Zimmerman et al. 2022) with results summarized in Table 2. Based on this analysis, the total annual runoff at the proposed POD is 28,600,000 gallons. These data are generally consistent with the rational method calculations described in Table 1 which results in a total runoff volume of 31,172,000 gallons using a runoff coefficient of 1.0. Based on these results, there will be wet-season runoff available at the POD to fill the pond.

Table 2. Preliminary water availability summary

	Monthly averaged daily discharge (cfs)											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
POD	0.33	0.32	0.25	0.14	0.06	0.02	0.00	0.00	0.00	0.01	0.07	0.26

8.3 Existing Flow Data and Expected Flow Enhancement Benefit

Dry season flow monitoring in Sproul Creek began in 2015 by CalTrout with SRF taking over the effort in 2019. Six stations within the subwatershed are monitored annually (Figure 9), four of which have been monitored each year since 2015. The monitoring station most pertinent for observation of flow enhancement benefit for this project is in West Fork Sproul Creek (station “WFS”). Station WFS is located approximately 2.2 miles downstream of the outlet of La Doo Creek and 800 feet upstream of the confluence with mainstem Sproul Creek. An additional monitoring station was established in La Doo Creek in 2022. As depicted in Figure 10, dry-season flows in West Fork Sproul Creek are very low. Flows at WFS dropped below 20 gallons per minute during each of the 2015 through 2022 dry seasons, except for 2019 which was an anomalously wet year. Flows at all other monitoring stations throughout the watershed follow similar trends with flows of less than 20 GPM recorded at most monitoring stations during most years. In 2015 and 2021, all stations monitored had no measurable flow during the months of August and September.

Based on this data, the proposed project benefit of approximately 15 gallons per minute of flow augmentation provides a substantial and meaningful increase above current dry season base flow that is expected to be particularly beneficial to West Fork Sproul Creek. Within mainstem Sproul Creek, a significant portion of the flow augmentation is likely to be hyporheic during the height of the dry season. La Doo Creek is expected to see the most substantial flow increases, and while it is not fish-bearing, it is anticipated other aquatic and riparian species will benefit.

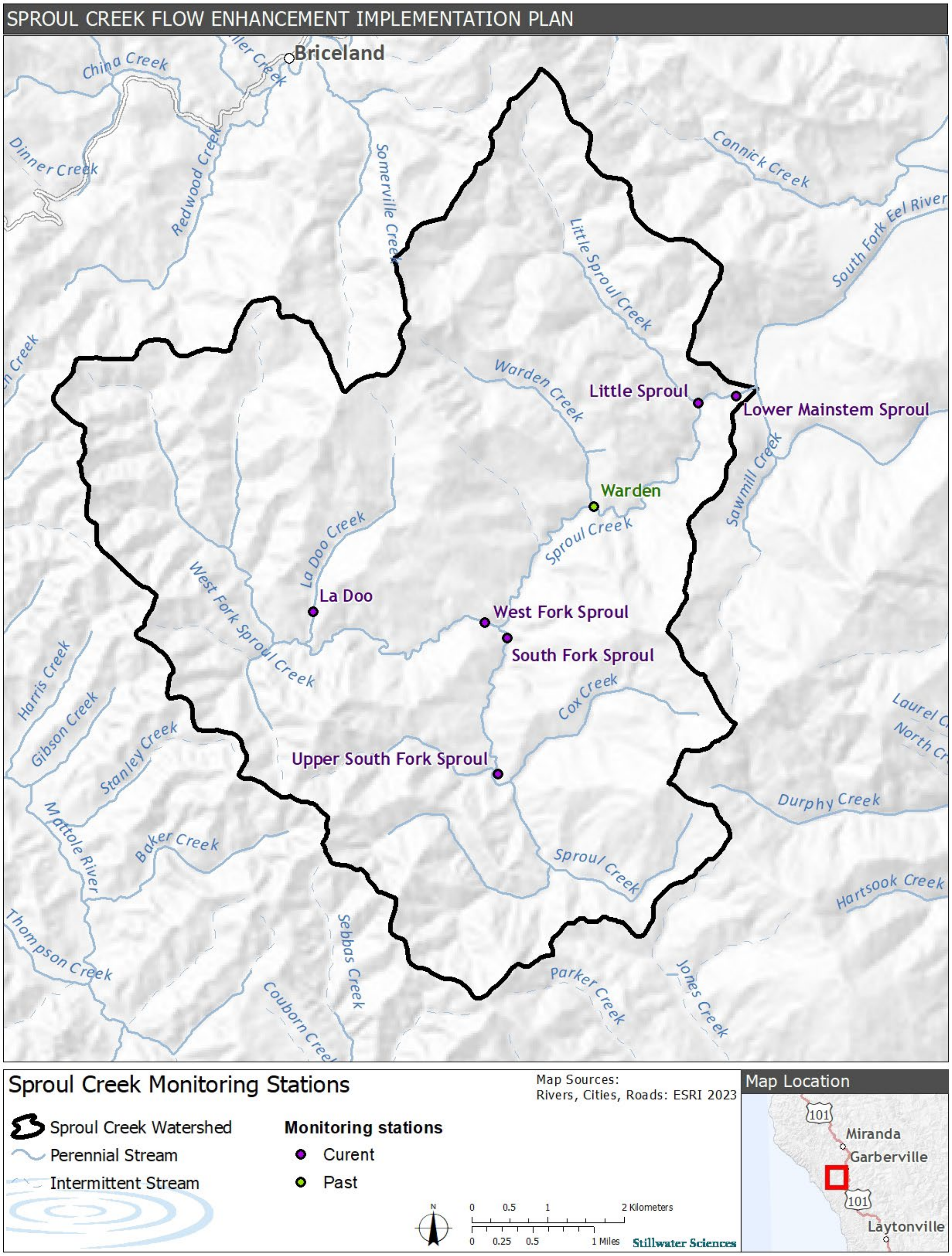

Figure 9. Dry season flow monitoring stations in Sproul Creek.

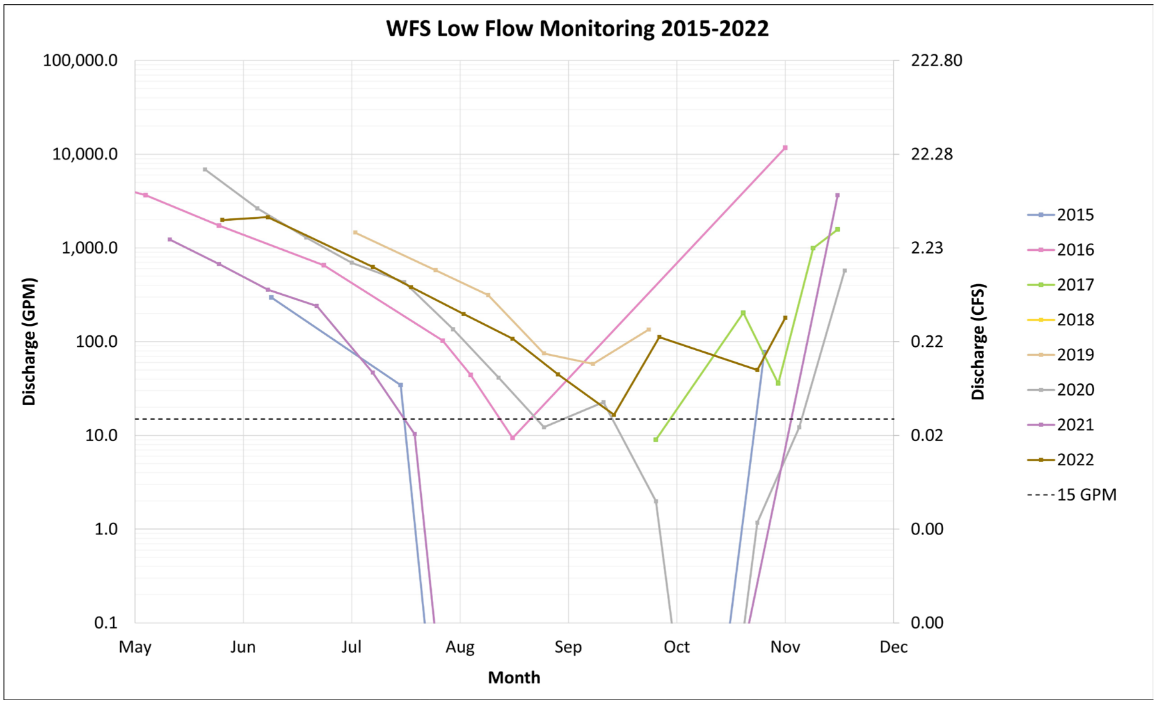

Figure 10. Dry season flow monitoring results for West Fork Sproul Creek.

8.4 100-year Storm Event Analysis

The 100-year storm event analyses utilized Rational Method runoff calculations for the pond area and POD.

8.4.1 100-year storm event rational method calculations

Based on the Rational Formula defined in Section 8.2.1 above, 100-yr discharges were calculated for the outfall of the pond as well as the stream discharge at the proposed POD. This method is appropriate for determining flow rates for relatively small drainage areas of less than 200 acres according to Cafferata et. al. (2004).

8.4.1.1 Determining storm duration

For the Rational Method analysis, the total area, slope, and longest flow path for each drainage was determined based on field observations and analyses of a USGS topographic map. Based on these values summarized on Table 3, the "Time to Concentration" was estimated using the Airport Drainage Formula. The "Time to Concentration" is defined as the time it takes runoff to travel along the longest flow path within the contributing watershed and arrive at a site crossing. Per Cafferata et. al., the "Time to Concentration" can be found with the following Airport Drainage Formula[1]:

[1] Note that two methods for determining Time to Concentration were described in Cafferata et. al. including (1) the Kirpich formula and (2) the Airport Drainage equation. The Kirpich Formula was developed in 1940 based on precipitation and runoff data from seven rural watersheds in Tennessee with average slopes ranging from 3% to 10%. We believe that the Kirpich Formula does not provide good

$T_c=((1.8)(1.1–C)(D^{0.5}))/(S^{0.33})$

Where:

Tc=Time of Concentration (minutes)
C=Runoff Coefficient (dimensionless, 0<C<1.0)
D=Distance (in feet from the point of interest to the point in the watershed from which the time of flow is the greatest)
S = Slope (percent)

Table 3. Summary of time-to-concentration analyses.

Site	Drainage area (ac)	Longest flow path (ft)	Maximum elevation change (ft)	Slope (%)	Time to concentration (min)	100-year intensity (in/hr)
Pond and hillslope (assumes pond liner underlay)	2.4	N/A	N/A	N/A	10	3.82
POD	28.7	1320	400	30	13	3.82

* Time to concentration for pond and hillslope assumed to be 10 minutes.

8.4.1.2 Precipitation data

The intensity-duration-frequency (IDF) curve used for the Rational Method analysis came from National Oceanic and Atmospheric Administration's National Weather Service Hydrometeorological Design Studies Center Precipitation Frequency Data Server (PFDS).[2] Rainfall intensity was determined from the IDF curves for the 100-year recurrence interval for storm durations equivalent to the "Time to Concentration" for the project sites. The 100-year rainfall intensity from the PFDS for each site is also shown on Table 3.

8.4.1.3 Runoff coefficients

Cafferata et. al. suggests a runoff coefficient ranging from 0.30 to 0.45, depending on the specific location of the crossing. Per Buxton et. al. (1996), as cited in Cafferata et. al., a runoff coefficient value of 0.4 is recommended for North Coast California specifically. Additionally, a runoff coefficient of 0.4 reflects woodland with heavy clay soil, soil with a shallow impeding horizon, or shallow soil over bedrock per Figure 11 taken from Appendix A, Table A-1 of *The Handbook for Forest, Ranch and Rural Roads* (Weaver et. al. 2015).

For this property, we have used a Runoff Coefficient of 0.4 because the drainage areas consist of mostly woodland with soil with a shallow impeding horizon. For the rain falling directly on the ponds and hillslope with pond liner underlay, the runoff coefficient is 1.0.

estimates for Time to Concentrations on steeper northern California watersheds. Additionally, Yee (1994) recommends use of the Airport Drainage equation.
[2] http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html

Soils	Land use or type	C value
Sandy and gravelly soils	Cultivated	0.20
	Pasture	0.15
	Woodland	0.10
Loams and similar soils without impeded horizons	Cultivated	0.40
	Pasture	0.35
	Woodland	0.30
Heavy clay soil or those with a shallow impeding horizon; shallow over bedrock	Cultivated	0.50
	Pasture	0.45
	Woodland	0.40

Figure 11. Runoff coefficients (adopted from Appendix A, Table A-1 of the *Handbook for Forest, Ranch and Rural Roads* [Weaver at al. 2015]).

8.4.1.4 Storm discharges

Discharges from the Rational Method calculations for 100-year storm events are shown on Table 4.

Table 4. 100-year discharges.

Site	100-year discharge (cfs)
Pond and hillslope (assumes pond liner underlay)	9
POD tributary	44

8.4.1.5 Drainage structure sizing

New drainage structures will be needed for road/stream crossing at the proposed POD and for the pond outlet. These drainage structures are required to carry 100-year discharges and are sized using the FHWA Culvert Capacity Inlet Control Nomograph (Figure A-1 of Weaver et. al. 2015) using an HW/D ratio of 0.67, as shown in Figure 12 below. The required culvert diameters for the pond spillway and culvert at the POD are shown in Table 5. Note that the pond spillway will have a rock armored spillway instead of a culvert, but the cross-sectional area of the spillway should be equal or greater to that of a 30-inch diameter culvert. Further spillway design analysis will be conducted prior to the 100% design.

Additional culvert and drainage structure sizing and design for the entire access road between the proposed pond and POD will be conducted during the final design phase.

Table 5. Drainage Structure Sizes

Site	Culvert diameter required (inches)
Pond outflow	30
POD tributary	54

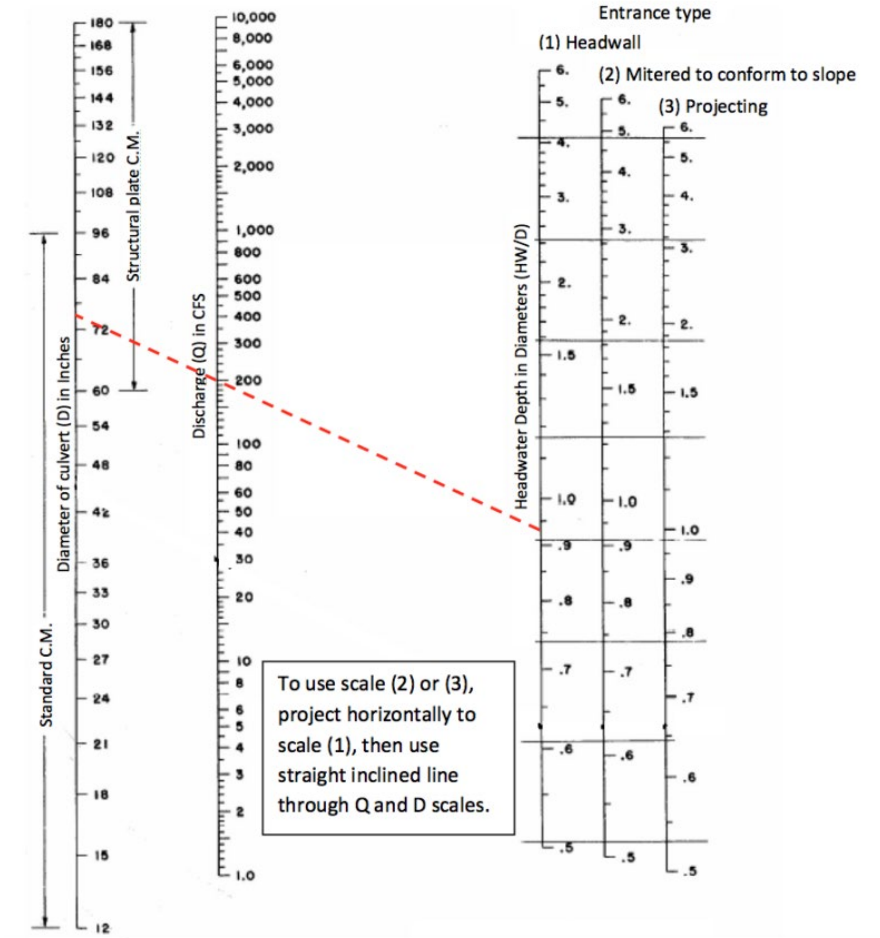

Figure 12. Culvert Capacity Inlet Control Nomograph (adopted from Appendix A, Table A-1 of *The Handbook for Forest, Ranch and Rural Roads* [Weaver et. al. 2015]).

8.5 Groundwater

Groundwater data is being collected in an existing well located just downslope from the proposed pond site. Data from the well has not yet been downloaded but will be included in a final version of this report. Based on groundwater monitoring results at nearby project sites in the Mattole headwaters and Redwood Creek, the groundwater dynamics are expected to be governed by precipitation with significant rainfall leading to increased groundwater levels. Within several weeks after rainfall ceases, groundwater levels drop quickly. During the dry season, the groundwater levels are expected to be perched just above the bedrock interface.

9 ADDITIONAL SITE EVALUATIONS

9.1 Cultural Resources

Findings from a cultural resources study are included in Appendix C. No significant cultural resources were identified within the project vicinity. No impacts are expected as long as the recommendations in the cultural resources study are followed.

9.2 Biological Resources

Findings from a biological resources assessment are included in Appendix D. The proposed project design was developed with the goal of enhancing local aquatic habitat while minimizing impacts to other wildlife. However, CDFW staff has raised concern about potential impacts to amphibians resulting from the dry season flow release period considering that several species such as the Coastal Giant Salamander, Tailed Frog, and Southern Torrent Salamander require cooler water temperatures than Coho salmon (Welsh and Hodgson 2008).

Based on water temperature data collected by SRF at the La Doo monitoring station (location shown on Figure 9), water temperatures ranged from 55 to 61 degrees during July through September. This existing water temperature range is higher than the “realized niche” for Southern Torrent Salamander, near the upper limit for Tailed frog, and likely suitable for Coastal Giant Salamander per Welsh and Hodgson 2008. During the final project design phase, additional analysis and design modifications will be conducted to minimize water temperature impacts. This will consist of:

- Additional water temperature monitoring in La Doo Creek,
- Additional assessment of amphibian habitat in La Doo Creek, and
- Modifications to the flow augmentation release location(s) to minimize impacts and maximize benefits to amphibian habitat in La Doo Creek.

10 PROJECT DESIGN

The primary objective of the La Doo Meadow Flow Enhancement Project is to construct 4.9 million gallons of off-stream water storage intended to deliver approximately 15 gpm of flow augmentation to Sproul Creek during the five-month dry season. This project includes the following components:

10.1 Main Components of Water Storage and Augmentation System

10.1.1 Pond

Construction of one off-channel pond will include excavation and placement of an earthen berm and spillway built into the natural topography. Construction will include removal of topsoil from the reservoir area. The topsoil will be saved and spread around the reservoir area along with mulch after construction. All critical fill placement will be subject to compaction testing to ensure 90% minimum compaction. Excavated material not used to build the berms will be placed and compacted in a designated fill areas as shown on the plans.

A High-density Polyethylene (HDPE) pond liner with associated woven geotextile fabric and gravel topping will be utilized. This approach is expected to maintain higher water quality in the pond by eliminating the rilling, erosion, and sedimentation that would have resulted from yearly filling of the pond with a natural clay liner. It also improves slope stability and eliminates seepage thereby resulting in better functionality of the ponds both in terms of water quality/quantity and long-term stability.

The pond has a rock-lined spillways sized for the 100-year storm discharge as shown on the design plans.

10.1.2 Diversion Structure in Seasonal Tributary

Water will be diverted from a new diversion structure installed at a culvert outlet under an existing road/stream crossing. The diverted water will be gravity piped to a tank and then pumped uphill to the off-stream pond via a two-staged electrical pump system. Water will only be diverted from the Sproul Creek tributary during the wet season.

10.1.3 Flow enhancement delivery system

The pond will have a screened outlet near the bottom to promote the release of cool water. A valve and flow meter will control the amount of water that is released from the pond. There may be periods during late summer when water temperatures begin to warm. Although there are no fish immediately downstream from the proposed flow release point, there is the potential for warm water releases to negatively impact amphibians. Therefore, several flow release points are proposed in the design at different locations along the hillslope between the pond and POD. Utilizing these different release points will allow for as-need natural infiltration and cooling of the flow augmentation.

10.2 Additional Components

There are several additional project components that are required to meet the main project objective of flow enhancement as described below.

10.2.1 Grid-tie energy system

A 10 KW solar array, battery bank, inverter, and control center building will allow for real time operations and monitoring capabilities and offset the wet season pumping costs.

10.2.2 Access road upgrades

The access roads within the Project vicinity will be improved to provide year-round access for monitoring, operations, and maintenance of all Project components. This will include reshaping and surfacing with gravel and upgrading approximately ten small road/stream crossings.

10.3 65% Design Engineer's Cost Estimates

The 65% cost estimates are shown on Table 6 and represent costs associated with the project design shown in Appendix A. Due to the complexity of the Project, a budget contingency is included.

Table 6. 65% Design engineer's cost estimate.

No.	Item	Unit cost	Quantity	Units	Total cost
1	Mobilization	$100,000	1	Lump Sum	$100,000
2	Clearing and grubbing	$30,000	1	Lump Sum	$30,000
3	Rough earthwork (cut/fill balanced onsite)	$20	22500	Cubic Yard	$450,000

No.	Item	Unit cost	Quantity	Units	Total cost
4	Pond liners and geotech fabric	$100,000	1	Square foot	$100,000
5	Pond liner installtion and topping	$80,000	1	Lump Sum	$80,000
6	Diversion and pump system materials and installation	$200,000	1	Lump Sum	$200,000
7	Pond outflow pipeline materials and installation	$80,000	1	Lump Sum	$80,000
8	Spillway	$30,000	1	Lump Sum	$30,000
9	Fencing	$20,000	1	Lump Sum	$20,000
10	Operations building and electrical system	$150,000	1	Lump Sum	$150,000
11	Access road improvements and surfacing	$150,000	1	Lump Sum	$150,000
12	Erosion control and revegetation	$75,000	1	Lump Sum	$75,000
13	Post project monitoring equipment (flow and pond level)	$20,000	1	Lump Sum	$20,000
14	SRF project management	$200,000	1	Lump Sum	$200,000
15	Cultural resources monitor	$10,000	1	Lump Sum	$10,000
16	Legal and ranch oversight	$100,000	1	Lump Sum	$100,000
17	SHN soils testing	$10,000	1	Lump Sum	$10,000
18	Stillwater, engineering, construction oversight, as-builts, monitoring	$300,000	1	Lump Sum	$300,000
19	20% contingency	$421,000	1	Lump Sum	$421,000
Total construction cost:					**$2,526,000**

11 LONG-TERM OPERATIONS AND MANAGEMENT

A critical component of the project is to ensure that long-term operations and management (O&M) of the project—including maintenance and monitoring activities—are conducted appropriately and funded for a minimum of 20 years. The project team has secured preliminary interest in this project from the same private foundation that is funding the long-term O&M tasks on the Marshall Ranch project.

During this project's final design phase, an O&M Plan will be developed that defines tasks, roles, costs, funding and adaptive management approaches. We anticipate working closely with agency staff during the final design and immediate post-construction period to optimize project function through adaptive management.

12 PROJECT RISK AND PERFORMANCE ASSESSMENT

There are several areas of potential project risks that have been thoroughly evaluated during the project planning and design process. A summary of project risks and risk management is summarized below.

12.1 Risk and Management of Pond and Hydraulic Appurtenances Failure

Risk: Failure of the earthen fill that constitutes the pond berm is a project risk that could result in negative impacts to downslope property and biological resources.

Management: The proposed pond site has been selected as one of the most suitable locations in Sproul Creek for a large pond based on topographic and geologic constraints. Downstream infrastructure includes several small road/stream crossings on the Wagner ownership on a private ranch road and a culvert crossing on Green Diamond ownership approximately 2 miles downstream from the project site. The HDPE-lined pond will be designed with engineered fill and spillway to minimize the risk of catastrophic failure. Additional geotechnical borings and engineering geology support will guide the final design.

Additionally, reservoir level measurements will be closely monitored post-construction to ensure that the pond is functioning as designed. Throughout, the planning, design, construction, and monitoring phases, the Project has and will utilize best professional practices with a team of licensed professionals working together to minimize project risk while maximizing benefits. Foundation funding is expected to provide resources for monitoring, operations, and maintenance of the system.

12.2 Overall Risks and Management Approaches Associated with Long-term Project Results

1) Risk: Water produced by the project is diverted out of Sproul Creek by downstream water users. Under applicable provisions of California water law, property owners downstream of the project site whose parcels are adjacent to Sproul Creek have the riparian rights to take and use the "natural flow" of the stream for certain limited purposes. Additionally, some downstream property owners may have appropriative rights to divert water.

   Management: Downstream diverters are required by law to report their diversions to CDFW and State Water Resources Control Board (SWRCB) and those agencies have the authority to control the amount and timing of those diversions. The project team is currently conducting broad outreach among property owners and regulatory agency staff (CDFW and SWRCB) to inform all parties about the project and develop a regulatory framework, engage the community, and prepare for monitoring/enforcement activities after the project is constructed. The project team will also provide technical and coordinate grant funding opportunities to assist landowners within critical stream reaches to increase their water storage capacity.

2) Risk: Water quality and temperature produced by the pond is not suitable for aquatic species in downstream channel.

   Management: The project planning process has taken these risks into consideration with the pond and water delivery systems designed such that appropriate temperature and water quality are maintained. The water delivery system will draw water out of the bottom of the pond which will have low temperatures for most of the year. An on-demand circulation system will be installed in the pond to maintain water quality. As necessary, passing cooling/filtration will be utilized to decrease the temperature of flow releases. Detailed post-project monitoring and adaptive management actions will be utilized to change pond operations as necessary. Furthermore, case studies from Russian River tributaries have shown that similar project greatly improved water quality and specifically dissolved oxygen (RRCWRP 2017, Grantham et. al. 2018, RRCWRP 2019).

3) Risk: Although there is broad agreement that fish need water to survive, there is some uncertainty regarding how the aquatic habitat will respond to enhanced flows, how to measure and quantify that response, and how to adjust the project flow delivery to maximize aquatic habitat benefit.

   Management: Based on similar projects conducted in Sonoma County in lower Russian River tributaries over the past several years, direct flow augmentation has been very effective in improving downstream aquatic habitat (Ruiz et al. 2018, Obedzinski et al. 2018, RRCWRP 2017, Grantham et. al. 2018, and RRCWRP 2019). However, as this habitat enhancement approach continues to develop, the risk can be addressed by post project monitoring of downstream discharge, temperature, dissolved oxygen levels, fish abundance, and fish health. Based on monitoring results from this and other projects, the Project operations can be adjusted to maximize aquatic habitat benefit.

13 CONCLUSION

Although there are risks associated with this project, the management actions described in Section 12 above reduce project risk to an acceptable level when compared to the expected project benefits. The "no-project alternative" will result in continued degradation of dry-season aquatic habitat in Redwood Creek. Also, this project will significantly improve the community's resilience to wildfire.

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Appendices

Appendix A

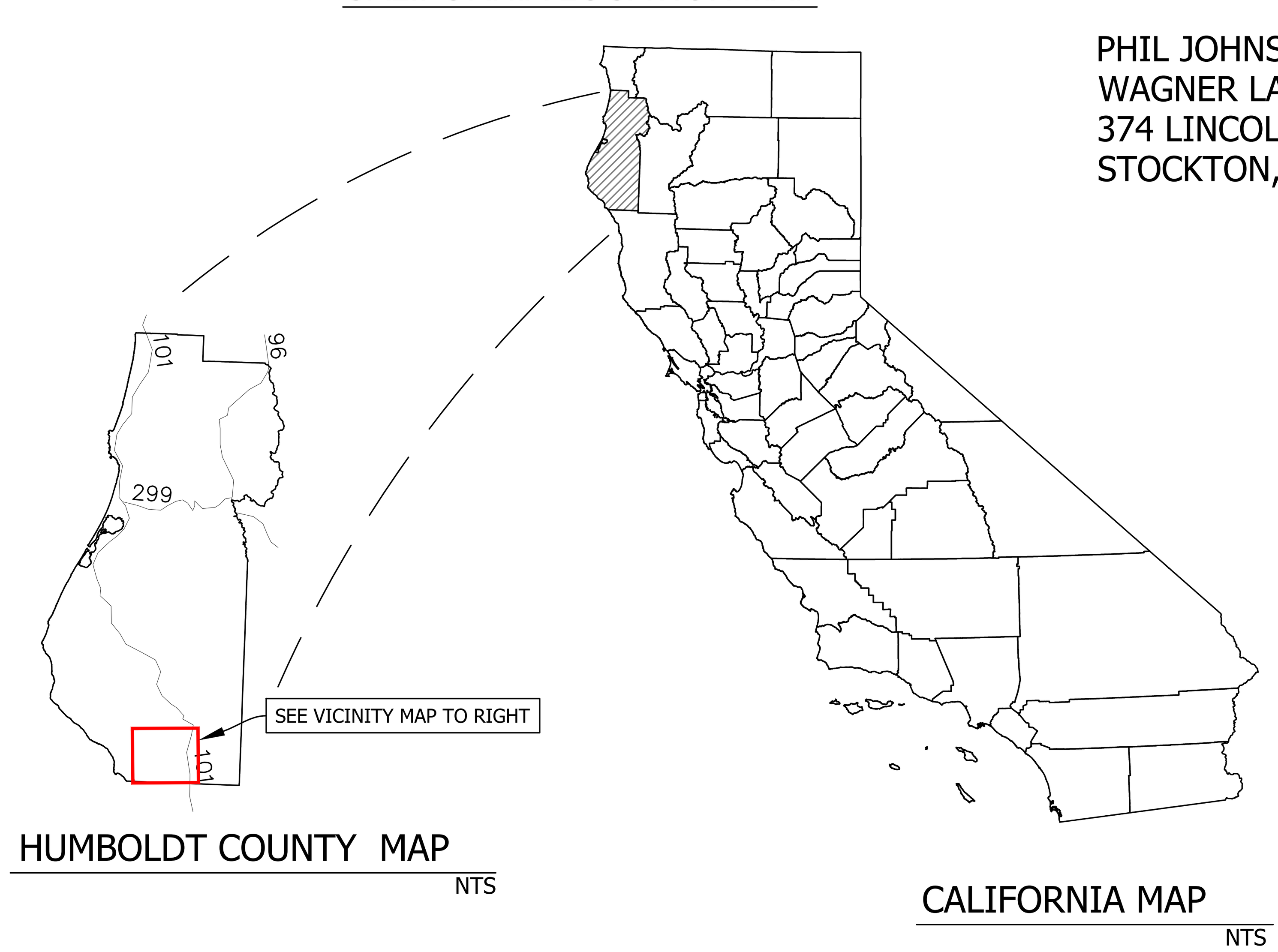
65% Design Plans

LA DOO MEADOW FLOW ENHANCEMENT PROJECT

65% DESIGN PLANS

HUMBOLDT COUNTY, CA

CALIFORNIA LOCATION MAP



HUMBOLDT COUNTY MAP
NTS

CALIFORNIA MAP
NTS

OWNER:

PHIL JOHNSON
WAGNER LAND COMPANY
374 LINCOLN CENTER
STOCKTON, CA 95207

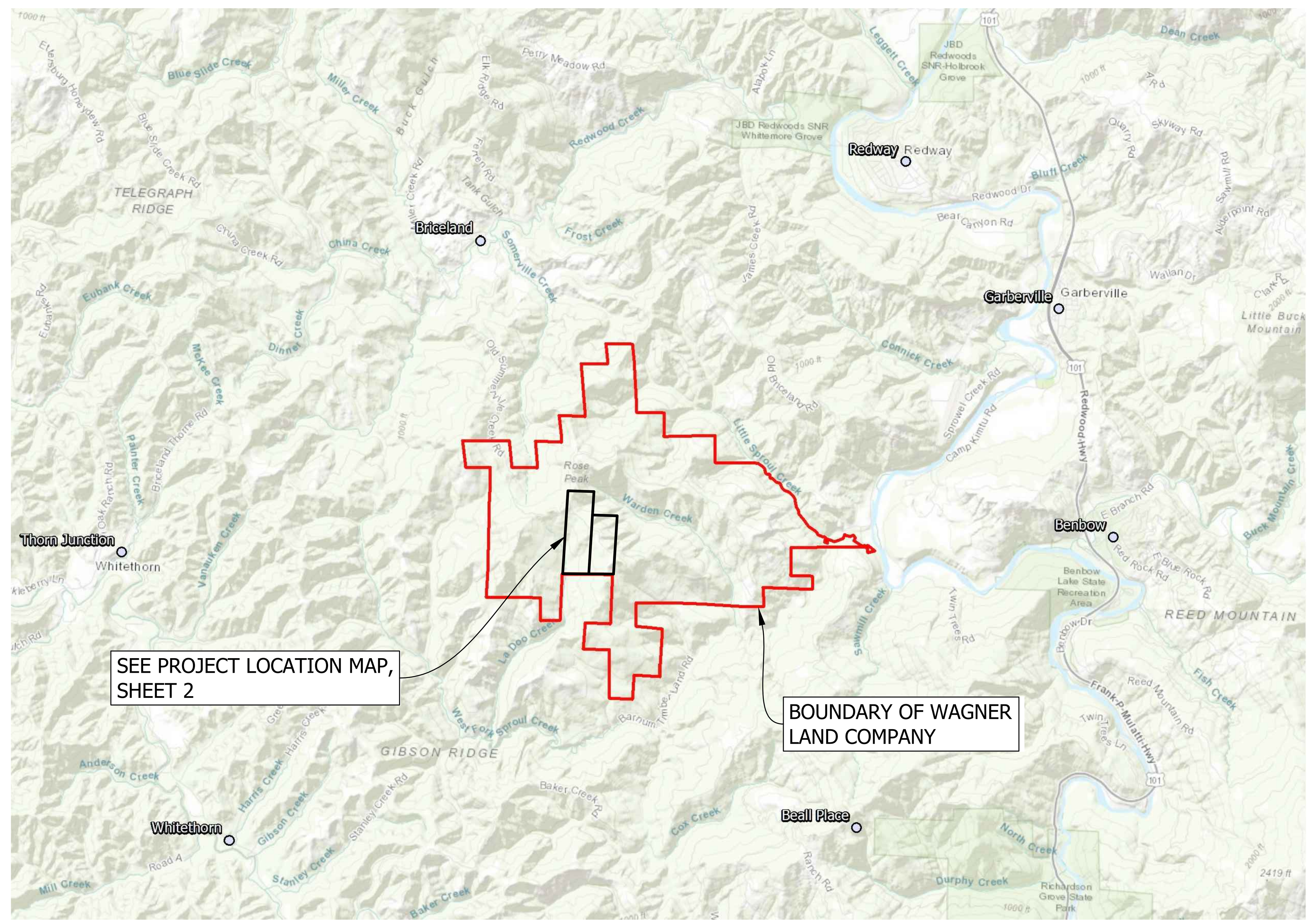
APPLICANT:

SALMONID RESTORATION FEDERATION
425 SNUG ALLEY, UNIT D
EUREKA, CA 95501
SRF@CALSALMON.ORG

AGENT:

JOEL MONSCHKE PE
STILLWATER SCIENCES
850 G STREET, SUITE K
ARCATA, CA 95521
707-496-7075
JMONSCHKE@STILLWATERSCI.COM

VICINITY MAP



SHEET LIST TABLE	
Sheet Number	Sheet Title
1	TITLE SHEET
2	PLOT PLAN
3	POND GRADING
4	FILL AREA GRADING
5	PUMP OVERVIEW
6	DIVERSION
7	EROSION CONTROL AND REVEGETATION
8	DETAILS

PERMITS NEEDED IN THE FUTURE:

HUMBOLDT COUNTY GRADING PERMIT
CDFW LSA
CA RWQCB 404/401

PROJECT DESCRIPTION:

THE PRIMARY OBJECTIVE OF THIS PROJECT IS CONSTRUCTION OF 4.87 MILLION GALLONS OF OFF-CHANNEL WATER STORAGE AND ASSOCIATED PLUMBING INFRASTRUCTURE DESIGNED TO DELIVER APPROXIMATELY 15 GALLONS PER MINUTE OF FLOW AUGMENTATION TO LA DOO AND THENCE SPROUL CREEK DURING THE 5-MONTH DRY SEASON TO IMPROVE INSTREAM AQUATIC HABITAT. STORAGE WILL BE IN ONE POND FILLED WITH WET-SEASON RUNOFF INCLUDING RAINWATER CATCHMENT AND WATER DIVERTED FROM A SMALL TRIBUTARY. OTHER ANCILLARY PROJECT COMPONENTS INCLUDE ROAD SURFACE AND STREAM CROSSING UPGRADES ALONG 0.9 MILES OF FOREST ROAD LEADING TO THE DIVERSION.

EARTHWORK ESTIMATES:

22,500 CY CUT/CY FILL BALANCED ON SITE

PROJECT PARCEL DETAILS:

APN: 222-084-004
APN: 222-085-002

AS INDICATED ON THE HUMBOLDT COUNTY WEB GIS PORTAL, PROJECT PARCEL ZONING, W/ COMBINING ZONES, ARE: AE-B-5 (160); TPZ
PARCELS ARE NOT WITHIN THE: 100-YR FLOOD ZONE; COASTAL ZONE, OR ALQUIST-PRIOLO FAULT HAZARD ZONE. PARCELS ARE WITHIN AN AGRICULTURAL PRESERVE ZONE AND STATE FIRE RESPONSIBILITY AREA, WITH A RELATIVE SLOPE STABILITY RANKING OF (2). NO LEACH FIELDS ARE PRESENT ON PROJECT PARCELS. NO KNOWN EASEMENTS. WORK WILL OCCUR WITHIN THE STREAM SIDE BUFFER REGIONS ASSOCIATED WITH LA DOO CREEK AND TRIBUTARIES.

ABBREVIATIONS AND SYMBOLS:

<E> EXISTING

<P> PROPOSED

3 / 8 — DETAIL # ON SHEET — SHEET #

NORTH ARROW

SURFACE RUNOFF

STREAM SIDE MANAGEMENT AREA

LA DOO MEADOW FLOW ENHANCEMENT PROJECT
65% DESIGN

HUMBOLDT COUNTY, CA

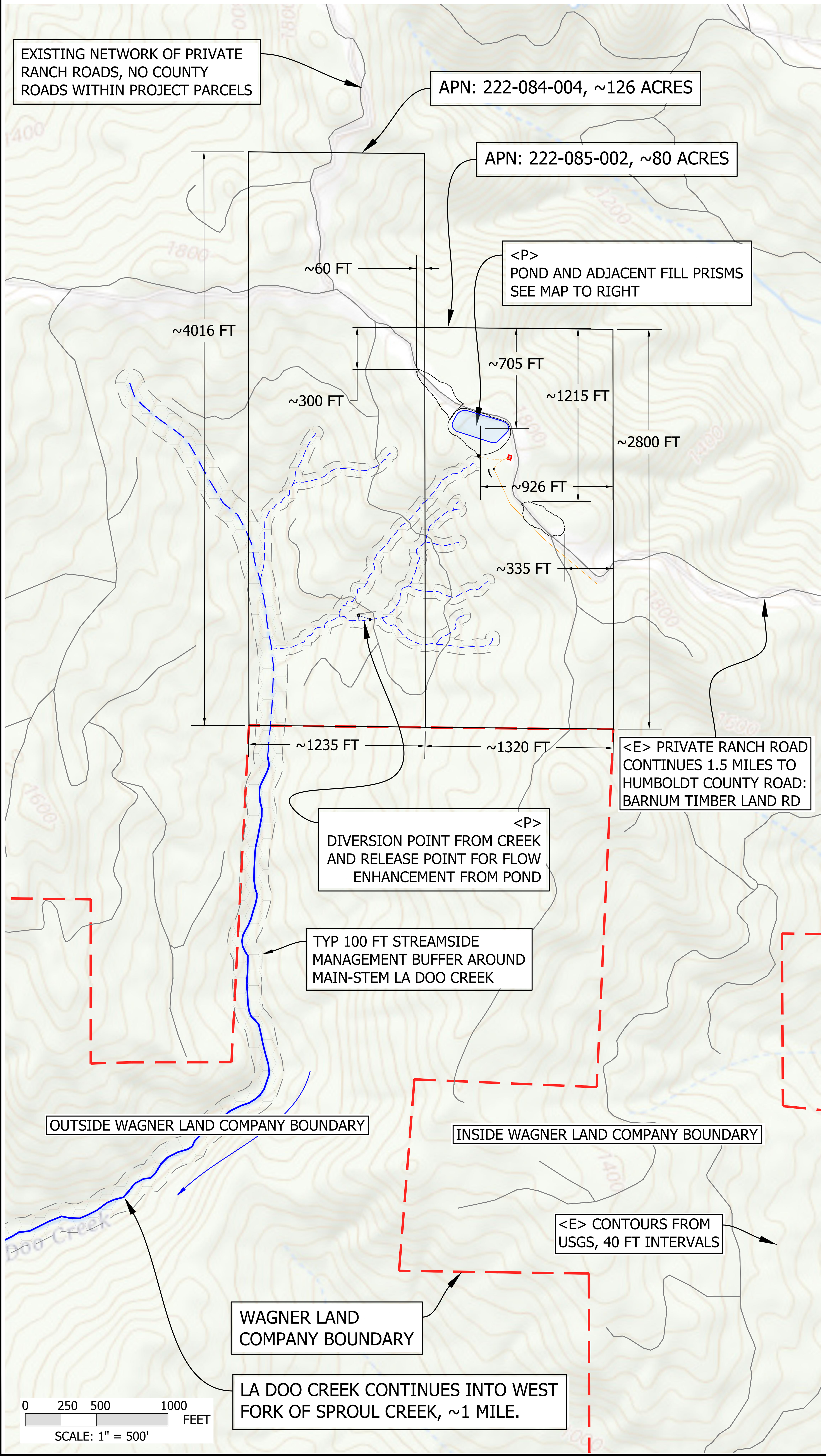
Stillwater Sciences
850 G STREET SUITE K
ARCATA, CA 95521 P: (707) 822-9607

PROJECT NUMBER: 603.03
SCALE: AS NOTED
DATE: 3/22/2023

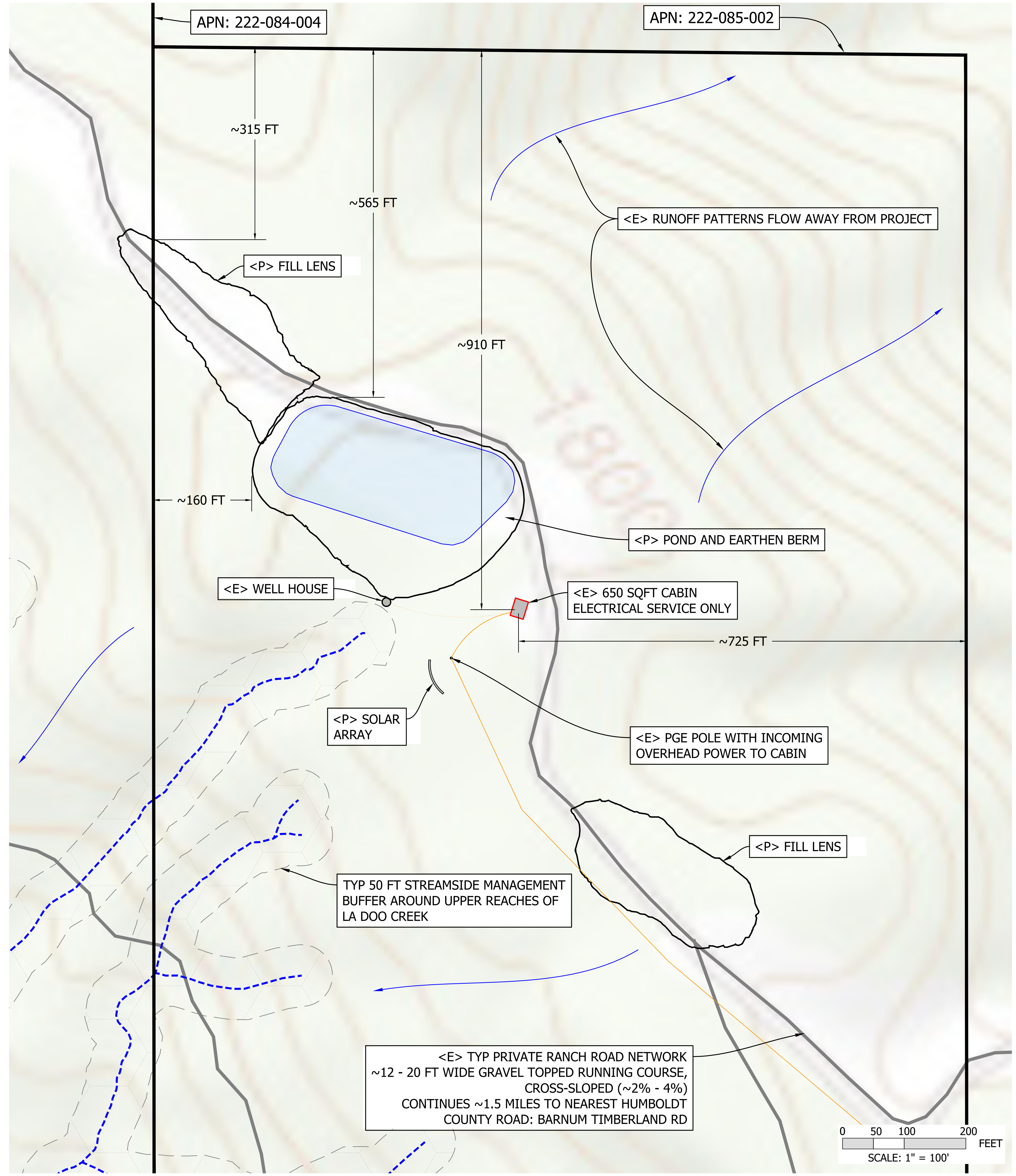
DESIGN: JM
DRAWN: BW,TC
CHECKED: JM
APPROVED: JM

TITLE SHEET

PROJECT LOCATION MAP



INSET PROJECT LOCATION MAP



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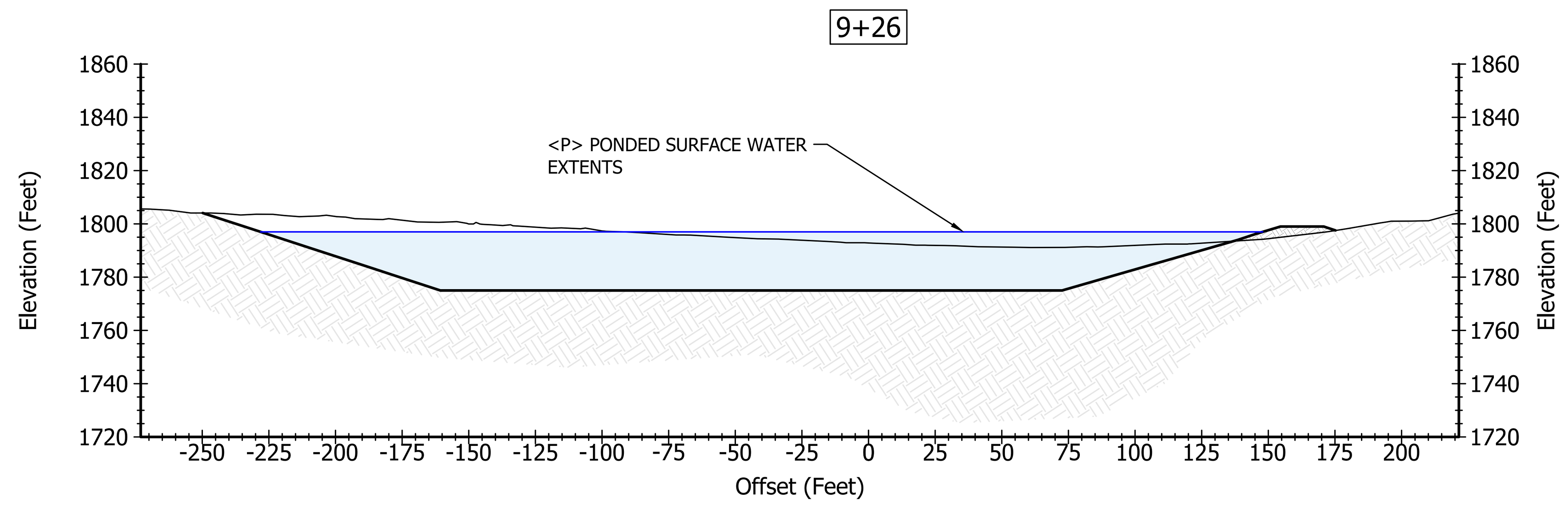
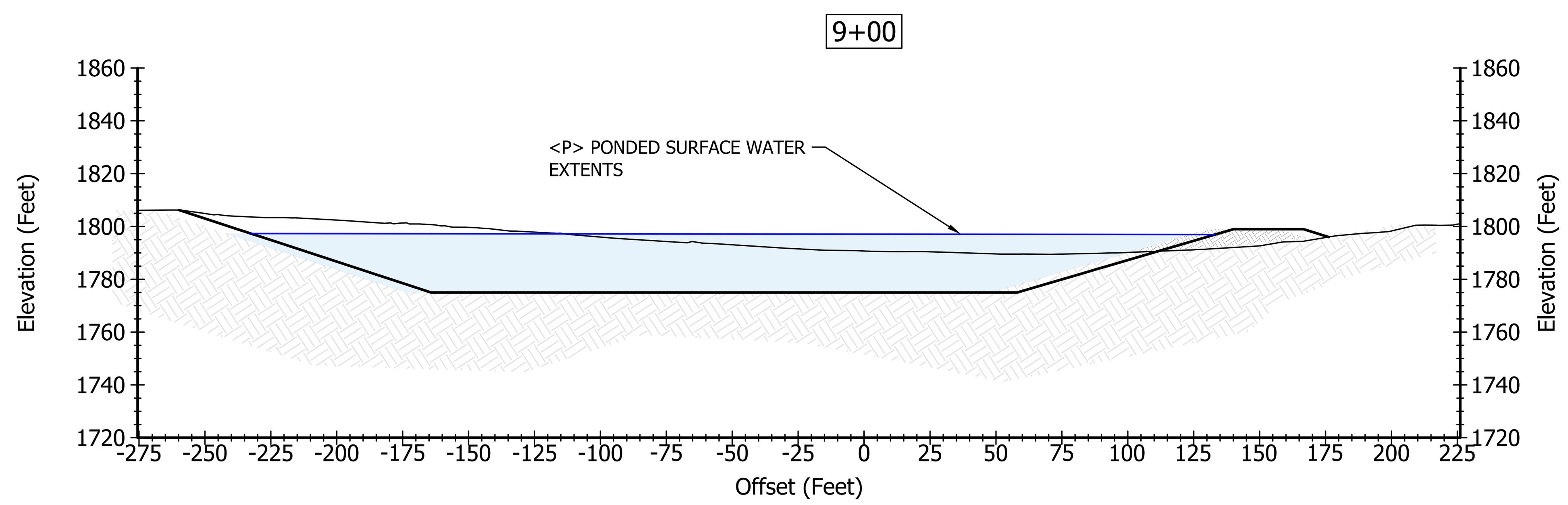
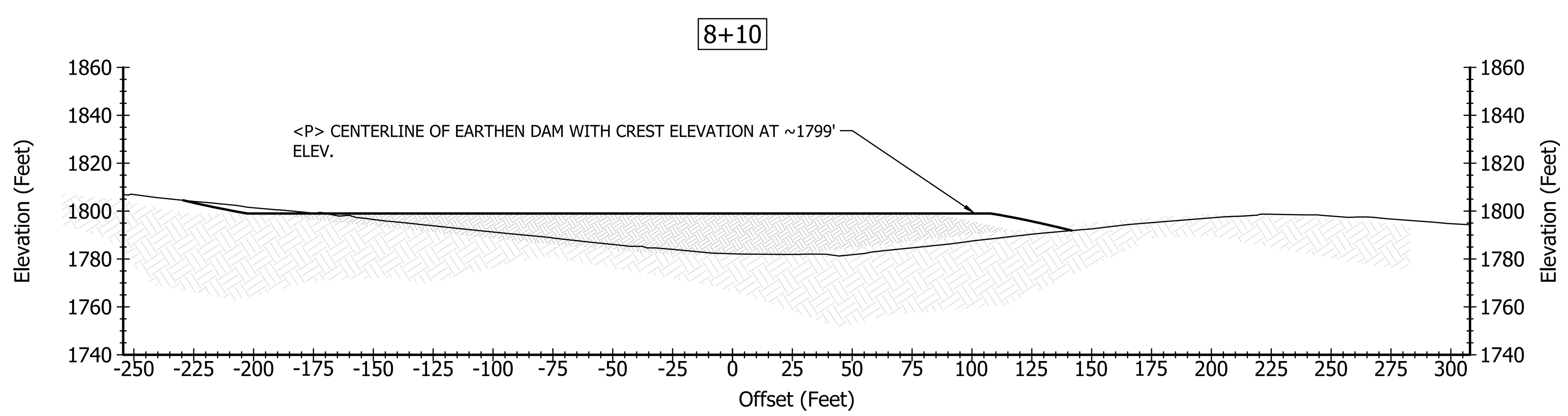
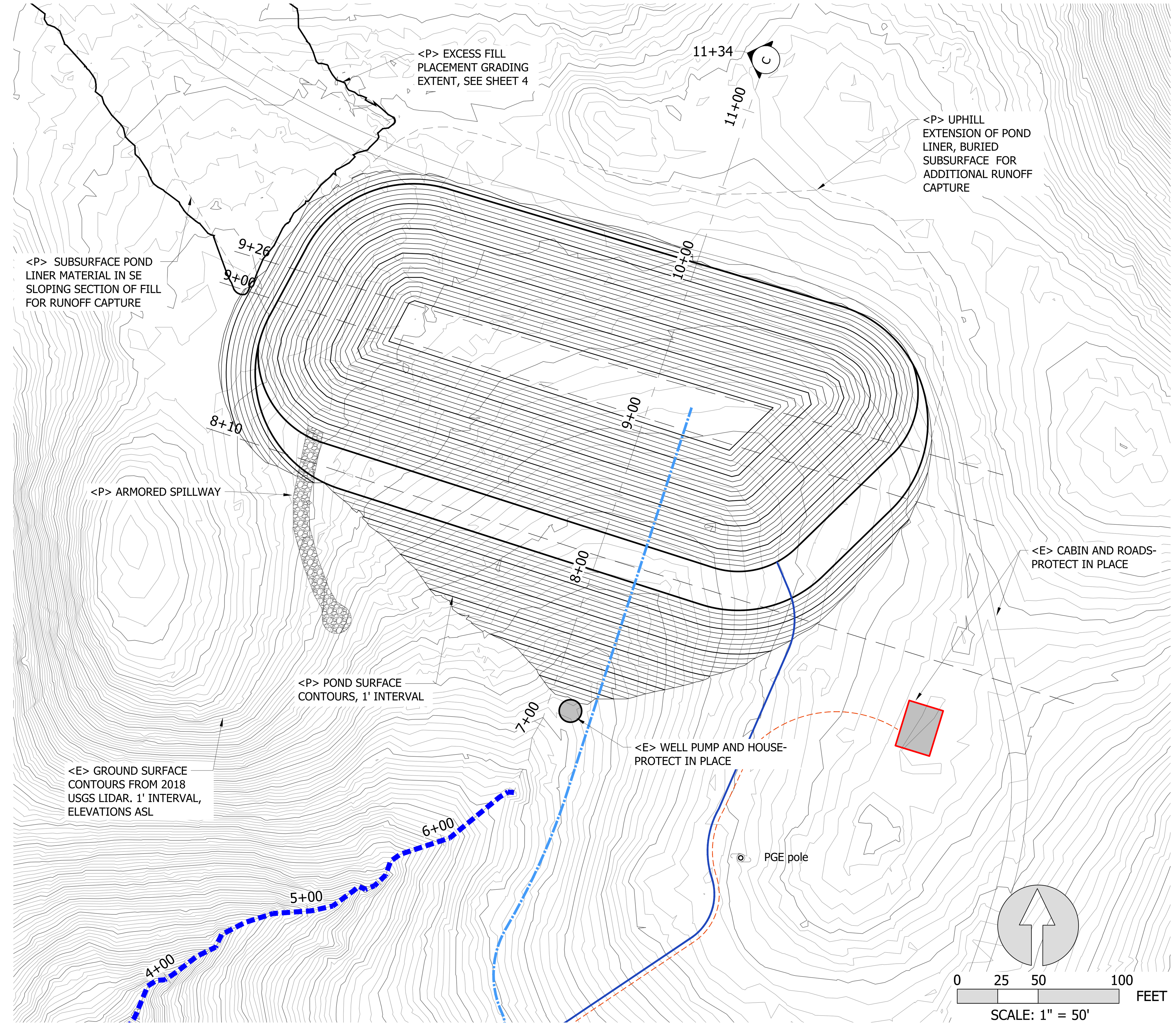
PLOT PLAN

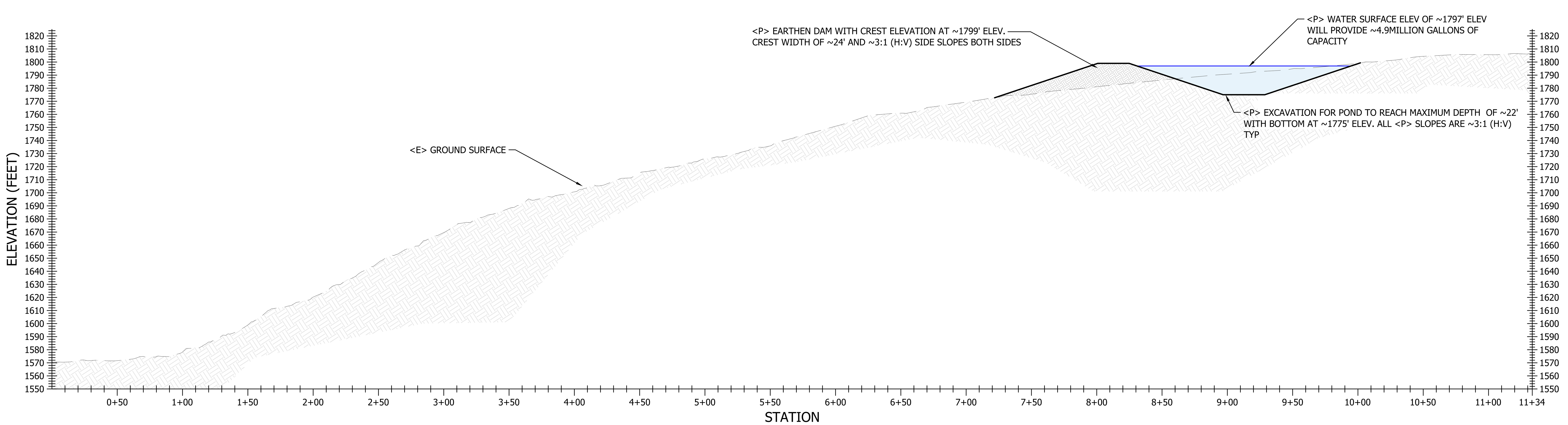
SHEET 2 OF 8











LA DOO MEADOW FLOW ENHANCEMENT PROJECT 65% DESIGN

HUMBOLDT COUNTY, CA

Stillwater Sciences
850 G STREET SUITE K
ARCATA, CA 95521
P: (707) 822-9607

PROPOSED POND DESIGN DETAILS

CAPACITY ~4.9 MILLION GALLONS W/ SPILLWAY CREST AT ~1799' AND ~2' OF FREEBOARD

~22.5KCYDS CUT
~9.7KCYDS FILL
~12.8KCYDS OF EXCESS SPOILS

PROJECT NUMBER: 603.03
SCALE: AS NOTED
DATE: 3/22/2023

DESIGN: JM
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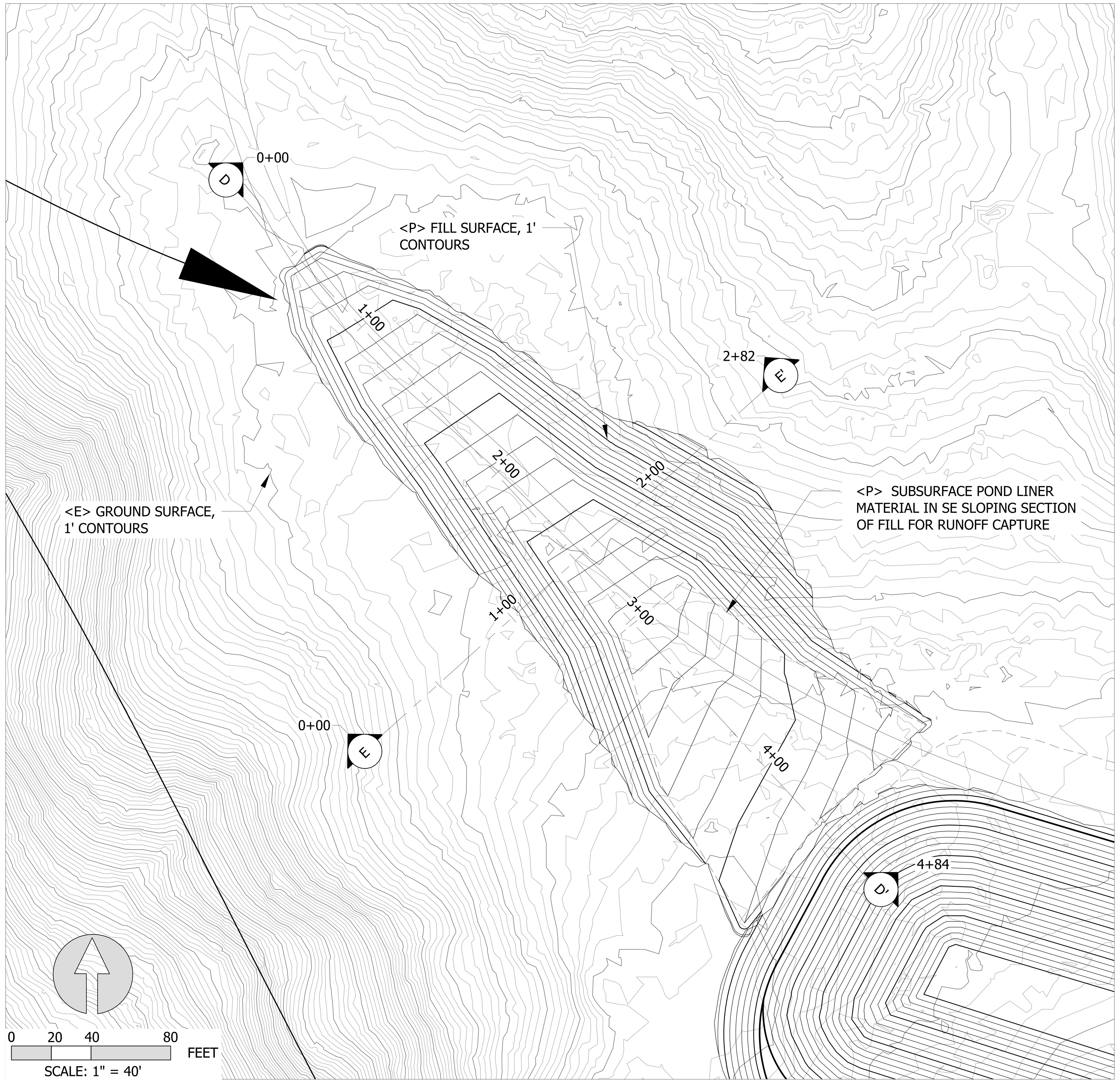
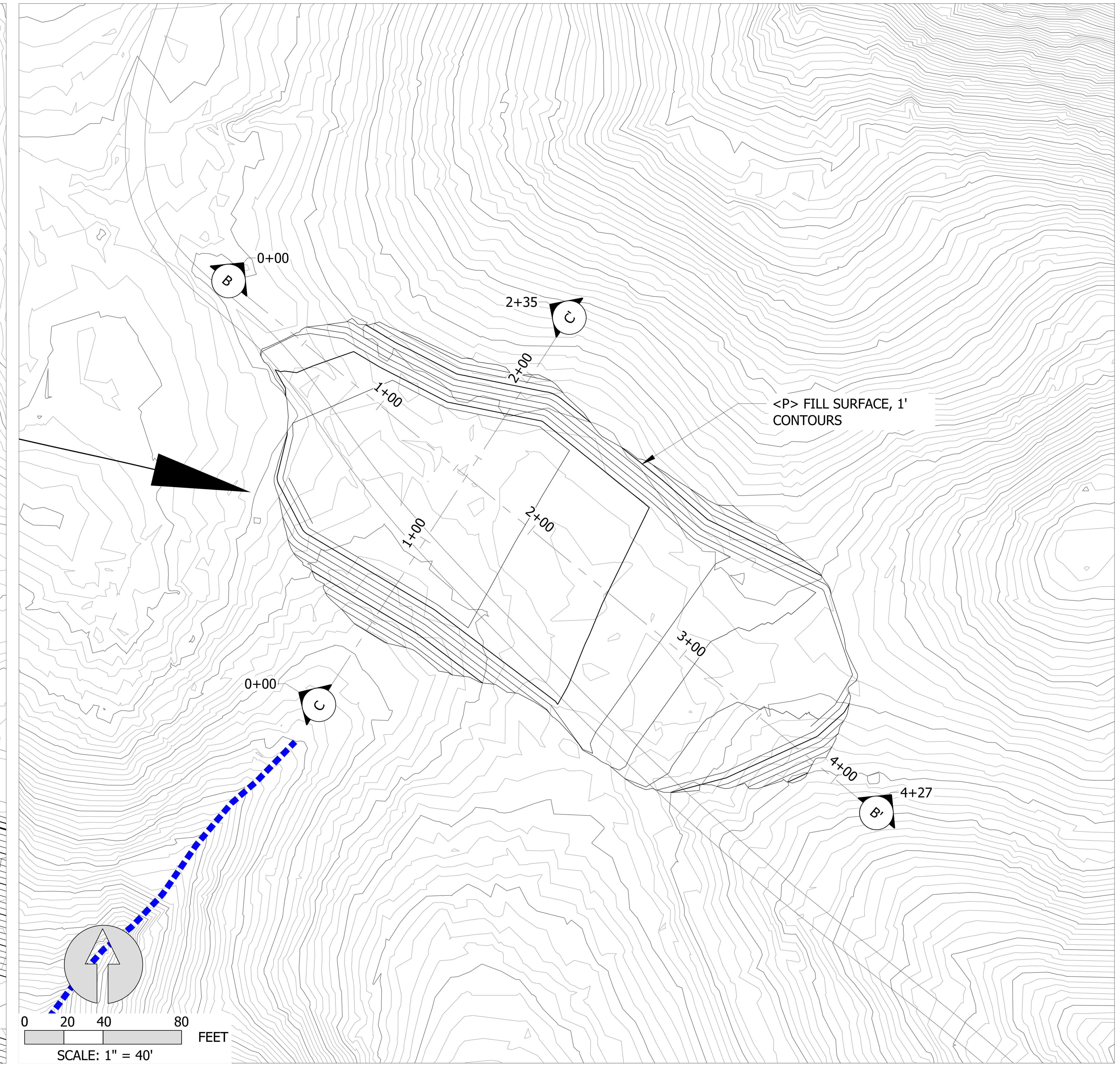
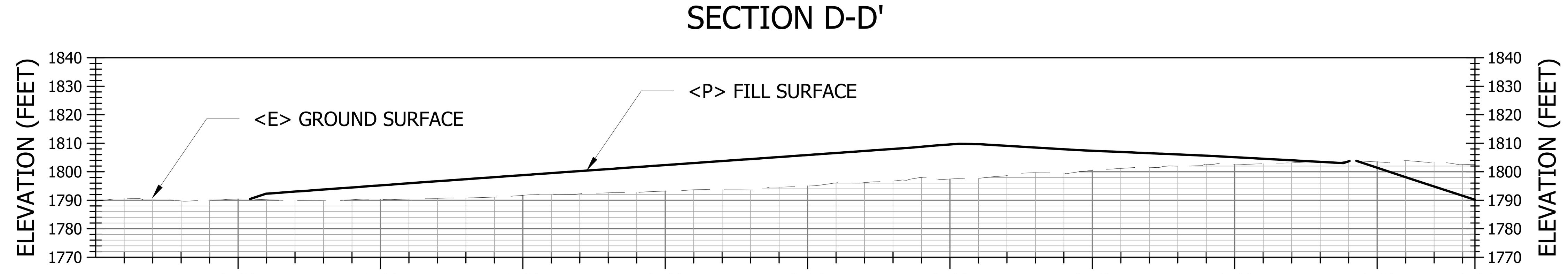
APPROVED: JM

POND GRADING





SECTION D-D'



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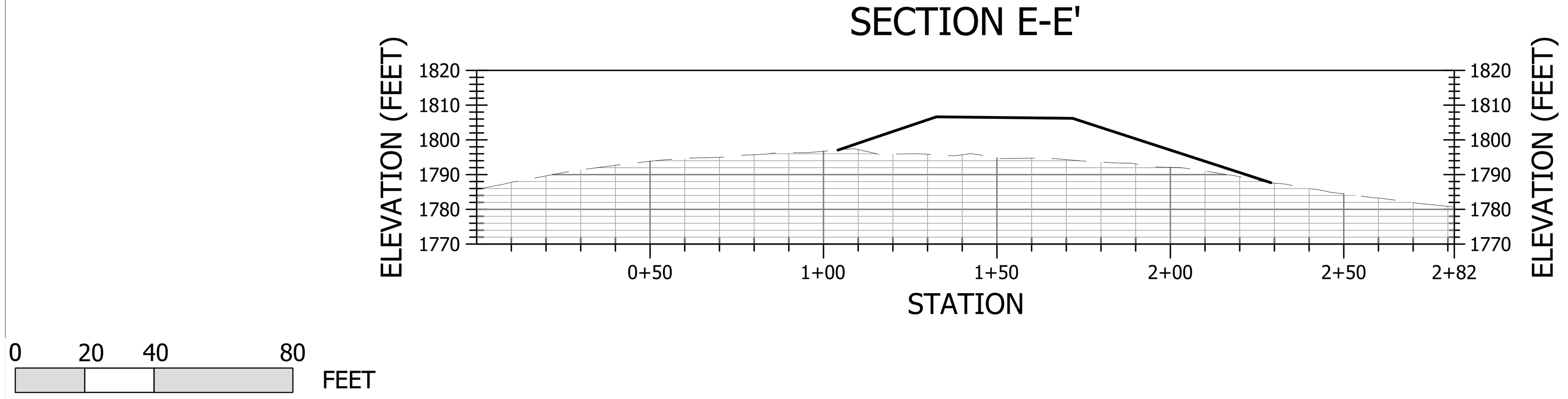

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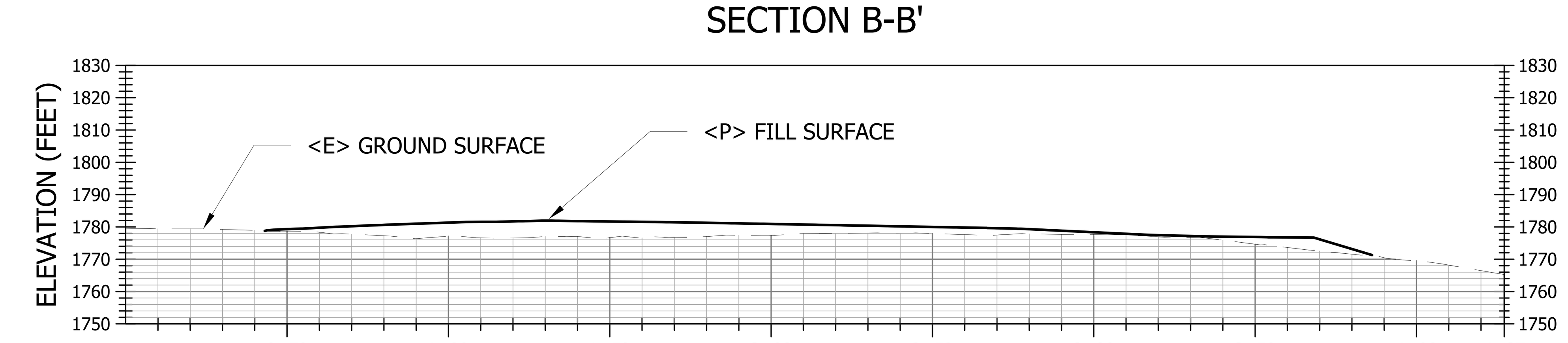

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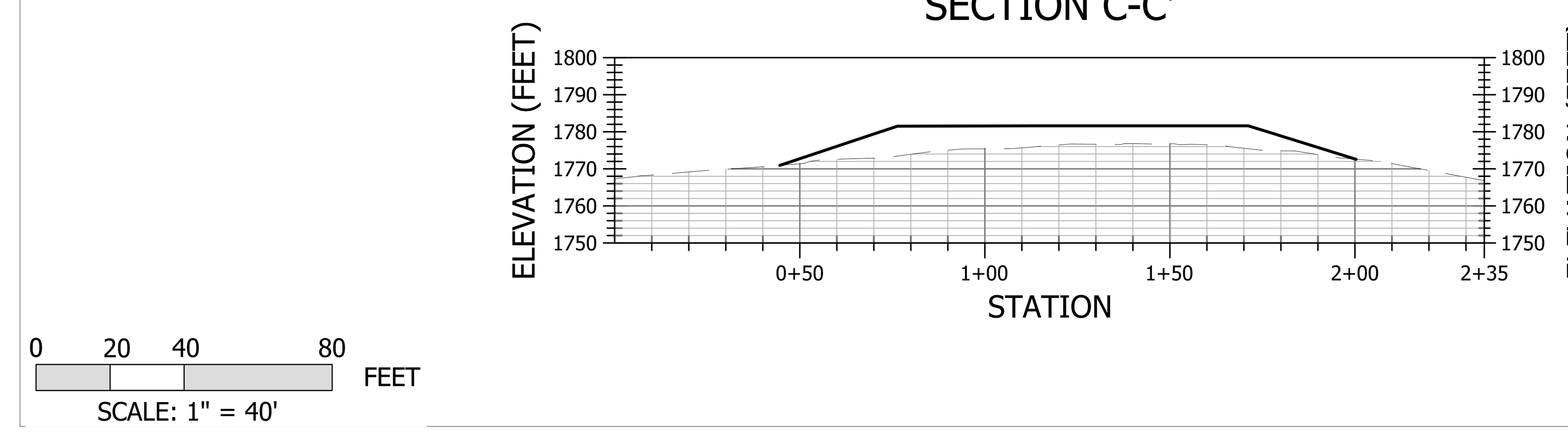

LA DOO MEADOW FLOW ENHANCEMENT PROJECT
65% DESIGN

HUMBOLDT COUNTY, CA

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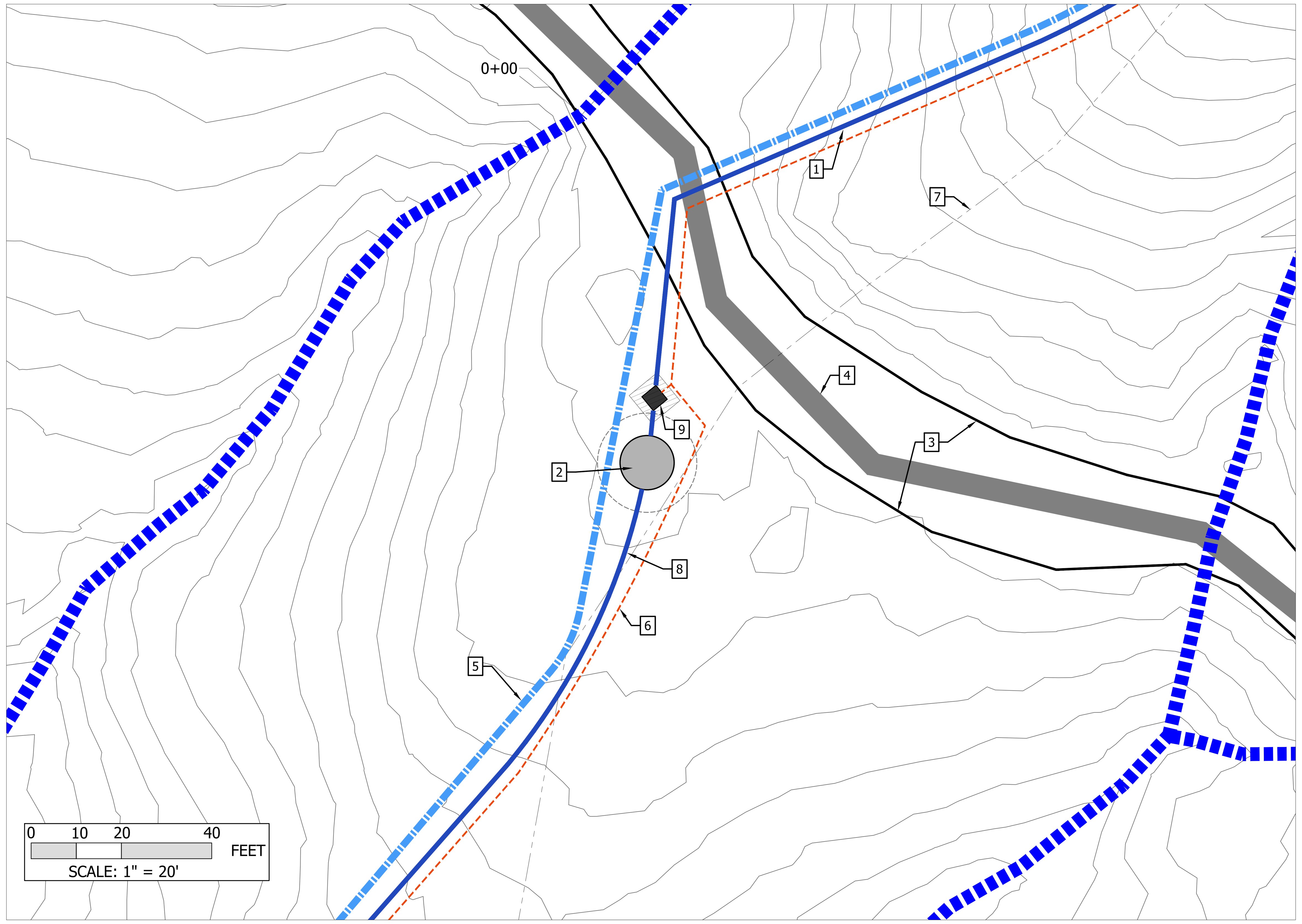
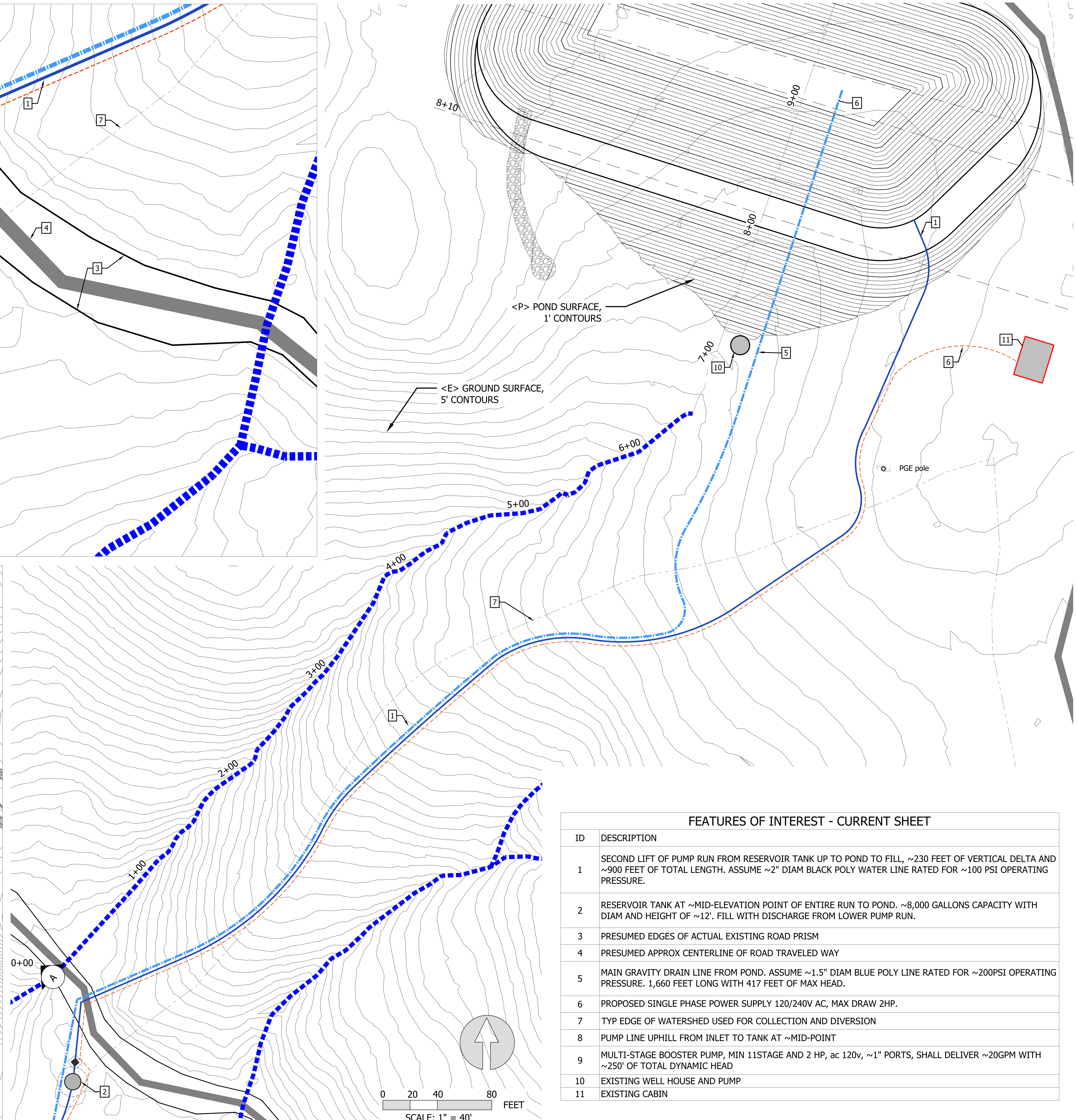
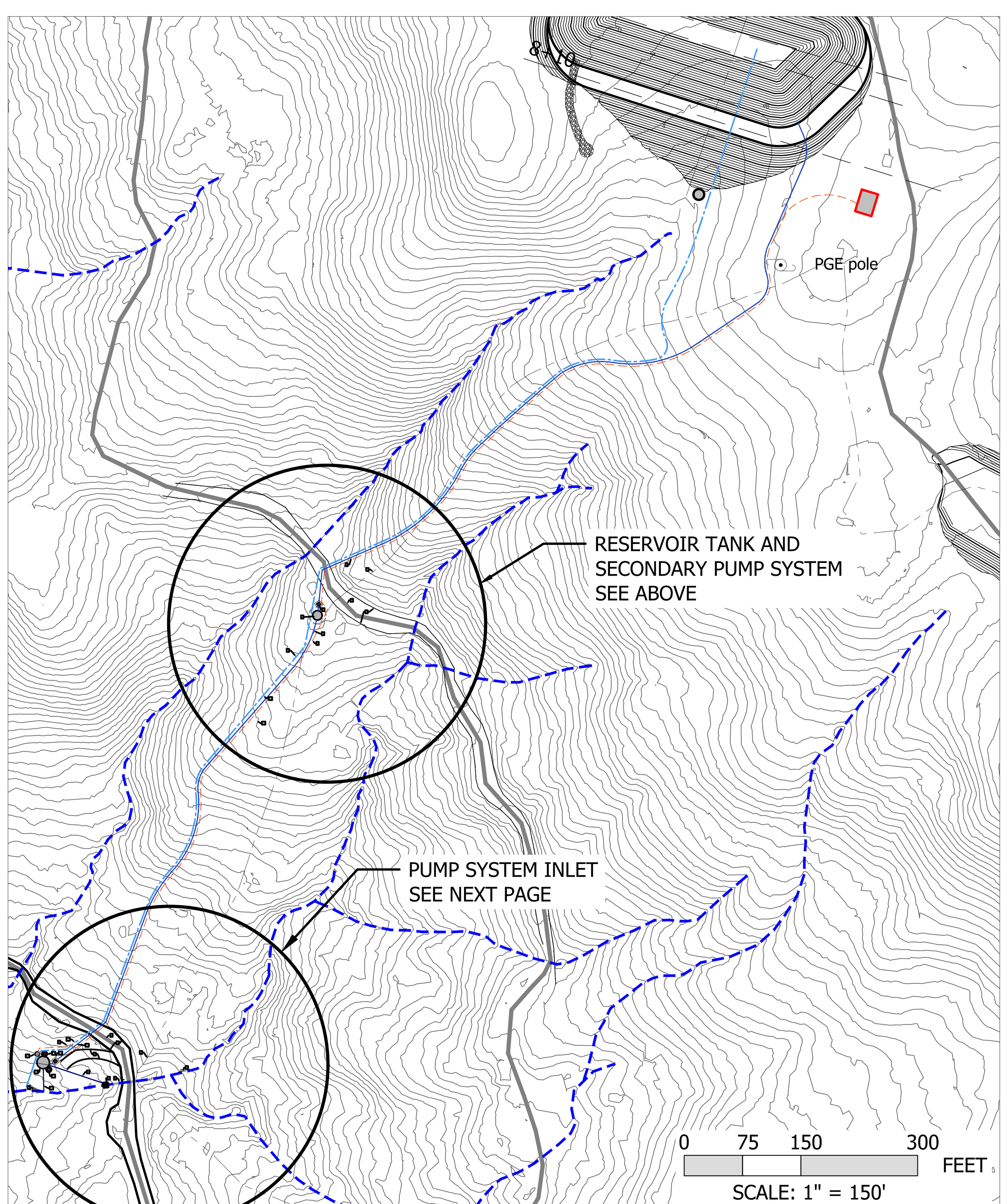
FILL AREA GRADING







FEATURES OF INTEREST - CURRENT SHEET	
ID	DESCRIPTION
1	SECOND LIFT OF PUMP RUN FROM RESERVOIR TANK UP TO POND TO FILL, ~230 FEET OF VERTICAL DELTA AND ~900 FEET OF TOTAL LENGTH. ASSUME ~2" DIAM BLACK POLY WATER LINE RATED FOR ~100 PSI OPERATING PRESSURE.
2	RESERVOIR TANK AT ~MID-ELEVATION POINT OF ENTIRE RUN TO POND. ~8,000 GALLONS CAPACITY WITH DIAM AND HEIGHT OF ~12'. FILL WITH DISCHARGE FROM LOWER PUMP RUN.
3	PRESUMED EDGES OF ACTUAL EXISTING ROAD PRISM
4	PRESUMED APPROX CENTERLINE OF ROAD TRAVELED WAY
5	MAIN GRAVITY DRAIN LINE FROM POND. ASSUME ~1.5" DIAM BLUE POLY LINE RATED FOR ~200PSI OPERATING PRESSURE. 1,660 FEET LONG WITH 417 FEET OF MAX HEAD.
6	PROPOSED SINGLE PHASE POWER SUPPLY 120/240V AC, MAX DRAW 2HP.
7	TYP EDGE OF WATERSHED USED FOR COLLECTION AND DIVERSION
8	PUMP LINE UPHILL FROM INLET TO TANK AT ~MID-POINT
9	MULTI-STAGE BOOSTER PUMP, MIN 11STAGE AND 2 HP, ac 120v, ~1" PORTS, SHALL DELIVER ~20GPM WITH ~250' OF TOTAL DYNAMIC HEAD
10	EXISTING WELL HOUSE AND PUMP
11	EXISTING CABIN

LA DOO MEADOW FLOW ENHANCEMENT PROJECT
65% DESIGN

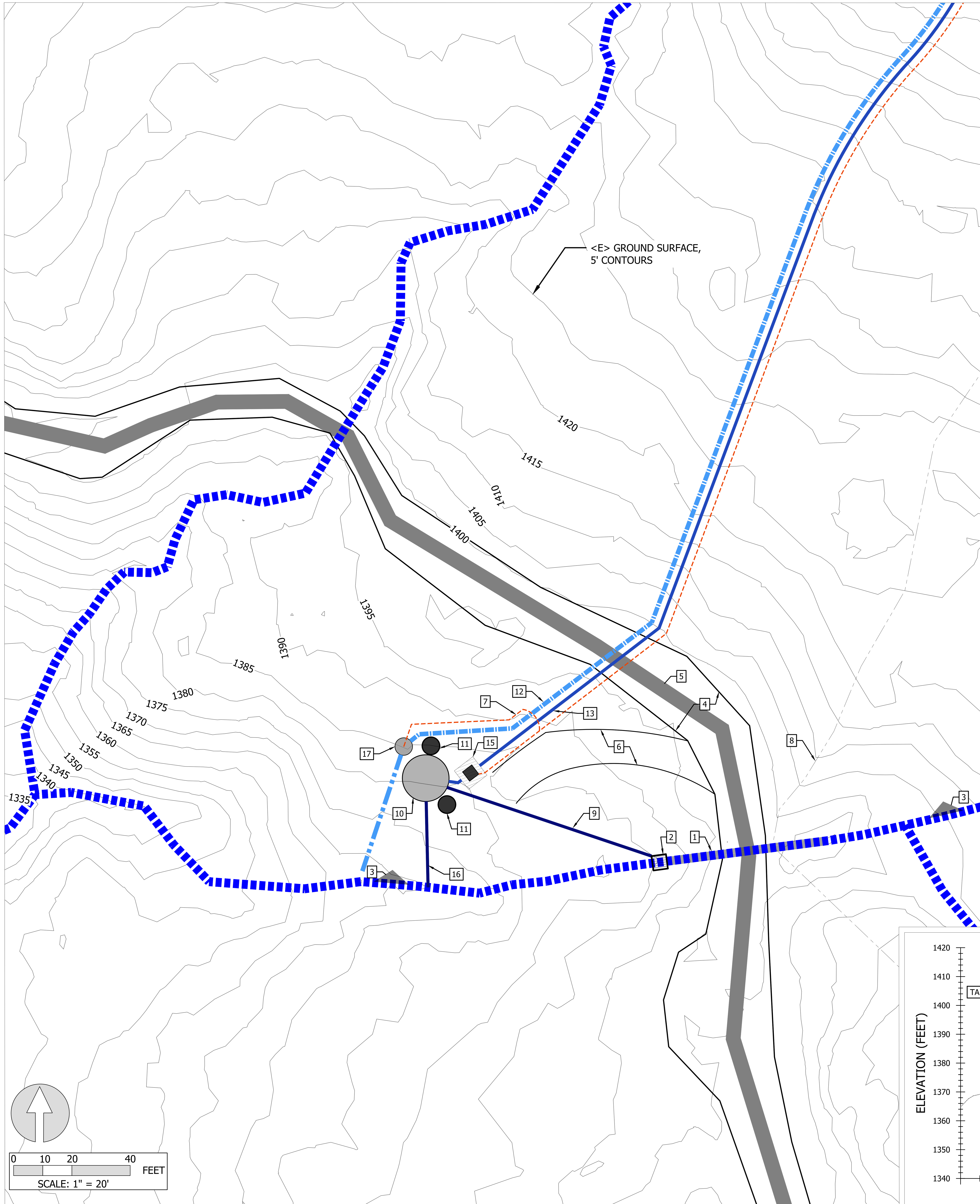
HUMBOLDT COUNTY, CA

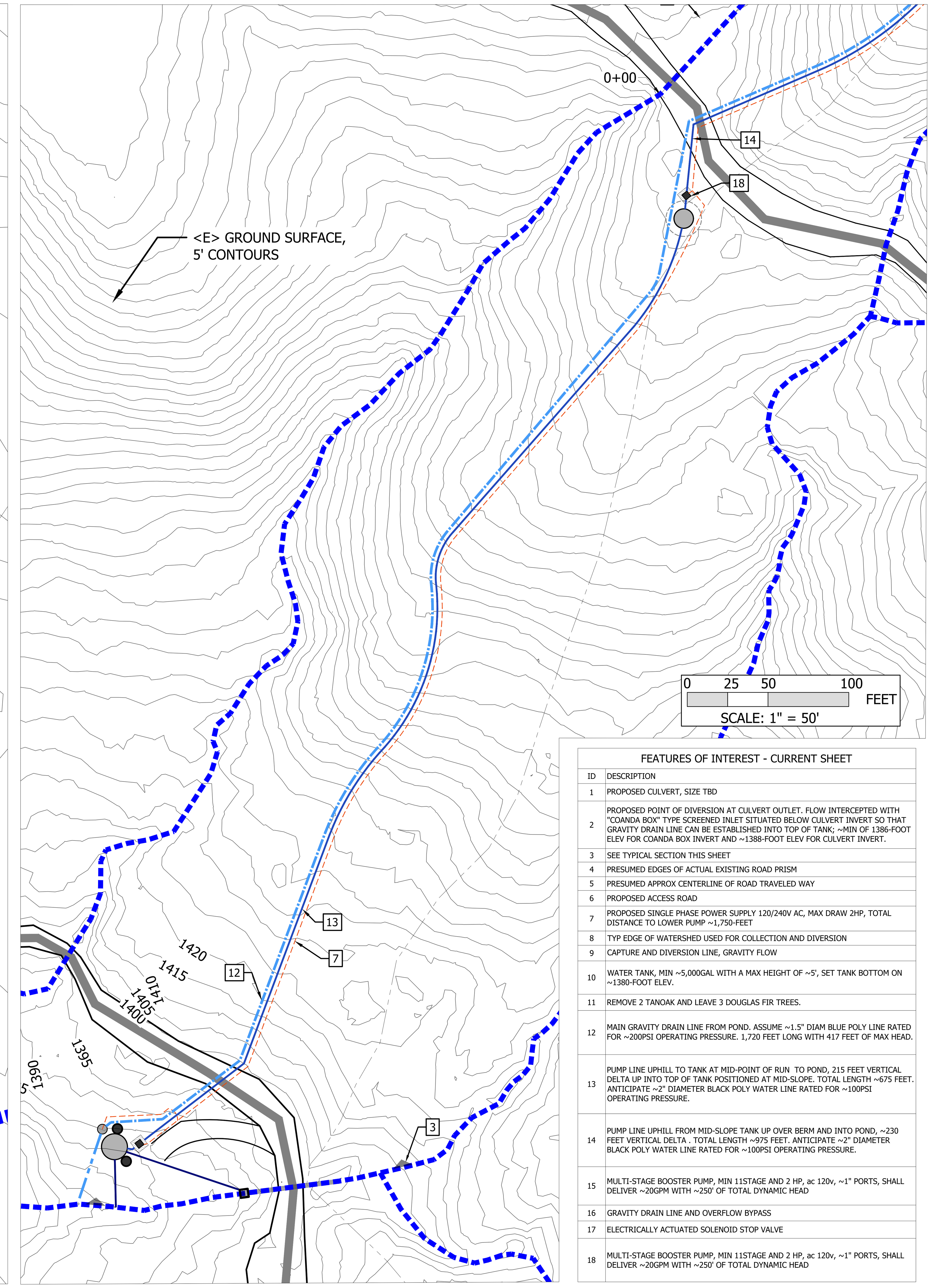
Stillwater Sciences
850 G STREET SUITE K
ARCATA, CA 95521
P: (707) 822-9607

PROJECT NUMBER: 603.03
SCALE: AS NOTED
DATE: 3/22/2023

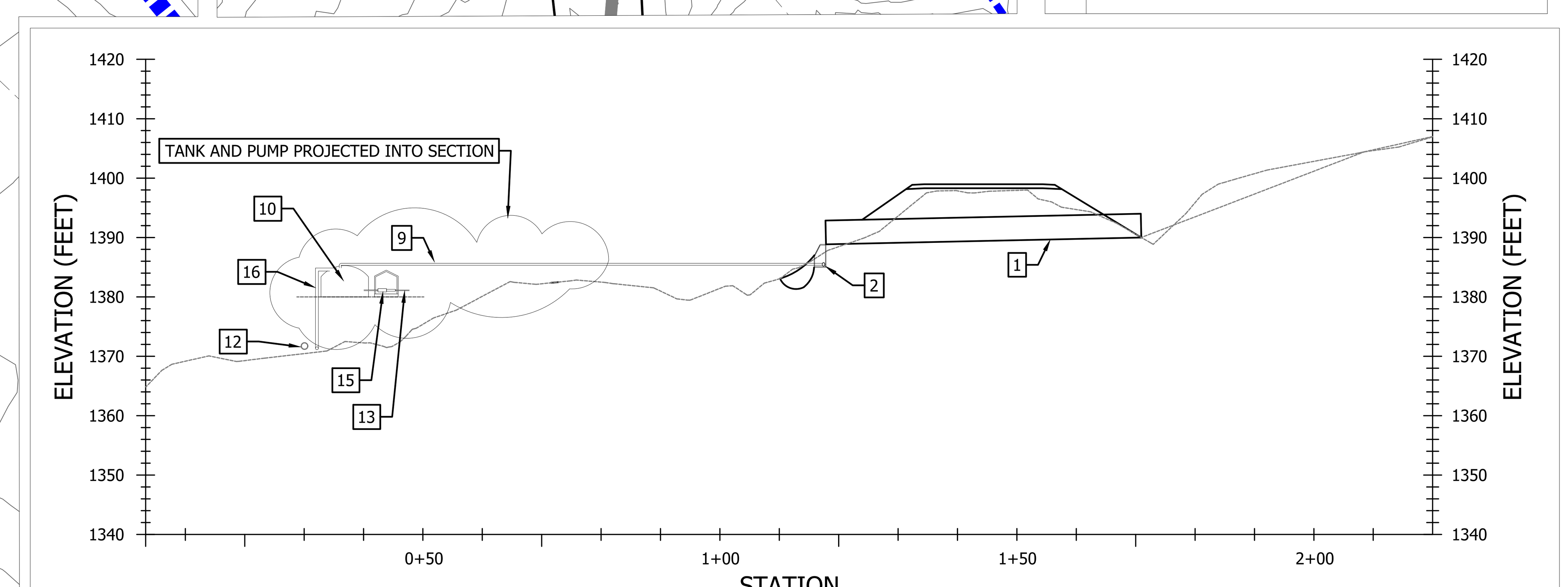
DESIGN: JM
DRAWN: BW,TC
CHECKED: JM
APPROVED: JM

PUMP OVERVIEW





FEATURES OF INTEREST - CURRENT SHEET	
ID	DESCRIPTION
1	PROPOSED CULVERT, SIZE TBD
2	PROPOSED POINT OF DIVERSION AT CULVERT OUTLET. FLOW INTERCEPTED WITH "COANDA BOX" TYPE SCREENED INLET SITUATED BELOW CULVERT INVERT SO THAT GRAVITY DRAIN LINE CAN BE ESTABLISHED INTO TOP OF TANK; ~MIN OF 1386-FOOT ELEV FOR COANDA BOX INVERT AND ~1388-FOOT ELEV FOR CULVERT INVERT.
3	SEE TYPICAL SECTION THIS SHEET
4	PRESUMED EDGES OF ACTUAL EXISTING ROAD PRISM
5	PRESUMED APPROX CENTERLINE OF ROAD TRAVELED WAY
6	PROPOSED ACCESS ROAD
7	PROPOSED SINGLE PHASE POWER SUPPLY 120/240V AC, MAX DRAW 2HP, TOTAL DISTANCE TO LOWER PUMP ~1,750-FEET
8	TYP EDGE OF WATERSHED USED FOR COLLECTION AND DIVERSION
9	CAPTURE AND DIVERSION LINE, GRAVITY FLOW
10	WATER TANK, MIN ~5,000GAL WITH A MAX HEIGHT OF ~5', SET TANK BOTTOM ON ~1380-FOOT ELEV.
11	REMOVE 2 TANOAK AND LEAVE 3 DOUGLAS FIR TREES.
12	MAIN GRAVITY DRAIN LINE FROM POND. ASSUME ~1.5" DIAM BLUE POLY LINE RATED FOR ~200PSI OPERATING PRESSURE. 1,720 FEET LONG WITH 417 FEET OF MAX HEAD.
13	PUMP LINE UPHILL TO TANK AT MID-POINT OF RUN TO POND, 215 FEET VERTICAL DELTA UP INTO TOP OF TANK POSITIONED AT MID-SLOPE. TOTAL LENGTH ~675 FEET. ANTICIPATE ~2" DIAMETER BLACK POLY WATER LINE RATED FOR ~100PSI OPERATING PRESSURE.
14	PUMP LINE UPHILL FROM MID-SLOPE TANK UP OVER BERM AND INTO POND, ~230 FEET VERTICAL DELTA . TOTAL LENGTH ~975 FEET. ANTICIPATE ~2" DIAMETER BLACK POLY WATER LINE RATED FOR ~100PSI OPERATING PRESSURE.
15	MULTI-STAGE BOOSTER PUMP, MIN 11STAGE AND 2 HP, ac 120v, ~1" PORTS, SHALL DELIVER ~20GPM WITH ~250' OF TOTAL DYNAMIC HEAD
16	GRAVITY DRAIN LINE AND OVERFLOW BYPASS
17	ELECTRICALLY ACTUATED SOLENOID STOP VALVE
18	MULTI-STAGE BOOSTER PUMP, MIN 11STAGE AND 2 HP, ac 120v, ~1" PORTS, SHALL DELIVER ~20GPM WITH ~250' OF TOTAL DYNAMIC HEAD



LA DOO MEADOW FLOW ENHANCEMENT PROJECT 65% DESIGN

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850 G STREET SUITE K
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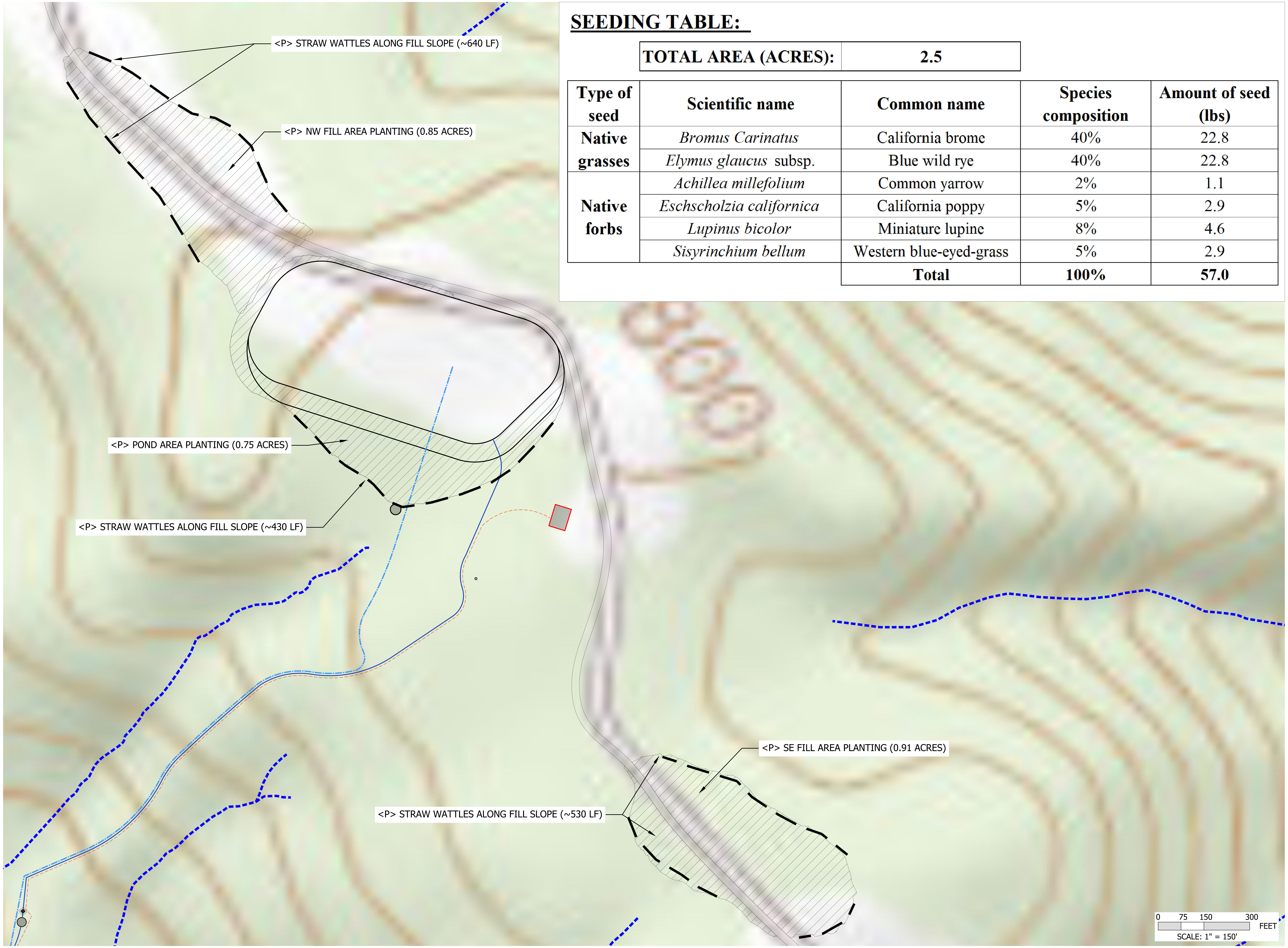
APPROVED: JM

DIVERSION



SEEDING TABLE:

TOTAL AREA (ACRES):	2.5

Type of seed	Scientific name	Common name	Species composition	Amount of seed (lbs)
Native grasses	*Bromus Carinatus*	California brome	40%	22.8
	Elymus glaucus subsp.	Blue wild rye	40%	22.8
Native forbs	*Achillea millefolium*	Common yarrow	2%	1.1
	Eschscholzia californica	California poppy	5%	2.9
	Lupinus bicolor	Miniature lupine	8%	4.6
	Sisyrinchium bellum	Western blue-eyed-grass	5%	2.9
		Total	**100%**	**57.0**

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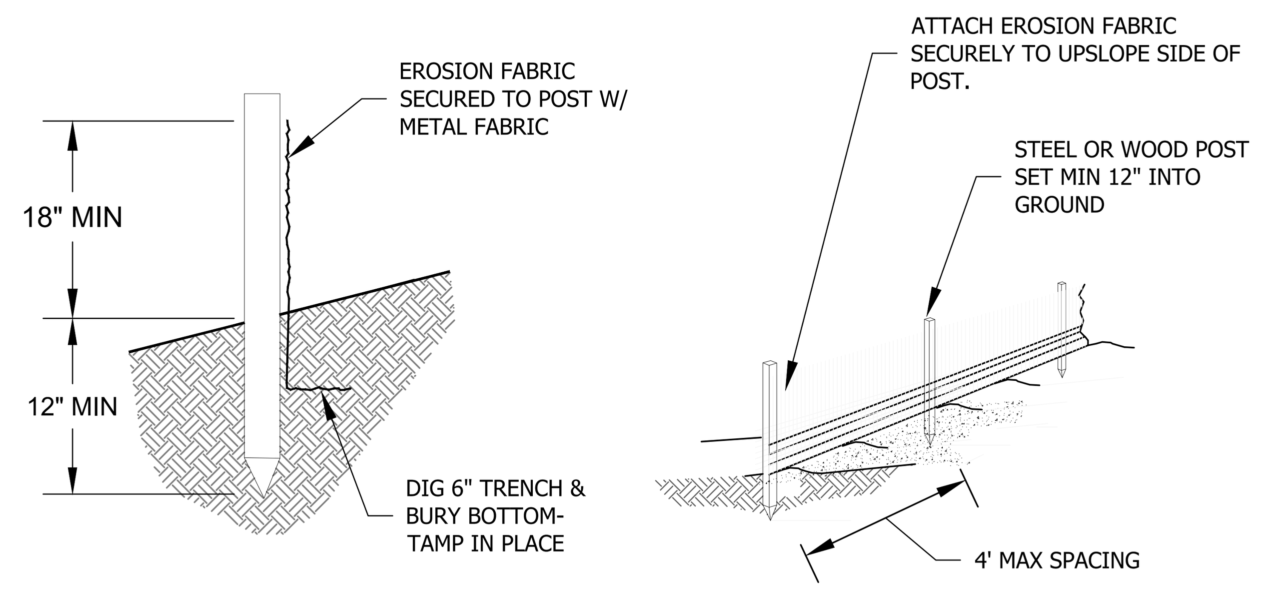
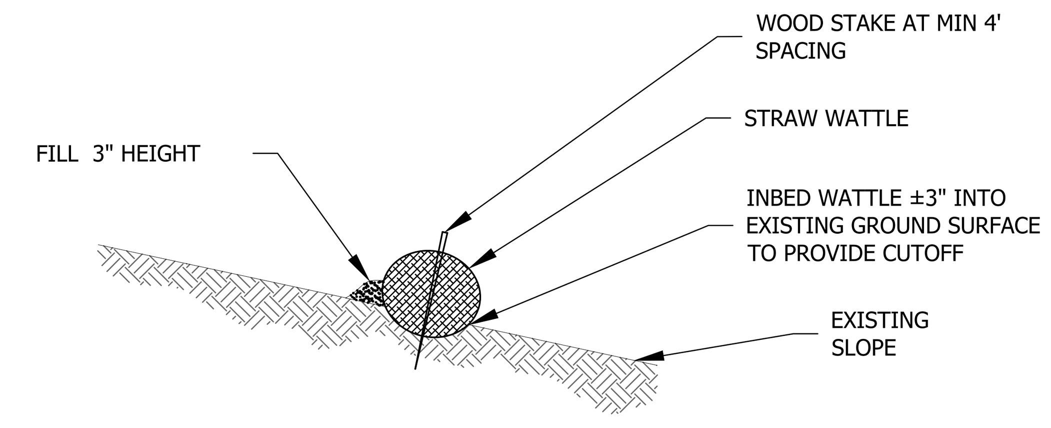
CHECKED: JM
APPROVED: JM

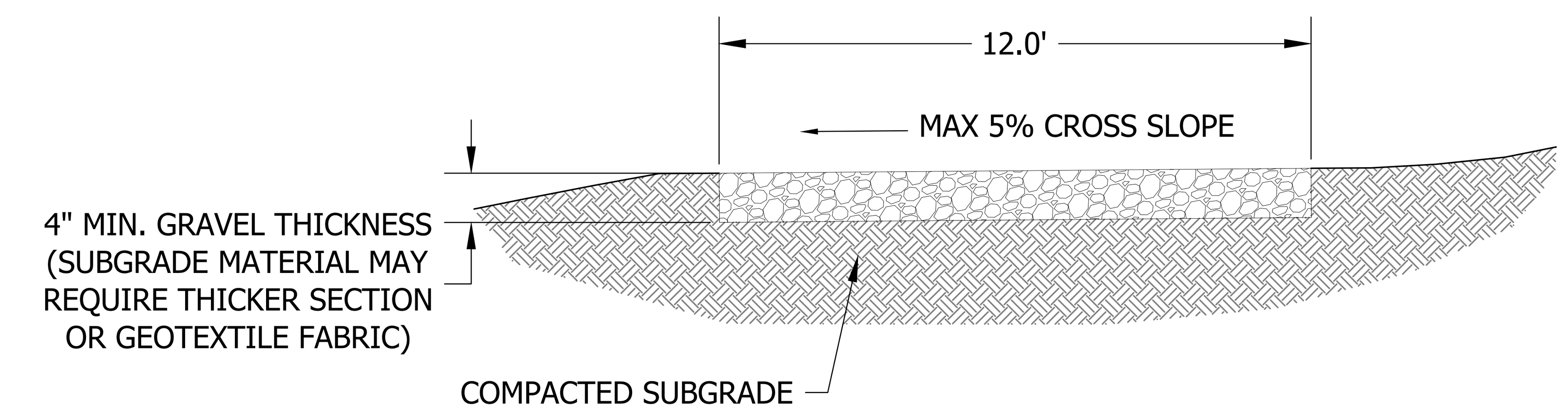
EROSION CONTROL AND REVEGETATION



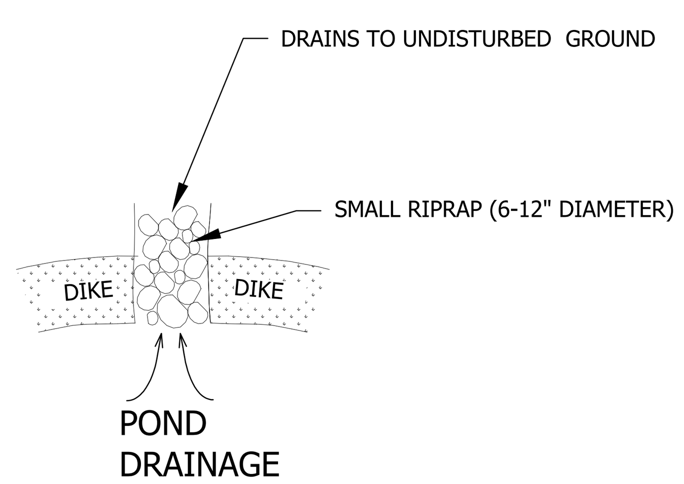
1 **SILT FENCING**
NTS



2 **STRAW WATTLE**
NTS



3 **GRAVEL ACCESS ROAD**
NTS



4 SPILLWAY PLAN VIEW
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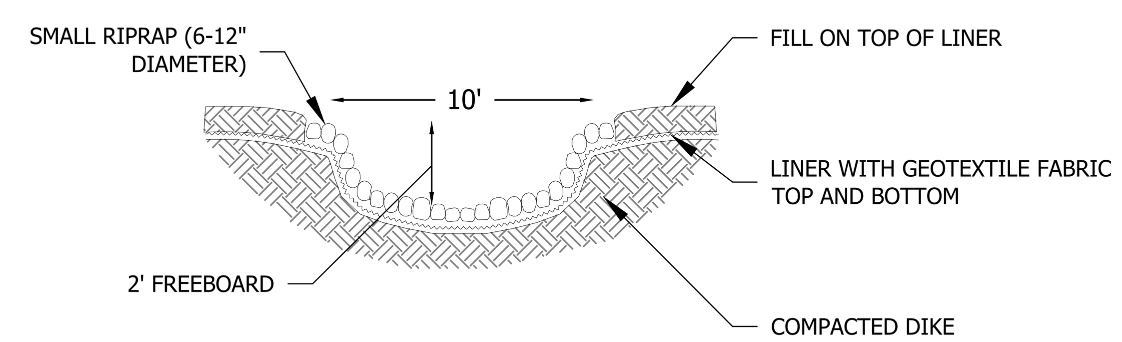
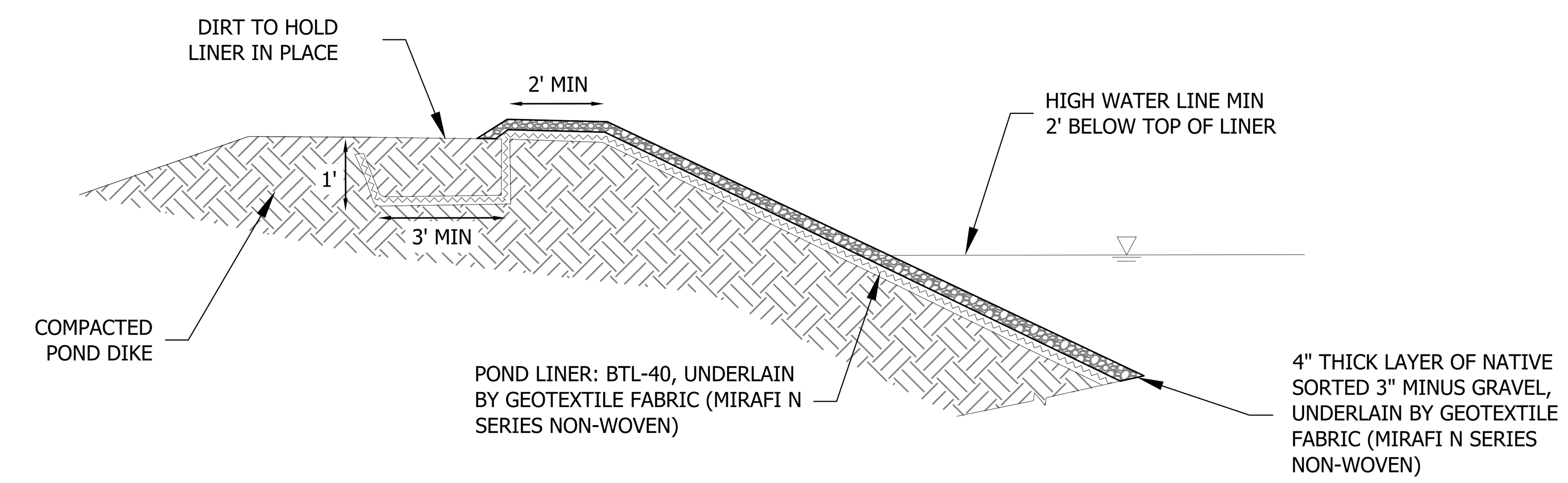
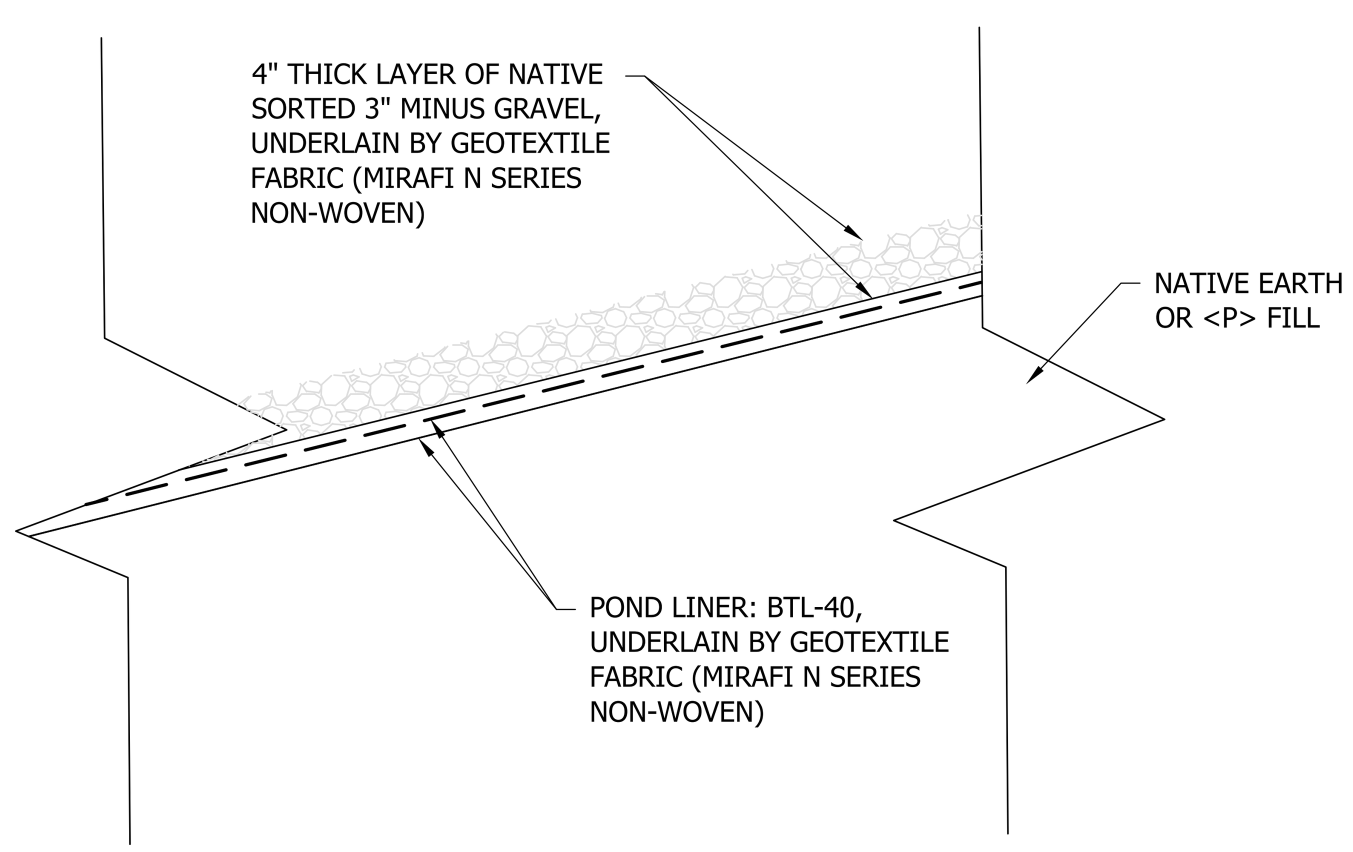


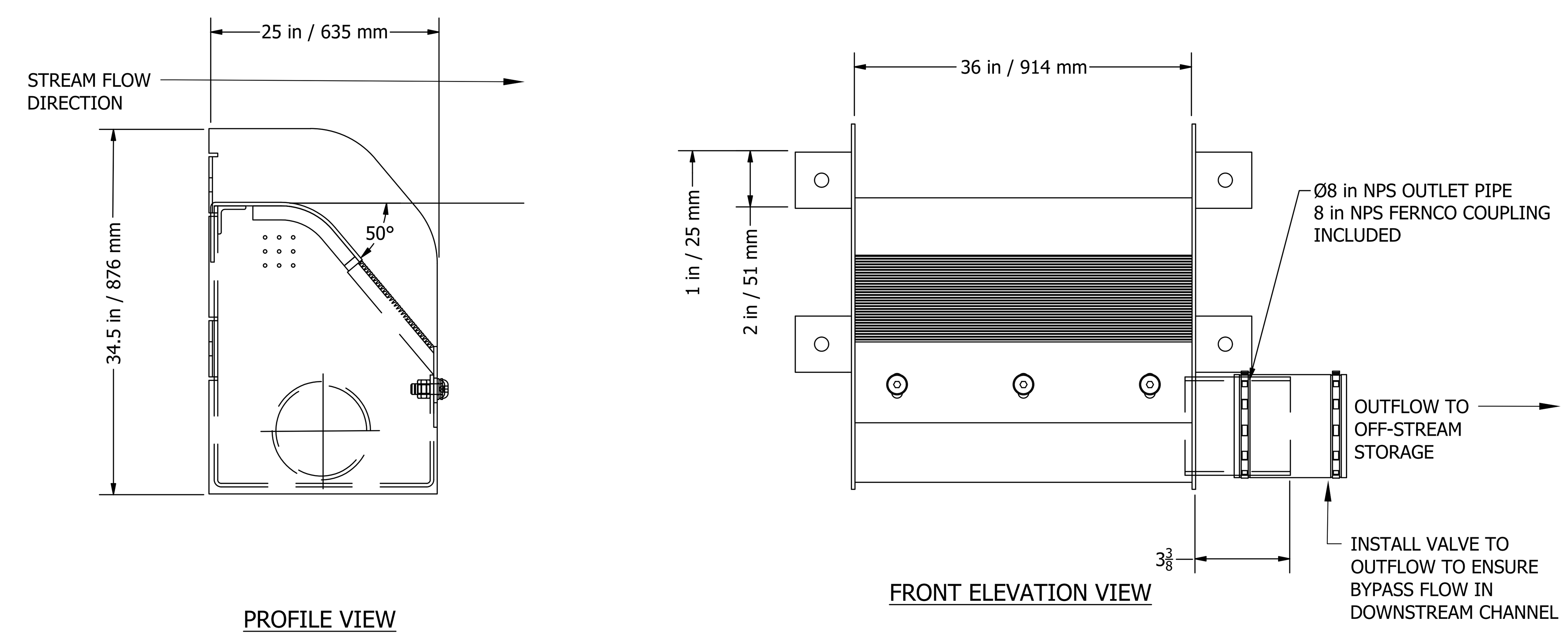
5 SPILLWAY SECTION VIEW
NTS



6 **POND EDGE DETAIL**
NTS



7 **POND LINER DETAIL**
NTS



8 **DIVERSION INTAKE**
NTS

COANDA BOX OR SIMILAR. SCREEN SLOT WIDTH OF 1MM, FABRICATED FROM 304 STAINLESS STEEL.

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DETAILS

SHEET 8 OF 8

Appendix B

Geophysical Investigation Report

In Situ Shear Wave Velocity

Measurements

La Doo Meadow
Briceland, Humboldt County, California

Prepared by
ARGO-E LLC

Prepared for

Stillwater Sciences
850 G Street, Suite K, Arcata, CA 95521
tel 707-822-9607   fax 888-766-5110
www.stillwatersci.com

July 14 2022

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1. INTRODUCTION

At the request of Mr. Joel Monschke, Stillwater Sciences, in situ seismic geophysical surveys have been performed as part of field characterization activities at the La Doo Meadow, Humboldt County, California. Field measurements were performed under the direction of Dr. Dimitrios Zekkos on May 17 2022 with the assistance of Parker Blunts and Jhih-Rou Huang. Analyses were conducted by Dr. Dimitrios Zekkos. This report was prepared by Dr. Dimitrios Zekkos and documents the field testing and the results.

2. FIELD TESTING DESCRIPTION

Field testing consisted of the measurement of surface wave velocities at three locations at the study area as shown in Figure 1. These locations were identified by Mr. Joel Monschke.

The location of the MASW arrays, as shown in Fig. 1, should be considered approximate and was interpreted on the basis of GPS points collected for the first and last geophone of the array, as well as the location of the energy source. The coordinates of the testing locations are attached as a .kmz file and are considered accurate within 10 ft or so. Photographs from the various testing locations are shown in Figures 2 through 5.

3. METHODOLOGY

The surface wave seismic method is used to estimate the shear wave velocity (V_S) profile. Surface methods are appealing because compared to other seismic geophysical methods, such as downhole, crosshole, and suspension logging, they have the advantage that they do not require boreholes. Among their main advantages are that they are non-intrusive, efficient, and reliable. Specifically, an active technique was performed. The 1D Multichannel Analysis of Surface Waves (MASW) method (Park et al. 1999a) was used for active measurements (Okada 2003). Generally, the method involves three steps: collection of field measurement data, dispersion curve analysis, and the forward modeling process. The procedure used in the field is described in more detail by Sahadewa et al. (2012).

3.1 MASW Method Field Measurements

In the MASW method, data acquisition was performed by recording the ground roll from a 10-lb sledge hammer blow. The source offset (x_s) was varied and was typically 10-30% of the total array length. Twenty four 2-Hz geophones were positioned with spacing (d_x) of 5 ft in a linear array, at each testing location, as shown in Table 1. Thus, the spread length (*D*) was 115 ft. A schematic of the data acquisition setup is shown in Fig. 6. Stacking was performed to improve the signal to noise ratio (S/N). Generally, 8 stacks were used to generate one active MASW record.

Table 1: Geometric characteristics of array at each testing location.

	Near offset, ft	Geophone spacing, ft	Array length, ft
Location #1	20	5	115
Location #2	20	5	115
Location #3	20	5	115

3.2 Dispersion Curve Analysis and Forward Modeling Process

Records from MASW measurements are transformed to a dispersion curve using the Park et al. (1999b) method. To obtain the V_s profile, the measured dispersion curve is compared against a theoretical dispersion curve through a forward modeling process. An assumed V_s profile is used to obtain a theoretical dispersion curve and modifications to the V_s profile are made iteratively until the two dispersion curves closely match. Matching of the measured dispersion curve and its theoretical counterpart was assessed by implementing a non-linear least squares method (Xia et al. 1999). Sensitivity analysis is performed to evaluate the depth to which the V_s profile is reliably estimated, typically yielding results to depth of about one-third of the maximum wavelength (λ_{max}).

Note that there is no single solution to the forward modeling problem. This means that different profiles (i.e., combinations of shear wave velocity values and layer thicknesses) may match the measured results, and the profiles shown should not be considered as the "truth". However, the general trend in the data related to the soil stiffness variation with depth should be captured well. Increased accuracy in the inversion results could be achieved if the profiles were compared to borehole data in one location to assess the stratigraphy and restrain the model, but such data is not available at this site.

4. RESULTS

The results of the measurements are shown individually in Figures 7 through 10 along with their corresponding dispersion curves. The numeric values of the 1D V_S profiles are included in Appendix A. In general a higher shear wave velocity layer is encountered in all locations at depths that vary from 30-42 ft. The V_S profile at Location 1, was found more challenging to interpret and thus two alternative Vs profiles are shown, while other models with similarities as the ones shown are also possible.

5. LIMITATIONS

The surface wave seismic method used herein provides an estimate of the variation of the small-strain shear wave velocity with depth, which is a measure of the stiffness profile. It has the advantage of being an efficient method to collect subsurface data in many locations. However, the data shown should also be used in context with other surface, geologic and subsurface data to make interpretations on the site conditions. A major limitation, as discussed earlier, of the method is that multiple relatively similar, but still different subsurface shear wave velocity profiles may still match the field data collected. Thus, caution should be used to not interpret the values shown here as a deterministic assessment of the subsurface conditions; instead the general trend of the data should be considered. ARGO-E has no involvement and assumes no responsibility on further interpretations made from the results of this geophysical measurements.

6. REFERENCES

Aki, K. (1957). "Space and Time Spectra of Stationary Stochastic Waves with Special Reference to Micro-tremors." *Bull. Earthq. Res. Inst.*, v. 35: 415-456.

Okada, H. (2003). "The Microtremor Survey Method." *Geophysical Monograph Series* no. 12. Society of exploration geophysicists: 135.

Park, C. B., Miller, R.D., and Xia, J. (1999a). "Multichannel Analysis of Surface Wave." *Geophysics*, 64: 800-808.

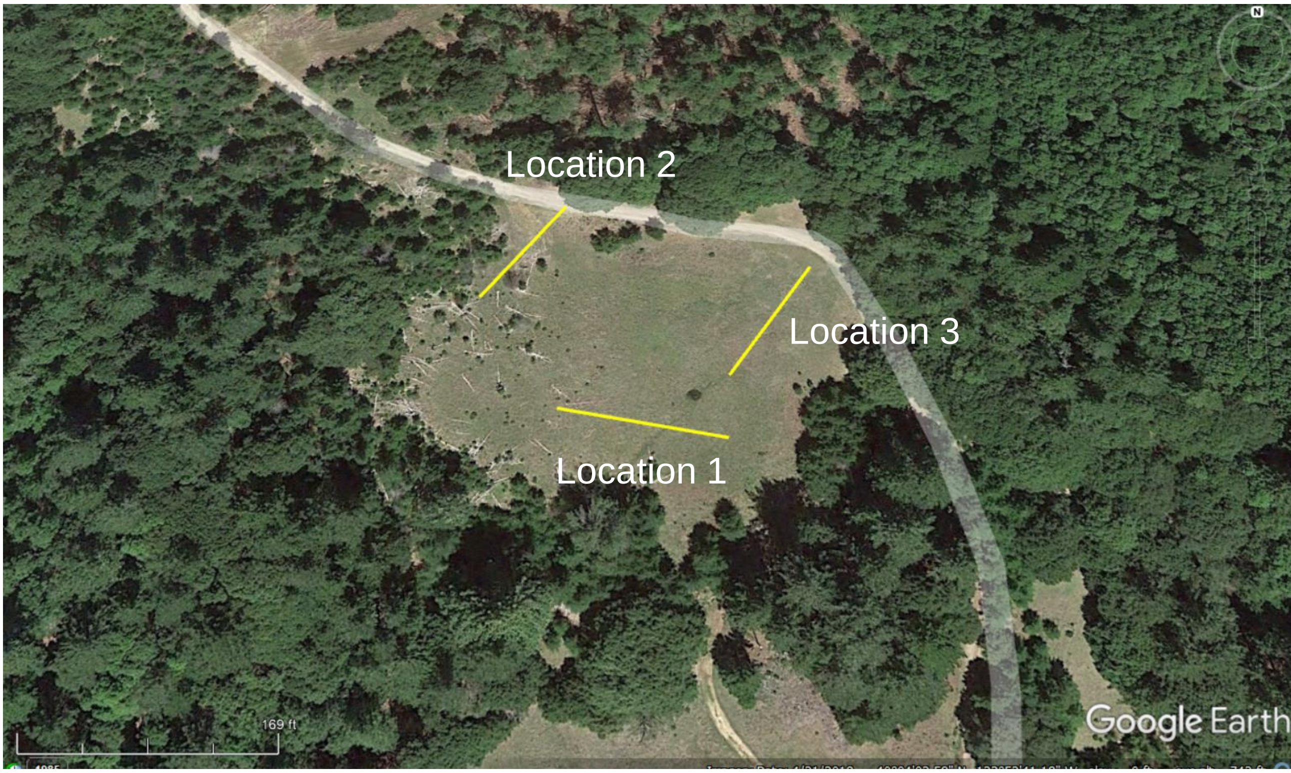
Park, C. B., Miller, R. D., Xia, J. (1999b). "Multimodal Analysis of High Frequency Surface Wave." *Proc. SAGEEP* 99, Oakland, CA, March 14-18.

Park, C. B., Miller, R. D., Ryden, N., Xia, J., and Ivanov, J. (2005). "Combined Use of Active and Passive Surface Waves." *Journ. of Env. & Eng. Geophys*; September 2005; v. 10: 323-334.

Sahadewa, A., Zekkos, D., and Woods R. D. (2012). "Observations from the Implementation of a Combined Active and Passive Surface Wave Based Methodology", Geocongress 2012: State of the Art and Practice in Geotechnical Engineering *Conference*, 25-29 March 2012, Oakland, California, edited by Hryciw, Athanasopoulos-Zekkos and Yesiller, ASCE Geotechnical Special Publication No. 225, pp. 2786-2795.

Xia, J., Miller, R.D., and Park, C.B. (1999). "Estimation of Near-surface Shear-wave Velocity by Inversion of Rayleigh Waves." *Geophysics* v. 64: 691-700.

FIGURES



Interpreted Locations of MASW surveys based on GPS points collected in the field. Location shown is accurate within ±10-15 ft

Figure 1: Google Earth Site Map and Approximate Sounding Locations		ARGO-E LLC
July 2022	La Doo Meadow, Briceland, CA	

Figure 2 Surface wave testing at Location 1		ARGO-E LLC
July 2022	La Doo Meadow, Briceland, CA	

Figure 3 Surface wave testing at Location 2		ARGO-E LLC
July 2022	La Doo Meadow, Briceland, CA	

Figure 4 Surface wave testing at Location 3		ARGO-E LLC
July 2022	La Doo Meadow, Briceland, CA	

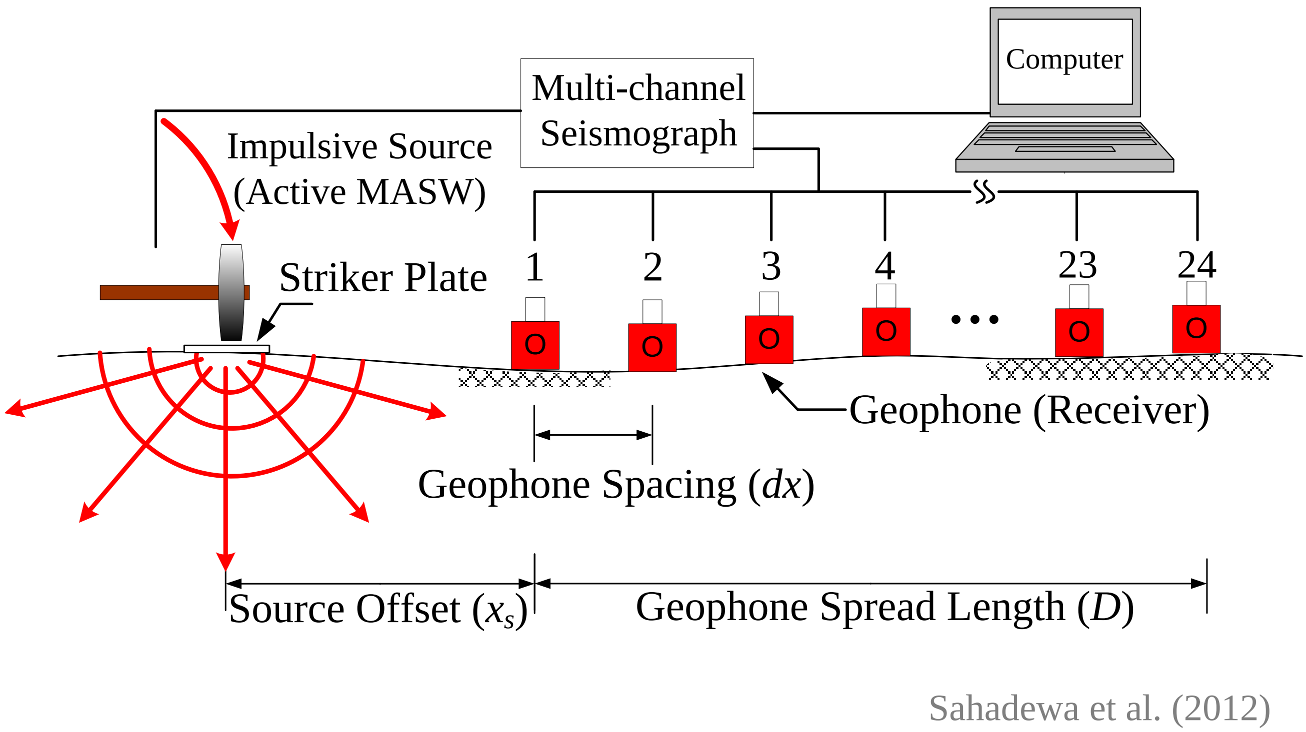
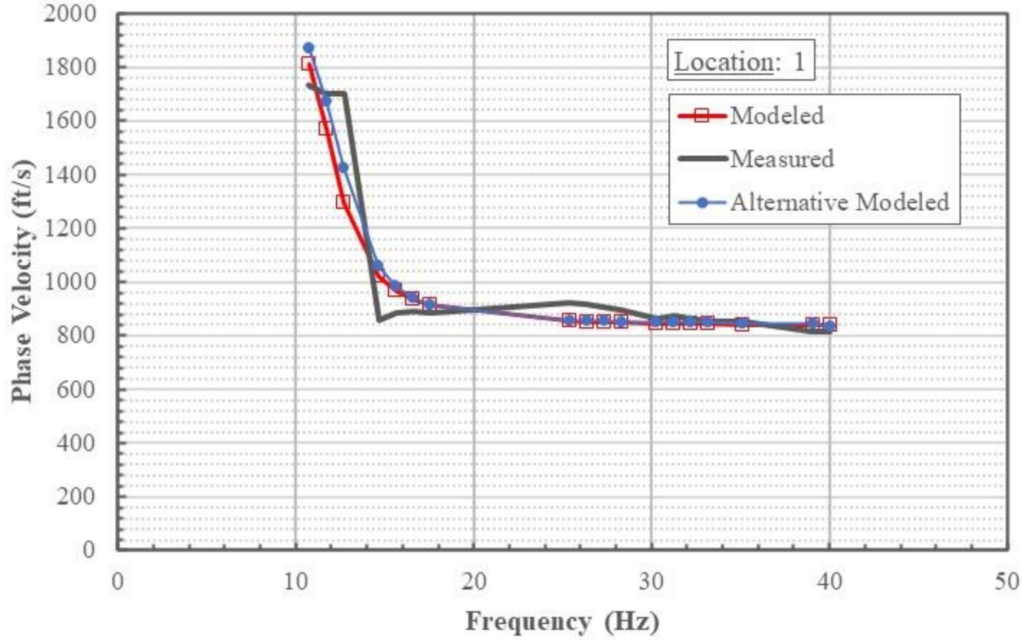


Figure 6: Schematic of linear array for surface wave measurements		ARGO-E LLC
July 2022	La Doo Meadow, Briceland, CA	



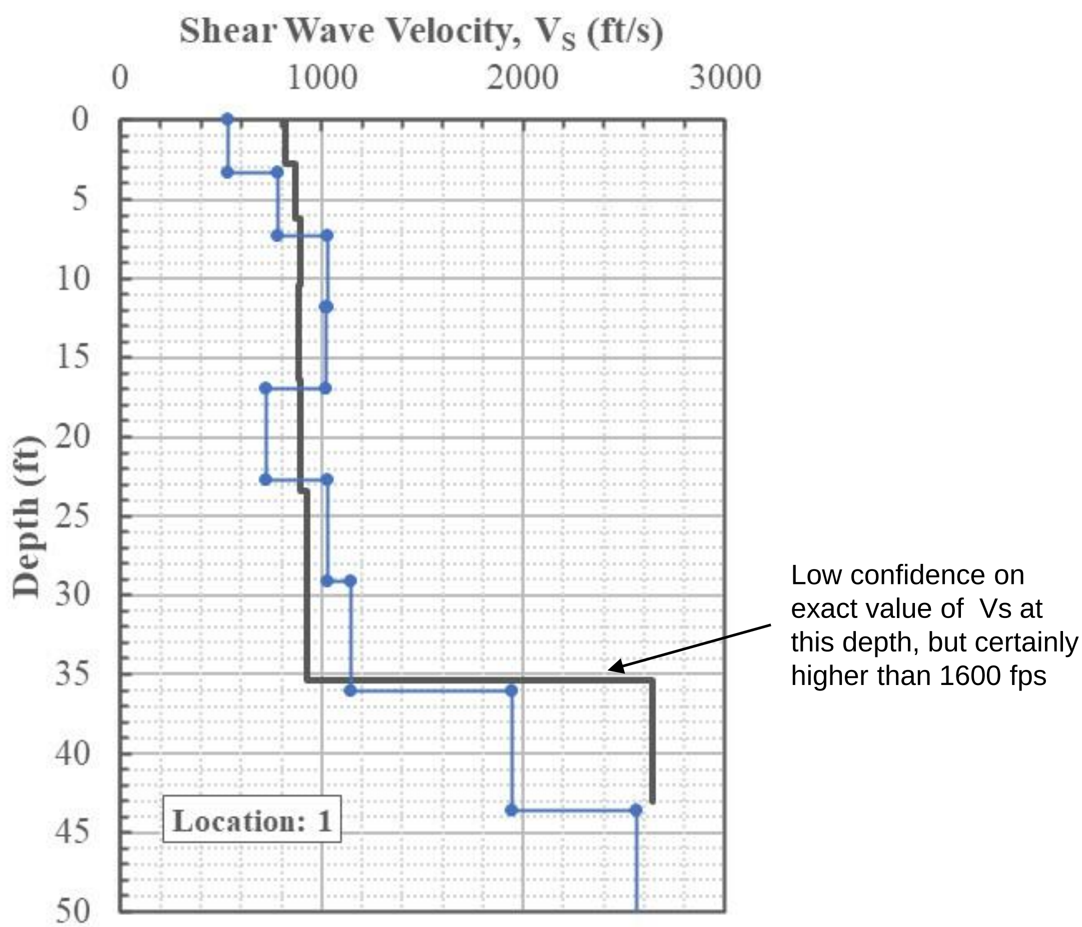
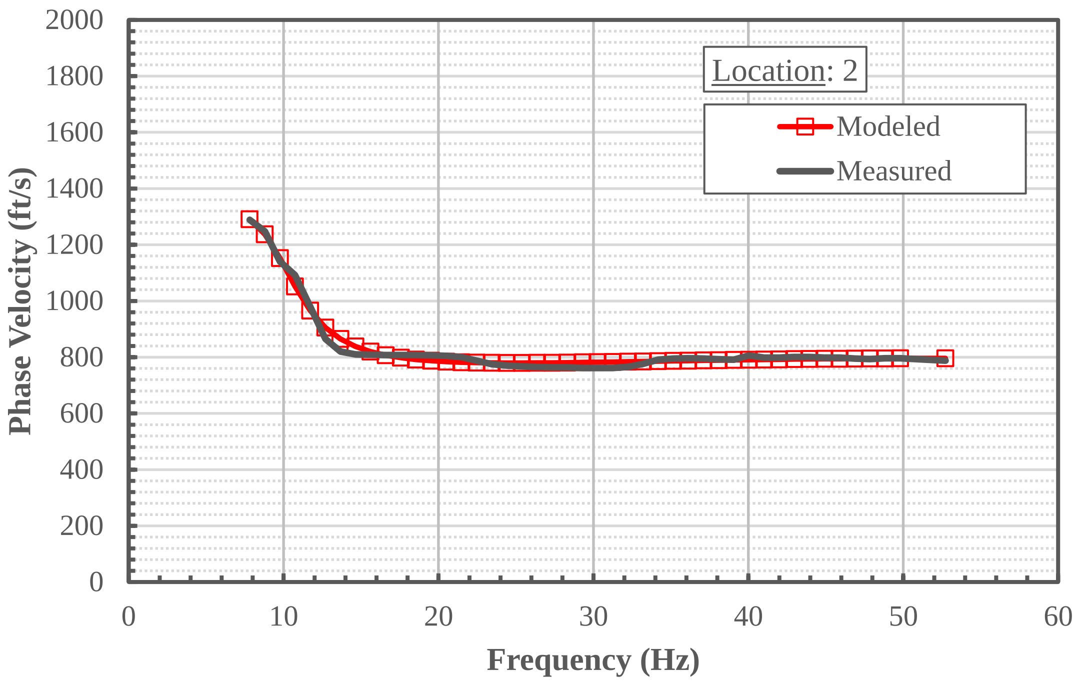


Figure 7: Dispersion Curve and Shear Wave Velocity Profile at Location 1		ARGO-E LLC
July 2022	La Doo Meadow, Briceland, CA	



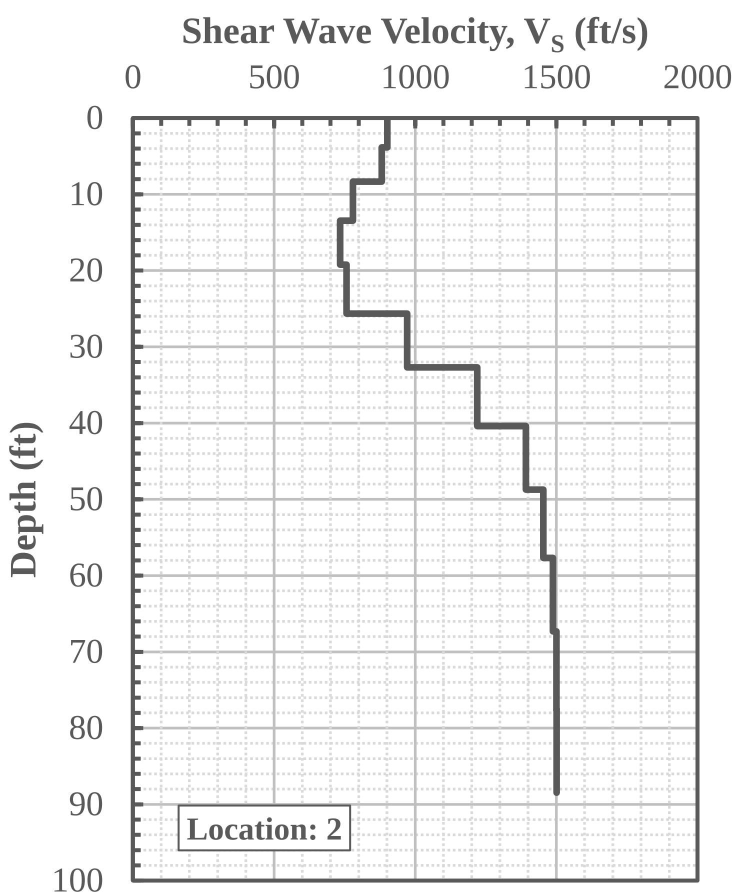
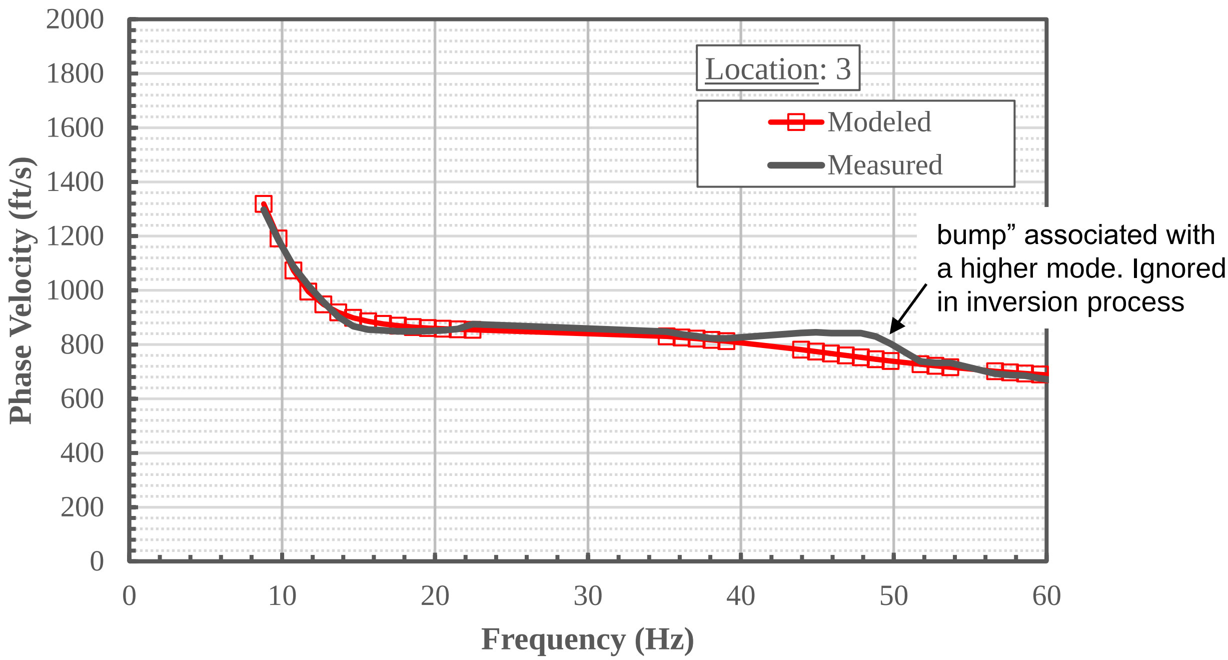


Figure 8: Dispersion Curve and Shear Wave Velocity Profile at Location 2		ARGO-E LLC
July 2022	La Doo Meadow, Briceland, CA	



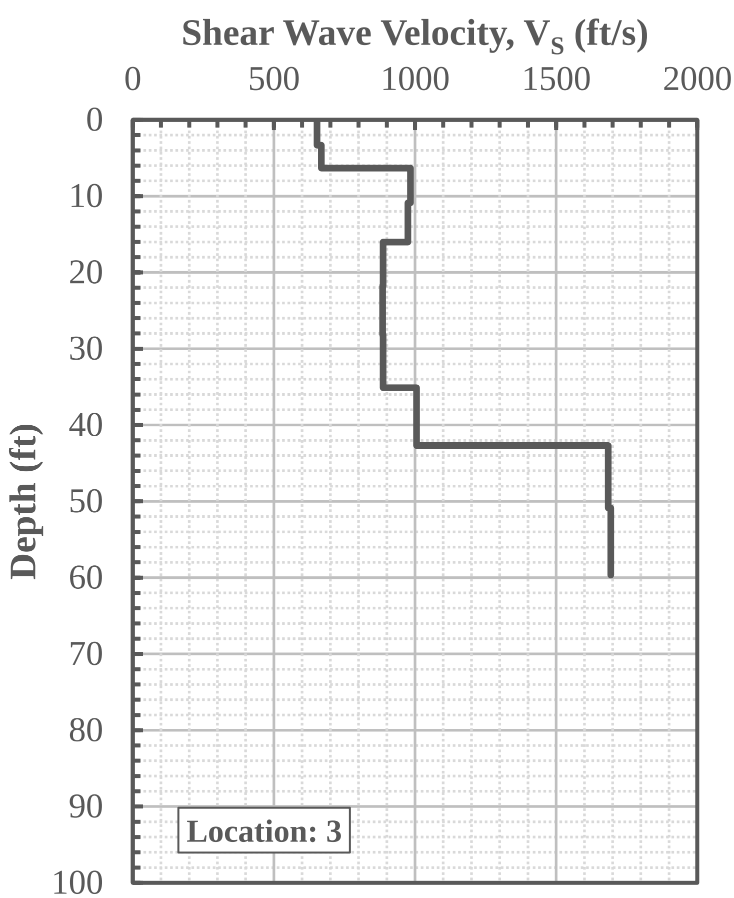


Figure 9: Dispersion Curve and Shear Wave Velocity Profile at Location 3		ARGO-E LLC
July 2022	La Doo Meadow, Briceland, CA	

APPENDIX A

Shear Wave Velocity Profiles in Tabular Format

Location #1				Location #2		Location #3	
Depth(ft)	Vs (ft/s)	Depth (ft)	Alternative Model Vs (ft/sec)	Depth(ft)	Vs (ft/s)	Depth(ft)	Vs (ft/s)
0.0	818	0.0	539	0.0	901	0.0	653
2.8	818	3.3	539	3.8	901	3.3	653
2.8	866	3.3	780	3.8	882	3.3	668
6.3	866	7.3	780	8.3	882	6.3	668
6.3	893	7.3	1030	8.3	780	6.3	984
10.4	893	11.8	1030	13.5	780	10.9	984
10.4	889	11.8	1024	13.5	734	10.9	975
16.4	889	17.0	1024	19.2	734	16.0	975
16.4	894	17.0	722	19.2	757	16.0	887
23.4	894	22.7	722	25.6	757	21.8	887
23.4	923	22.7	1027	25.6	972	21.8	885
29.4	923	29.1	1027	32.7	972	28.2	885
35.4	923	29.1	1143	32.7	1220	28.2	887
35.4	2643	36.1	1143	40.4	1220	35.1	887
43.1	2643	36.1	1945	40.4	1392	35.1	1005
		43.6	1945	48.7	1392	42.7	1005
		43.6	2566	48.7	1454	42.7	1685
				57.7	1454	50.9	1685
				57.7	1488	50.9	1693
				67.3	1488	59.7	1693
				67.3	1500		
				77.6	1500		
				77.6	1501		
				88.5	1501		

Appendix C

Cultural Resources Report

A Cultural Resources Investigation for the Sproul Creek Flow Enhancement Project Located Near Garberville, Humboldt County, California

Prepared by:
William Rich, M.A., RPA
William Rich and Associates
P.O. Box 184
Bayside, CA 95524

Prepared for:
Salmonid Restoration Federation
425 Snug Alley, Unit D
Eureka, CA 95501

November 2022

CONFIDENTIAL INFORMATION

This report contains confidential information. Archaeological and other heritage resources can be damaged or destroyed through uncontrolled public disclosure of information regarding their location. Any information regarding the nature and location of archaeological sites should not be disclosed to unauthorized persons. This information is exempt from the Freedom of Information Act pursuant to 16 U.S.C. 470w-3 (National Historic Preservation Act) and 16 U.S.C. § 470hh (Archaeological Resources Protection Act) and California State Government Code, Section 6254.10.

Cover photo: View to the south on March 24, 2022 of the area proposed for pond construction in the northwest ¼ of APN 222-085-002.

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1.0 INVESTIGATION SUMMARY

During the spring of 2022, the Salmonid Restoration Federation (SRF) contracted with William Rich and Associates (WRA) to complete a cultural resources survey for the Sproul Creek Flow Enhancement Project, located approximately 3.5 miles south of Briceland in southern Humboldt County, California. The project is located on the Wagner Land Company Ranch within Assessor's Parcel Numbers (APN) 222-084-004 and 222-085-002. The SRF is seeking funding and permitting to increase dry-season streamflow rates in Sproul Creek, by constructing a water storage pond on a ridgetop in the headwaters of La Doo Creek, a tributary of Sproul Creek. The SRF requested the investigation to satisfy cultural resource obligations under the California Environmental Quality Act (CEQA). This report provides the results of background research, Native American correspondence, cultural resources field survey, and the investigation findings.

The purpose of this investigation is to document whether significant cultural resources, defined as historical resources, tribal cultural resources, or unique archaeological resources are located in the project area (Title 14 CCR §15064.5(a), and PRC §5020.1 (j); PRC §21074; PRC §21083.2 (g)). The methods used to accomplish this included a record search at the Northwest Information Center (NWIC), and a review of other historical reports and published literature pertinent to the project area. Correspondence was conducted with the Native American Heritage Commission (NAHC), and representatives of tribes with an interest in the project area. A comprehensive field survey was performed over the entire project area, encompassing approximately 40 acres.

According to the NWIC, the entire project area was already included in a cultural resource survey for timber management activities in 2000 (Howard 2000). This identification efforts by Mr. Howard resulted in the recordation of an historical site (P-12-001312) that includes a small building (c. 1940s Ladoo Cabin), a few surviving fruit trees from a once larger orchard, and a small shed at a spring and water tank. This site is situated adjacent to the proposed pond and spoil locations in the north-central part of APN 222-085-002 also documented a pre-contact archaeological site (P-12-001313) within ½ mile of the project area (Howard 2000). This is described as an artifact scatter containing chert debitage from toolstone maintenance and manufacturing. One projectile point is noted. This site lies about 0.4 miles (640 meters) north of the proposed project area, on a neighboring parcel within the Wagner Land Company Ranch property. No other cultural resources are known at the project location or within ½ mile radius.

Ethnographic and historical research identifies the project location within the traditional territory of the Sinkyone people, whose descendants today are part of the Bear River Band of the Rohnerville Rancheria, the Sinkyone Wilderness Council, and other tribal communities. As part of the resource identification effort, Mr. Rich sent emails and letters to representatives of the Bear River Band of the Rohnerville Rancheria, InterTribal Sinkyone Wilderness Council, Round Valley Reservation/ Covelo Indian Community, and Wailaki Tribe. Bear River Band of the Rohnerville Rancheria Tribal Historic Preservation Officer Melanie McCavour responded via email., expressing an interest in the project and also the opinion that tribal cultural resources may be located in the project area. She requested a copy of this report when completed. Mr. David Sanchez of the Sovereign Nation of the Eel River Wailaki responded by phone indicating he knew about the project and supports fisheries restoration. No other responses have been received. No ethnographic or other known Native American sites are located in or adjacent to the proposed project area.

Early Euro-American history of this area of Humboldt County was dominated mainly by the development of the timber industry and livestock ranching. The project land was part of two separate land patents: Peter Ladoo in 1896, and William Albert Herman in 1906. By 1911, the Wagner Leather Company owned the Herman parcel, and a decade later both parcels were owned by Peter Ladoo's son, Preston

Ladoo. In 1949 the Ladoo parcel was owned by Charles and Edward Wagner, and the surrounding land was owned by the Wagner Corporation, which harvested tanoak bark for use in leather tanning until most of the oak stands had been cut, and synthetic tanning practices came into use.

On March 24 and October 18, 2022, WRA conducted a pedestrian field survey of the entire project area in order to identify and record cultural resources that could be affected by implementation of the project. This involved walking the areas proposed for pond construction and spoils deposition, water diversion/release, pipeline routes, and project access roads. The previously documented 1940s-era Ladoo cabin, pump house and well (P-12-001312) were also investigated. Although close, these structures are outside of the direct project area, and no proposals to affect this resource have been made at this time.

It is the opinion of WRA that the background research and field survey methods employed during this investigation were adequately matched to identify cultural resources at this project location. At this time, no further archaeological studies are recommended for the project, as it is currently proposed. Unanticipated discovery of buried archaeological resources during project construction does not seem likely given the disturbed nature of the ground surface along the periphery of the proposed pond areas and throughout the spoils location. This report does, however, offer recommendations to follow in the event of unanticipated discoveries. These recommendations are designed to ensure that potential project impacts on inadvertently discovered cultural resources are eliminated or reduced to less than significant levels and that decision making regarding unanticipated discovery follows state and local laws.

2.0 PROJECT DESCRIPTION

The SRF is proposing to improve instream habitat conditions in Sproul Creek, in the South Fork Eel River watershed in southern Humboldt County, California (Figure 1).

Figure 1. Project vicinity map showing the location of the proposed project area.

This project is on land owned by Wagner Land Company Ranch about 3.5 miles south of Briceland in southern Humboldt County, and is specifically located in the southwest ¼ of Section 32, and in the east half of the southeast ¼ of Sections 31 and 32 of Township 4 South, Range 3 East (Humboldt Meridian), as shown on the USGS 7.5' Briceland and Garberville California Topographic Quadrangles (Figure 2).

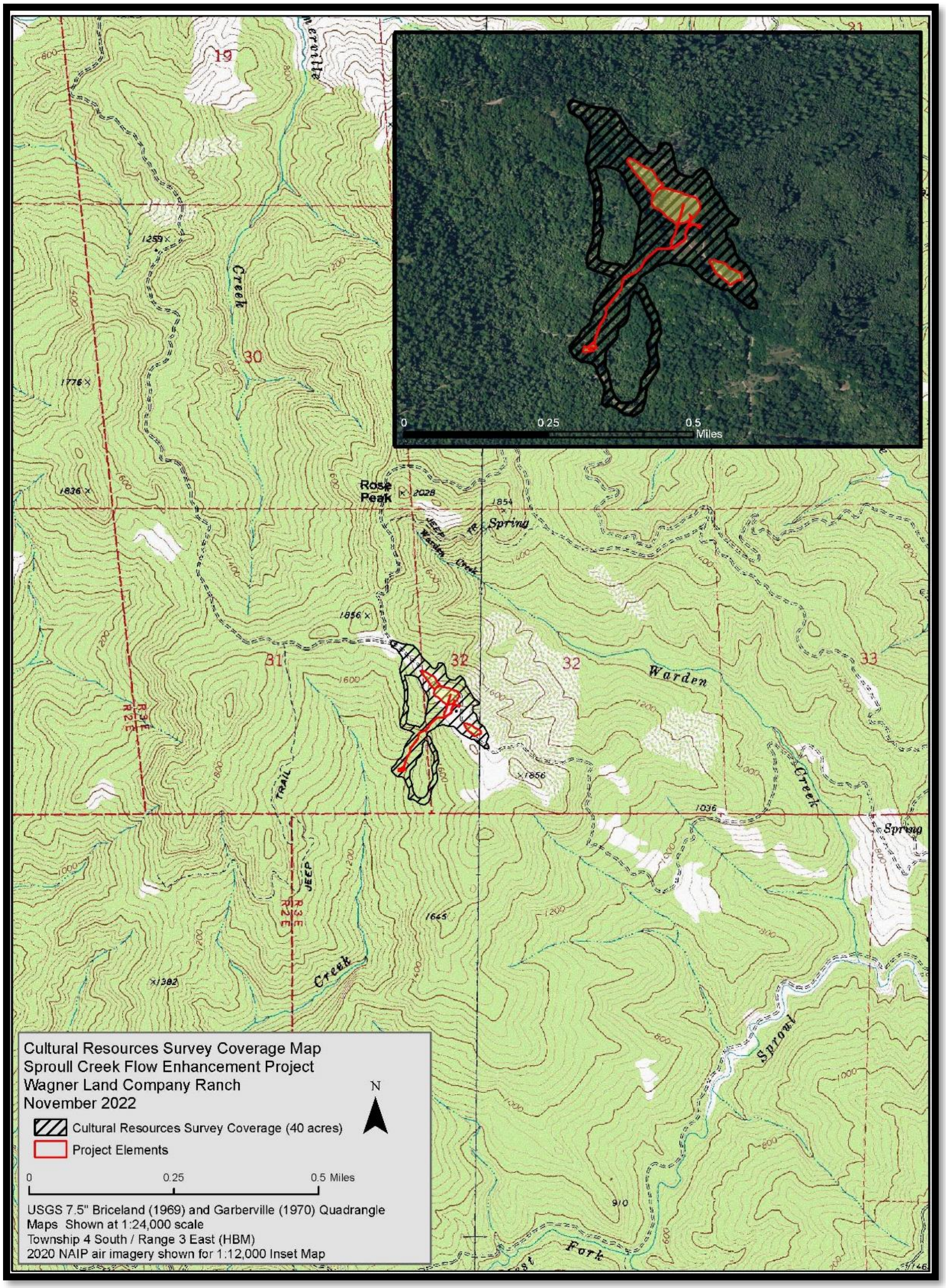

Figure 2. Project location and survey coverage map.

The SRF is seeking grant funding and permitting to construct a 4.9 million gallon pond which will enhance dry-season stream-flow rates in Sproul Creek, a tributary of the South Fork Eel River, by augmenting the amount of water released into the creek during the summer season with water collected during wet winter seasons (Figure 3; Appendix A). The pond will be constructed in a natural ridge-top swale, forming one of the headwater streams of Ladoo Creek, tributary to Sproul Creek. A pond liner will be used to hold the pond water and also extended upslope from the pond location to capture additional runoff. An armored spillway will be built in the southwest corner of the pond, to release excess water downhill into the stream channel. Spoils from pond excavation will be utilized to build an earthen berm on the downhill slope, which will serve as a dam for runoff impoundment. Additional spoils will be stored as fill in two nearby areas. A 1.5-inch diameter black poly pipe leading downhill from the pond will serve to fill the pond during the winter months and to release the water back into the stream channel. Along the access road at the water diversion/release point, an existing culvert will be replaced. A water storage tank (minimum capacity 5,000 gallons) will be installed at the diversion point.

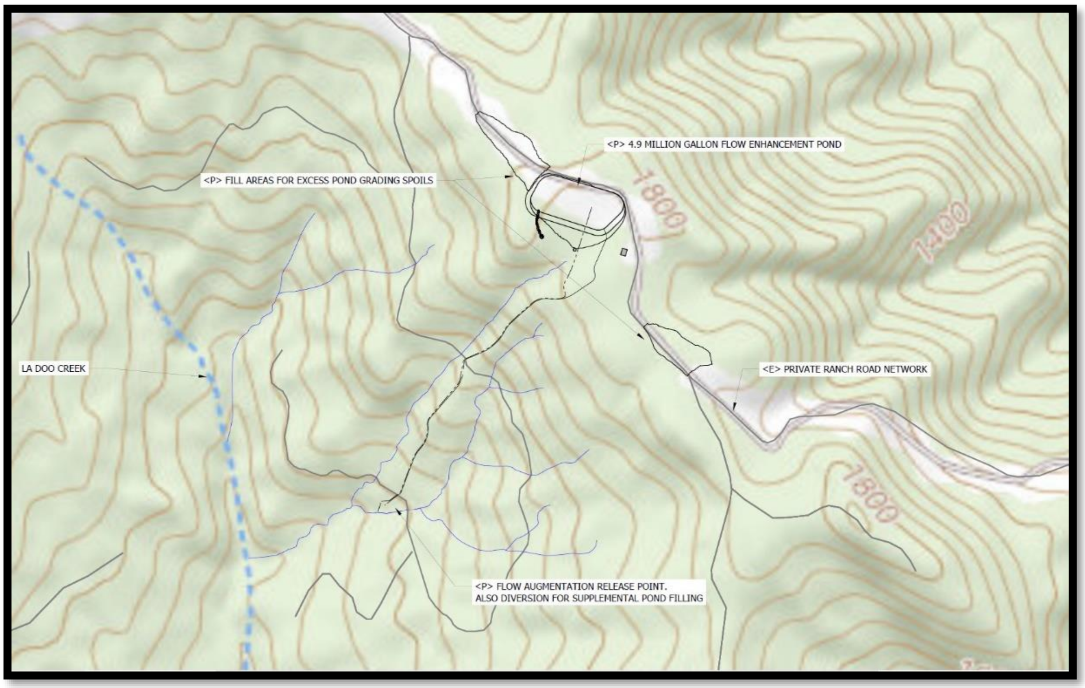

Figure 3. Project plan map, showing the previously-recorded Ladoo cabin, P-12-001312, as the square south of the east end of the proposed pond (north-center) along with proposed project elements; courtesy of Stillwater Sciences, Arcata.

3.0 REGULATORY FRAMEWORK

3.1 California Environmental Quality Act

The California Environmental Quality Act (CEQA), codified in California Public Resources Code (PRC) Sections 21000 et seq., is the principal statute governing the environmental review of projects being funded of permitted by California state agencies. CEQA requires that proponents of projects financed or approved by state agencies, assess the project's potential to affect the environment. In accordance with CEQA, a project that may cause a substantial adverse change in the significance of a historical, tribal cultural, or unique archaeological resource is a project that may have a significant effect on the environment (PRC 21084.1, CA AB52 Chapter 532 (2014), and PRC Section 21083.2).

The term "historical resource" is legally defined in California Code of Regulations (CCR), Title 14, Chapter 3, Section 15064.5 (a). Under 14 CCR 15064.5(a)(3), an historical resource is defined as:

(1) A resource listed in, or determined to be eligible by the State Historical Resources Commission, for listing in the California Register of Historical Resources (CRHR) (PRC Section 5024.1).

(2) A resource included in a local register of historical resources, as defined in section 5020.1(k) of the PRC or identified as significant in an historical resource survey meeting the requirements in section 5024.1(g) of the PRC, shall be presumed to be historically or culturally significant. Public agencies must treat any such resource as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant.

(3) Any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may be considered to be an historical resource, provided the lead agency's determination is supported by substantial evidence in light of the whole record. Generally, a resource shall be considered by the lead agency to be "historically significant" if the resource meets the criteria for listing on the CRHR (PRC Section 5024.1) including the following:

A. is associated with events that have made a significant contribution to the broad patterns of California’s history and cultural heritage;
B. is associated with the lives of persons important in our past;
C. embodies the distinctive characteristics of a type, period, region, or method of construction, represents the work of an important creative individual, or possesses high artistic values; or
D. has yielded, or may be likely to yield, information important in prehistory or history.

The CRHR also includes resources listed in or formally determined eligible for the listing in the National Register of Historic Places, as well as California State Landmarks and Points of Historical Interest. Resources of local significance that are listed under a local preservation ordinance or are otherwise considered historically significant at a local level, may also be considered eligible for the CRHR. The fact that a resource is not listed in, or determined to be eligible for listing in the CRHR, not included in a local register of historical resources (pursuant to section 5020.1(k) of the PRC), or identified in an historical resources survey (meeting the criteria in section 5024.1(g) of the PRC) does not preclude a lead agency from determining that the resource may be an historical resource as defined in PRC sections 5020.1(j) or 5024.1.

The term "tribal cultural resource" is legally defined in PRC Section 21074:

(a) “Tribal cultural resources” are either of the following:

(1) Sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a

California Native American tribe that are either of the following:

(A) Included or determined to be eligible for inclusion in the CRHR.

(B) Included in a local register of historical resources as defined in subdivision (k) of Section 5020.1.

(2) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of PRC Section 5024.1. In applying the criteria set forth in subdivision (c) of PRC Section 5024.1 for the purposes of this paragraph, the lead agency shall consider the significance of the resource to a California Native American tribe.

(b) A cultural landscape that meets the criteria of subdivision (a) is a tribal cultural resource to the extent that the landscape is geographically defined in terms of the size and scope of the landscape.

(c) A historical resource described in PRC Section 21084.1, a unique archaeological resource as defined in subdivision (g) of PRC Section 21083.2, or a "non-unique archaeological resource" as defined in subdivision (h) of PRC Section 21083.2 may also be a tribal cultural resource if it conforms with the criteria of subdivision (a).

A "unique archaeological resource" is an archaeological artifact, object, or site that meets any of the criteria presented in PRC Section 21083.2(g):

(g) As used in this section, "unique archaeological resource" means an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

(1) Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.

(2) Has a special and particular quality such as being the oldest of its type or the best available example of its type.

(3) Is directly associated with a scientifically recognized important prehistoric or historic event or person.

Based on Section 15064.5(b)(2), a project would have a significant adverse effect on historical resources if the project causes a substantial adverse change in the significance of a historical resource. This includes demolishing or altering the physical characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for, inclusion in the CRHR or a local historic register, or by disturbing any human remains including those interred outside of formal cemeteries.

Section 15064.5(c) applies to effects on archaeological sites as follows:

(1) When a project will impact an archaeological site, a lead agency shall first determine whether the site is an historical resource, as defined in subsection (a).

(2) If a lead agency determines that the archaeological site is an historical resource, it shall refer to the provisions of this section and Section 15126.4 of the Guidelines.

In addition, the CEQA Guidelines (Section 15064.5(c) (3), and (4)) provide tests for significance for archaeological resources, as summarized below:

(1) If the site does not meet the criteria [for a historical resource] (a), but does meet the definition of a unique archaeological resource in Section 21083.2 of the Public Resources Code, the site shall be treated in accordance with the provisions of section 21083.2.

(2) If an archaeological resource is neither a unique archaeological nor an historical resource, the

effects of the project on those resources shall not be considered a significant effect on the environment.

In addition to meeting one or more of the above criteria, the resources must be at least 50 years of age. A resource less than 50 years of age may qualify if it is exceptionally important to understanding our more recent history.

4.0 ARCHAEOLOGICAL SETTING

Archaeological research in the north coast region of California has shown evidence of Native American occupation over the last 8,000 years. Fredrickson (1984) introduced the notion of cultural patterns, a concept that centers on the understanding that local variations to a widespread culture-horizon can be seen in the archaeological record. He defined a period sequence consisting of a Paleoindian Period, an Archaic Period (which was divided into Lower, Middle, and Upper periods) and an Emergent Period. Fredrickson (1973, 1984) also introduced the terms Pattern, Aspect, and Phase to illustrate the concept that generalized, regional material traditions (Patterns) can be broken into localized manifestations (Aspects or Phases) of greater regional patterns. The changes associated with each of these Patterns appear linked with climatic and population changes (Hildebrandt 2007; Hildebrandt and Hayes 1983; Hildebrandt and Swenson 1985; Hildebrandt and Roscoe 2003; Hughes 1978; Levulett and Hildebrandt 1987).

A limited number of archaeological excavations have been conducted in southern Humboldt County, at site CA-HUM-405, near Whitethorn (Bramlette and Fredrickson 1979; Levulett 1978), at several locations on the coast to the west (Levulett 1985; Whitaker 2005), and along the South Fork Eel River to the east (Origer 1995). Further contributions to our understanding of the prehistoric peopling of California's north coast and of the evolution of cultural complexity have come from excavations in the vicinity of Fort Bragg and MacKerriker State Park to the south (Van Bueren 2008, 2011; White 1989), and in the Humboldt Bay region to the north. Provided below is a summary of the major environmental and archaeological trends for this region.

Lower Archaic

The Borax Lake Pattern is the oldest assemblage known for this region. The assemblage is thought to represent hunting and gathering by small, highly mobile family groups, and defines the earliest known prehistoric occupation, known as the Lower Archaic period. Provisional dates of 8,000 to 3,000 years B.P. have been assigned to the Borax Lake Pattern sites distributed from Sonoma to Humboldt County.

Archaeological investigations at Pilot Ridge-South Fork Mountain located approximately 20 miles east of Eureka, revealed archaeological sites with Borax Lake assemblages that were dated to 7120 +/- 50 radiocarbon years (Hildebrandt and Hayes 1983, 1984). This is one of the earliest archaeological deposits that has been dated in the North Coast region. Artifacts diagnostic of the Borax Lake Pattern have also been identified in the coastal setting of Dows Prairie, 15 miles north of Eureka (Roscoe 1995). The Borax Lake Pattern assemblage generally consists of relatively large Borax Lake Widestem projectile points (typically made of locally available chert), handstones and millingslabs, and ovoid and dome scrapers. Borax Lake Pattern sites typically contain a similar array of artifact types, implying each served as a base camp where similar activities took place, and a lack of specialization. Obsidian is poorly represented; suggesting exchange networks with obsidian rich areas (southern North Coast Ranges, northeast California) were not established. This adaptive pattern corresponded to a significant warming trend that followed the Ice Age, when higher elevations could have been occupied for a longer portion of the year. Palynological studies demonstrated that the upland environments within the South Fork Mountain area had been affected by a mid-Holocene warm period with the result of an upward migration of the oak woodland environment (Hildebrandt and Hayes 1983).

Middle Archaic Period

The Middle Period is represented by the Mendocino Pattern as proposed by Hildebrandt and Hayes (1983, 1984) based on their research at Pilot Ridge and South Fork Mountain, and by Bickel (1979) with her work in the Bald Hills of Redwood National Park. The pattern emerges north of Cape Mendocino around 5,000 years ago (Fredrickson 1973, 1984; Hildebrandt 2007). Hildebrandt has dated this pattern between 4,500 and 1,500 B.P (2007:91).

This adaptive pattern was oriented towards use of low elevation villages, located along salmon bearing streams near acorn crops and occupied by larger concentrations of people during the winter months. Compared to the earlier Borax Lake Pattern, this adaption is hypothetically linked to the advent of storage facilities, particularly for fish and acorns to feed the population during the lean winter months. It represents an adaptive shift wherein resources were moved to the people, resulting in a variety of functionally different site types that reflect more specialized activities (Binford 1980). This shift coincided with a significant cooling trend, the Neo-glacial, beginning ca. 3300 years ago, which particularly affected the resource base of interior northwest California. The variety and productivity of upland resources declined; whereas annual salmon runs were more productive and reliable in local rivers. Archaeologically, Mendocino Pattern sites are marked by a greater reliance on mortars and pestles (associated with acorn processing) over millingslabs and handstones and greater variety of generally smaller projectile point forms including atlatl dart points.

Middle Period components excavated at high elevation sits on South Fork Mountain implied specialized activities, including the establishment of native burning practices to maintain open prairies as implied by Palynological dates (Hildebrandt and Hayes 1983). Hildebrandt and Hayes (1983) also noted that Mendocino Pattern components at lower elevations in interior northwest California contained a diversity of artifacts including bowl mortars, pestles, non-utilitarian items, and well-developed middens. One diagnostic component of Middle Period assemblages, the McKee uniface, was identified and the pattern named during excavations at McKee Flat archaeological site CA-HUM-405 (Bramlette and Fredrickson 1979; Levulett 1978), two miles south of the project area. Initial use of coastal resources is evident by Mendocino Pattern components investigated at sites located at the mouth of the Mattole River (Levulett and Hildebrandt 1987).

Upper Archaic Period

The artifacts and assemblages of this period generally represent a continuation of the patterns from the Middle Archaic Period. Sites dating to this time are found throughout the central North Coast Ranges in moderate density. Large side- and corner-notched projectile points continue to occur. Medium-to-large, shouldered, lanceolate points appear. Leaf shaped points are also present. Mano-metate grinding technology is replaced by bowl mortars and pestles, indicating initial development and elaboration of the “acorn complex” (Basgall 1987). Bone tools such as fishing equipment are present. In general, cultural components are rich in cultural materials; artifact numbers become greater, artifact categories become broader, and tool kit variability higher. Obsidian develops into the preferred material for tool making in many parts of the central North Coast Ranges, often manifested by an elaborate obsidian biface reworking industry. This is seen as reflecting greater complexity of exchange systems, characterized by occurrence of regular, sustained exchange between social groups. During the Early Late Holocene, non-utilitarian features and artifacts (e.g., beads, pendants, and rock art) begin to appear in numbers. In particular, shell beads become an important grave good artifact, and may be indicators of sustained exchange and social status differentiation. During this period, the growth of sociopolitical complexity is evidenced by apparent development of status distinctions based upon wealth, and emergence of group-oriented religions (Hildebrandt and Hayes 1983).

Late or Emergent Period

The Late Period in north-coastal California exemplifies some of the most socially complex hunter-gather populations who relied heavily on marine and/or riverine resources (Fredrickson 1984; Kroeber 1925; Loud 1918). The Tuluwat Pattern (previously called the Gunther Pattern) characterizes the Late Period adaptation in north-coastal California. The Tuluwat Pattern dates from ca. 1100 years B.P. to historic contact, and characterizes the material culture of north-coast tribes such as the Tolowa, Yurok and Wiyot. This Late Period assemblage was first described by ethnographer Loud (1918) based on archaeological data from Gunther Island at the ancestral village of Tuluwat in Humboldt Bay. The assemblage comprises several specialized tool kits intended for a variety of subsistence activities, including sea and terrestrial mammal hunting, fishing, and vegetal resource procurement and storage. Significant traits include a well-developed wood-working technology, riverine fishing specialization, wealth consciousness, and distinctive artifact types including zoomorphs, large obsidian ceremonial blades, antler spoons, steatite bowls and pipes, and small distinctive barbed, Tuluwat Series projectile points. Populations were concentrated in permanent villages situated around the coast and adjacent to the major rivers. This adaptation is similar to, but a more refined and specialized form, of the preceding Mendocino Pattern adaptation. Exchange networks had become regularized in the Late Period. Trade is documented both archaeologically (Hughes 1978; Levulett and Hildebrandt 1987) and ethnographically (Kroeber 1925; Loud 1918; Nomland 1935; Powers 1877), with exchange relationships reaching north to Vancouver Island for dentalium shells, east to the Warner Mountains and Medicine Lake Highlands for obsidian, and south to the San Francisco Bay region for clam shell disc beads.

Activities in the Mattole Valley and other interior valleys of southern Humboldt County increased during the Middle and Late Holocene, as evidenced by the diversity and abundance of artifact forms in Late Holocene archaeological sites along the coast. The presence of human burials indicates that certain coastal locations were occupied residentially, at least sporadically; although the interior riverine and ridge-top ecosystems seem to have been favored during this period. As time passed, the importance of coastal sites increased, as indicated by the gradual development of midden soils and abundant lithic tools and debris, including imported items indicative of trade. Obsidian blades and beds of obsidian pressure-flakes were recorded in association with burials (Levulett 1985; Levulett and Hildebrandt 1987).

5.0 ETHNOGRAPHIC AND HISTORIC PERIOD OVERVIEW

5.1 Ethnogeography

The project area is located within the traditional territory of the Athabaskan speaking Native Americans given the tribal name "Sinkyone" by early anthropologists (Hodge 1910:576). In the absence of definite information about tribelet boundaries, the project area is assigned to the territory of a village, and possibly tribelet called the Nahs-lin-chi-keah, whose main villages were near the confluence of Sproul Creek and the South Fork of the Eel River (Baumhoff 1958:185). The ridgeline in which the project is situated, known as Ladoo opening, likely delineated a boundary with the neighboring To-cho-be-keah tribelet of the Briceland region. To-cho-be-keah consultant Sally Bell gave the name of the region to the southeast of Briceland as "yenekuk"; "kuk" is the Sinkyone word for "ridge" (Nomland 1935:151).

The Sinkyone tribal group was part of a larger grouping of Southern Athabaskan language speaking tribes labeled the "Kuneste" by early anthropologist Pliny E. Goddard. Goddard wrote in Harold Hodge's 1910 *Handbook of Native Indians North of Mexico*: "Kuneste (Wailaki: 'Indian') The southernmost of the Athabascan group on the Pacific coast, consisting of several tribes loosely or not at all connected politically, but speaking closely related dialects and possessing nearly the same culture. They occupied the greater part of the Eel r. basin, including the whole of Van Duzen fork, the main Eel to within a few miles of Round Valley, the s. fork and its tributaries to Long and Cahto valleys, and the coast from Bear River range s. to Usal" (Hodge 1910:735).

Goddard described the subdivisions of the Kuneste as Lassik, Wailaki, Sinkyone, Kato, and Mattole (Hodge 1910:735). Besides not identifying the Bear River tribe, and the Nongatl tribe of the Blocksburg/Van Duzen region, Goddard sometimes ascribed tribal names that have become dogma in academia. However, what we do know about the Sinkyone is largely due to his efforts. Based on linguistic differences, he differentiated them into two groups with large territories: the Loh-lan-kok (Bull Creek) and Shelter Cove Sinkyone (ibid.:576).

The term Sinkyone "was likely derived from the widely used Native name for the South Fork of the Eel River, Sin-ke-kok" (Goddard 1908:216). The tribal name "Sinkyone" did not come from any of the Native consultants in the "Sinkyone" region; according to Loh-lan-kok Sinkyone man Briceland Charlie, the name was given to Goddard by a Nongatl informant who lived east of the mainstem Eel River: "nōñ gaL call us siñkyōne (siñ ke nûk / siñ ke ni) We don't call that way" (Goddard 1908:494). As it is in common usage in modern times, we will use the name Sinkyone though it presents ample grounds for 'revisionism'.

As is the case in much of southern Humboldt County, the ethno-history of the pre-contact history of the Sinkyone is largely unknown. A pre-European contact Shelter Cove Sinkyone population estimated at 2,145 (Baumhoff 1958:220) was reduced to only six or seven local "full blooded" Sinkyone Natives by the time Goddard started studying them (Heizer 1971). Southern Humboldt's Native population was decimated during the first five years of the 1860s as military expeditions and settler vigilante groups both killed off and removed these people from their ancestral land to reservations at some distance. Establishing accurate boundaries for the different subdivisions and tribelets of the Sinkyone is difficult due to this lack of informants.

The concept of tribes and territories illustrates the complexities involved in understanding the traditional culture of the "Sinkyone" groups connected to the local area. The term *tribe* was applied by ethnographers to broad groups of people who shared a common language, despite the fact that each village was in fact politically autonomous. Individual land ownership is an American concept different from the collective control of land and resources as understood by local indigenous people, so these boundaries do not represent "territories" in the same way that we use the term. Tribe and tribelet boundaries were often fiercely defended, but villages or groups (bands) of allied communities also acted as autonomous “tribelets” which interacted with surrounding communities, creating changeable alliances through visitation, trade, and marriage.

The Shelter Cove Sinkyone territory extended along the coast from Usal creek in the south to their boundary with the Mattole at Spanish Flat on the north. In the northern interior their boundary was with the Lolangkok Sinkyone. Their eastern boundary ran along the South Fork Eel River south from Phillipsville south to the mouth of Hollow Tree Creek. Their neighbors to the east were the Lassik and Wailacki. From the mouth of Hollow Tree Creek their southern boundary went to the coast with a line near, or south of, the mouth of Usal Creek. The Sinkyone shared their southern border with the Coast Yuki and the Cahto (To-chil-pe keah hahng) tribes (Baumhoff 1958:160)

To the south of Sproul Creek, and primarily in the East Branch of the South Fork Eel River drainage, lived a tribelet of the Sinkyone that C. Hart Merriam identified as the To-kub-be-keah. Albert Smith was the sole surviving member of the To-kub’-be-ke’ah tribelet; he provided village site locations near Sproul Creek to anthropologist Pliny Goddard in 1907. The To-kub’-be-ke’ah are named after a village site To-kub’-be which has never been placed on a map but is described as being upriver from Garberville, on a hill near the East Branch (Merriam 1966:93).

On October 21st, 1907, Albert Smith told Goddard that the territory of the To-kub’-be-ke’ah extended up the South Fork Eel as far as Smith Point, about five miles southeast of the project area; went up the East Branch South Fork Eel River to the east past Harris; and that Sprowel Creek was as far north on the west side of the South Fork as his people went (Goddard 1907:3371).

Goddard recorded that the two nearest village sites to the project area were located on either side of the mouth of Sprowel Creek. He wrote:

> Nas lin tcī (kīt) (middle 34 T. 4 S./R. 3 E). Used to live Indians. Lots there. About two miles. On west side of main river. Nas lin kōk name of creek there. (saw a nice flat there) Silt na la kī on the other side of the creek, Sprowel Creek. Used to be Indians. (middle of sec. 34). (Goddard 1907:3357)

Goddard described the village site on the large flat to the north of the mouth of Sproul Creek:

> Thursday morning. North of the mouth of Sprowel Creek I found a large flat with narrow roadway between bank of stream and fence. Found a badly broken pestle. Saw several grinding rocks. A small enclosure at the southern end in the corner made by Spr. Ck. and S. Fork was freshly plowed or spaded. It looked as if Indians had lived there. (ibid:3455).
>
> Just east by the sawmill and toward the river at the western end of a long flat found 14 pits, Many plain and deep close to the bank. (S.E. 34?) Upstream 100 yds were 4 more. One large place may have been the ne yik Albert said used to be here. 500 yds up the flat a gulch crosses. Here were some signs of houses (grinding rock) Had been plowed (?). (Goddard 1907:3456)

This sawmill was the Charles Stone sawmill, one of the first in southern Humboldt County, and was located to the south of the large flat near Sproul Creek (Hawk 2019).

Another tribal language group name for the Native Americans living on the west side of the South Fork Eel was added by Merriam. Demonstrating the incomplete and often contradictory knowledge about the Sinkyone, in the early 1920s anthropologist and naturalist C. Hart Merriam interviewed several of Goddard’s previous consultants, including Sally Bell. Although anthropologists initially had named the southern division of the Sinkyone as the Shelter Cove Sinkyone, Merriam stated that:

> To'-cho-be-keah is their own name and the Lolahnkok name for the tribe (and village) in the Briceland region (between the South Fork of the Eel and the coast). It is used also in a larger sense for all bands speaking the same dialect from the west side of the South Fork of the Eel River (in the Garberville region) to the coast. The Set'tenbi'den (Lassik) call this group Yis-sing'kun-ne. The name of the group is pronounced To-cho'-be ke'ah by the Lolahn'kok and Taw-chaw-be-ke'ah by themselves. (Baumhoff 1958:185)

Merriam's other interviews suggest that the Nahs-lin-che-keah may have been their own tribelet group. He interviewed Sinkyone George Burt, Sally Bell, and Kato (To-chil-pe-keah-hahng) Bill Ray fifteen years after Goddard, and concluded that the Nahs-lin-tci-keah was the "To-ch-be ke-ah name for related band or 'tribe' on South Fork Eel River next south of Garberville. (Named from the locality, Nahs-lin-che,)" (Merriam 1966:83). He also summarized:

> Nas-lin-ko-ke-ah- Lolahnkok name for tribe next south of Garberville on west side South Fork Eel River.-CHM. The To-chaw-be-keah name for same people is Nahs-lin-che keah.-CHM. The To-chilpe keah-hahng name for same people is Nas-ling-che keah-hahng.-CHM. (ibid.:84).

There is a data gap for the name of the Sinkyone sub-division from Sproul Creek north to Phillipsville, where the boundary with the Loh-lan-kok Sinkyone was drawn. Though village site names were obtained from Native consultants, no specific name for the larger tribelet in this region was obtained by Goddard.

Two women taken by early Euro-American settlers as domestic partners were the only specific historic mention of members of the Nahs-lin-tci–keah. James Wood and Sam Piercy, two of the better-known early "settlers" in southern Humboldt and northern Mendocino County had Native partners from the Nahs-lin-tci area. James Wood's eldest son, and the only child of his Native American wife Nellie, shared that after his mother's death he was taken to his aunt, who was Sam Piercy's Native partner from the Nahs-lin-tci-keah area (Cook and Hawk 1999:141).

Alfred Kroeber describes the Athabascans, including the Sinkyone, as "hillside" people, although they occupied more permanent streamside or river bench village sites in the winter season. After the spring salmon runs they would move to higher elevation hillside encampments near water, from which they could hunt and gather seasonal food sources such as clover, bulbs, grass seeds, and acorns (Kroeber 1925:123). Principal occupation sites were generally, but not always, located on terraces along the river courses, and occasionally on the lower slopes of the mountainsides, taking their source of water from large springs or annual streams.

Native Americans knew and utilized every inch of their territory. Sproul Creek undoubtedly provided a rich source of fish for the Nahs-lin-tci keah who likely had seasonal encampments along the creek, and its tributaries and upland springs anywhere that the terrain would allow.

5.2 History

Some of southern Humboldt's earliest written history involves Sproul Creek and two early Euro-American settlers, Atwood and Gilbert Sproul, who built a cabin on the north side of the creek which later took their name. The spelling of the Sproul brothers' name and creek has varied over the years. Although the spelling "Sprowel" is common in the modern era, the "Sproul" spelling will be used in this document except when different spellings are used in quotations.

It is likely that the Sproul brothers arrived in 1860, as no mention of their presence was reported in October of 1859 by road viewers scouting for the best route of a Petaluma-to-Humboldt Bay road. The road viewers found only an old man and horse rancher named Armstrong in the South Fork Eel River valley (*Trinity Journal* 8 Oct. 1859). Tensions with local Native Americans led to an attack with an elk knife on the two brothers around January 19th, 1861. When a report of the incident traveled to Fort

Humboldt, it was rumored that the brothers had been killed. A unit of Company D of the 6th US Infantry under Lt. Daniel D. Lynn was already in the field, and was rerouted to southern Humboldt to investigate (*Humboldt Times* 19 Jan. 1861).

After a 10 day march, Lt. Lynn and his men crossed the South Fork Eel and established Camp Armstrong near the Armstrong Ranch as a base of operations for nearly two months. The written report he sent to his commanding officer at Ft. Humboldt shows the perspective of an educated, upper class West Point graduate assessing the low character of the local Euro-Americans in the area. His inquiry revealed that the Sproul brothers had only been knifed with elk knives and had recovered, their attack having been provoked by their repeatedly offering their cabin as sanctuary to a known slaver named Ross shortly after he had killed a Native man nearby. Lt. Lynn's report shows that the local Native Americans had reason to be already on edge because the settlers at the Armstrong Ranch practiced whipping and raping Native Americans (U.S. War Department 1897:7-9). This 1861 military response was the beginning of four years of military and settler vigilante activities against the Native Americans of Humboldt County. By 1865, most Native people in the area had been killed, or captured and removed to distant reservations, or were allied with local men who had taken Native American female partners and had Native ranch laborers (U.S. War Department 1897:258).

The first official county map, the 1865 Doolittle map of Humboldt County, shows the ranch of Charles Bailey, one of those early "settlers" who raised a mixed-race family with his partner Sally on the large flat alongside the South Fork Eel River just downstream from Sproul Creek. (Doolittle 1865). As more Euro-American settlers moved into the region, government surveying in the early 1870s allowed men to patent-claim public lands. Government surveys of the Mt. Rose area began in 1872, with the first plat map drawn up in 1874 (Surveyor General's Office 1874). The relatively late filing dates for these patents was due largely to their being forest lands and not agricultural lands. When the tanoak-bark and timber industries developed on the North Coast, land patents began to be filed because of the timber value of the land.

The plat map also shows the primary trail from Garberville to the area later named Briceland, about three miles north of the project area. Once the Garberville and Shelter Cove Wagon Road was completed in late 1878 by S.F. Taylor's "Oriental brigade", many pack trains passed through the future townsite of Briceland, and the inland towns and sheep ranches were now connected to a shipping port at Shelter Cove (*Daily Humboldt Standard* 12 Sept. 1878).

The original land patent for the NW ¼ of the SW ¼ of Section 32, Township 4 South, Range 3 East was granted to Peter Ladoo on June 8, 1896 as part of a 160 acre claim (BLM 2022a). Peter Ladoo was a naturalized citizen from Canada who farmed and raised stock on his land (Hawk 2019). The Ladoo family, like many homesteaders, built a cabin, a small barn and stable, and had an apple orchard. Unlike most homesteaders who usually claimed land with a spring, the Ladoos dug a well. This well is the only visible sign left of their homestead. According to Chuck Wagner, the Ladoo cabin was downhill and slightly to the right of a line drawn from the existing cabin to the well (Chuck Wagner, personal communication with D. Heller, 5 June 2022). The Ladoo ownership is shown on the Lentell map two years later (Lentell 1898) and in 1911 (Denny 1911). The former map also depicts the claim of Peter's neighbor to the east, Louis Rose, a German immigrant who gave his name to Rose Peak. Mr. Rose was an old veteran of the Civil and Indian Wars who had 320 acres on Sproul Creek, raised hogs and grew vegetables which he would bring to market in Garberville (Hawk 2019).

The east half of the SE ¼ of Section 31 was patent-claimed on November 19, 1906 by William Albert Herman, as part of a 160 acre claim (BLM 2022b). Mr. Herman also patented 160 acres about half a mile northwest of the project area, in 1892 (BLM 2022c). He was born around 1862 in Corning, New York and lived in California since the age of 18, residing in Briceland from 1890 until his death at the age of 87, in 1947 (Blue Lake Advocate 6 Dec. 1947:7). He was married to Laura Minerva Herman with whom he had seven children, and served as Justice of the Peace for the Briceland Township in 1921 in addition to his ranching occupation (Jordan 1921:45).

In the southeast corner of the 1898 Lentell map is shown the route of the Moody Road, leading from the Sproul Creek area to the south/southwest. Built in 1897-98, this road connected to the stage towns of Moody and Kenny before heading south to Fort Bragg, and was one of the earliest access roads to southern Humboldt and Garberville (Zachary 1986:16).

The turn of the 20th century saw an important new resource extraction industry which brought a wave of prosperity to southern Humboldt. A nascent tanbark oak bark harvesting industry was emerging. In the later 1800s the vast tanoak forests of southern Humboldt attracted the notice of leather companies interested in harvesting their bark for its tannic acid which was used to process leather. In 1888, 3,000 cords of tanbark were shipped out of the port at Bear Harbor at a rate of two schooner-loads a week (*Humboldt Times* 17 Oct. 1888). At the time, harvested, peeled rolls of tanbark were carried on mules and wagons to shipping ports at Bear Harbor, Needle Rock and Shelter Cove.

In 1900, Stockton Leather Company founder Charles Wagner and son Edward C. Wagner traveled north to Humboldt County to view its tan oak forests and the potential for a tanbark extract plant to be built. Rumors of a tanbark extract mill to be built in Briceland began to appear in the news:

> BRICELAND, October 27.—Briceland people are at present taking great interest in the establishment of a plant to extract tannin from the tan bark of which there is a great abundance in this section. The Wagner Leather Company of Stockton is the company that is going to put up the plant next spring provided a suitable point for shipping the output can be secured. In the vicinity of Briceland there is in the neighborhood of 30,000 cords of tan bark and if the plant becomes a reality about 3000 cords will be utilized per year. A large number of men will be employed getting out bark and in the mill, which will be the means of putting a large amount of money in circulation, then will business hum at this place. (*Humboldt Times* 31 Oct. 1900)

Many lands with little agricultural potential, but having tanbark forests, were soon taken up with claims: "It is reported that nearly every resident of the Briceland section has filed on a tanbark claim and realizes that within a very few years that tanbark will be worth almost double what it is now" (*Blue Lake Advocate* 6 Oct. 1900). The Pacific Oaks Bark Extracts Works plant opened for operation in 1903.

The year 1901 also saw a number of important developments in the Sproul Creek area. Charles Wagner, president of the Stockton-based Wagner Leather Company, moved north and purchased land northeast of Sproul Creek, in order to set up a tanbark camp: "Mr. Wagner has started his bark camp. He is boarding his men at Mr. Cox's now, but will move up in the woods as soon as the cookhouse, which L. Schumacher, P. Ladoo and R. Thomas are building, is completed. Mr. Wagner thinks he will have between twenty and thirty men at work this summer" (*Humboldt Times* 22 May 1901).

In the summer of 1901, the Moody Road saw its first stage-run from the small town of Kenny to Garberville, passing through Sproul Creek (*Humboldt Times* 22 May 1901), and the Wagners started building a family home on land they had purchased the previous year on Sproul Creek (*Humboldt Times* 21 June 1901). This home was built on the south bank of Sproul Creek, upstream from the current Wagner home known as the "Chalet" (Jim Johnson, personal communication with D. Heller, 19 May 2022).

Working in the woods harvesting tanoak bark provided much-needed employment to area locals, including Preston Ladoo, the son of Peter Ladoo: "Preston Ladoo injured himself lifting tanbark at Mr. Wagner's camp" in 1901 (*Humboldt Times* 11 July 1901).

In anticipation of the tanbark extract plant being built in Briceland, the town prepared itself. It was resurveyed, lots changed hands, and real estate agents and land locators had carpenters at work building cabins. Towards the end of 1901, the Wagner Leather Company leased ten acres of land for a period twenty years from the Briceland family and commenced clearing the land to build the mill (*Humboldt Times* 17 Nov. 1901).

Within a few years most of the tanoak stands within four or five miles of Briceland had been filed upon. At this time, Briceland consisted of two stores, a blacksmith shop, hotel, livery stable, saw mill, town hall, saloon, and the Pacific Oaks Extract Works plant. The construction of the plant and its operation brought great prosperity to the town, and its population at the time was greater than that of Garberville. It became the social hub of Southern Humboldt and held 4th of July celebrations that brought visitors from all over the county (Vincent 1983).

The Ladoo family's elderly neighbor Louis Rose suffered a mishap in 1906:

> News was received here a few days ago that Louis Rose was lost in the brush on the home ranch near Sproul. He wanted to find the horses that had strayed away from the openings, into the woods, but Mrs. Rose, who knew that he could not travel far into the brush without getting lost, as he had been lost twice before, tried to persuade the old gentleman not to go. However, he started early Wednesday morning, and not returning, Mrs. Rose tried to find him, but could not, so she started on horseback for Moody, where their son Lee is at work. Lelia Bell, who lives on the Moody ranch, helped Mrs. Rose when she arrived, nearly exhausted from excitement, in her search for her husband by finishing the trip after Lee, who arrived home after dark, but could not make a successful hunt for his father until daylight, as the old man is very deaf and cannot hear anyone calling him. It was nearly noon Thursday before Lee found his father, who was still walking around nearly in a circle, and who was about exhausted from his tramping and long fast. Mrs. Rose had given Lee a supply of edibles for the lost man, and after his lunch he was able to reach home, with help. He suffered the most from thirst, as he did not find any water during his wanderings. (*Humboldt Times* 11 Oct. 1906)

The Wagner Leather Company continued purchasing land, tan bark rights and numerous right-of-ways to access the tanoak forests. As shown on the 1911 Denny map, the Wagners owned large acreage in the Sproul Creek area, including the former William Hermann land in the southeast ¼ of Section 31, in the west end of the project area. The Herman family retained their land in the NW ¼ of Section 31. The decline of Mr. Rose's health and his death in 1908 was likely the reason for the family having sold their land to the Wagners (*Daily Humboldt Standard* 26 Mar. 1908).

In early 1918, southern Humboldt experienced a number of large fires, and some fifty square miles were burnt. One of the fires had started on the Ladoo land, but due to the large response from locals who showed up to fight the blaze with backfires, the progress of the fire was halted on the four-mile ridge back of Sproul Creek (*Blue Lake Advocate* 7 Sept. 1918).

By the 1920s Peter Ladoo's son Preston Ladoo owned the 190 acres comprising what is now APN 222-084-004 and 222-085-002, including the eastern half of the Hermann patent (Figure 4). The Wagner Leather Company and E.H. Wagner owned all of the surrounding land. The Belcher atlas also shows an access road to the land from Briceland, extending up the west side of Somerville Creek. The tanbark plant in Briceland began scaling down operations around that time, "owing to the slackness of the leather industry" (*Humboldt Times* 17 Feb. 1921). The most easily-accessed tanoak forests had been harvested by that time.

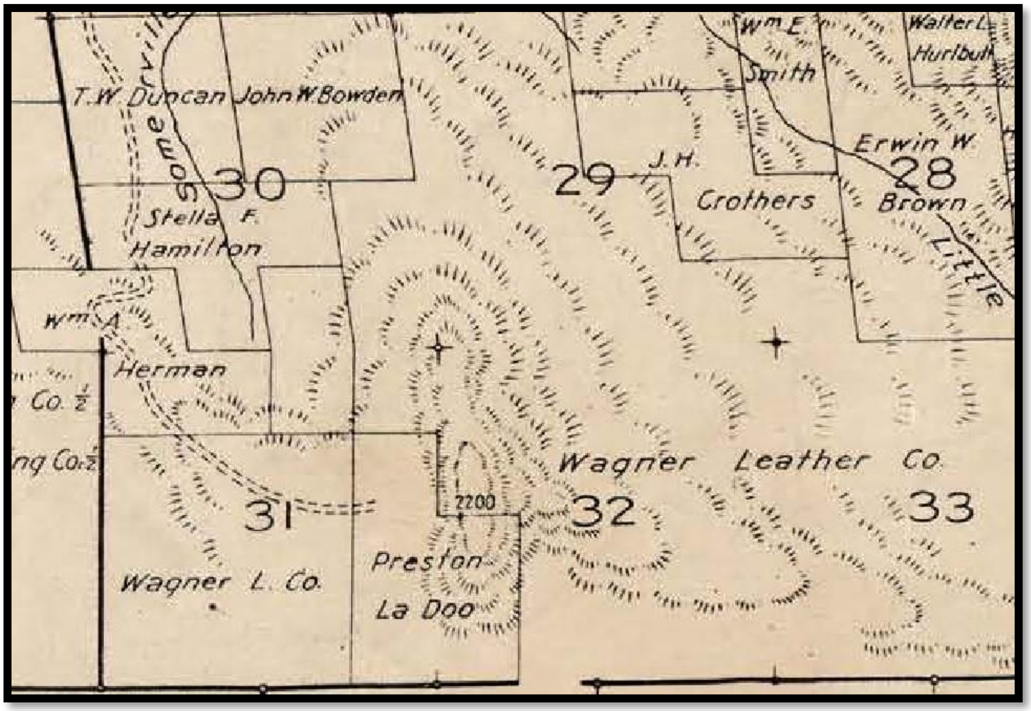

Figure 4. Map 3 of the 1921-1922 county atlas, showing the Preston Ladoo ownership in Sections 31-32, southwest of center (Belcher Abstract & Title Co. 1921-1922:3).

In 1923, much of the plant in Briceland was dismantled, shipped back to the company's Stockton site, or stored at the Wagner storage area in Garberville (*Stockton Independent* 22 June 1923). The Garberville storage area on Maple Street was remodeled into a home for Edward and his mother, and water was procured for a large garden site on family land that hosted many a Garberville social event (Cook 1997a).

The Wagner family continued to visit the area: Edward and Charles, sons of E.C. Wagner of Stockton hosted school friends at a summer camp they had established on Sproul Creek, upstream from their family home (*Humboldt Times* 9 Aug. 1924; Chuck Wagner, personal communication with D. Heller, 5 June 2022).

On June 7, 1927, Preston Ladoo sold the E ½ of the SW ¼ of Section 31 to E.D. Finch for ten dollars (Humboldt County Recorder's Office 2022a). On the same day, Finch sold the same land to Charles C. and Edward C. Wagner for the same amount (Humboldt County Recorder's Office 2022b).

The Wagner Leather Company gained possession of the SW ¼ of the NW ¼ of Section 32 on November 17, 1927 when Mrs. Lena Anderson, Mrs. Delia Harmon, Mrs. Laura Herman, and Preston LaDoo accepted ten dollars from Wagner Leather Company "to release and forever quitclaim" the 40-acre parcel (Humboldt County Recorder's Office 2022c).

At some date, the meadowlands in the vicinity of the project area began to be used for sheep raising by Edward H. Wagner, who was for many years a dedicated member of many local clubs and organizations (Cook 1997b).

By the 1940s, most of the timber lands in the Sproul Creek drainage were owned by either the Wagner family or Barnum Timber Company. In 1943, "One hundred and twenty acres of land on Sprowl Creek**,** known as the Rose timber, have been purchased by Into Wirta, one of the leading manufacturers of timber split products in Humboldt County. Wirta will move his camp there in the near future, it was announced by Charles Barnum, timber broker of Eureka" (*Blue Lake Advocate* 16 Oct. 1943). In 1946, the family built the cabin with the prominent stone fireplace on the ridge near the proposed pond project, now known as the Ladoo Cabin (site P-12-001312). It was accessed via Somerville road out of Briceland until 1949 when an access road was built up from Sproul Creek. In later decades the cabin was utilized by a commercial hunting club out of San Francisco (Chuck Wagner, personal communication with D. Heller, 5 June 2022).

The post-World War II timber boom in northwestern California saw a surge of sawmill construction and timber company incorporation. The history of sawmills along Sproul Creek has not been well documented, and few retired loggers or mill employees are alive today. Sprowel Creek area residents believe that there were four or five mills, but there may some overlap of ownership. Overhead photos from 1948 shows three of the mills that existed at that time in the Sproul Creek area.

The 1949 county atlas shows that the former Ladoo land straddling the line between Sections 31 and 32 was owned by Charles C. and Edward Wagner, part of a 200-acre parcel, and all the surrounding land by the Wagner Corporation (Metsker 1949:40). Along Sproul Creek, the Bland Mill was depicted on a flat at the lowest segment of Sproul Creek in the NE ¼ of the NE ¼ of Section 4, about two miles southeast of the project area (Metsker 1949:58). This same flat was the site of the Gooch and Rogers mill which burnt down in 1949 (Hawk 2019), and was followed by the Ward Brooks Lumber Company in 1950:

> My dad operated a sawmill, which employed about 8 people in Oregon. In 1949, he took a trip to California looking for timber for his mill. While having lunch in Miranda, he met Charles Barnum. Charles told dad that he had enough timberland that dad could operate his sawmill for the rest of his life. That's all dad needed to decide to move down to Garberville and set up his mill on Sprowel Creek adjacent to Gooch's old mill site. Gooch's mill burned about a year before we came. (Brooks 2005:68)

According to Robin Brooks, there were ten mill cabins on the flat (Robin Brooks, personal communication with D. Heller, 1 Sept. 2021).

The average life of a sawmill was about seven years. Insurance for mills was exorbitant, causing Ward Brooks to rely on his night watchmen staying sober. The mistakes made by an intoxicated night watchman in 1959 allowed a fire to burn the Brooks mill down (Brooks 2005:75-76).

Today, little evidence of lumbering activities along Sproul Creek remains, save for an overhead cable and a few scattered cabins. The "1,000 year" flood of the winter of 1964-1965 took out the wooden bridge that crossed Sproul Creek and required constructing a bypass. Shortly thereafter, local builder Jim Johnson built the Wagner family a new home called the "Chalet" on Sprowl Creek Road (*Redwood Record* 1965).

Charles C. Wagner continued to live in Stockton, but visited Humboldt County to hunt and fish. In the 1950s he moved back to Garberville and

> turned his attention to forestry, as the director of the Wagner Corp. timber division. He realized that sustained yield forestry and careful planning would lead to a long-term timber management plan that could be followed for generations to come. Eventually, timber professionals recognized that he was ahead of his time, and in 1977 named him California Tree Farmer of the Year. Charles personally planted thousands of trees throughout Northern California. He enjoyed teaching others about forestry, and conducting field trips with professionals and young people on the Wagner property that now consists of some 4,000 acres. (Johnson 2022)

Charles was a founding member and a past director of the Forest Land Owners Association and director of the Save the Redwoods League. In the 1970s, Mr. Wagner was named to the State Board of Forestry Advisory Committee on Reforestation. He was an active partner of the Humboldt House Inn in Garberville until his death. He initiated the program of giving away redwood seedlings to guests of the motel" (Cook 1997c)

In 1954, tragedy struck the Wagner family when their Garberville home was destroyed: "Fire ruined the interior of the 8-room home of Edward H. Wagner at Garberville late Friday night. The loss was estimated at $14,000 and included all Wagner's belongings in the way of furniture, tapestries and European items. The Wagner family were pioneers in Garberville and the gardens around the home on Maple Lane have been the scene of many social events in the community" (*Blue Lake Advocate* 1 Apr. 1954).

The Wagner family's contributions to the region were many and beyond the scope of this study. Pillars of their community, the Wagner family acknowledged here, but only briefly, for their place in Humboldt County history.

6.0 INVESTIGATION METHODS AND RESULTS

6.1 Background Archival Research

Background archival research was aimed at obtaining information pertinent to the pre-contact era and historical uses of the project's vicinity, to generate specific geographic information about relevant archaeological and historic-era sites that may be present. Background research also provided an understanding of the types of cultural resources that were likely to be encountered in the project vicinity. Ethnohistoric research included an examination of historical maps, records and published and unpublished ethnographic digital documents at the Humboldt State University (HSU) Library, as well as the author's personal library.

Also searched were the directories of the National Register of Historic Places, the California Register of Historical Resources, local California Points of Historical Interest, and the listing of the California Historical Landmarks. This research indicated that the project location is not associated with or located near an historic district, historical landmark, locally registered historic resource, or nationally registered historic property.

Northwest Information Center Records Search

Background research for this project included an examination of the archaeological site records and survey reports at the California Historical Resources Information System's regional Northwest Information Center (NWIC) in Rohnert Park, California. On October 25, 2022, NWIC staff conducted the record search under IC File #22-0627. Following completion of this cultural resources study, a copy of this report will be filed with the NWIC, per the access agreement.

The objectives of the record search were to: 1) review cultural resource survey reports that either included the project area or were conducted within ½ mile; 2) to review pertinent regional archaeological, ethnographic, and historical overview documents; and 3) determine if cultural or historical resources have been recorded within the project area or within ½ mile.

The records review indicated that the project area was included in a cultural resources survey for a non-industrial timber management plan, by Gary Howard (2000), which resulted in the identification of four cultural resources. One of these four sites, the historical Ladoo cabin (P-12-001312), is located approximately 110 feet southeast of the proposed pond. One additional site was recorded within ½ mile of the project area, an ancestral Native American artifact scatter (P-12-001313) containing chert flakes and one projectile point approximately 0.4 mile (640 meters) north of the project area, during that 2000 survey (S-041000). No other cultural resources are recorded in or within ½ mile of the project area. Two additional surveys have been conducted within ½ mile of the project area, both for timber harvesting plans (S-018612: Howard 1996; S-045948: Howard 2000). No new cultural resources were identified in either of these two surveys.

6.2 Correspondence with Native American Tribal Representatives

On October 19, 2022, WRA sent a letter to the Native American Heritage Commission (NAHC) requesting a search of the Sacred Lands File (SLF) and a current list of Native Americans who might have knowledge of cultural resources in the project area (Appendix B). The NAHC responded on November 1, 2022 with a suggested list of contacts and negative SLF results.

On October 19, 2022, Mr. Rich sent emails (to those whose address was provided) or letters to representatives of the Bear River Band of the Rohnerville Rancheria, InterTribal Sinkyone Wilderness Council, Round Valley Reservation/ Covelo Indian Community, and Wailaki Tribe (Appendix B). Bear River Band of the Rohnerville Rancheria Tribal Historic Preservation Officer Melanie McCavour responded on October 19, 2022, expressing an interest in the project and also the opinion that cultural resources may be located in the project area. She requested a copy of the report when it is completed. David Sanchez of the Sovereign Nation of the Eel River Wailaki responded by phone on October 24, 2022, indicating that the project area is within the Wailaki interest area and that he would also be in coordination the Salmon Restoration Federation about this project. He generally shared his support for fisheries restoration project like this. No other responses have been received.

6.3 Survey Methods and Results

On March 24 and October 18, 2022, William Rich, M.A. and Steven Grantham, M.A. conducted a pedestrian field survey of the entire project area in order to identify and record cultural resources that could be affected by implementation of the project. The survey involved walking the areas proposed for pond construction and spoils deposition on APN 222-084-004 and 222-085-002, as well as the water diversion/release point, the routes proposed for water transmission pipe placement, and the project access roads. Mineral soil exposures in the project area include the road cuts, ubiquitous rodent-tailings piles in the proposed pond and spoils areas, and livestock tracks (Figures 5 - 7).

The project area is within an active non-industrial timber management plan, a cultural resources survey of which did not result in the identification of any cultural resources within the proposed streamflow enhancement project area. Mineral soil exposures resulting from recent logging operations near the project area were also examined for the presence of cultural resources during this field survey.

Figure 5. View of the access road and the area proposed for pond construction, in the northwest ¼ of APN 222-085-002, facing northwest, March 24, 2022.

The previously recorded Ladoo cabin, site P-12-001312, is located approximately 110 feet southeast of the proposed pond in the north-central part of APN 222-085-002 (Figure 7). Other associated resources include a small fruit orchard and a well and small pump-house which are located about 200 feet west of the cabin, in the steep-sided riparian ravine on the south end of the project area. These structures are outside of the project area, and no proposals to affect this cabin or the pump house and well have been made at this time

The survey included 40 acres (see Figure 2) and no other artifacts, features, or sites were identified during the field survey.

Figure 6. View of the access road leading to diversion point October 18, 2022.

Figure 7. View of the historical circa 1940s Ladoo cabin (P-12-001312), 110 feet southeast of the proposed pond in the north-central part of APN 222-085-002, March 24, 2022.

7.0 CONCLUSIONS AND RECOMMENDATIONS

No cultural resources were identified during this investigation. The previously recorded Ladoo cabin (P-12-001312), is located approximately 110 feet south of the east end of the proposed pond and will be avoided during project implementation. An associated orchard, well, pump house and water tank will also be avoided.

It is the opinion of WRA that the background research and field survey methods employed during this investigation were adequately matched to identify cultural resources at this project location. Aside from the location of the identified Ladoo cabin described above, no other historical resources or unique archaeological resources, as defined in Title 14 CCR §15064.5(a), and PRC §5020.1 (j); PRC §21083.2 (g)), were identified in the project area. At this time, no further archaeological studies are recommended for the project, as it is currently proposed.

Although discovery of cultural resources during project construction is not anticipated because of the ample opportunity to access bare ground surface throughout the project area, the following offers recommendations to follow in small scale deposits or features are buried below surface and are encountered. These recommendations are designed to ensure that potential project impacts on inadvertently discovered cultural resources are eliminated or reduced to less than significant levels.

7.1 Protocols for Inadvertent Discoveries

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 Officer (THPO) or representatives for the tribes listed in Native American Correspondence (Section 6.2) should be contacted immediately to evaluate the discovery and, in consultation with the project proponents, and consulting archaeologist, develop a treatment plan in any instance where significant impacts cannot be avoided. Precontact Native American 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 or concentrations of artifacts made of glass, ceramics, metal or other materials found in buried pits, wells or privies. In the event human remains are encountered, the county coroner and the Native American Heritage Commission need to be immediately contacted to establish origin of the remains and, in the event the remains are precontact Native American, a most likely descendent can be determined.

8.0 PROFESSIONAL QUALIFICATIONS

This investigation was completed by William Rich, M.A, RPA (#16584). Mr. Rich has over 20 years of professional experience in northwest California and meets the Secretary of Interior's Professional Qualifications Standards for Archaeology (Title 36 Code of Federal Regulations Part 61, and 48 Federal Regulation 44716). David Heller, M.A. provided information regarding the ethnography and history of the project vicinity. Melinda Salisbury, B.A. also provided assistance with the report.

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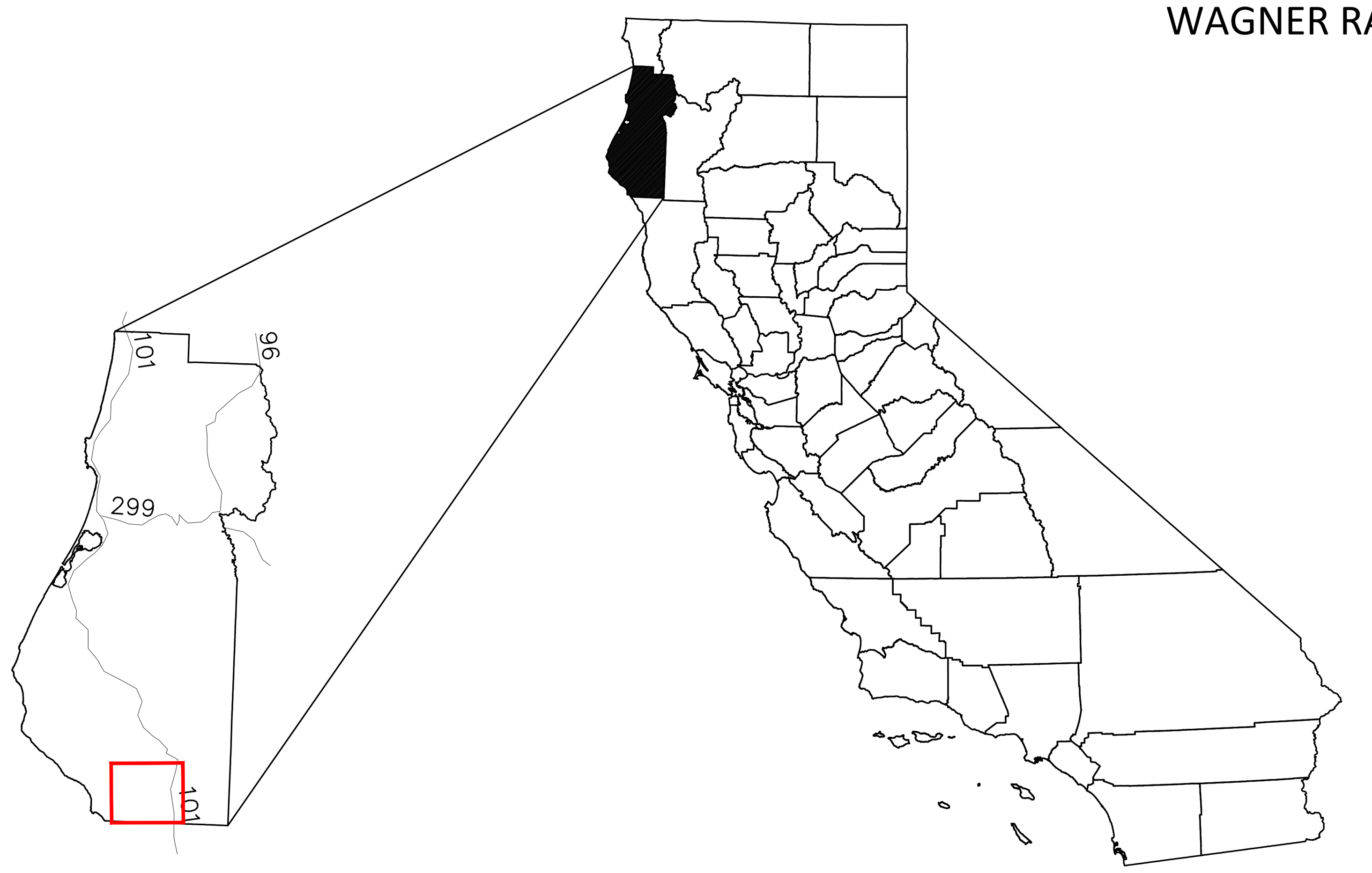
APPENDIX A
Project Design Plans

SPROUL CREEK FLOW ENHANCEMENT PROJECT

65% DESIGN PLANS

WAGNER RANCH, HUMBOLDT COUNTY, CA

CALIFORNIA LOCATION MAP



HUMBOLDT COUNTY MAP
NTS

CALIFORNIA MAP
NTS

OWNER:

WAGNER RANCH, LLC

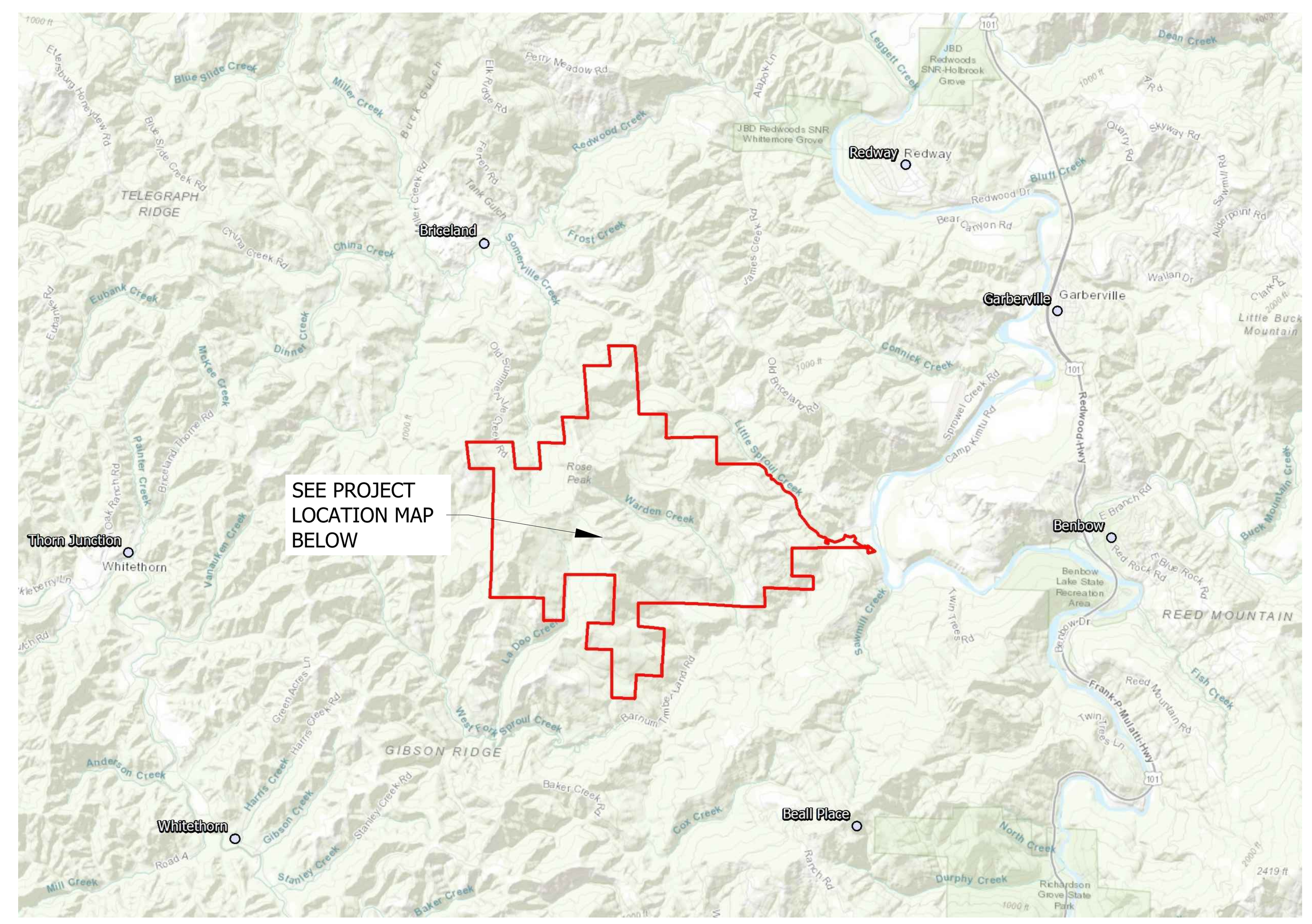
APPLICANT:

SALMONID RESTORATION FEDERATION
425 SNUG ALLEY, UNIT D
EUREKA, CA 95501
SRF@CALSALMON.ORG

AGENT:

JOEL MONSCHKE PE
STILLWATER SCIENCES
850 G STREET, SUITE K
ARCATA, CA 95521
707-496-7075
JMONSCHKE@STILLWATERSCI.COM

VICINITY MAP



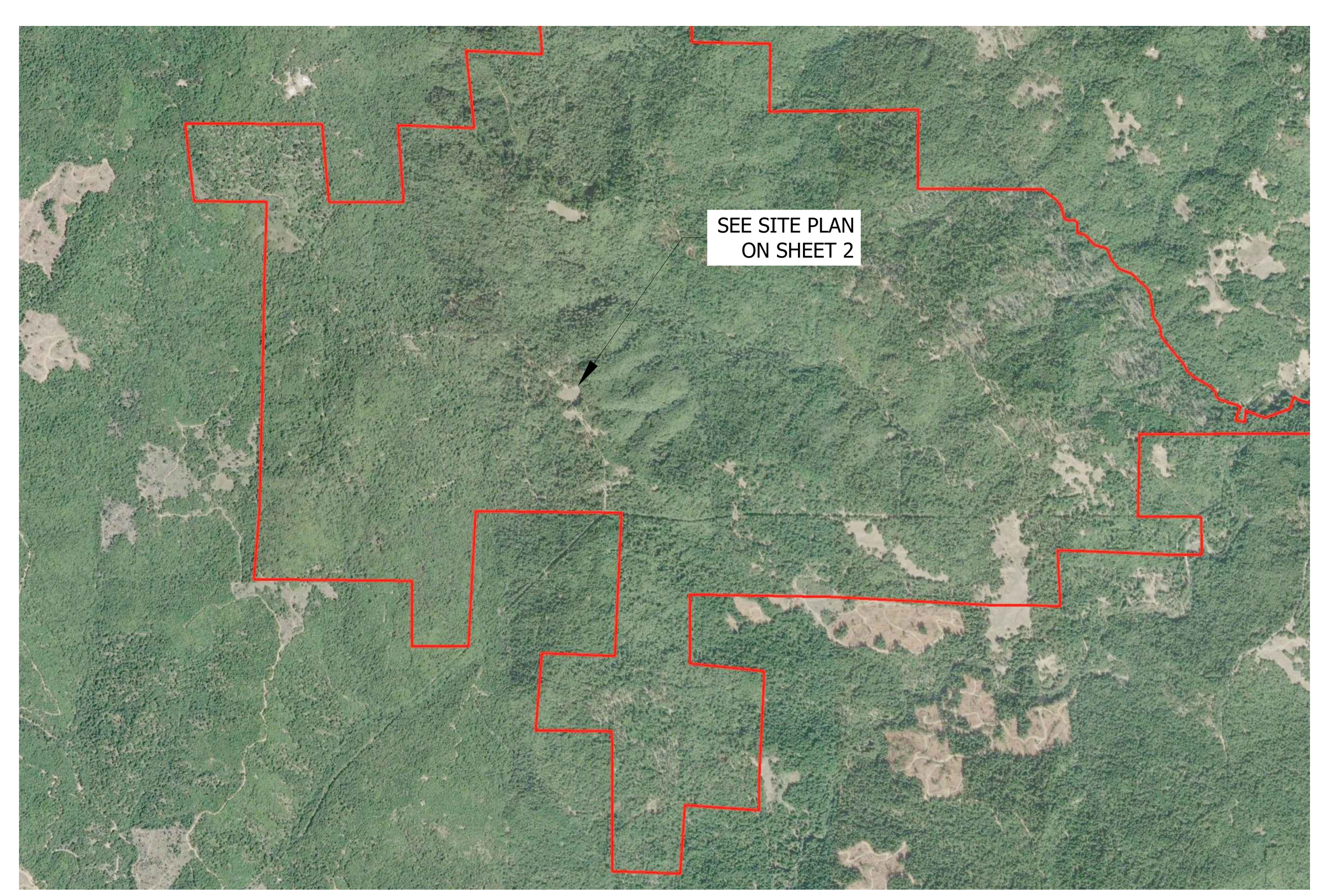
SHEET LIST TABLE

SHEET NUMBER	SHEET TITLE
1	TITLE SHEET
2	VICINITY OVERVIEW
3	POND GRADING
4	FILL AREA GRADING
5	PUMP OVERVIEW
6	DIVERSION INLET
7	EROSION CONTROL AND REVEGETATION
8	DETAILS

PROJECT DESCRIPTION:

THE PRIMARY OBJECTIVE OF THIS PROJECT IS CONSTRUCTION OF 4.87 MILLION GALLONS OF OFF-CHANNEL WATER STORAGE AND ASSOCIATED PLUMBING INFRASTRUCTURE DESIGNED TO DELIVER APPROXIMATELY 20 GALLONS PER MINUTE OF FLOW AUGMENTATION TO LA DOO AND THENCE SPROUL CREEK DURING THE 5-MONTH DRY SEASON TO IMPROVE INSTREAM AQUATIC HABITAT. STORAGE WILL BE IN ONE POND FILLED WITH WET-SEASON RUNOFF INCLUDING RAINWATER CATCHMENT AND WATER DIVERTED FROM A SMALL TRIBUTARY. OTHER ANCILLARY PROJECT COMPONENTS INCLUDE ROAD SURFACE AND STREAM CROSSING UPGRADES ALONG 0.9 MILES OF FOREST ROAD LEADING TO THE DIVERSION.

PROJECT LOCATION MAP



EARTHWORK ESTIMATES:

22,500 CY CUT/CY FILL BALANCED ON SITE

ABBREVIATIONS AND SYMBOLS:

(E) EXISTING

(P) PROPOSED

3 / 8 — DETAIL # ON SHEET / SHEET #

SPROUL CREEK FLOW ENHANCEMENT PROJECT

HUMBOLDT COUNTY, CA

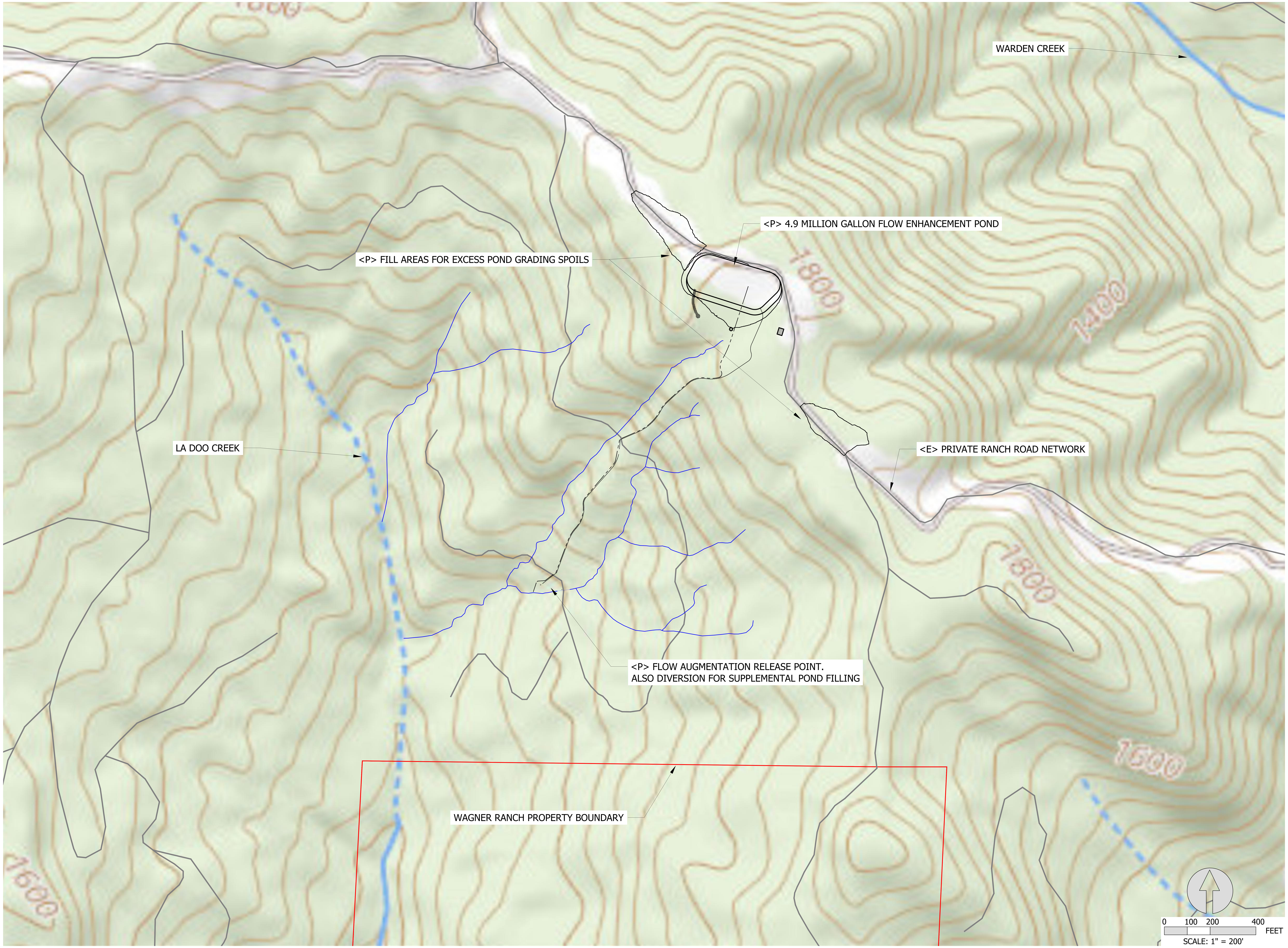
Stillwater Sciences
850 G STREET SUITE K
ARCATA, CA 95521
P: (707) 822-9607

PROJECT NUMBER: 603.03
SCALE: AS NOTED
DATE: 8/18/22

DESIGN: JM
DRAWN: BW,TC
CHECKED: JM
APPROVED: JM

TITLE SHEET

SHEET 1 OF 8



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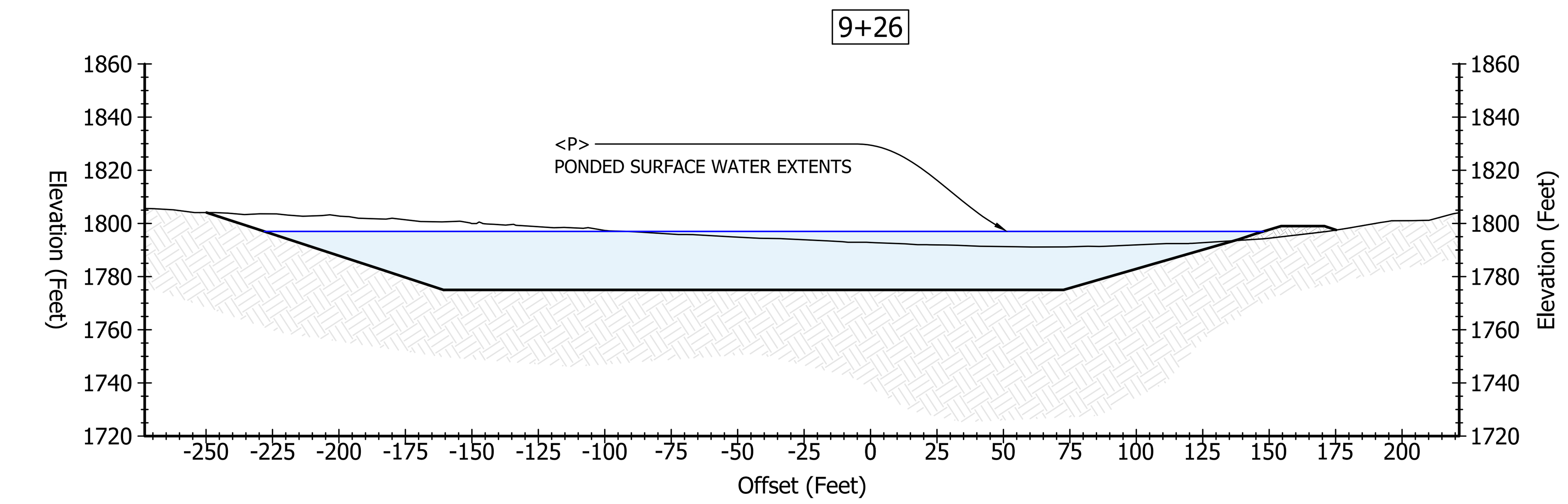
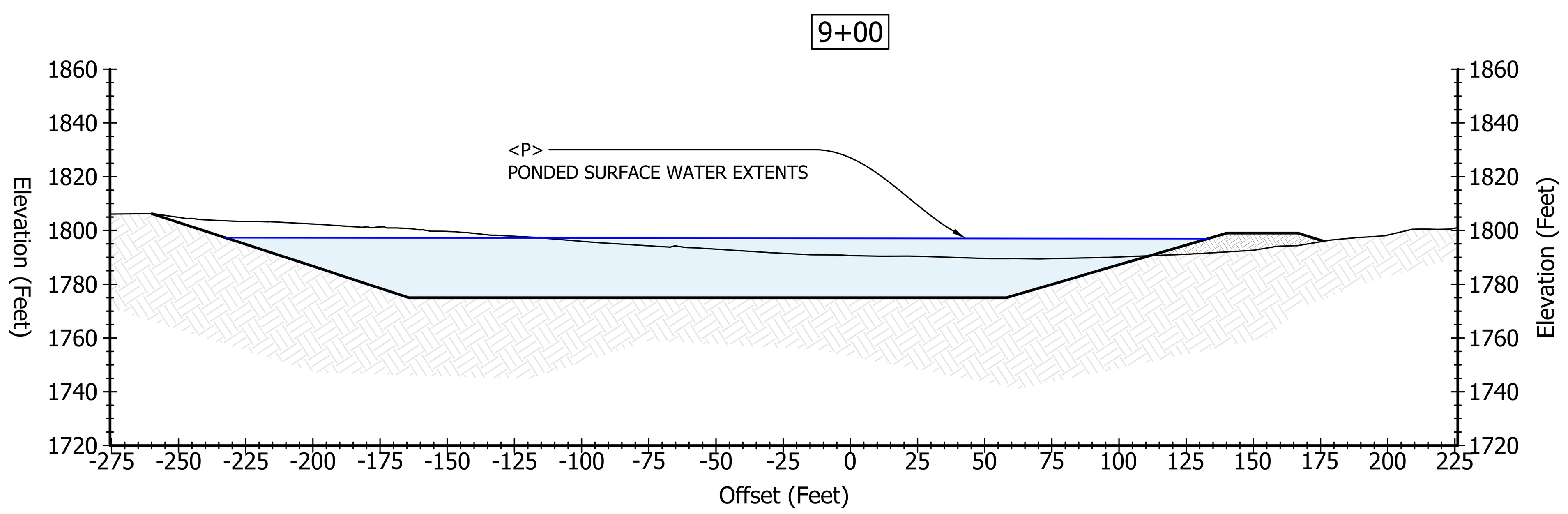
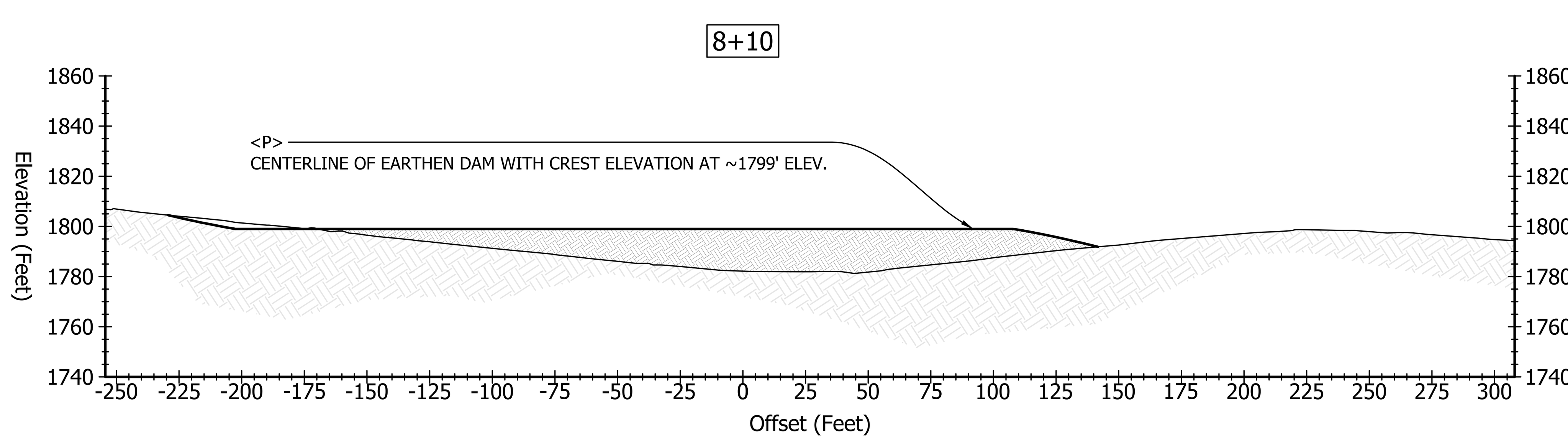
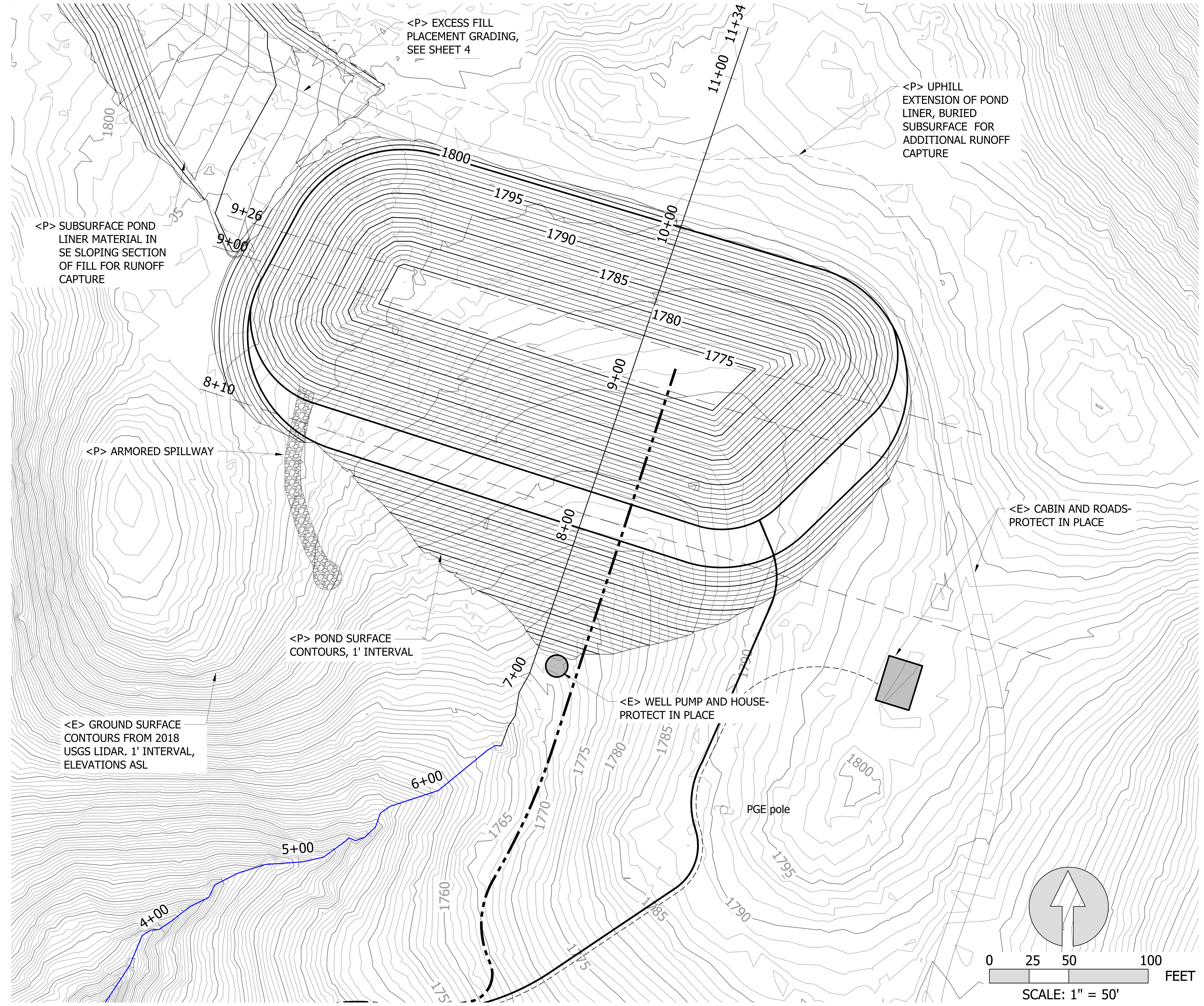
SITE OVERVIEW

SHEET 2 OF 8





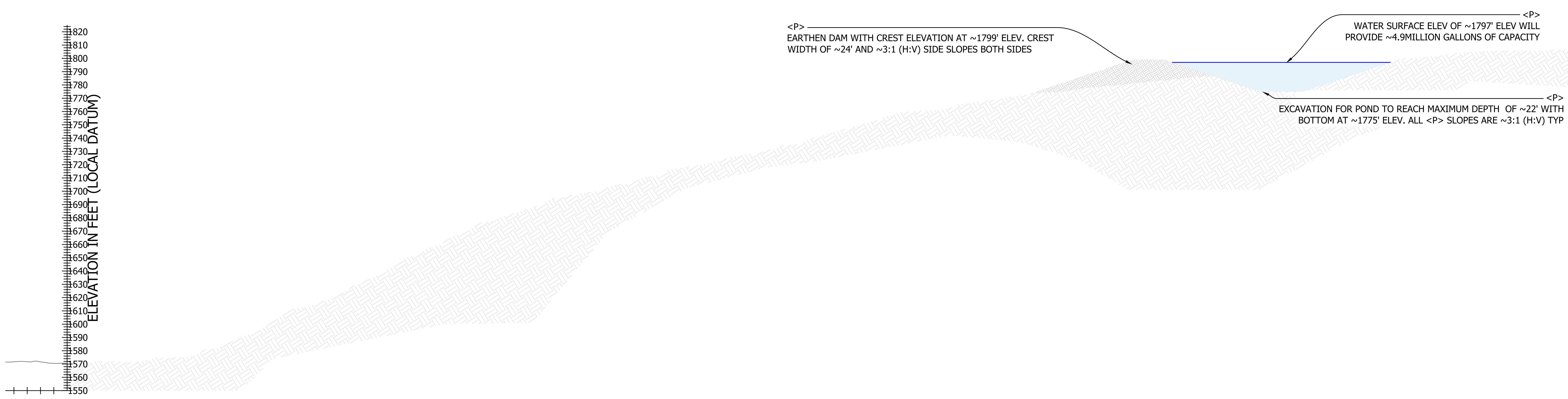




PROPOSED POND DESIGN DETAILS

CAPACITY ~4.9 MILLION GALLONS
W/ SPILLWAY CREST AT ~1799' AND ~2' OF FREEBOARD

~22.5KCYDS CUT
~9.7KCYDS FILL
~12.8KCYDS OF EXCESS SPOILS



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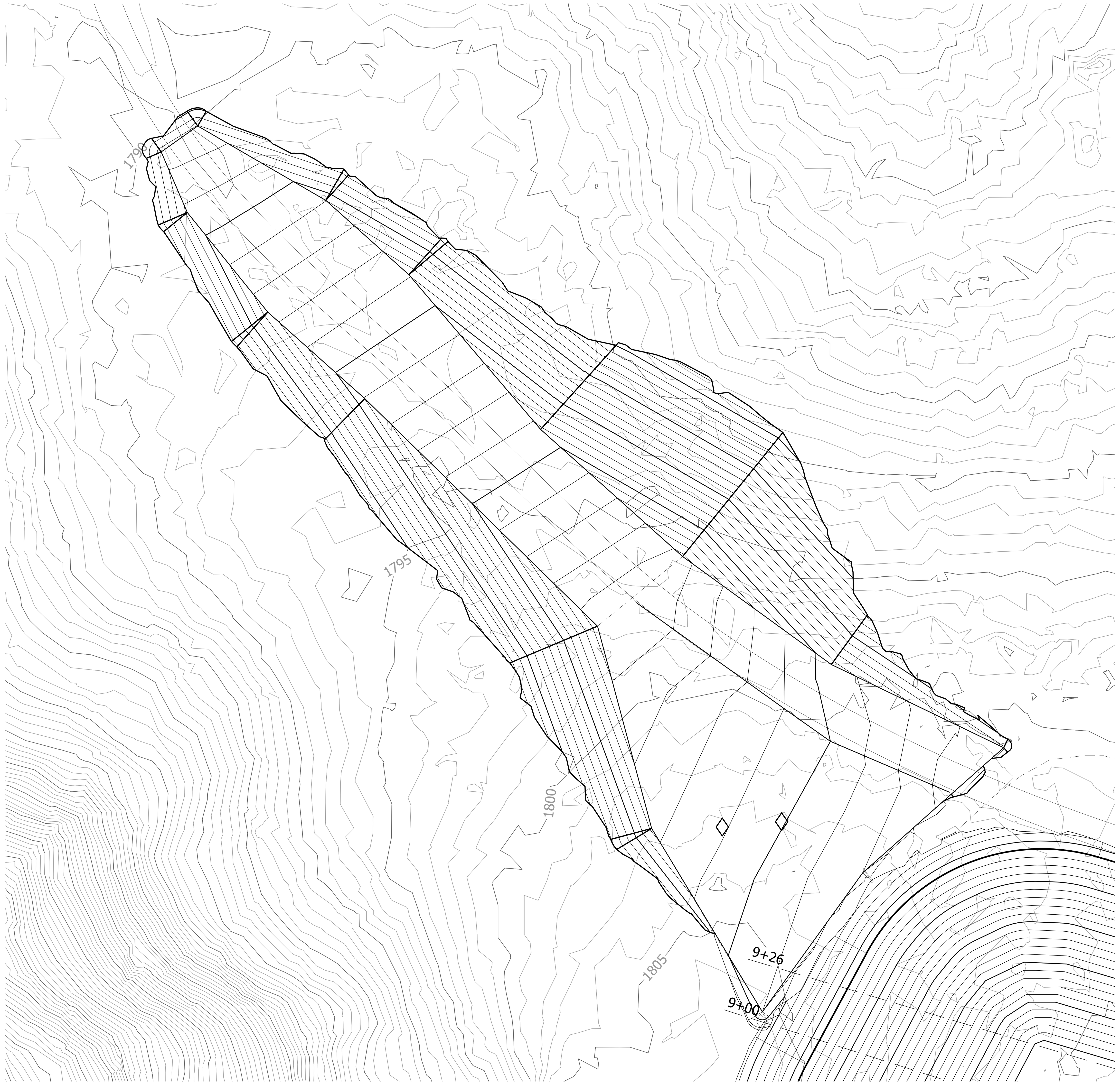
POND GRADING



SPROUL CREEK FLOW ENHANCEMENT PROJECT

HUMBOLDT COUNTY, CA

Stillwater Sciences
850 G STREET SUITE K
ARCATA, CA 95521
P: (707) 822-9607

PROPOSED POND DESIGN DETAILS

GROSS CAPACITY ~4.9 MILLION GALLONS
W/ CREST AT ~1799' AND ~2' OF FREEBOARD

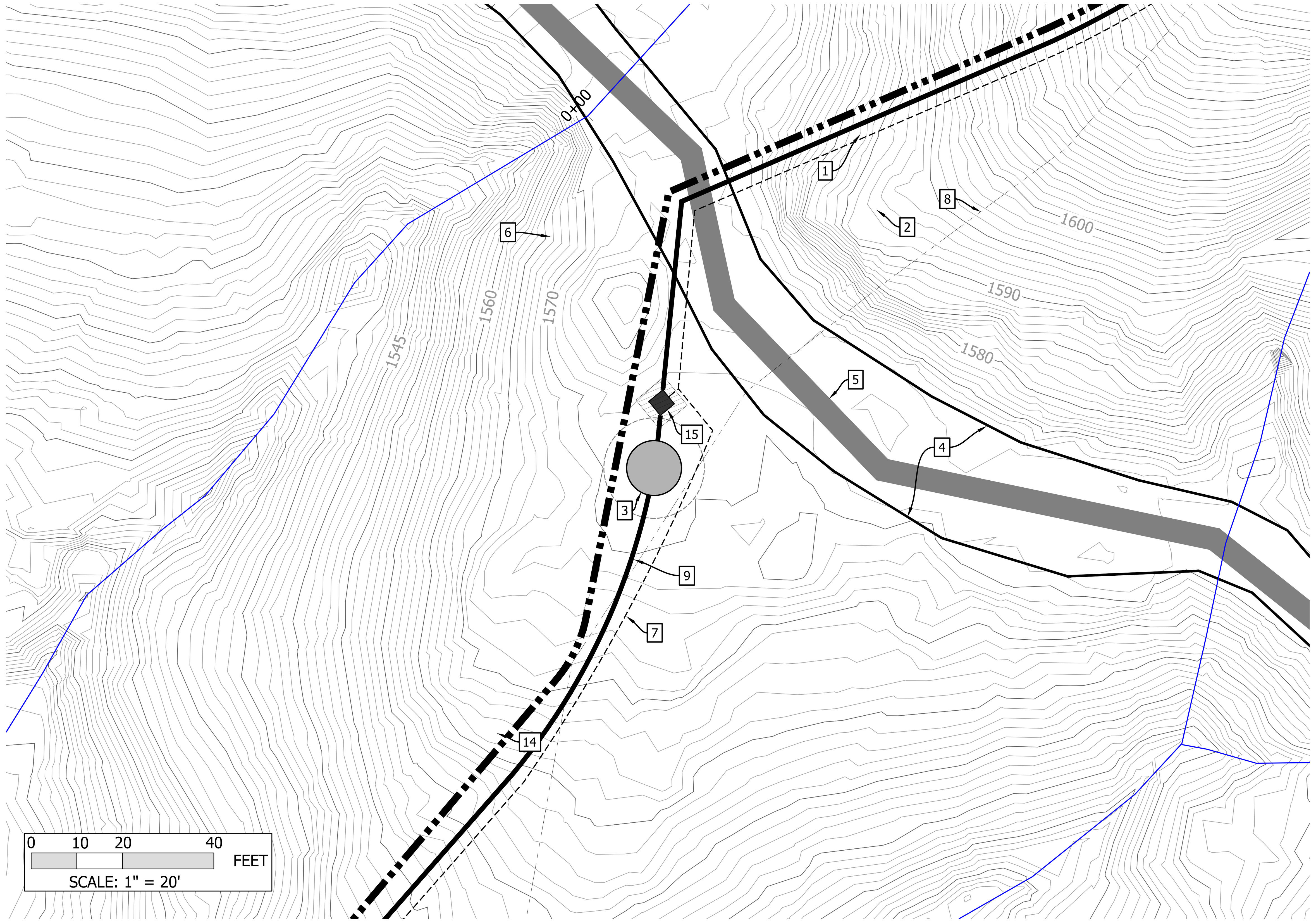
~22.5KCYDS CUT
~9.7KCYDS FILL
~12.8KCYDS OF EXCESS SPOILS

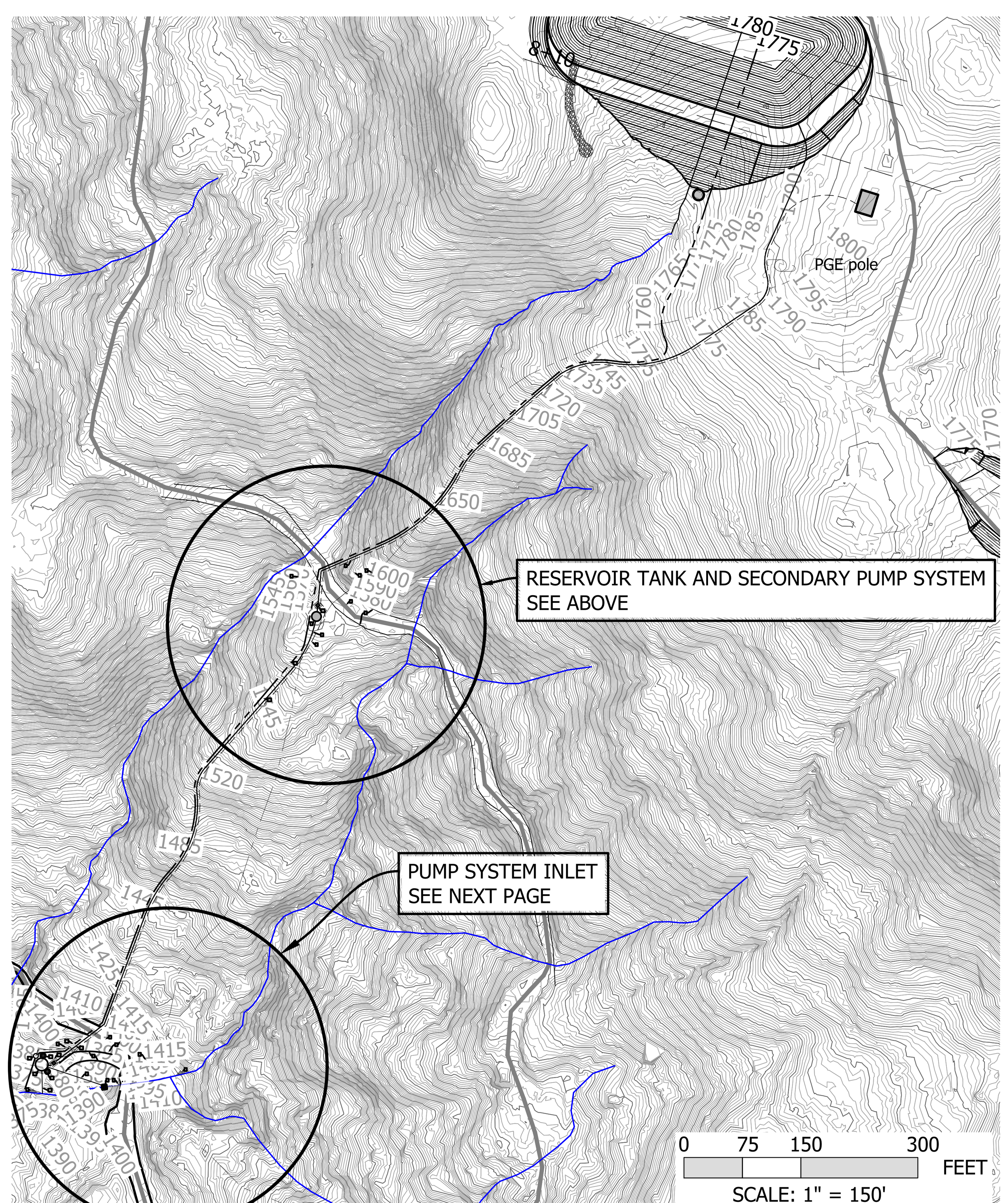
PROJECT NUMBER: 603.03
SCALE: AS NOTED
DATE: 8/18/22

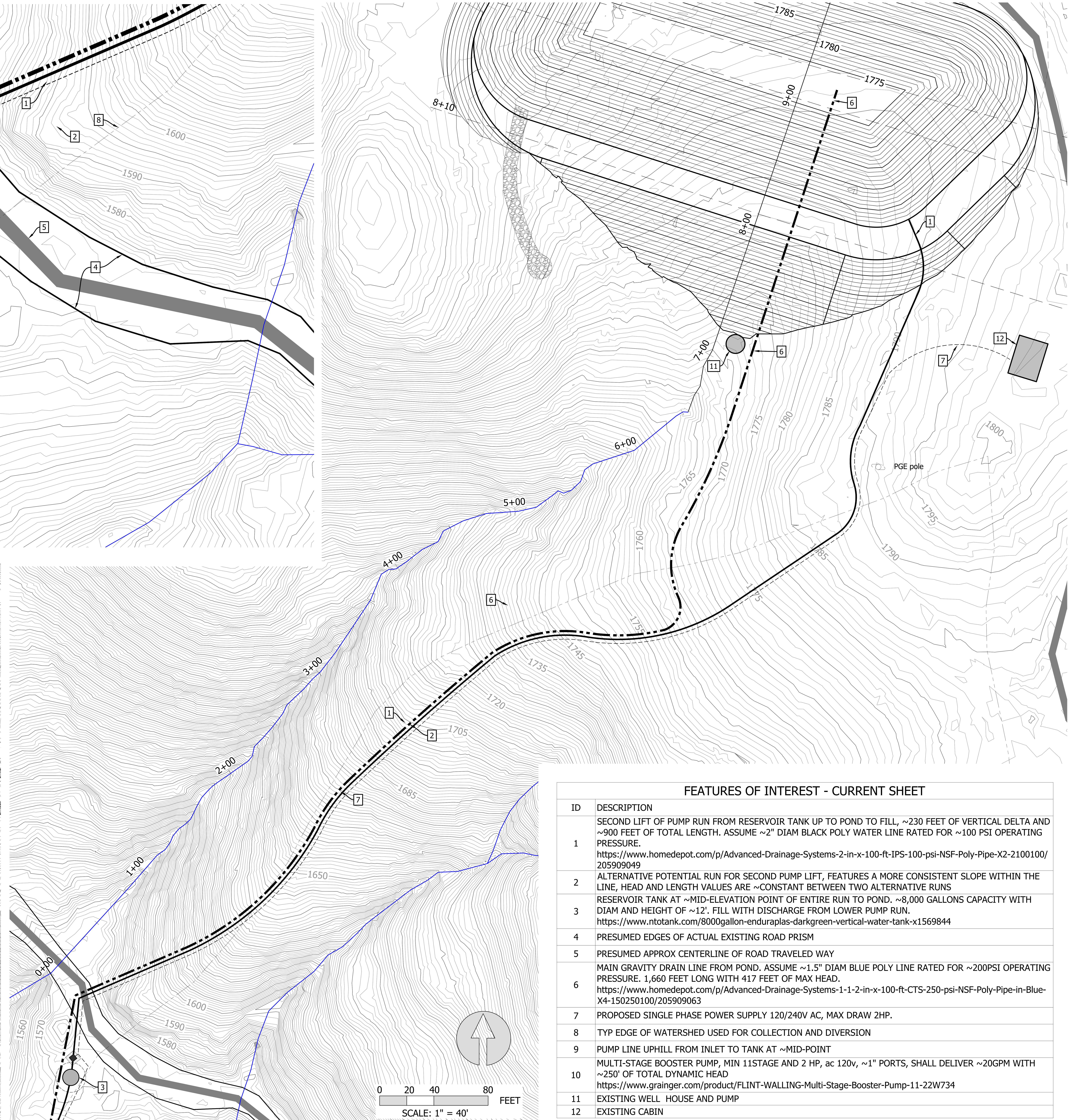
DESIGN: JM
DRAWN: BW,TC
CHECKED: JM
APPROVED: JM

FILL AREA GRADING

SHEET 4 OF 8







FEATURES OF INTEREST - CURRENT SHEET

ID	DESCRIPTION
1	SECOND LIFT OF PUMP RUN FROM RESERVOIR TANK UP TO POND TO FILL, ~230 FEET OF VERTICAL DELTA AND ~900 FEET OF TOTAL LENGTH. ASSUME ~2" DIAM BLACK POLY WATER LINE RATED FOR ~100 PSI OPERATING PRESSURE. https://www.homedepot.com/p/Advanced-Drainage-Systems-2-in-x-100-ft-IPS-100-psi-NSF-Poly-Pipe-X2-2100100/205909049
2	ALTERNATIVE POTENTIAL RUN FOR SECOND PUMP LIFT, FEATURES A MORE CONSISTENT SLOPE WITHIN THE LINE, HEAD AND LENGTH VALUES ARE ~CONSTANT BETWEEN TWO ALTERNATIVE RUNS
3	RESERVOIR TANK AT ~MID-ELEVATION POINT OF ENTIRE RUN TO POND. ~8,000 GALLONS CAPACITY WITH DIAM AND HEIGHT OF ~12'. FILL WITH DISCHARGE FROM LOWER PUMP RUN. https://www.ntotank.com/8000gallon-enduraplas-darkgreen-vertical-water-tank-x1569844
4	PRESUMED EDGES OF ACTUAL EXISTING ROAD PRISM
5	PRESUMED APPROX CENTERLINE OF ROAD TRAVELED WAY
6	MAIN GRAVITY DRAIN LINE FROM POND. ASSUME ~1.5" DIAM BLUE POLY LINE RATED FOR ~200PSI OPERATING PRESSURE. 1,660 FEET LONG WITH 417 FEET OF MAX HEAD. https://www.homedepot.com/p/Advanced-Drainage-Systems-1-1-2-in-x-100-ft-CTS-250-psi-NSF-Poly-Pipe-in-Blue-X4-150250100/205909063
7	PROPOSED SINGLE PHASE POWER SUPPLY 120/240V AC, MAX DRAW 2HP.
8	TYP EDGE OF WATERSHED USED FOR COLLECTION AND DIVERSION
9	PUMP LINE UPHILL FROM INLET TO TANK AT ~MID-POINT
10	MULTI-STAGE BOOSTER PUMP, MIN 11STAGE AND 2 HP, ac 120v, ~1" PORTS, SHALL DELIVER ~20GPM WITH ~250' OF TOTAL DYNAMIC HEAD https://www.grainger.com/product/FLINT-WALLING-Multi-Stage-Booster-Pump-11-22W734
11	EXISTING WELL HOUSE AND PUMP
12	EXISTING CABIN

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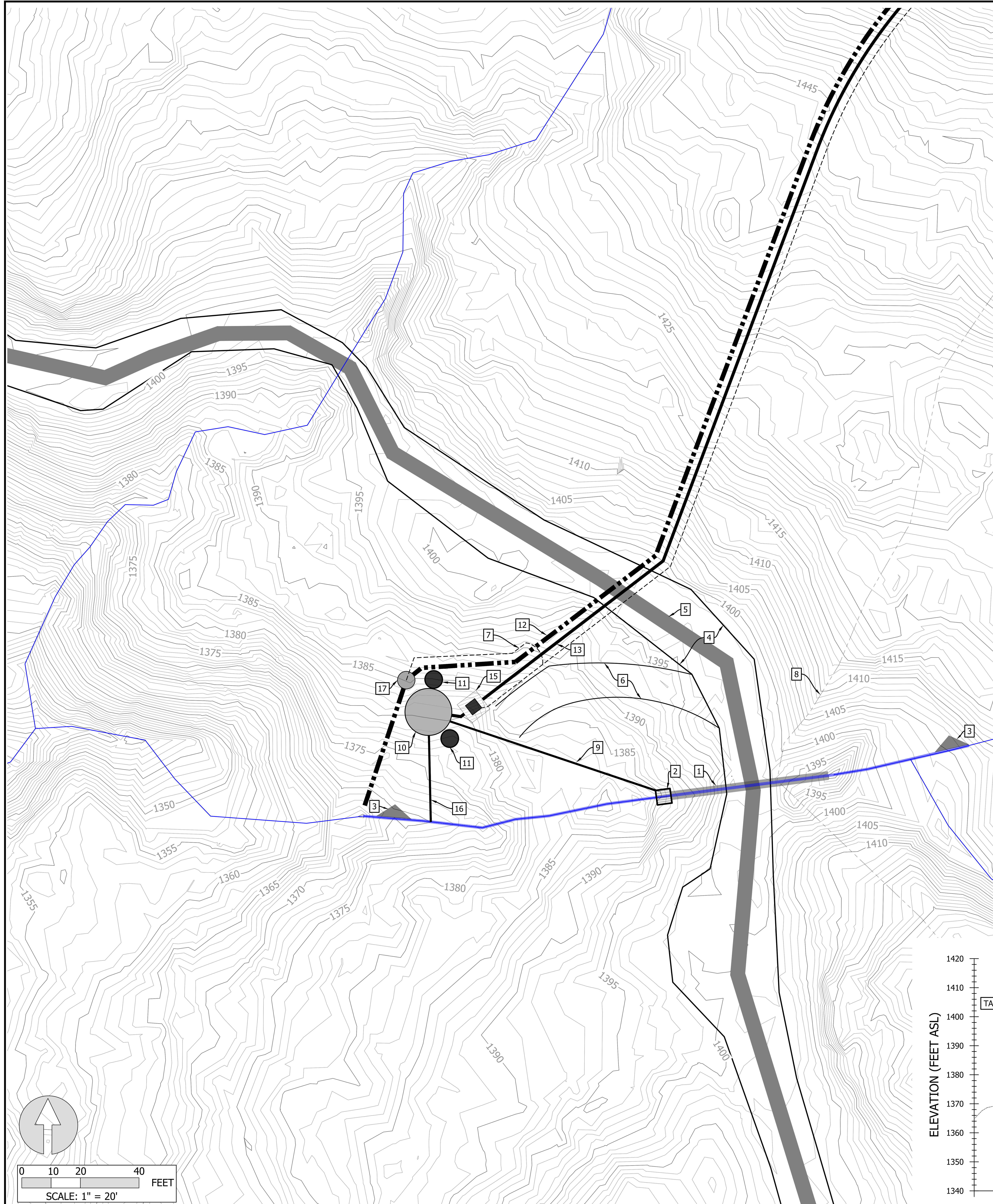
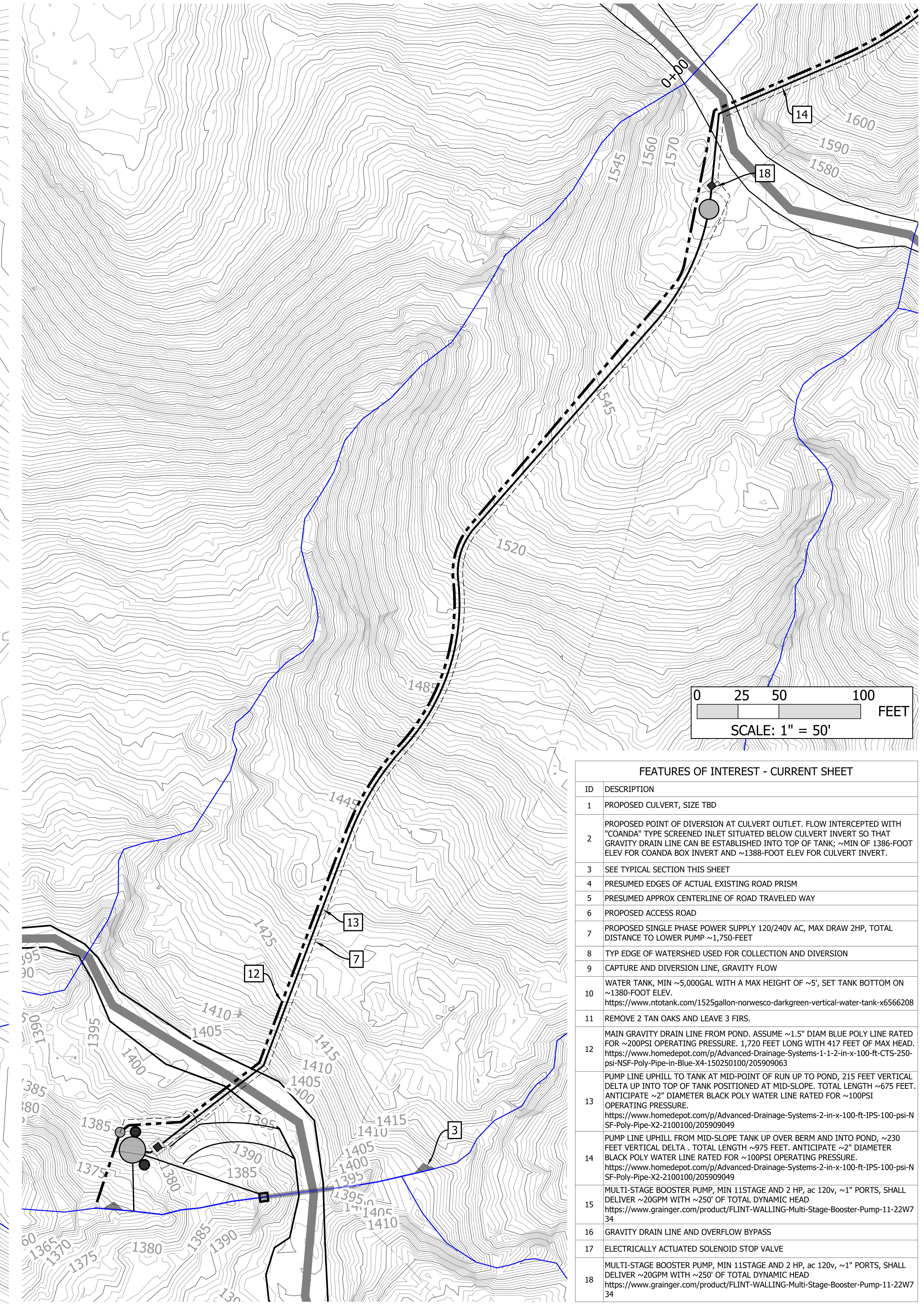
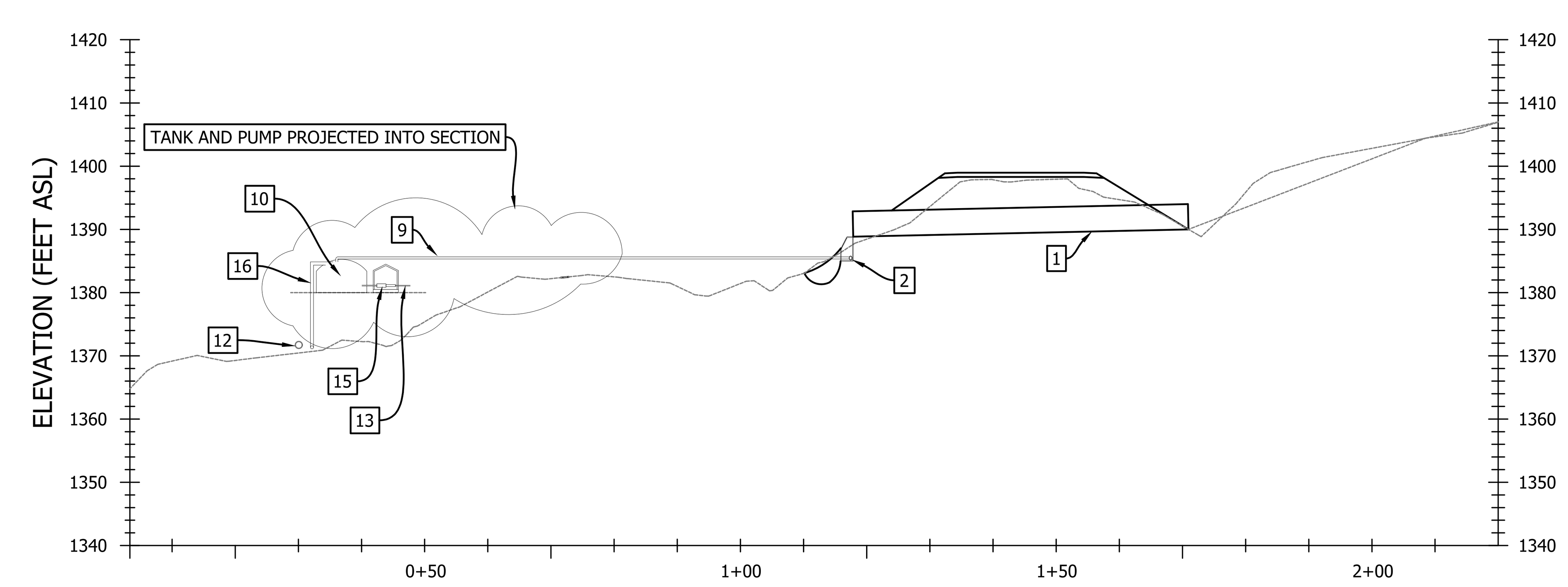
PUMP OVERVIEW





FEATURES OF INTEREST - CURRENT SHEET	
ID	DESCRIPTION
1	PROPOSED CULVERT, SIZE TBD
2	PROPOSED POINT OF DIVERSION AT CULVERT OUTLET. FLOW INTERCEPTED WITH "COANDA" TYPE SCREENED INLET SITUATED BELOW CULVERT INVERT SO THAT GRAVITY DRAIN LINE CAN BE ESTABLISHED INTO TOP OF TANK; ~MIN OF 1386-FOOT ELEV FOR COANDA BOX INVERT AND ~1388-FOOT ELEV FOR CULVERT INVERT.
3	SEE TYPICAL SECTION THIS SHEET
4	PRESUMED EDGES OF ACTUAL EXISTING ROAD PRISM
5	PRESUMED APPROX CENTERLINE OF ROAD TRAVELED WAY
6	PROPOSED ACCESS ROAD
7	PROPOSED SINGLE PHASE POWER SUPPLY 120/240V AC, MAX DRAW 2HP, TOTAL DISTANCE TO LOWER PUMP ~1,750-FEET
8	TYP EDGE OF WATERSHED USED FOR COLLECTION AND DIVERSION
9	CAPTURE AND DIVERSION LINE, GRAVITY FLOW
10	WATER TANK, MIN ~5,000GAL WITH A MAX HEIGHT OF ~5', SET TANK BOTTOM ON ~1380-FOOT ELEV. https://www.ntotank.com/1525gallon-norwesco-darkgreen-vertical-water-tank-x6566208
11	REMOVE 2 TAN OAKS AND LEAVE 3 FIRS.
12	MAIN GRAVITY DRAIN LINE FROM POND. ASSUME ~1.5" DIAM BLUE POLY LINE RATED FOR ~200PSI OPERATING PRESSURE. 1,720 FEET LONG WITH 417 FEET OF MAX HEAD. https://www.homedepot.com/p/Advanced-Drainage-Systems-1-1-2-in-x-100-ft-CTS-250-psi-NSF-Poly-Pipe-in-Blue-X4-150250100/205909063
13	PUMP LINE UPHILL TO TANK AT MID-POINT OF RUN UP TO POND, 215 FEET VERTICAL DELTA UP INTO TOP OF TANK POSITIONED AT MID-SLOPE. TOTAL LENGTH ~675 FEET. ANTICIPATE ~2" DIAMETER BLACK POLY WATER LINE RATED FOR ~100PSI OPERATING PRESSURE. https://www.homedepot.com/p/Advanced-Drainage-Systems-2-in-x-100-ft-IPS-100-psi-NSF-Poly-Pipe-X2-2100100/205909049
14	PUMP LINE UPHILL FROM MID-SLOPE TANK UP OVER BERM AND INTO POND, ~230 FEET VERTICAL DELTA . TOTAL LENGTH ~975 FEET. ANTICIPATE ~2" DIAMETER BLACK POLY WATER LINE RATED FOR ~100PSI OPERATING PRESSURE. https://www.homedepot.com/p/Advanced-Drainage-Systems-2-in-x-100-ft-IPS-100-psi-NSF-Poly-Pipe-X2-2100100/205909049
15	MULTI-STAGE BOOSTER PUMP, MIN 11STAGE AND 2 HP, ac 120v, ~1" PORTS, SHALL DELIVER ~20GPM WITH ~250' OF TOTAL DYNAMIC HEAD https://www.grainger.com/product/FLINT-WALLING-Multi-Stage-Booster-Pump-11-22W734
16	GRAVITY DRAIN LINE AND OVERFLOW BYPASS
17	ELECTRICALLY ACTUATED SOLENOID STOP VALVE
18	MULTI-STAGE BOOSTER PUMP, MIN 11STAGE AND 2 HP, ac 120v, ~1" PORTS, SHALL DELIVER ~20GPM WITH ~250' OF TOTAL DYNAMIC HEAD https://www.grainger.com/product/FLINT-WALLING-Multi-Stage-Booster-Pump-11-22W734



SPROUL CREEK FLOW ENHANCEMENT PROJECT

HUMBOLDT COUNTY, CA

Stillwater Sciences
850 G STREET SUITE K
ARCATA, CA 95521
P: (707) 822-9607

PROJECT NUMBER: 603.03
SCALE: AS NOTED
DATE: 8/18/22

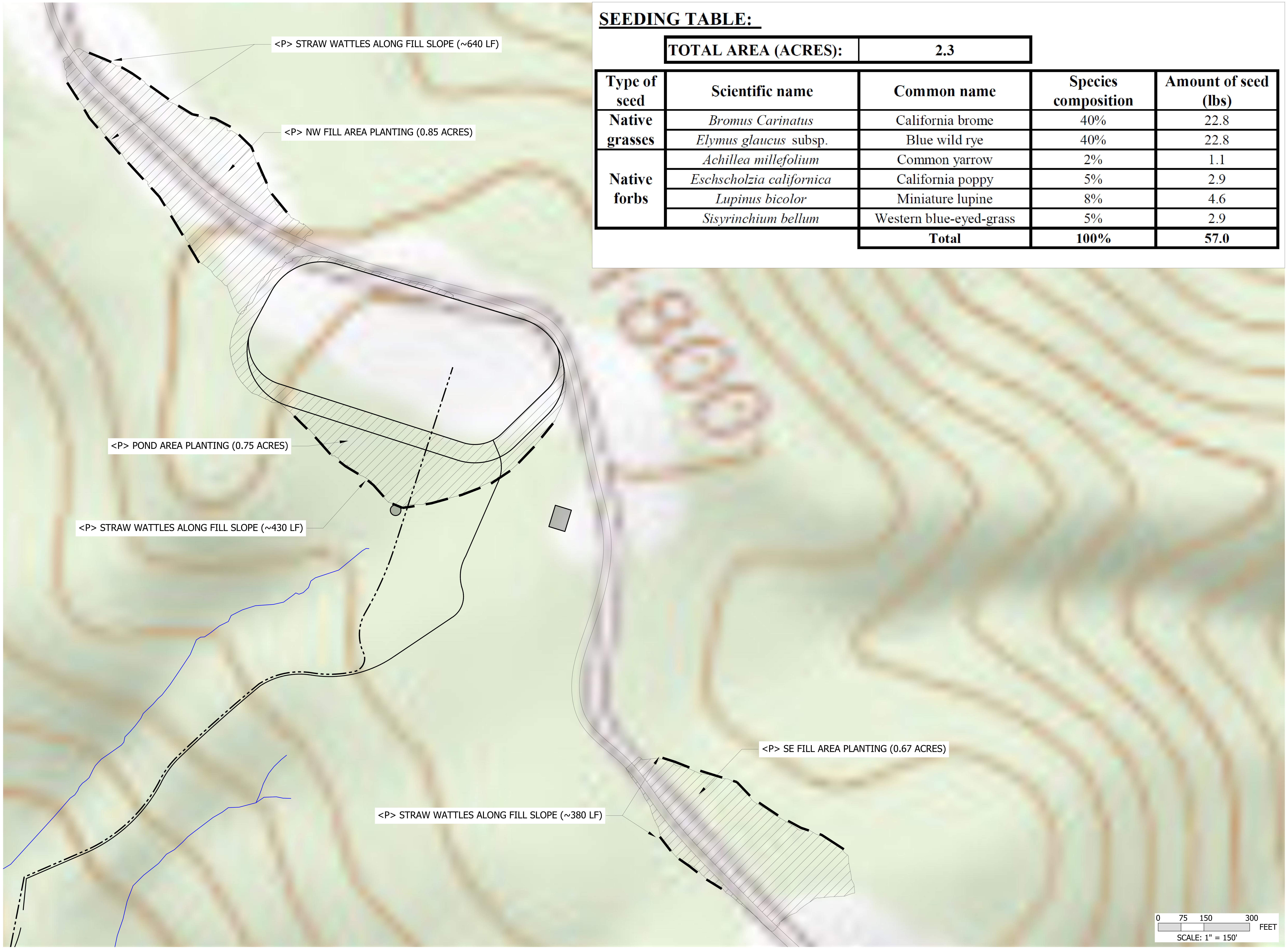
DESIGN: JM
DRAWN: BW,TC
CHECKED: JM
APPROVED: JM

DIVERSION INLET

SEEDING TABLE:

TOTAL AREA (ACRES):	2.3

Type of seed	Scientific name	Common name	Species composition	Amount of seed (lbs)
Native grasses	*Bromus Carinatus*	California brome	40%	22.8
	Elymus glaucus subsp.	Blue wild rye	40%	22.8
Native forbs	*Achillea millefolium*	Common yarrow	2%	1.1
	Eschscholzia californica	California poppy	5%	2.9
	Lupinus bicolor	Miniature lupine	8%	4.6
	Sisyrinchium bellum	Western blue-eyed-grass	5%	2.9
		Total	100%	57.0



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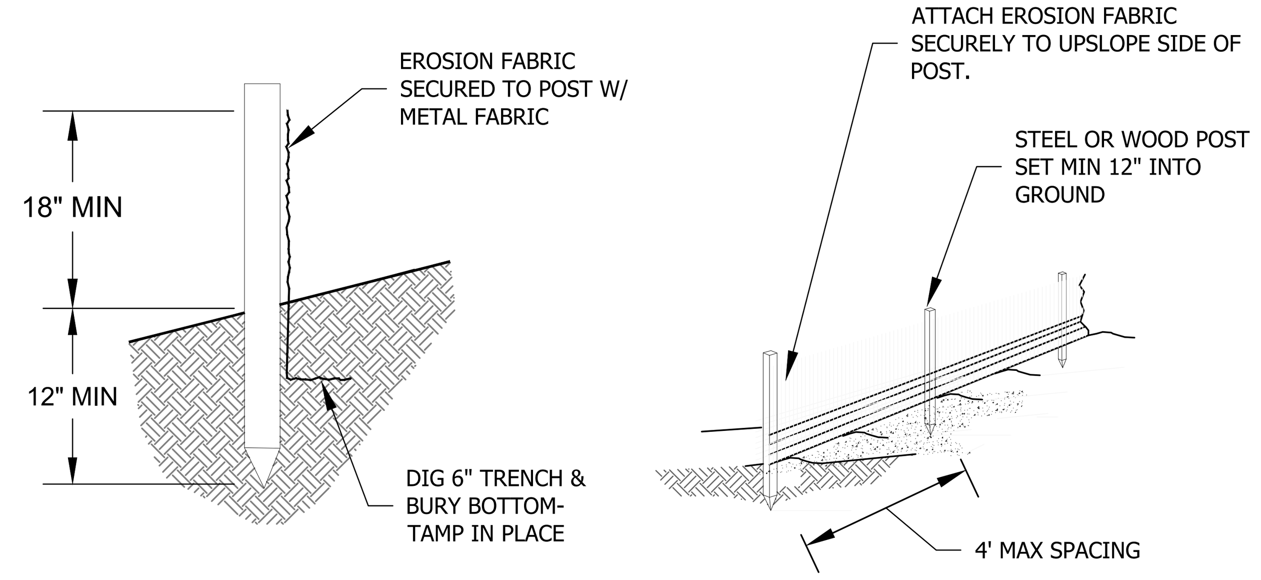
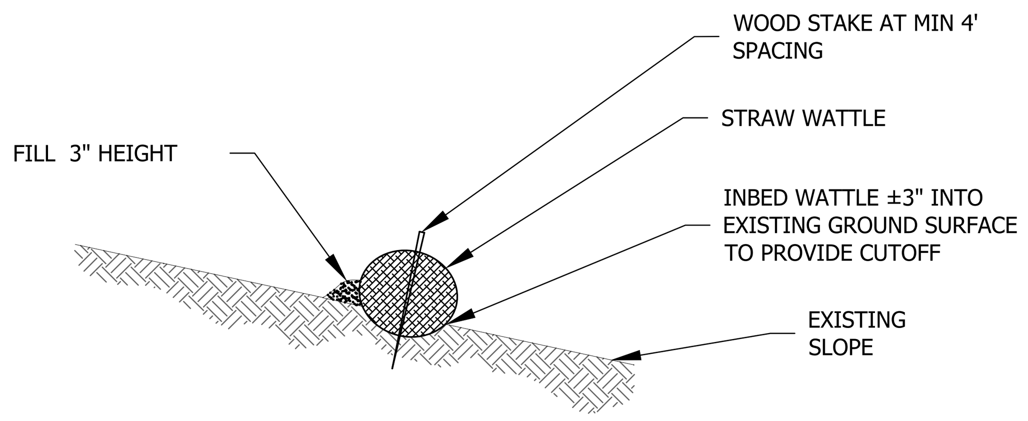
EROSION CONTROL AND REVEGETATION

SHEET 7 OF 8



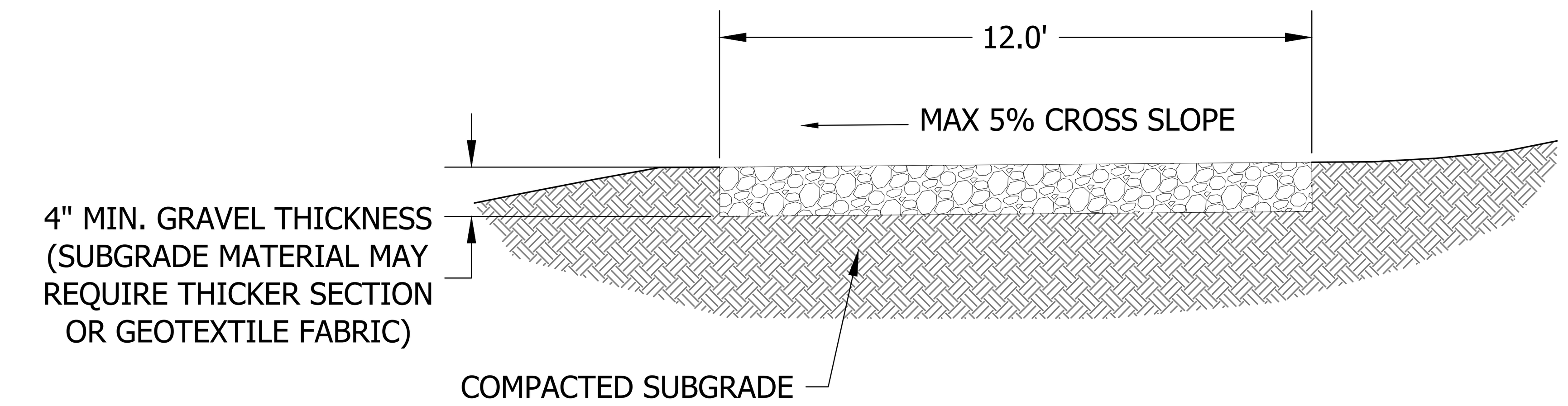
1 **SILT FENCING**

NTS



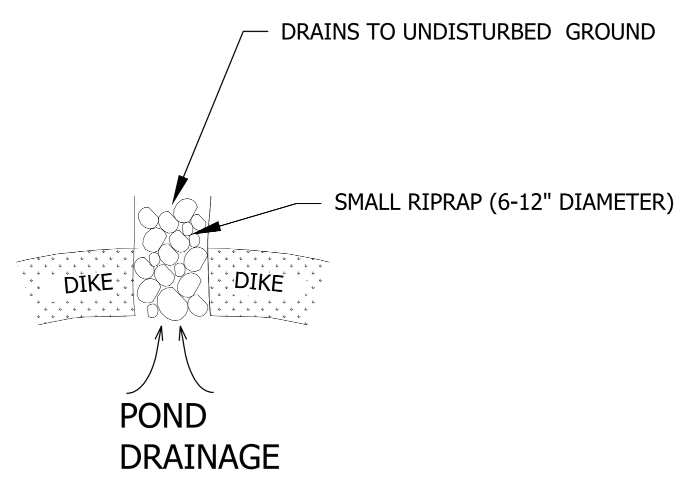
2 **STRAW WATTLE**

NTS



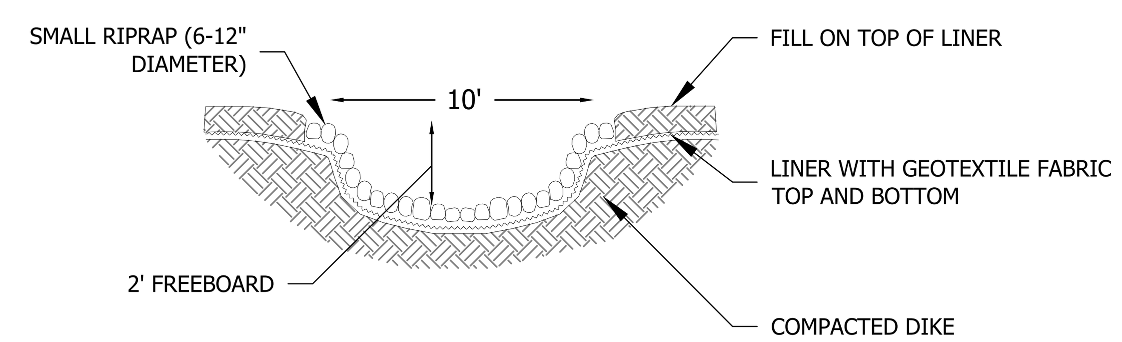
3 **GRAVEL ACCESS ROAD**

NTS



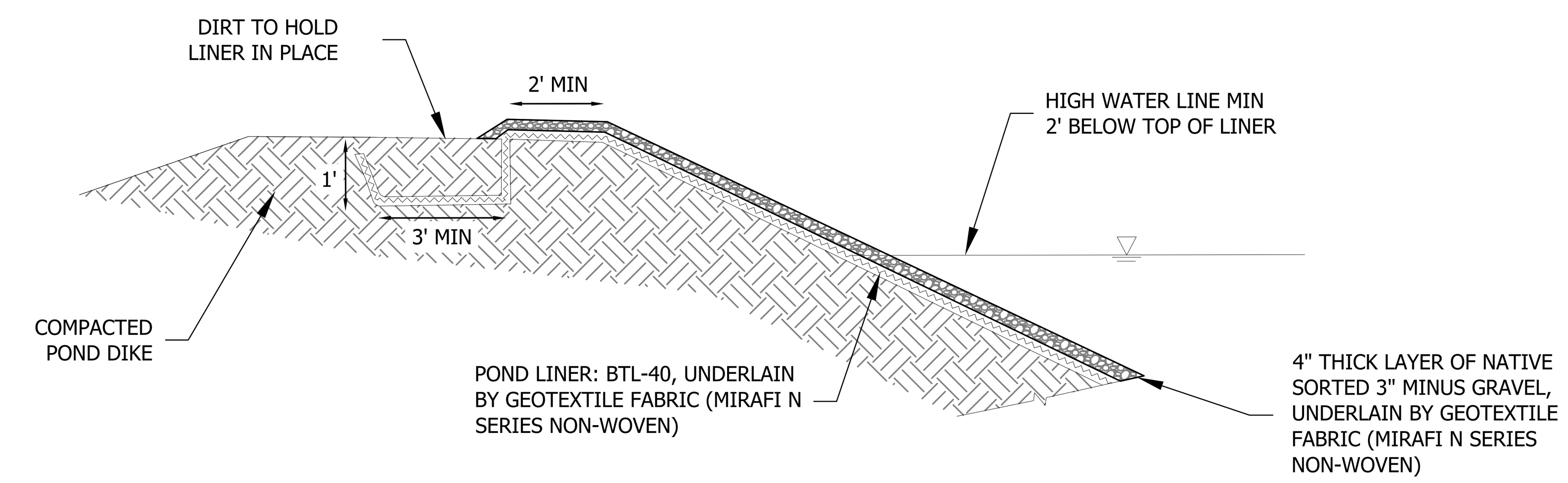
4 SPILLWAY PLAN VIEW

NTS



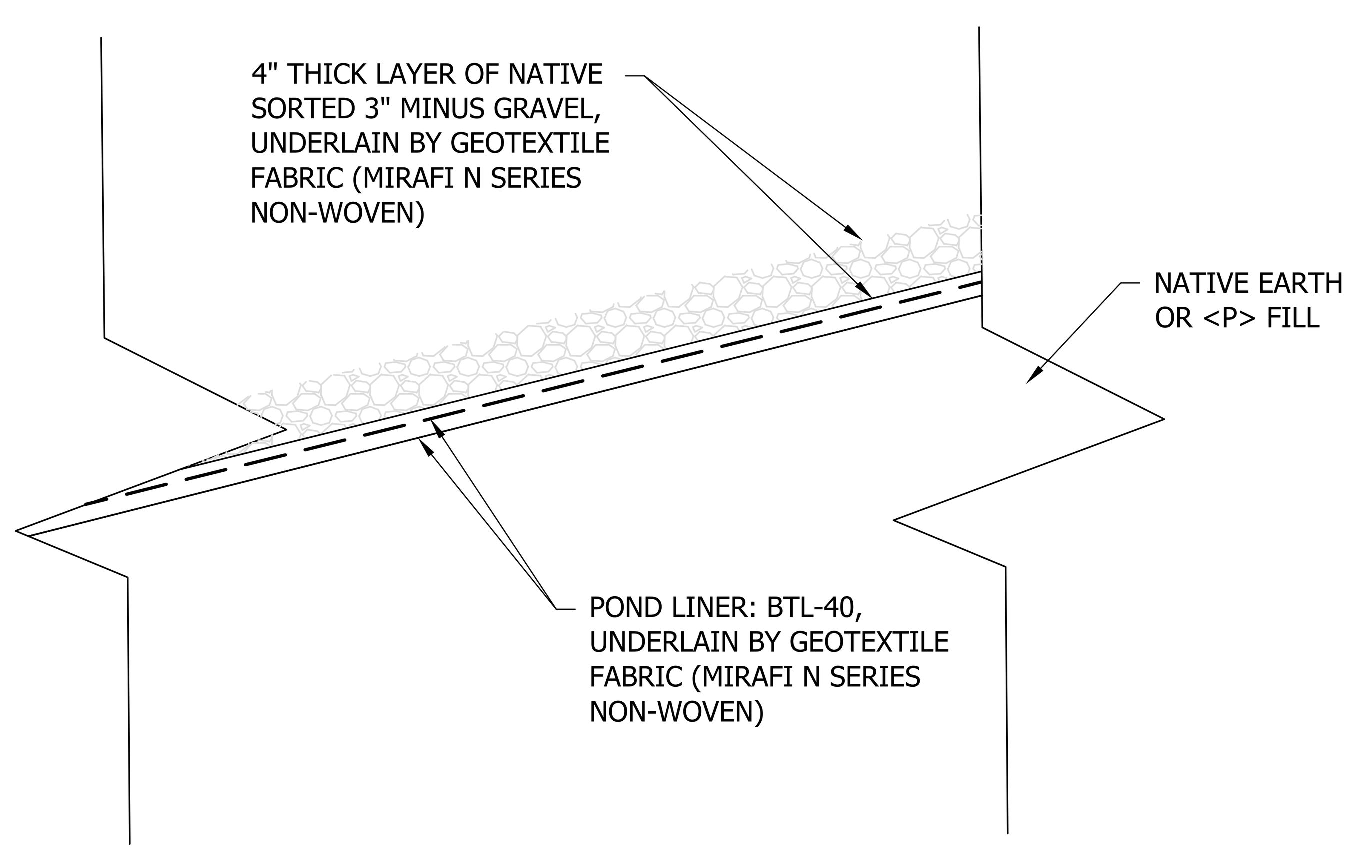
5 SPILLWAY SECTION VIEW

NTS



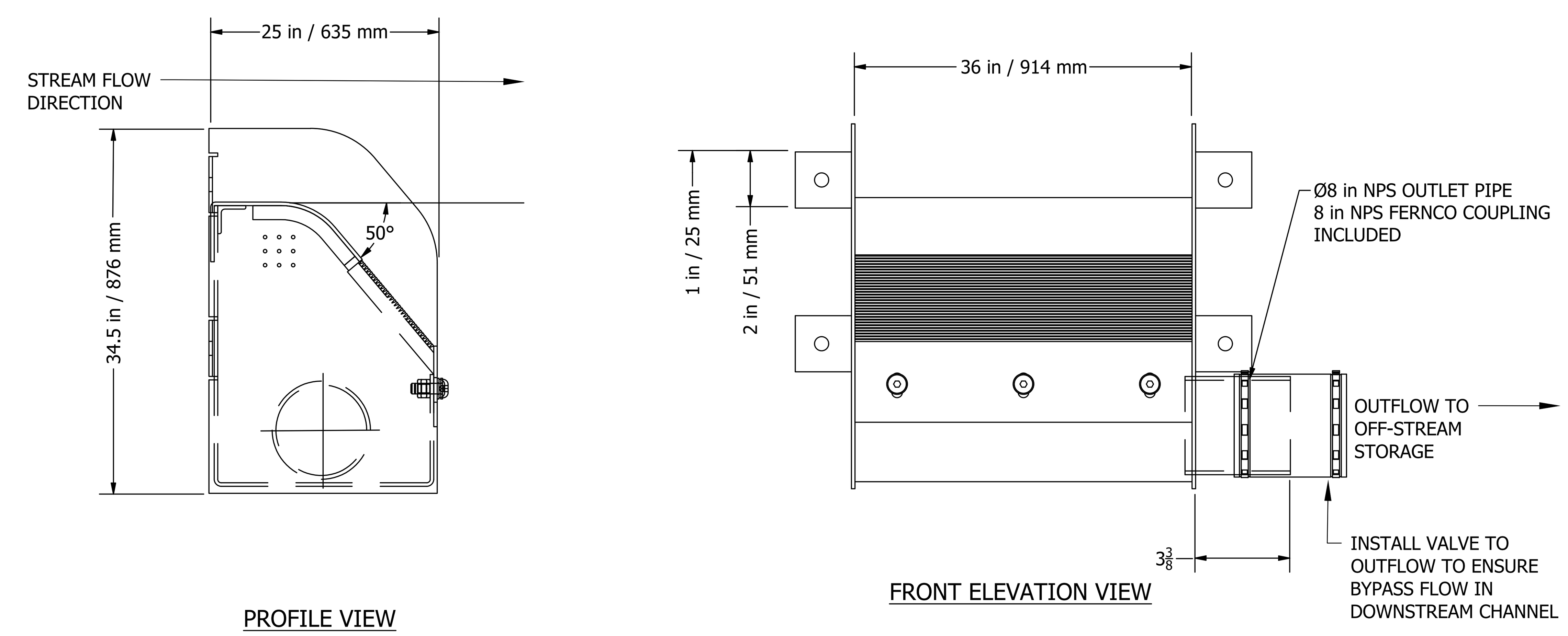
6 **POND EDGE DETAIL**

NTS



7 **POND LINER DETAIL**

NTS



8 **DIVERSION INTAKE**

NTS

COANDA BOX OR SIMILAR. SCREEN SLOT WIDTH OF 1MM, FABRICATED FROM 304 STAINLESS STEEL.

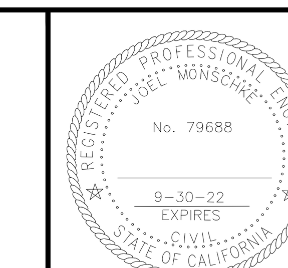
SPROUL CREEK FLOW ENHANCEMENT PROJECT

HUMBOLDT COUNTY, CA

Stillwater Sciences
850 G STREET SUITE K
ARCATA, CA 95521
P: (707) 822-9607

PROJECT NUMBER: 603.03
SCALE: AS NOTED
DATE: 8/18/22

DESIGN: JM
DRAWN: BW,TC
CHECKED: JM
APPROVED: JM



DETAILS

APPENDIX B
Native American Correspondence

Sacred Lands File & Native American Contacts List Request

Native American Heritage Commission
1550 Harbor Blvd, Suite
100 West Sacramento, CA 95691
916-373-3710
916-373-5471 – Fax
nahc@nahc.ca.gov

Information Below is Required for a Sacred Lands File Search

Project: Sproul Creek Flow Enhancement Project

County: Humboldt

USGS Quadrangle Name: North

Township: 4S **Range:** 3E **Section(s):** 31, 32

Company/Firm/Agency: William Rich and Associates

Street Address: PO Box 184

City: Bayside **Zip:** 95524

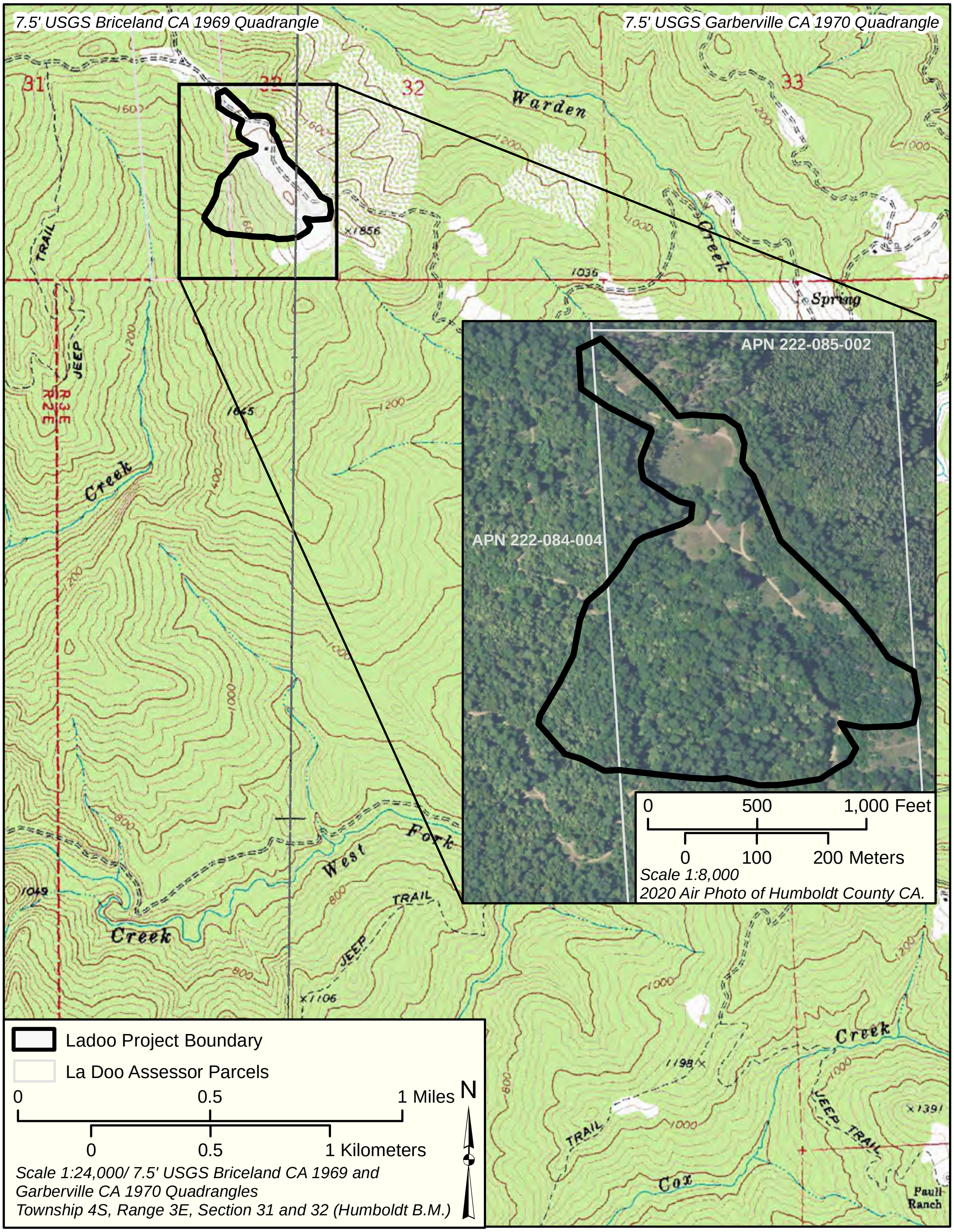
Phone: (707) 834-5347

Fax: ____________________

Email: wcr@williamrichandassociates.com

Project Description: Off-channel water storage

La Doo Pond Project within APNs 222-084-004 and 222-085-002
Briceland, Humboldt County CA
William Rich and Associates - Cultural Resources Investigation



STATE OF CALIFORNIA Gavin Newsom, *Governor*

NATIVE AMERICAN HERITAGE COMMISSION

NAHC HEADQUARTERS
1550 Harbor Boulevard
Suite 100
West Sacramento,
California 95691
(916) 373-3710
nahc@nahc.ca.gov
NAHC.ca.gov

November 21, 2022

William C. Rich
William Rich and Associates

Via Email to: wcr@williamrichandassociates.com

Re: Sproul Creek Flow Enhancement Project, Humboldt County

Dear Mr. Rich:

A record search of the Native American Heritage Commission (NAHC) Sacred Lands File (SLF) was completed for the information you have submitted for the above referenced project. The results were negative. However, the absence of specific site information in the SLF does not indicate the absence of cultural resources in any project area. Other sources of cultural resources should also be contacted for information regarding known and recorded sites.

Attached is a list of Native American tribes who may also have knowledge of cultural resources in the project area. This list should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated; if they cannot supply information, they might recommend others with specific knowledge. By contacting all those listed, your organization will be better able to respond to claims of failure to consult with the appropriate tribe. If a response has not been received within two weeks of notification, the Commission requests that you follow-up with a telephone call or email to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from tribes, please notify me. With your assistance, we can assure that our lists contain current information.

If you have any questions or need additional information, please contact me at my email address: Cameron.vela@nahc.ca.gov.

Sincerely,

Cameron Vela

Cameron Vela
Cultural Resources Analyst

Attachment

Native American Heritage Commission
Native American Contact List
Humboldt County
11/21/2022

Bear River Band of Rohnerville Rancheria
Josefina Cortez, Chairwoman
266 Keisner Road — Mattole
Loleta, CA, 95551 — Wiyot
Phone: (707) 733 - 1900
Fax: (707) 733-1723

Bear River Band of Rohnerville Rancheria
Erika Cooper, Tribal Historic Preservation Officer
266 Keisner Road — Mattole
Loleta, CA, 95551 — Wiyot
Phone: (707) 733 - 1900
Fax: (707) 733-1723

Bear River Band of the Rohnerville Rancheria
Edward "Gusto" Bowie, Cultural Liaison
266 Keisner Rd. — Mattole
Loleta, CA, 95551 — Wiyot
Phone: (707) 733 - 1900
Fax: (707) 733-1723

Big Lagoon Rancheria
Virgil Moorehead, Chairperson
P. O. Box 3060 — Tolowa
Trinidad, CA, 95570 — Yurok
Phone: (707) 826 - 2079
Fax: (707) 826-1737
vmoorehead@earthlink.net

Blue Lake Rancheria
Jacob Pounds, Assistant THPO
428 Chartin Road P. O. Box 428 — Tolowa
Blue Lake, CA, 95525 — Wiyot
Phone: (707) 668 - 5101 — Yurok
jpounds@bluelakerancheria-nsn.gov

Blue Lake Rancheria
Claudia Brundin, Chairperson
428 Chartin Road P.O. Box 428 — Tolowa
Blue Lake, CA, 95525 — Wiyot
Phone: (707) 668 - 5101 — Yurok
Fax: (707) 668-4272
lalbright@bluelakerancheria-nsn.gov

Blue Lake Rancheria
Janet Eidsness, Tribal Historic Preservation Officer
428 Chartin Road P.O. Box 428 — Tolowa
Blue Lake, CA, 95525-0428 — Wiyot
Phone: (707) 668 - 5101 — Yurok
Fax: (707) 668-4272
jeidsness@bluelakerancheria-nsn.gov

Cher-Ae Heights Indian Community of the Trinidad Rancheria
Garth Sundberg, Chairperson
P.O. Box 630 — Miwok
Trinidad, CA, 95570-0630 — Tolowa
Phone: (707) 677 - 0211 — Yurok
Fax: (707) 677-3921
gsundberg@TrinidadRancheria.com

Hoopa Valley Tribe
Byron Nelson, Chairperson
P.O. Box 1348 — Hoopa
Hoopa, CA, 95546
Phone: (530) 625 - 4211
Fax: (530) 625-4594
bighorn1004@hotmail.com

Hoopa Valley Tribe
Keduescha Lara-Colegrove, THPO
P.O. Box 1348 — Hoopa
Hoopa, CA, 95546
Phone: (530) 625 - 4211
hvt.thpo@gmail.com

This list is current only as of the date of this document. Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resource Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources assessment for the proposed Sproul Creek Flow Enhancement Project, Humboldt County.

Native American Heritage Commission
Native American Contact List
Humboldt County
11/21/2022

Karuk Tribe
Alex Watts-Tobin, Tribal Historic Preservation Officer
PO Box 282 — Karuk
Orleans, CA, 95556
Phone: (530) 627 - 3446
Fax: (530) 627-3448
atobin@karuk.us

Karuk Tribe
Russell Attebery, Chairperson
P.O. Box 1016 — Karuk
Happy Camp, CA, 96039
Phone: (530) 493 - 1600
Fax: (530) 493-5322

Round Valley Reservation/ Covelo Indian Community
James Russ, President
77826 Covelo Road — ConCow, Nomlaki, Pit River, Pomo, Wailaki, Wintun, Yuki
Covelo, CA, 95428
Phone: (707) 983 - 6126
Fax: (707) 983-6128
tribalcouncil@rvit.org

Shasta Indian Nation
Sami Jo Difuntorum, Cultural Resource Coordinator
P.O. Box 634 — Shasta
Newport, OR, 97365-0045
Phone: (530) 643 - 2463

Shasta Nation
Roy Hall, Chairperson
10808 Quartz Valley Road — Shasta
Fort Jones, CA, 96032
Phone: (530) 468 - 2314

Tsnungwe Council
Paul Ammon, Chairperson
P.O. Box 373 — Hupa
Salyer, CA, 95563
Phone: (530) 739 - 3828
Fax: (530) 629-3356
tsnungweofcalifornia@gmail.com

Wiyot Tribe
Ted Hernandez, Chairperson
1000 Wiyot Drive — Wiyot
Loleta, CA, 95551
Phone: (707) 733 - 5055
Fax: (707) 733-5601
ted@wiyot.us

Yurok Tribe
Yurok Tribe, NAGPRA Coordinator
P.O. Box 1027 — Yurok
Klamath, CA, 95548
Phone: (707) 482 - 1350
Fax: (707) 482-1377

Yurok Tribe
Rosie Clayburn, Tribal Historic Preservation Officer
190 Klamath Blvd. P. O. Box 1027 — Yurok
Klamath, CA, 95548
Phone: (707) 482 - 1350
rclayburn@yuroktribe.nsn.us

Yurok Tribe
Joe James, Chairperson
PO Box 1027 — Yurok
Klamath, CA, 95548
Phone: (707) 482 - 1350
Fax: (707) 482-1377
jjames@yuroktribe.nsn.gov

This list is current only as of the date of this document. Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resource Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources assessment for the proposed Sproul Creek Flow Enhancement Project, Humboldt County.

October 19, 2022

Distribution List
1. Bear River Band of Rohnerville Rancheria – Josefina Cortez, Chairperson; Edwin Smith, Vice Chairperson; Melanie McCavour, THPO; Edward "Gusto" Bowie, Cultural Liaison
2. InterTribal Sinkyone Wilderness Council – Priscilla Hunter, Board Chair
3. Round Valley Reservation/Covelo Indian Community-James Russ, President; Patricia Rabano, THPO
4. Wailaki Tribe- Louis Hoaglin, Jr.- Chairperson

RE: Cultural Resources Investigation for the Sproul Creek Flow Enhancement Project near Garberville, Humboldt County, CA

Dear Tribal Representative,

William Rich and Associates is conducting a cultural resource investigation for an off-channel water storage project that will augment the flow of La Doo and Sproul Creek during the dry season to improve aquatic habitat. The project area is located approximately 7 miles southwest of Garberville. Specifically, the project is located in Sections 31 and 32, T4S, R3E, as shown on the USGS 7.5' Briceland, CA Topographic Quadrangle (Humboldt B.M.). The project area is indicated on the accompanying map.

We would greatly appreciate any information that would help identify cultural resources in the project area. Any culturally sensitive information that you may disclose to WRA will be held under strict confidentiality and will not be made available to the public. All cultural sites will be documented in accordance to the guidelines established by the State Office of Historic Preservation. A copy of the final report and any completed archaeological site records will be submitted to the California Historical Resources Information System's regional Northwest Information Center.

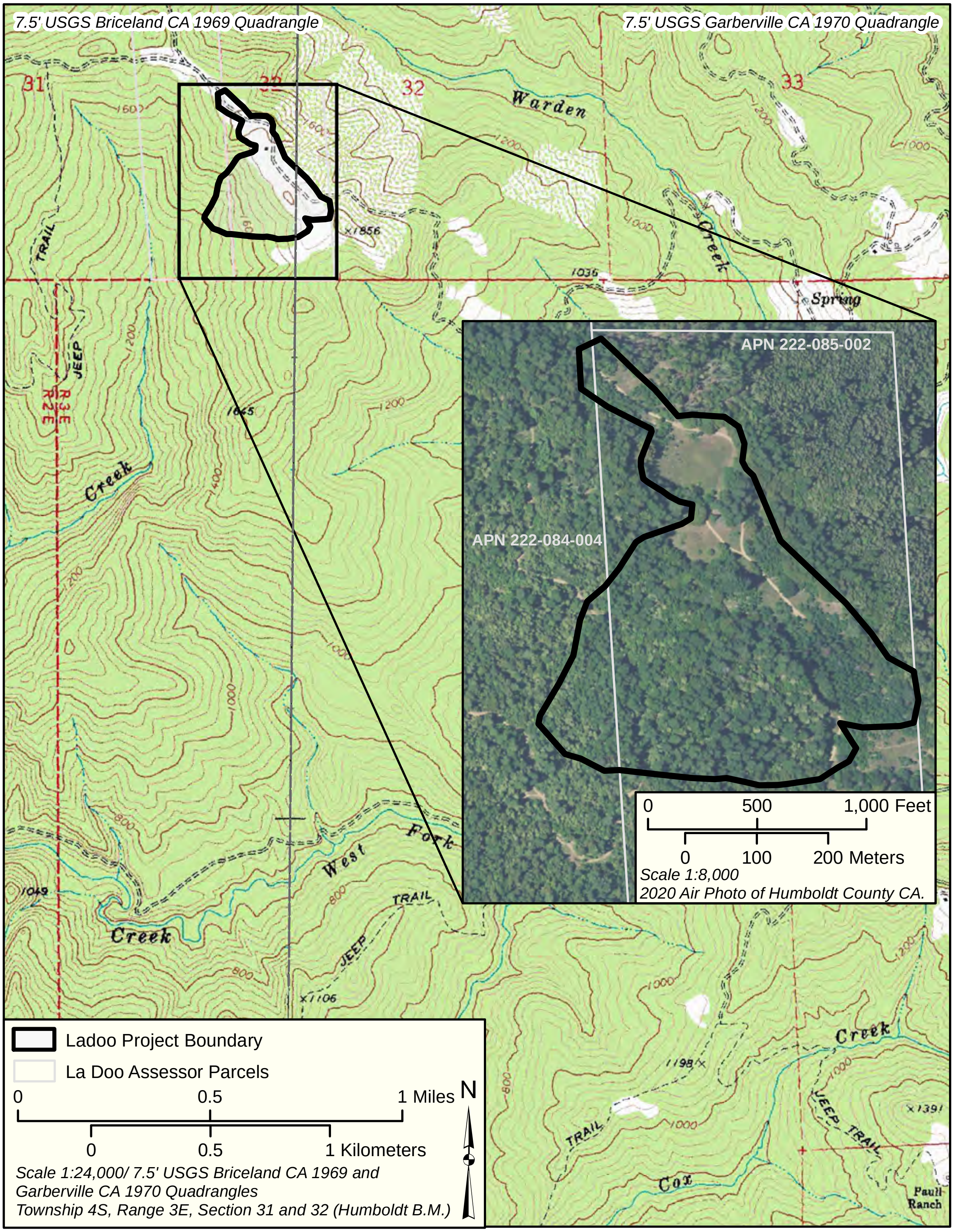
Thank you,

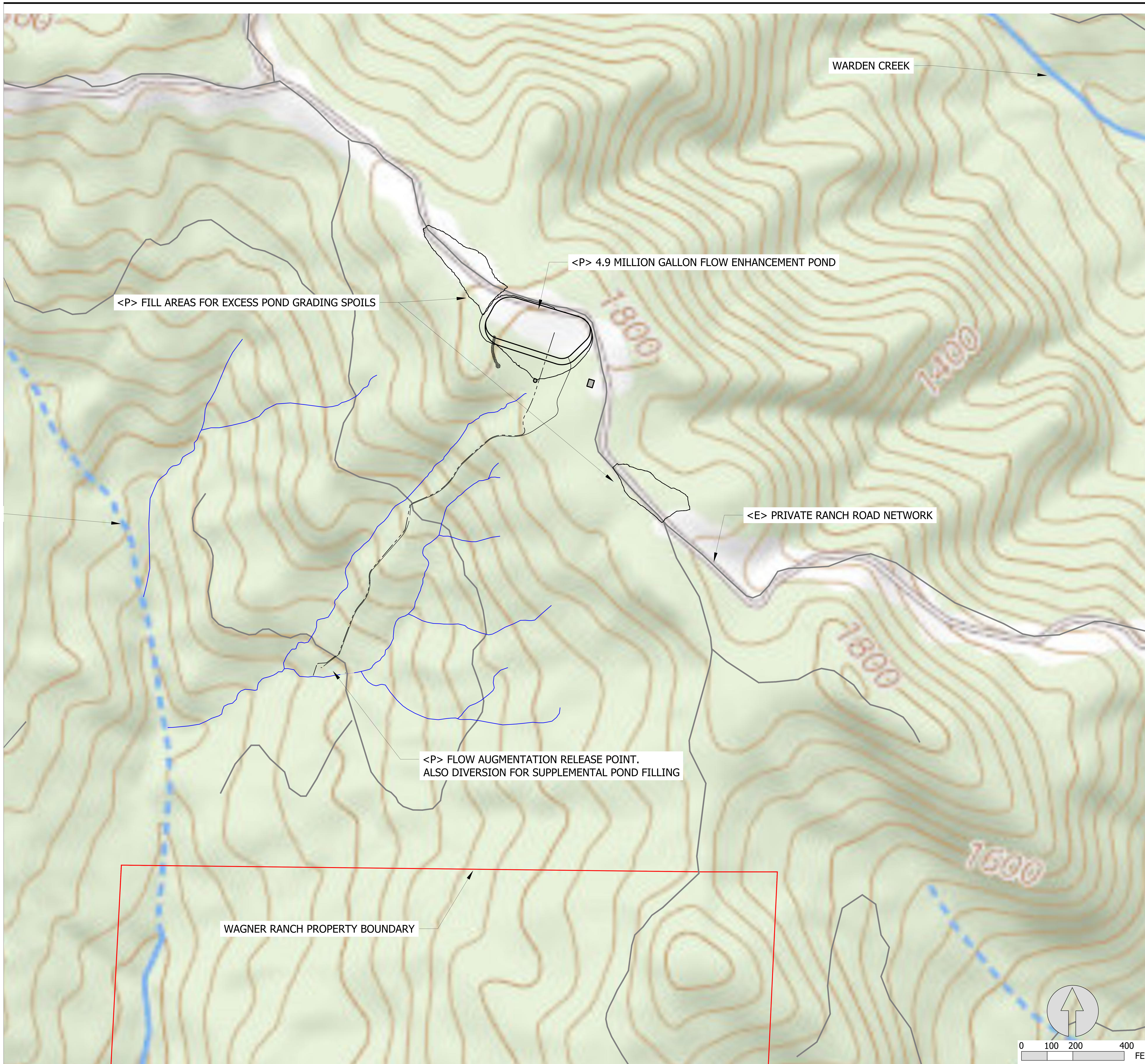
William Rich

William Rich, M.A., RPA
P.O. Box 184, Bayside, CA 95524
wcr@williamrichandassociates.com
(707)834-5347

Enclosures (2)

La Doo and Sproul Creek Project- APNs 222-084-004 and 222-085-002
Briceland, Humboldt County CA
William Rich and Associates - Cultural Resources Investigation





SPROUL CREEK FLOW ENHANCEMENT PROJECT

HUMBOLDT COUNTY, CA

Stillwater Sciences
850 G STREET SUITE K
ARCATA, CA 95521
P: (707) 822-9607

PROJECT NUMBER: 603.03
SCALE: AS NOTED
DATE: 8/18/22

DESIGN: JM
DRAWN: BW,TC
CHECKED: JM
APPROVED: JM

SITE OVERVIEW

SHEET 2 OF 8

Gmail **William <wcr@williamrichandassociates.com>**

Cultural Resources Investigation - Sproul Creek Flow Enhancement

5 messages

William <wcr@williamrichandassociates.com> Wed, Oct 19, 2022 at 11:57 AM
To: William <wcr@williamrichandassociates.com>
Bcc: Melanie Mccavour <melaniemccavour@brb-nsn.gov>, info@sinkyone.org, prabano@rvit.org, tribalcouncil@rvit.org, THPO Bear River Band <THPO@brb-nsn.gov>

Dear Tribal Representative,

Attached is a letter regarding a cultural resources investigation we are conducting near Garberville. It is an off-channel water storage project at La Doo and Sproul Creeks.

Please let me know if you have any questions or concerns.

Thank you!
Bill

William C. Rich, M.A., RPA
Principal Investigator
William Rich and Associates
Cultural Resources Consultants
P.O. Box 184
Bayside, CA 95524
(707) 834-5347

Visit our website - www.williamrichandassociates.com

Sproul_LaDoo_Creeks_Letter_WRA_10_19_2022.pdf
2463K

THPO Bear River Band <thpo@brb-nsn.gov> Wed, Oct 19, 2022 at 4:57 PM
To: William <wcr@williamrichandassociates.com>

We have received the overview and map and wish to convey that the proposed project is in an area with a likelihood of discovery.

Corrections: Josefina's name is Josefina Frank, Edwin Smith is no longer Vice-Chair, and Gusto is no longer cultural liaison.
Our preferred requested mode of communication is electronic. You can send all referrals, requests and archaeological reports (including this one once completed, to Josefina Frank (josefinafrank@brb-nsn.gov), and the THPO email you have used here.
Regards,
--

Melanie McCavour
Tribal Historic Preservation Office Director

Bear River Band of the Rohnerville Rancheria
266 Keisner Road, Loleta, CA 95551
(707) 532-0193

[Quoted text hidden]
--

THPO Bear River Band
Tribal Historic Preservation Office

Bear River Band of the Rohnerville Rancheria
266 Keisner Road, Loleta, CA 95551
(707) 733-1900 x1233

William <wcr@williamrichandassociates.com> Wed, Oct 19, 2022 at 5:01 PM
To: THPO Bear River Band <thpo@brb-nsn.gov>

Thank you Melanie, The names we use are what is listed with the NAHC. We'll make the changes you mention. Thanks.

Bill

[Quoted text hidden]

--

[Quoted text hidden]

Melanie McCavour <melaniemccavour@brb-nsn.gov> Tue, Nov 1, 2022 at 7:05 PM
To: William <wcr@williamrichandassociates.com>

Thank you. Is the report available?

On Wed, Oct 19, 2022 at 11:57 AM William <wcr@williamrichandassociates.com> wrote:

[Quoted text hidden]

--

Melanie McCavour
Tribal Historic Preservation Office Director

Bear River Band of the Rohnerville Rancheria
266 Keisner Road, Loleta, CA 95551
(707) 532-0193

[Quoted text hidden]

William <wcr@williamrichandassociates.com> Tue, Nov 1, 2022 at 7:08 PM
To: Melanie McCavour <melaniemccavour@brb-nsn.gov>

Hi Melanie, Not yet but it will be coming out soon. I'll send you a copy when it's ready. Bill

[Quoted text hidden]

--

[Quoted text hidden]

Gmail

William <wcr@williamrichandassociates.com>

Tribal Consultation

1 message

David Sanchez <ldjlsanchez@hotmail.com> Thu, Oct 20, 2022 at 3:14 PM
To: William <wcr@williamrichandassociates.com>
Cc: "Dorothy Hoaglin@Wailaki" <Dorothyhoaglin@gmail.com>

Hi Bill,

I am writing to let you know what the Wailaki tribe and Wailaki 501c3 are currently working on and to ask for your coordination on specific projects.

[redacted]

[redacted]

I am reaching out to you to begin a formal coordination on such projects that are currently in different phases of work including design, feasibility, CEQA, Implementation, etc. Projects that immediately come to my mind are, [redacted] and The Wagner Ranch Flow Enhancement Project. Of course there are other projects that should include participation by our organization at every relevant stage of project development. Louis Hoaglin, Wailaki Tribal member and ED of the Wailaki 501c3 would be our primary on site consultant.

Please let me know what your availability is to have a conversation with us concerning developing our coordination with you on the projects listed and others that are not.

I am including our Tribal Chairperson, Dorothy Hoaglin by CC.

[redacted]

My best,

David

Pastor David Sanchez, CEO

Wailaki 501c3

P.O. Box 684

Laytonville, CA. 95454

707-223-3946

ldjlsanchez@hotmail.com

Appendix D

Biological Resources Technical Report

DECEMBER 2022

Biological Resources Technical Report for the La Doo Meadow Streamflow Enhancement Project, Humboldt County, California

PREPARED FOR

Salmonid Restoration Federation
425 Snug Alley, Unit D
Eureka, CA 95501

PREPARED BY

Stillwater Sciences
850 G Street, Suite K
Arcata, CA 95521

Stillwater Sciences

Suggested citation:
Stillwater Sciences. 2022. Biological Resources Technical Report for the La Doo Streamflow Enhancement Project, Humboldt County, California. Prepared by Stillwater Sciences, Arcata, California for Salmonid Restoration Federation, Eureka, California.

Cover photos:
Top photo: La Doo meadow. September 29, 2022. Bottom photos: Canyon live oak within Project area (left) and La Doo meadow (right). February 22, 2022. Source: Stillwater Sciences 2022.

Table of Contents

Tables

Figures

Appendices

1 PROJECT BACKGROUND

The Salmonid Restoration Federation (SRF) is planning to construct a 4.9-million-gallon reservoir, diversion structure, pump system, and flow release piping on the Wagner Land Company ownership, in the La Doo Creek watershed, a tributary to Sproul Creek. The primary objective of this project is to deliver approximately 15 gallons per minute of flow augmentation to Sproul Creek during the five-month dry season to improve instream aquatic habitat. This Project seeks to improve habitat for Coho salmon (*Oncorhynchus kisutch*) and steelhead (*Oncorhynchus mykiss*), in Sproul Creek, an important salmon bearing tributary, by addressing the limiting factor of low summer stream flows. Sproul Creek flows into the South Fork Eel River. The South Fork Eel River is one of five priority watersheds selected for flow enhancement projects in California by the State Water Resources Control Board (SWRCB) and California Department of Fish and Wildlife (CDFW) as part of the California Water Action Plan effort (SWRCB 2019). Sproul Creek is a critical tributary to the South Fork Eel River that historically supported Coho and Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead.

Coho salmon have experienced precipitous declines in abundance and are currently listed as threatened under the federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA). Numerous factors are responsible for the declines in Coho salmon abundance, and many of these limiting factors are also impacting Chinook salmon and steelhead, which are also severely depressed in abundance relative to historical population estimates. Land use practices including logging and road systems have greatly increased winter run off resulting in decreased groundwater storage capacity and lower summer streamflows. Widespread removal of large wood from streams has also decreased groundwater storage through channel incision and loss of floodplain connectivity and resulted in fewer and shallower instream pools that are of insufficient size to withstand drought. Cannabis cultivation has also expanded in the last 15 years, which has resulted in increased water diversions that have affected area watercourses and summer stream flows. Industrial logging practices combined with fire suppression have resulted in overly dense even aged forests with higher evapotranspiration rates which significantly contribute to lower dry season flows. The problems of reduced groundwater storage and increased evapotranspiration are intensified during longer dry seasons or drought years. During recent drought years, Sproul Creek has experienced extreme low flow conditions at SRF's downstream monitoring stations along West Fork Sproul Creek and mainstem Sproul Creek.

The Project design is based on the best available science and is informed by the *California Salmonid Stream Habitat Restoration Manual* edition (Flosi et al. 2010), and *Ponds – Planning, Design, Construction* (NRCS USDA 1997). Additionally, the Project is informed by scientific studies and streamflow enhancement techniques that have been used in the Mattole River and Redwood Creek watersheds, California.

1.1 Project Location

The Project is located on a 7.62 acre (ac) area within the 3,348-ac Wagner Land Company ownership, approximately 4.66 miles (mi) east of Benbow, Humboldt County, California (Latitude: 40.067440, Longitude: -123.878105) (Figure 1-1). To the east of the Project is the South Fork Eel River, a tributary to the Eel River and eventually the Pacific Ocean (Figure 1-1). The Project area is in southwest quarter of Section 32, Township 4 South, Range 3 East of the Briceland, U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle. The elevation within the Project area ranges from approximately 1,600 to 1,700 feet (ft) above mean sea level.

The Project can be accessed from Sproul Creek Road after exiting Highway 101 at Garberville, California (Figure 1-1).

1.2 Report Purpose and Organization

This biological resource technical report has been developed to describe the special-status and/or sensitive biological resources in or with potential to occur in the Project area (plants, vegetation communities, fish, wildlife, and wetlands and waters) that may be affected by Project construction activities. Potential impacts on biological resources are discussed along with suggested minimization measures to reduce impacts.

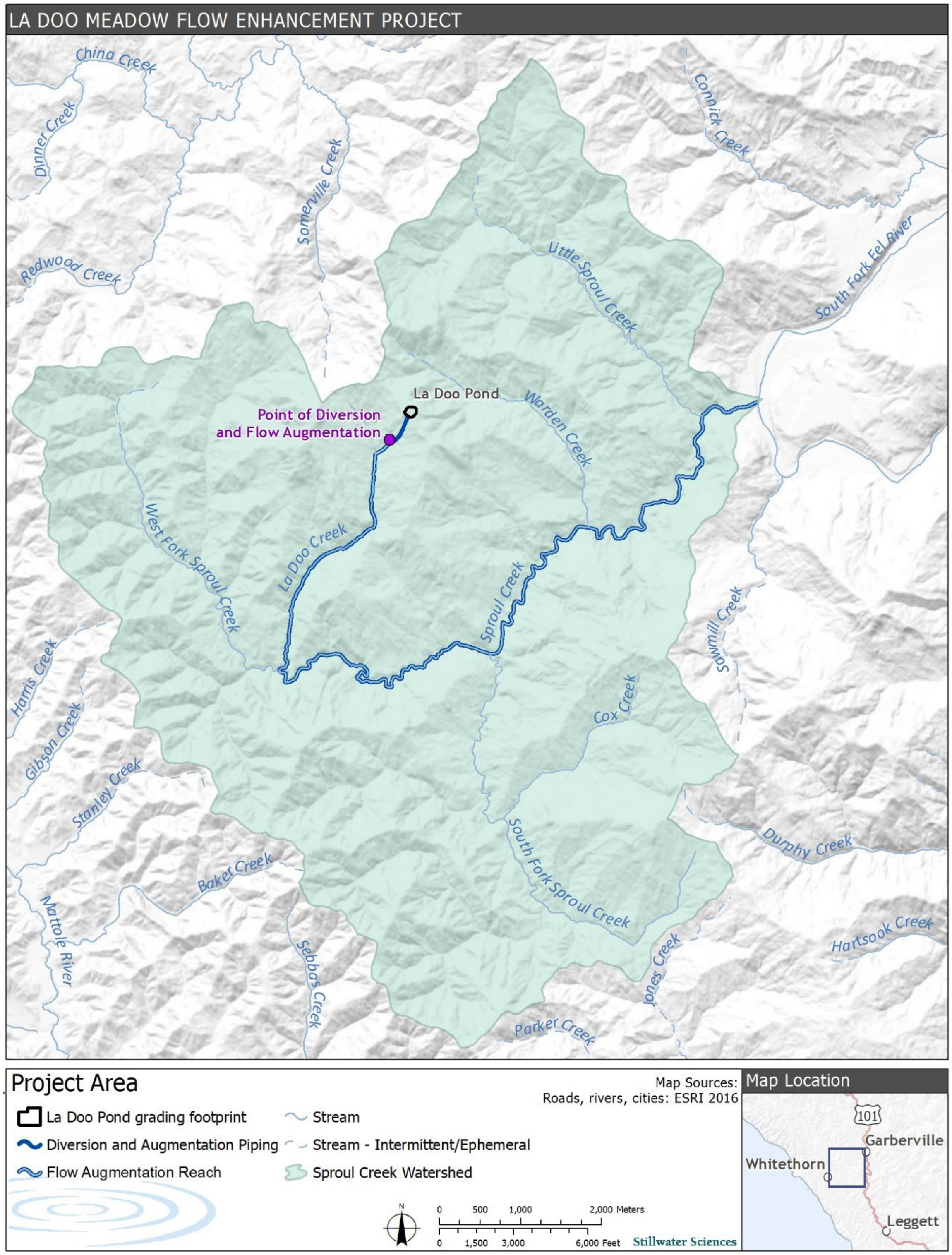


Figure 1-1. Project area.

2 PROJECT DESCRIPTION

The primary objective of this project is construction a 4.9 million gallon of off-channel pond and associated plumbing infrastructure designed to deliver approximately 15 gallons per minute of flow augmentation to Sproul Creek during the 5-month dry season to improve instream aquatic habitat. Storage will be filled with wet-season runoff including rainwater catchment and water pumped from a small Sproul Creek tributary. Other ancillary project components include:

- Construction of a grid-intertie solar power system to offset the energy use and a backup power supply including battery bank, inverter, internet connection, and small control center building to support operations and monitoring capabilities.
- Upgrading access roads within the Project area including road/stream crossing upgrades and gravel surfacing to provide year-round access.

2.1 Site Description

The Project will occur on the Wagner Land Company in the Sproul Creek watershed, which is located south of the town of Briceland in southern Humboldt County (Figure 1-1).

Sproul Creek is a fish-bearing watercourse that is known to contain Coho and Chinook salmon and steelhead. Sproul Creek and its tributaries experience very low or intermittent flows during the summer and fall, impairing habitat for these species. The Project is located in the intermittent flow headwaters of La Doo Creek, which is a tributary of Sproul Creek. According to CDFG (1992), La Doo Creek has a 14-ft-high natural waterfall fish barrier located approximately 53 ft upstream of its confluence with the West Fork Sproul Creek. This barrier restricts all upstream access by fish. CDFG did not observe any fish upstream of the barrier (CDFG 1992). The barrier is located approximately 2.6 mi downstream of the Project area. In addition, CDFG (1992) reported intermittent flow conditions in La Doo Creek beginning 963 ft upstream of its mouth.

Hillslope and stream channel morphologies in the Sproul Creek watershed are similar to those found throughout the western side of the South Fork Eel River basin, due to the prevalence of the underlying Franciscan Coastal Belt terranes. Although there is variability among the terranes, the rock strength in Coastal Belt rocks typically leads to steeper, ridge-and-valley topography with organized drainage networks. Small to large-scale landslides are still common in the basins that drain the Coastal Belt terranes, particularly where sedimentary rocks are less competent and in mélange units.

Sproul Creek tributaries, including Warden and La Doo Creeks to the northeast and southwest of the Project respectively, are typically characterized by narrow, steep-walled canyon slopes that are covered by relatively thin soils and dense conifer and hardwood stands and drained by perennial and intermittent streams. The Project site is located along a broad ridgetop with prairie and oak woodland vegetation, a unique geomorphic feature that is flanked by the steeper slopes.

2.2 Proposed Project

Implementation of the proposed Project will include site preparation, materials procurement and construction of the features described below:

- 4.9 million gallon lined off-channel pond to be filled through rainwater catchment and water diverted and pumped from La Doo Creek during the wet season.

- Diversion and flow release appurtenances including diversion intake, pump, piping, tanks and electrical system.
- 5 KW grid-tie solar energy array.
- Upgrade access roads within the Project area including crossing upgrades and gravel surfacing to provide year-round access to point of diversion.

2.2.1 Off-channel pond

Construction of the off-channel pond will include excavation and construction of an earthen berm and spillway built into the natural topography. Construction will include removal of topsoil from the reservoir area. The topsoil will be saved and spread around the reservoir area along with mulch after construction. All excavated material not used to build the berms will be placed and compacted in several designated fill areas as shown on the plans. The spillways for the reservoir will be engineered for 100-year storm events and armored with 6–12 inch rock armoring.

Outside materials for the reservoir will include rock for the spillways, pond liner, and weed free straw. Heavy equipment will be used for clearing, excavation, compaction and trenching.

The small watershed area to the north and northwest of the pond will be graded and covered with a pond liner, which will then be buried. The purpose of the buried pond liner is to enhance passive rainfall catchment and reservoir filling.

2.2.2 Point of diversion

A stream diversion structure will be installed approximately 0.2 mi downslope from the pond that will feed an adjacent storage tank. The location of the diversion will be located at the outfall of an existing culvert crossing (to be upgraded with the project). Water will be collected into a 5,000-gallon storage tank. Water in the storage tank will be pumped uphill to help fill the reservoir as necessary. Water will only be diverted from the tributary during the wettest months of each year.

2.2.3 Hydraulic appurtenances (piping, valves, pump, etc.)

Water from the 5,000-gallon storage tank will be pumped uphill through a 675-ft-long (215 ft vertical height) 2-inch PVC pipe to where it will be delivered into a second tank with an 8,000-gallon capacity. From that point, a secondary booster pump will transfer the water through 900 ft (230-ft vertical height) of 2-inch PVC pipe to the reservoir.

The primary gravity-fed outflow pipe (1.5-inch PVC) that delivers water from the reservoir to the tributary channel will be installed during construction of the pond. The pipe will run downhill approximately 1,720 feet to where it will discharge into an unnamed intermittent flow tributary to La Doo Creek downstream of the original diversion point. A metered valve will control how much water is released from the reservoir.

2.2.4 Electrical supply

Power to the system will be supplied by an existing Pacific Gas and Electric Company hook-up to the property. A 5 KW grid-tie solar array will be constructed to offset the project's energy use.

2.2.5 Access road improvements

The access roads within the Project vicinity will be improved to provide year-round access for monitoring and maintenance of all Project components. This will include crossing upgrades, reshaping and surfacing with gravel along the road segment between the pond and point of diversion.

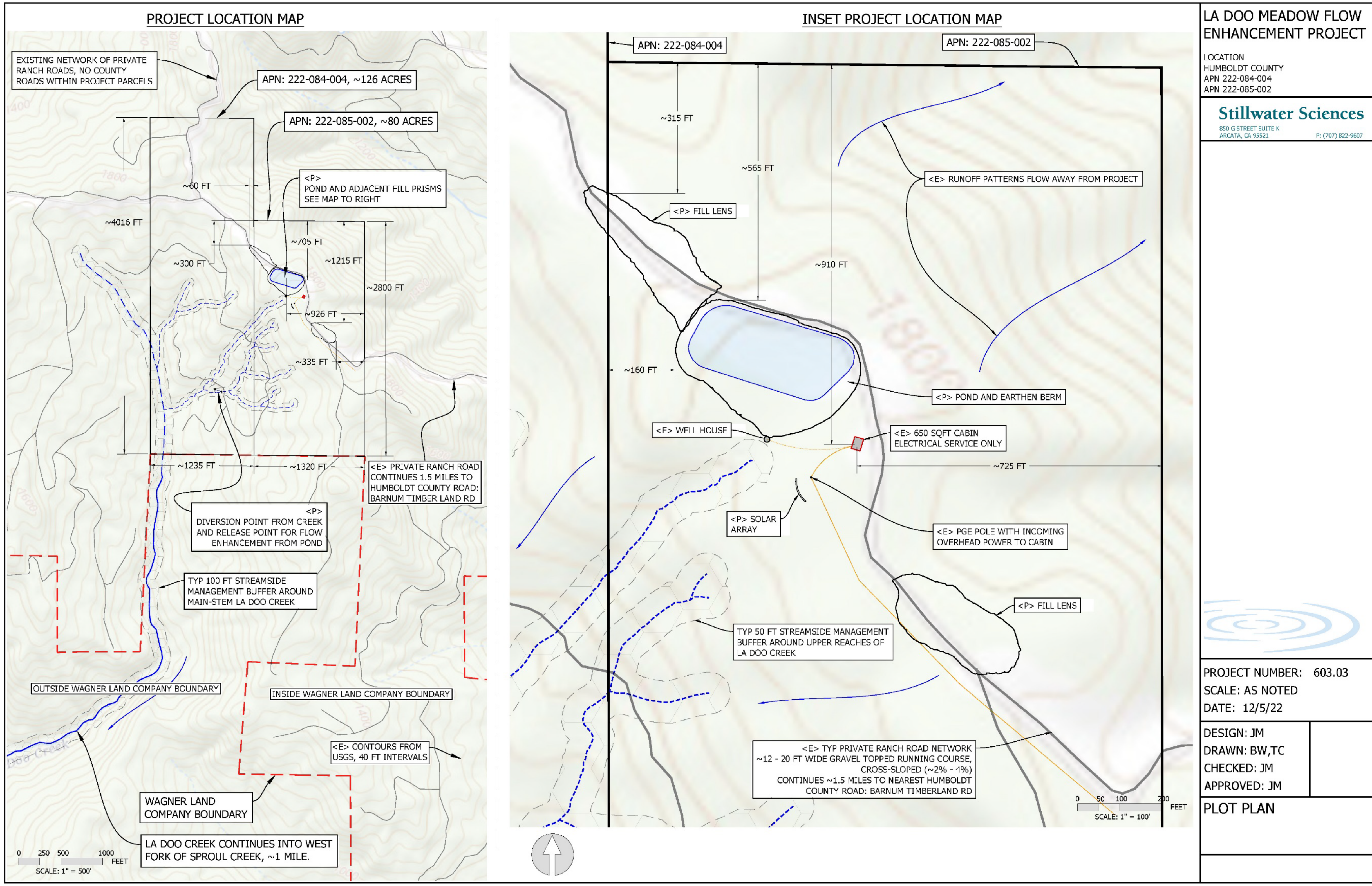


Figure 2-1. Project Site Plan.

3 VEGETATION ASSESSMENT

Vegetation assessments were conducted on 23 September 2022 within the Project area to the alliance or finer associate-level following classification described in the online edition of *A Manual of California Vegetation* (California Native Plant Society [CNPS] 2022a). The resulting vegetation map was used to: (1) determine if any stands are considered sensitive natural communities; (2) assess the likelihood of occurrence for special-status species in the Project area; and (3) inform the Project's potential to impact sensitive natural communities and/or special-status species.

Sensitive natural communities are defined as those with a state ranking of S1, S2, or S3 (critically imperiled, imperiled, or vulnerable; respectively) on CDFW's *California Sensitive Natural Communities List* (CDFW 2022a).

3.1 Methods

3.1.1 Desktop review

Prior to the vegetation assessment, existing information from the CALVEG geodatabase (USDA Forest Service 2019) and the USGS regional geologic map (McLaughlin et al. 2000) on vegetation and soils in the Project area were reviewed.

The CDFW's California Natural Diversity Database (CNDDB) (CDFW 2022b) was queried for the U.S. Geological Survey (USGS) 7.5-minute quadrangle where the Project is located (Briceland), and the surrounding seven quadrangles (Garberville, Honeydew, Shelter Cove, Miranda, Bear Harbor, Piercy, Ettersburg, Harris, and Fort Seward) (hereinafter Project vicinity) to determine if a sensitive natural community (i.e., legacy natural community) was recorded in the Project area.

3.1.2 Field survey

The field survey was conducted by a qualified botanist/ecologist with: (1) experience conducting floristic surveys; (2) knowledge of plant taxonomy and plant community ecology and classification; (3) familiarity with the plant species of the area; and (4) familiarity with appropriate state and federal statutes related to plants and plant collecting. The survey followed the methods of the *CDFW-CNPS Protocol for the Combined Vegetation Rapid Assessment and Relevé Method* (CNPS and CDFW 2019) and *Protocols for Surveying and Evaluating Impacts to Special-Status Native Plant Populations and Natural Communities* (CDFW 2018).

Existing vegetation information from CALVEG (USDA Forest Service 2019) were reviewed prior to the field effort. Representative locations of each stand type observed in the Project area were sampled using the rapid assessment method. Plot size varied based on stand size and vegetation structure. Dominant vegetation and their plant associates, habitat characteristics (e.g., disturbance, substrates/soils, aspects/slopes), known site history, and overall health of the stand were noted on a *CNPS and CDFW Combined Vegetation Rapid Assessment and Relevé Field Form* (CNPS and CDFW 2018). If plant identification was not possible in the field, the plants were collected for identification in the laboratory using the "1 in 20" rule (Wagner 1991) or, if a potential special-status plant, according to the botanists' current CDFW plant voucher collection permit guidelines (e.g., not more than five individuals or 2% of the population, whichever is less, for one voucher sheet). Plants were identified following the taxonomy of *Jepson eFlora* (Jepson Flora Project 2022). Visual estimates of cover were noted for each species as well as its size, strata, and height class. Regeneration within sampling locations was also noted. Photographs were taken at each sampling location to document stand characteristics. A field-assessed vegetation alliance was assigned based on dominant and diagnostic species of the stand. Vegetation sampling points were mapped using a handheld geographic positioning system (GPS) and stand boundaries within the Project area were delineated onto field maps. Data on field maps were digitized onto aerial imagery using geographical information systems (GIS) software.

Each field-assessed vegetation alliance was keyed using the vegetation composition data and the online edition of *A Manual of California Vegetation* (CNPS 2022a) to determine final vegetation alliances. Where applicable, vegetation was characterized and mapped to the finer association level. The finalized vegetation alliance/association names were checked against CDFW's *California Sensitive Natural Communities List* (CDFW 2022a) to determine if any of these types are considered sensitive natural communities. These alliances were also used to further assess the likelihood of occurrence for special-status plants in the Project (see Section 4).

3.2 Results

Vegetation alliances observed in the Project Area are listed in Table 3-1 and presented in Figure 3-1. Descriptions of the vegetation cover types are provided in the sub-sections below, along with representative photographs.

Table 3-.1. Vegetation groups and alliances observed in the Project area.

Cover types	State status[1]	Total area (acres)
Vancouverian and Rocky Mountain naturalized perennial grassland (Group)[2]	S3/S4[2]	2.88
Pseudotsuga menziesii Forest & Woodland Alliance	S4	1.47
Quercus chrysolepis (tree) Forest & Woodland Alliance	S5	3.27
Total		**7.62**

[1] State ranks for natural communities:
S3 Vulnerable—Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation from the state
S4 Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5 Secure—Common, widespread, and abundant in the state.

[2] The vegetation characterization occurred outside of the peak growing season for this grassland cover type. As such, this stand was characterized to the Group level (CNPS 2022a) and further survey work will determine the final grassland alliances and their state ranking in the Project area.

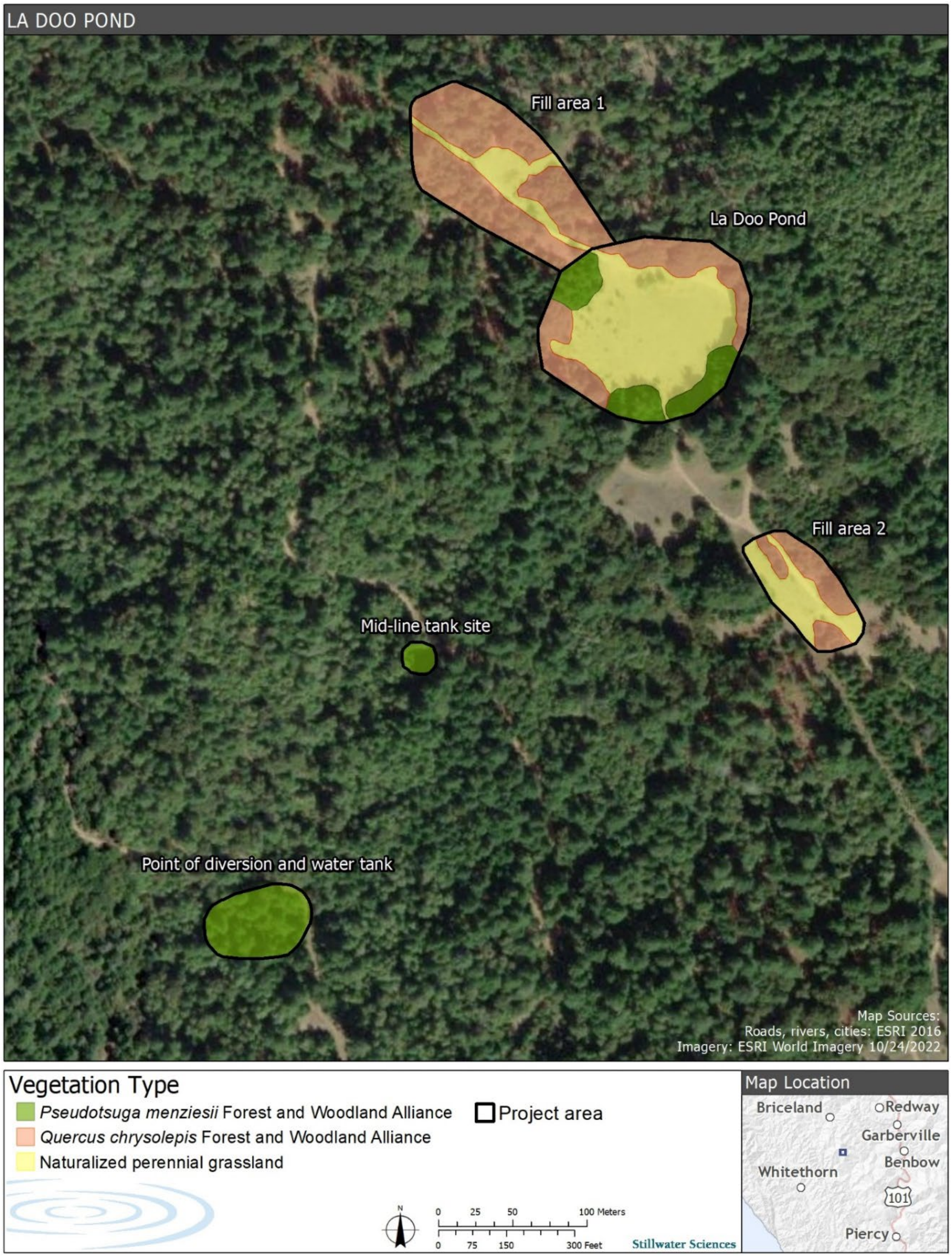


Figure 3-1. Vegetation cover types within the Project area.

3.2.1 *Pseudotsuga menziesii* forest and woodland alliance

The Douglas-fir forest and woodland alliance was composed of continuous canopy cover by Douglas-fir (60%) with moderate cover of *Quercus chrysolepis* (canyon live oak) (15%) and low cover of *Arbutus menziesii* (Pacific madrone) (5–10%). Regenerating tree cover is low (2–5%) and is comprised of *Notholithocarpus densiflorus* (tanoak) and canyon live oak seedlings, and Douglas-fir saplings. Based on the moderate cover of canyon live oak within the Douglas-fir forest, a *Pseudotsuga menziesii* - *Quercus chrysolepis* association is likely. Herbaceous cover was low and was composed of only two species: *Pteridium aquilinum* var. *pubescens* (western brackenfern) (5–10%) and *Iris douglasiana* (Douglas iris) (1–5%). This alliance can occur along all topographical positions and aspects and on varying substrates (CNPS 2022). In the Project area, Douglas-fir forest occurred along the southern access road as well as in the northwestern part of the Project area near the northern access road (Figure 3-1). Both stands are located outside of the Project footprint action area. They contained mature trees with high seedling and sapling cover.

Douglas-fir forest is associated with broadleaved upland forest, north coast coniferous forest, and lower montane coniferous forest habitats. This forest alliance has a total geographic extent of 1.47 ac in the Project area (Table 3-1, Figure 3-1).

3.2.2 *Quercus chrysolepis* forest and woodland alliance

The canyon live oak forest and woodland alliance was composed primarily of canyon live oak along with moderate cover by Douglas-fir and low cover by Pacific madrone and tanoak. The shrub layer consists of canyon live oak, tanoak, and Douglas-fir saplings. Herbaceous cover was sparse and included patches of western brackenfern and Douglas iris. Stands of canyon live oak forest occurred outside of the Project footprint action area. One stand bordered the grassland on the west side of the Project area and another stand bordered the east side of the access road (Figure 3-1). Stands were generally composed of mature trees with little to no seedling and sapling recruitment.

This forest alliance is associated with chaparral, broadleaved upland forest, riparian forest, and lower montane coniferous forest habitats. It is typically located along stream benches and terraces in canyon bottoms and upland slopes on steep, shallow, rocky, infertile soils (CNPS 2022a). It has a total geographic extent of 3.27 ac in the Project area (Table 3-1, Figure 3-1).

3.2.1 Naturalized perennial grassland

This grassland cover type is best characterized within the Vancouverian and Rocky Mountain naturalized perennial grassland group (Sawyer et al. 2008). This group includes alliances that are primarily composed of nonnative grasses. Grasses observed within areas mapped as grassland included *Bromus hordeaceus* (soft chess), *Bromus diandrus* (ripgut brome), *Bromus sitchensis* var. *carinatus* (California brome), *Anthoxanthum odoratum* (sweet vernal grass), *Aira caryophyllea* (silver hair grass), *Cynosurus echinatus* (bristly dogtail grass), *Elymus glaucus* subsp. *glaucus* (blue wild rye), *Agrostis stolonifera* (creeping bent grass), *Holcus lanatus* (common velvet grass), and *Danthonia californica* (California oat grass). Herbaceous vegetation included western bracken fern, *Linum bienne* (flax), *Carduus pycnocephalus* ssp. *pycnocephalus* (Italian thistle), *Mentha pulegium* (pennyroyal), *Plantago lanceolata* (English plantain), *Juncus bufonis* var. *bufonis* (toad rush), and Douglas iris. Small patches of *Baccharis pilularis* (coyote brush) were observed in the grassland. Species dominance varied through the grassland with the nonnative grasses sweet vernal grass and creeping bent grass dominating the lower, central area of the grassland and nonnative grasses blue wild-rye and common velvet grass dominating the upper portion. One isolated wetland depression was noted during the February 2022 site assessment. The grassland was located in the center of the Project footprint action area as well as in the temporary staging area (Figure 3-1). Based on cover totals, this naturalized perennial grassland most closely resembled the *Holcus lanatus* - *Anthoxanthum odoratum* Herbaceous Semi-Natural Alliance, the *Poa pratensis - Agrostis gigantea - Agrostis stolonifera* Herbaceous Semi-Natural Alliance, or the *Festuca idahoensis - Danthonia californica* Herbaceous Alliance (a sensitive natural community with a state rank of S3). An additional survey in the spring will determine the grassland alliance(s) present and its extent in the Project area.

This grassland cover type is associated with valley and foothill grassland habitat and has a total geographic extent of 2.88 ac in the Project area (Table 3-1, Figure 3-1).

4 SPECIAL-STATUS PLANTS

Special-status plant species are defined as those listed, proposed, or under review as threatened or endangered under the federal ESA and/or CESA; designated as rare under the California Native Plant Protection Act; and/or taxa that meet the criteria for listing as described in Section 15380 of the California Environmental Quality Act (CEQA) Guidelines including species listed on the CDFW's *Special Vascular Plants, Bryophytes, and Lichens List* (CDFW 2022c); that have a California Rare Plant Rank (CRPR) of 1, 2, 3 or 4; and/or that are considered a locally significant species (i.e., rare or uncommon in the county or region).

4.1 Methods

4.1.1 Establishing the list of species that could occur in the Project area

A list of special-status plants that may occur in the Project area was developed by querying the following resources:

- The U.S. Fish and Wildlife Service (USFWS) online *Information for Planning and Consultation* (IPaC) (USFWS 2022b),
- The California Native Plant Society's (CNPS) online *Inventory of Rare and Endangered Vascular Plants of California* (CNPS 2022b), and
- CDFW's CNDDB (CDFW 2022b).

The database queries were based on a search of the Project vicinity (as defined in Section 3.1.1). Appendix A (Table A–1) lists special-status plants identified from the sources described above and provides.

The potential for species meeting the above criteria to occur in the Project area was determined by: (1) reviewing the current distribution of each species (i.e., whether it overlaps with the Project area); (2) reviewing the documented occurrence information from the CNDDB; (3) reviewing existing information on vegetation in the CALVEG geodatabase (USDA Forest Service 2019) and soils in the USGS regional geologic map (McLaughlin et al. 2000); (4) comparing the habitat associations of each species with the vegetation alliances and habitat conditions documented in and adjacent to the Project area; and (5) using professional judgement to evaluate habitat quality and the relevance of occurrence data, or lack thereof.

This review and analysis resulted in the following categories of the likelihood for a special-status species to occur in the Project area:

- None: the Project area is outside the species' current distributional or elevation range and/or the species' required habitat is lacking from the Project area (e.g., coastal dunes).
- Low: the species' known distribution or elevation range overlaps with the Project vicinity but not the Project area, and/or the species' required habitat is of very low quality or quantity in the Project area.
- Moderate: the species' known distribution or elevation range overlaps with the Project area and/or the species' required habitat occurs in the Project area.
- High: the species has been documented in the Project area and/or its required habitat occurs in the Project area and is of high quality.

4.1.2 Pre-field review

A pre-field review was conducted to:

- Review key identifying characteristics and life history stages (e.g., bloom time) of the targeted special-status plant species and sensitive natural communities with potential to occur in the Project area,
- Create maps of known locations for targeted special-status plant species and sensitive natural communities within the Project area, and
- Prepare and plan for field surveys.

The timing of life history stages for each targeted plant species (Table B-1) was reviewed to determine survey periods that would coincide with the phenological stage (e.g., flowering or fruiting) during which the special-status species were most easily identified in the field.

To familiarize surveyors with key characteristics and natural variation of those characteristics of each special-status plant species, information was obtained through a review of: (1) CNPS (2022b), CDFW (2022b), and CCH1 Portal (2022) data; (2) photographs on CalPhotos (CalPhotos 2022); and (3) key characteristics using the online *Jepson eFlora* (Jepson Flora Project 2022).

Information on known occurrences of special-status plant species and sensitive natural communities was compiled and plotted in GIS and printed onto field maps.

4.1.3 Field survey

A survey for special-status plant species was performed on September 23, 2022. An additional survey in June 2023 will assess the presence of spring-blooming special-status plants. The survey was conducted by a qualified botanist/ecologist with: (1) experience conducting floristic surveys; (2) knowledge of plant taxonomy and plant community ecology and classification; (3) familiarity with the plant species of the area; (4) familiarity with appropriate state and federal statutes related to plants and plant collecting; and (5) experience with analyzing impacts of a project on native plant species and natural communities. The survey followed the methods of the *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants* (USFWS 2000) and *Protocols for Surveying and Evaluating Impacts to Special-Status Native Plant Populations and Sensitive Natural Communities* (CDFW 2018). Specifically, surveys were comprehensive for vascular plants such that “every plant taxon that occurs on site is identified to the taxonomic level necessary to determine rarity and listing status” (CDFW 2018). If identification was not possible in the field, the plants were collected for identification in the laboratory using the “1 in 20” rule (Wagner 1991) or, if potentially a special-status plant, according to the botanists’ current CDFW plant voucher collection permit guidelines (e.g., not more than five individuals or two percent of the population, whichever is less, for one voucher sheet). All plant species were identified following the taxonomy of the *Jepson eFlora* (Jepson Flora Project 2022).

If documented, the location and population boundaries of any identified special-status species would be recorded in the field using a handheld GPS unit. Information collected for each population would include the following:

- numbers of individuals,
- phenology,

- habitat description (e.g., surrounding plant communities, dominant species, associated species, substrates/soils, aspects/slopes),
- relative condition of the population (i.e., a qualitative assessment of site quality and occurrence viability [excellent, good, fair, or poor]), and
- recognizable risk factors.

In addition, photographs would be taken to document diagnostic floral characteristics, growth forms, and habitat characteristics of special-status species.

4.2 Results

4.2.1 Desktop review

A total of 43 special-status plant species were documented as occurring within the Project vicinity (Appendix A). Alliances documented during the vegetation assessment (Section 3.2) are associated with the following habitats: north coast coniferous forest, broadleaved upland forest, riparian forest, and lower montane coniferous forest (Table 4-1). Twenty-three special-status plants have a likelihood to occur based on their habitat associations and the landform, soils, and known elevation range within the Project area. Of these 23 special-status plants, 16 have low potential to occur (Appendix A) and seven have moderate potential to occur in the Project area (Appendix A and Table 4-1). Of the seven species with moderate potential to occur, none are federally listed, one is listed with the state as endangered, two have a CRPR of 1B (rare, threatened, or endangered in California and elsewhere), two have a CRPR of 2B (rare, threatened, or endangered in California and more common elsewhere), and two have a CRPR of 4 (plants of limited distribution in California, a watch list species) (Table 4-1). Furthermore, only one species, *Piperia candida* (white-flowered rein orchid), has documented occurrences within one mile (mi) of the Project area; all others are located 3.6 to 10 mi from the Project. A late spring survey in June 2023 will capture the blooming period for all special-status plants with low and moderate potential to occur in the Project area (Appendix A).

4.2.2 Field survey

No special-status plant species were observed during the 23 September 2022 botanical survey conducted in the Project area. A comprehensive list of all plant species observed in the Project area from the summer survey is provided in Appendix B. An additional late spring survey in June 2023 will coincide with an appropriate survey window (see Section 4.1.2) for all species with low and moderate potential to occur in the Project area.

Table 4-1. Special-status plant species with moderate potential to occur in the Project area.

Scientific name (common name)	Status (Federal, State, CRPR[1])	Habitat association[2]	Source	Likelihood of occurrence
Astragalus agnicidus (Humboldt County milk-vetch)	None/CE/1B.1	Openings, disturbed areas, and sometimes roadsides in broadleaf upland forest and north coast coniferous forest; 390–2,625 ft. Blooming period: April–September	CNPS, CDFW	**Moderate:** Broadleaf upland and north coast coniferous forest habitats present within Project area. Two occurrences within 5–10 mi of the Project area.
Coptis laciniata (Oregon goldthread)	None/None/4.2	Mesic meadows and seeps and streambanks in north coast coniferous forest; 0–3,280 ft. Blooming period: (February) March–May (September–November)	CNPS, CDFW	**Moderate:** North coast coniferous forest habitat present within Project area. Two occurrences approximately 4.5 mi from the Project area.
Erythronium revolutum (coast fawn lily)	None/None/2B.2	Mesic, streambanks, bogs and fens, broadleaf upland forest, and north coast coniferous forest; 0–5,250 ft. Blooming period: March–July (August)	CNPS, CDFW	**Moderate:** Broadleaf upland and north coast coniferous forest habitats present within Project area. Two occurrences within 5–10 mi of the Project area.
Montia howellii (Howell's montia)	None/None/2B.2	Vernally mesic, sometimes roadsides in meadows and seeps, north coast coniferous forest, and vernal pools; 0–2,740 ft. Blooming period: (February) March–May	CNPS, CDFW	**Moderate:** North coast coniferous forest habitat present within Project area. Two occurrences approximately 3.6 mi from the Project area.
Piperia candida (white-flowered rein orchid)	None/None/1B.2	Sometimes serpentinite in broadleaf upland forest, lower montane coniferous forest, and north coast coniferous forest; 95–4,300 ft. Blooming period: (March) May–September	CNPS, CDFW	**Moderate:** Broadleaf upland, lower montane coniferous, and north coast coniferous forest habitats present within Project area. No ultramafic soils mapped or observed, yet multiple occurrences approximately one mile from the Project area.
Sidalcea malviflora ssp. *patula* (Siskiyou checkerbloom)	None/None/1B.2	Often on roadsides of coastal bluff scrub, coastal prairie, and North Coast coniferous forest; 50–4,035 ft. Blooming period: (March) May–August	CNPS, CDFW	**Moderate: N**orth coast coniferous forest habitats present within Project area. Several occurrences within 5–10 mi of the Project area.

Scientific name (common name)	Status (Federal, State, CRPR[1])	Habitat association[2]	Source	Likelihood of occurrence
Usnea longissima (Methuselah's beard lichen)	None/None/4.2	On tree branches, usually on old growth hardwoods and conifers in broadleaf upland forest and north coast coniferous forest; 160–4,790 ft. Blooming period: N/A (lichen)	CNPS, CDFW	**Moderate:** Broadleaf upland and north coast coniferous forest habitats present within Project area. Multiple occurrences within 5–10 mi of the Project area.

[1] Status:

State:

CE California endangered

California Rare Plant Rank (CRPR):

1B Plants rare, threatened, or endangered in California and elsewhere

2B Plants rare, threatened, or endangered in California, but more common elsewhere

4 Plants of limited distribution, on watchlist

CRPR Threat Ranks:

0.1 Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat)

0.2 Moderately threatened in California (20–80% occurrences threatened / moderate degree and immediacy of threat)

[2] Months in parentheses are uncommon; N/A = Not applicable

5 WETLANDS AND WATERS

Waters and wetlands are under United States Army Corps of Engineers (USACE) jurisdiction pursuant to Section 404 of the Clean Water Act (CWA) regulatory authority and under SWRCB jurisdiction by Section 401 of the CWA. Section 404 of the CWA applies to all waters, including wetlands, that have sufficient nexus to interstate commerce (USACE 1986).

A formal delineation of potential USACE jurisdictional waters or wetlands was not conducted as part of the field assessment; however, a wetland characterization occurred on 22 February 2022 to provide preliminary information on wetland conditions and assist with Project planning.

5.1 Methods

Prior to the wetlands assessment, existing information on vegetation, soils, and hydrology for the site was evaluated. Available data from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey website was reviewed for the Project area and nearby vicinity. Information on potential jurisdictional waters and wetlands in the Project area and nearby vicinity was obtained from the USFWS National Wetlands Inventory (NWI) online application, *Wetlands Mapper* (USFWS 2022a).

Any potential USACE- and/or state-jurisdictional three-parameter wetland observed in the Project area was drawn onto field maps and later digitized using GIS. Evidence of a three-parameter wetland included the observation of at least two of the following wetland parameters: (1) dominant cover by hydrophytic vegetation (i.e., plants with a wetland indicator status of OBL [obligate], FACW [facultative-wet], or FAC [facultative] in the *Western Mountains, Valleys, and Coast Region* [Lichvar et al. 2016]), (2) wetland hydrology (e.g., saturated soils, standing water), and/or (3) mapped hydric soils. Per the 2003 United States Supreme Court issued decision on *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers* (SWANCC), any three-parameter wetland not adjacent or abutting a USACE-jurisdictional water of the U.S. does not fall under federal jurisdiction. Instead, these isolated three-parameter wetlands are potentially state jurisdictional under the *Porter-Cologne Water Quality Control Act at Water Code section 13000 et seq.* (Porter-Cologne Act) by the Regional Water Quality Control Board (RWQCB).

5.2 Results

No wetland features or watercourses were noted in the mapped grassland alliance during the February 2022 site assessment. At the point of diversion site, the intermittent stream channel was considered both USACE- and state-jurisdictional waters and was bound by the top of bank topographic break. No adjacent wetlands to the stream channel were observed.

6 SPECIAL-STATUS FISH AND WILDLIFE

6.1 Methods

An assessment of suitable habitat for special-status fish and wildlife was conducted to inform future analysis of the Project's potential to impact such species. Special-status species are defined as those that are:

- listed as endangered or threatened, or are proposed/candidates for listing, under ESA and/or CESA); and
- designated by CDFW as a Species of Special Concern

6.1.1 Desktop review

The following biological databases were queried for records of special-status fish and wildlife or critical habitat that have potential to occur in the Project area:

- USFWS species list using the USFWS IPaC portal (USFWS 2022b),
- CDFW's CNDDB (CDFW 2022c),
- CDFW's CNDDB northern spotted owl viewer (CDFW 2022c), and
- National Marine Fisheries Service's (NMFS) *California Species List Tools* database (NMFS 2022).

The CNDDB and USFWS database queries were each based on a search of records within the Project vicinity (see Section 3.1.1). The NMFS database query was based on a query of the Briceland quadrangle. Literature on recent occurrences of special-status species in the region was also consulted to determine which special-status species could occur in the Project area.

This review and analysis resulted in the following categories of the likelihood for a special-status species to occur in the Project area:

- None: the Project area is outside the species' current distributional or elevation range and/or the species' required habitat is lacking from the Project area (e.g., coastal dunes).
- Low: the species' known distribution or elevation range overlaps with the Project vicinity but not the Project area, and/or the species' required habitat is of very low quality or quantity in the Project area.
- Moderate: the species' known distribution or elevation range overlaps with the Project area and/or the species' required habitat occurs in the Project area.
- High: the species has been documented in the Project area and/or its required habitat occurs in the Project area and is of high quality.

6.1.2 Fish and wildlife site assessment

A habitat assessment was conducted on 21 February 2022 to evaluate habitat conditions for special-status fish and wildlife species in the in the Project area. The site visit included a field review of the Project area, general characterization of aquatic and wildlife habitat, and photo documentation. The field survey was conducted in the entire pond construction zone and an area extending 250–500 ft into the forest surrounding the proposed reservoir area.

6.2 Results

A total of 14 special-status wildlife species were identified from the database queries as having potential to occur in the Project area (Table 6-1). Suitable habitat for some of the queried species does not occur in the Project area. There are four special-status wildlife species that have a moderate or high potential to occur and/or be affected by Project activities (Table 6-1). Except for anadromous salmonids, species without suitable habitat or with a low potential to occur in the Project area are not discussed further in the main body of this document.

6.2.1 Fish

There are no fish-bearing watercourses within 2.8 mi of the Project area due to a 14-foot-high natural waterfall located at the mouth of La Doo Creek (CDFG 1994). This waterfall forms a complete barrier to upstream fish migration. However, the West Fork Sproul Creek is inhabited by Coho and Chinook salmon, steelhead, and possibly, Pacific lamprey. Brief life history discussions for each species are below.

6.2.1.1 Coho salmon, Southern Oregon/Northern California Coast ESU

The Southern Oregon/Northern California Coast evolutionary significant unit (ESU) for Coho salmon is listed as threatened under the federal ESA (NMFS 2005a) and was listed as threatened under the California ESA in 2005. Critical habitat was designated in 1999 between the Mattole River in California and the Elk River in Oregon, inclusive (NMFS 1999a). Critical habitat includes all accessible streams and waters of estuarine areas. Coho salmon are known to spawn and rear in the South Fork Eel River and its tributaries. Upon emergence from the gravels, Coho fry seek low-velocity areas along shallow stream margins (Shapovalov and Taft 1954). As they grow, juvenile Coho move to deeper habitats, although they continue to prefer low-velocity habitat throughout the rearing period.

Coho salmon adults typically migrate upstream from October through December, and spawn from November through January. Spawning generally occurs in low-gradient stream reaches with gravel and cobble substrates. Females dig nests (redds) in the gravel, and deposit 2,500–5,000 eggs in a sequence of egg pockets, which are fertilized by one or more males (Beacham 1982, Sandercock 1991). Egg development is temperature-dependent, with fry emerging from the gravel in the spring, approximately three to four months after spawning. Upon emergence from the gravels, Coho fry seek low-velocity areas along shallow stream margins (Shapovalov and Taft 1954). As they grow, juvenile Coho move to deeper habitats, although they continue to prefer low-velocity habitat throughout the rearing period. Juveniles typically spend one to two years rearing in fresh water before outmigrating. Emigration from streams to the estuary and ocean generally takes place from February through June. Coho typically spend two years foraging at sea before returning to their natal streams to spawn.

Suitable habitat for Coho salmon spawning and rearing is present in the West Fork Sproul Creek (CDFW 2016). Young-of-the-year Coho salmon were observed in West Fork Sproul Creek during an instream habitat inventory in 2016 (CDFW 2016).

Table 6-1. Special-status fish and wildlife species with moderate to high potential to occur in the Project area.

Species name	Status[1] Federal/ State	Distribution and habitat associations	Location of suitable habitat in Project area	Likelihood of occurrence
Fish				
Oncorhynchus kisutch (Coho salmon – southern Oregon/northern California coast Evolutionarily Significant Unit)	FT, CH/ST	Spawn in coastal streams and large mainstem rivers (e.g., S.F. Eel River and Sproul Creek) in riffles and pool tails-outs and rear in pools ≥ 3 ft deep with overhead cover with high levels oxygen and temperatures between 50–59ºF.	The project is in a swale uphill of an intermittent, high gradient watercourse. No suitable habitat occurs in the Project area.	**None**: Natural 14-ft waterfall barrier near mouth of La Doo Creek.
Oncorhynchus tshawytscha (Chinook salmon – California Coastal ESU*)*	FT, CH/None	Wild coastal, spring, and fall-run Chinook found in streams and rivers between Redwood Creek, Humboldt County to the north and the Russian River, Sonoma County to the south.	The project is in a swale uphill of an intermittent, high gradient watercourse. No suitable habitat occurs in the Project area.	**None**: Natural 14-ft waterfall barrier near mouth of La Doo Creek.
Oncorhynchus mykiss (Steelhead – northern California coast Distinct Population Segment)	FT, CH/None	Inhabits small coastal streams to large mainstem rivers with gravel-bottomed, fast-flowing habitat for spawning. However, habitat criteria for different life stages (spawning, fry rearing, juvenile rearing) can vary significantly.	The project is in a swale uphill of an intermittent, high gradient watercourse. No suitable habitat occurs in the Project area.	**None**: Natural 14-ft waterfall barrier near mouth of La Doo Creek.
Entosphenus tridentatus (Pacific lamprey)	None/SSC	Similar to anadromous salmonids, inhabits coastal streams and rivers with gravel-bottomed, fast-flowing habitat for spawning. Ammocoetes rear in backwater areas with sand, silt, and organic material for 4 to 10 years before migrating to the ocean.	The project is in a swale uphill of an intermittent, high gradient watercourse. No suitable habitat occurs in the Project area.	**None**: Natural 14-ft waterfall barrier near mouth of La Doo Creek.

Species name	Status[1] Federal/ State	Distribution and habitat associations	Location of suitable habitat in Project area	Likelihood of occurrence
Amphibians				
Rana boylii (foothill yellow-legged frog)	None/SSC, CT	Associated with partially shaded, shallow streams, and riffles with rocky substrate. Some cobble-sized substrate required for egg laying. Adults move into smaller tributaries after breeding.	Suitable habitat is present and breeding likely occurs in Sproul Creek downstream of Project area.	**Moderate**: Suitable dispersal habitat present.
Ascaphus truei (Coastal tailed frog)	None/SSC	Associated with perennial and montane streams in hardwood conifer, redwood, Douglas-fir, and ponderosa pine habitats. Inhabits cold, clear, permanent rocky streams in wet forests. Tadpoles require water temperatures below 15°C (59°F).	Suitable habitat may occur in within the perennial reach of La Doo Creek downstream of the tributary containing the point of diversion.	**Moderate**: Suitable habitat may be present downstream of the Project area.
Taricha rivularis (red-bellied newt)	None/SSC	Ranges from southern Humboldt to Sonoma counties. Found in streams during breeding season. Moist habitats under woody debris, rocks, and animal burrows.	Suitable habitat may occur downstream of the tributary containing the point of diversion.	**Moderate**: Suitable habitat may be present.
Rhyacotriton variegatus (southern torrent salamander)	None/SSC	Coastal redwood, Douglas-fir, mixed conifer, montane riparian and montane hardwood-conifer habitats. Seeps and small streams in coastal redwood, Douglas-fir, mixed conifer, montane riparian, and montane hardwood-conifer habitats. Seeps and springs need to be relatively unembedded with fine sediment.	Suitable habitat occurs in high-gradient gravelly seeps and springs within redwood and montane riparian habitat types. May occur within isolated seeps or the perennial reach of La Doo Creek.	**Moderate**: High-gradient seeps and perennial flow may be present downstream of the tributary containing the point of diversion.
Dicamptodon tenebrosus (coastal giant salamander)	None/SSC	Northern Humboldt County to British Columbia. Wet coastal forests in or near clear, cold permanent and semi-permanent streams and seepages.	Suitable habitat occurs in the Sproul Creek and tributaries. Suitable habitat is present in La Doo Creek.	**High**: Suitable habitat present downstream of the Project area.

Species name	Status[1] Federal/ State	Distribution and habitat associations	Location of suitable habitat in Project area	Likelihood of occurrence
Birds				
Strix occidentalis caurina (Northern spotted owl)	FT/ST	Typically found in large, contiguous stands of mature and old-growth coniferous forest with dense multi-layered structure.	Suitable nest/roosting habitat is present southwest of the Project area. Habitat within the Project area is suitable for foraging. The nearest NSO activity center (HUM0282) is located 0.5 mi west-southwest of the diversion area.	**Moderate**: Suitable foraging habitat exists in the Project area.
Brachyramphus marmoratus (Marbled murrelet)	FT/SE	Associated with mature conifers (i.e., redwood and Douglas-fir) for nesting. During the breeding season, may be present 6–8 mi inland.	A small stand of mature, widely spaced conifers is located outside of Project Area. However, no suitable habitat within or adjacent to the Project area.	**None**: No suitable habitat.
Reptiles				
Emys marmorata (western pond turtle)	None/SSC	Ponds, marshes, rivers, streams, and irrigation ditches with abundant vegetation, and either rocky or muddy bottoms, in woodland forest and grasslands. Below 6,000 ft elevation. Basking sites are required. Egg-laying sites are located on suitable upland habitats (grassy open fields) up to 1,640 ft from water.	Suitable habitat may occur in lower Sproul Creek and the South Fork Eel River. However, there are no ponds of suitable watercourses on the Wagner Ranch or neighboring properties.	**None**: No suitable habitat.

Species name	Status[1] Federal/ State	Distribution and habitat associations	Location of suitable habitat in Project area	Likelihood of occurrence
Mammals				
Arborimus pomo (Sonoma tree vole)	None/SSC	Associated nearly exclusively with Douglas-fir trees and occasionally grand fir trees within the north coast fog belt between the northern Oregon border and Sonoma County. Eats Douglas-fir needles exclusively.	Early to late-seral Douglas-fir stands are present adjacent to the Project area, which could provide nesting and foraging habitat.	**Moderate**: Suitable habitat is present in timber stands adjacent to the Project area
Pekania pennanti (Pacific fisher – West Coast DPS)	None/SSC	Associated with dense advanced-successional conifer forests, with complex forest structure and high percent canopy closure; den in hollow trees and snags.	Habitat in the Project area does not correspond to the dense advanced-successional forest this species prefers. Nearest recorded sighting is approximately 7 mi to the southeast near Cooks Valley.	**Low**: Potential suitable habitat is present in the timber adjacent to the Project area.
Antrozous pallidus (pallid bat)	None/SSC	Found throughout California. Roosts in rock crevices, outcrops, cliffs, mines, and caves; trees (underneath exfoliating bark of pine and oak) and in basal hollows; and a variety of vacant and occupied structures (e.g., bridges) or buildings. Roost individually or in small to large colonies (hundreds of individuals). Feeds low to or on the ground in a variety of open habitats, primarily on ground-dwelling arthropods. Forages most frequently in riparian zone, in open oak savannah, and open mixed deciduous forest. Drinks at stream pools.	Suitable foraging habitat throughout most of the Project area. An old hunting cabin is in the Project area.	**Moderate**: May be present in the trees or cabin in the Project area.

[1] Status:

Federal

FT Federal Threatened

State

ST Threatened

SSC CDFW species of special concern

6.2.1.2 Chinook salmon, California coastal ESU

California coastal Chinook salmon were listed in 1999 as threatened under the federal ESA (NMFS 1999b). The California coastal Chinook salmon ESU extends from the Klamath River (exclusive) south to the Russian River (inclusive). Critical habitat for the species was designated in 2005 (NMFS 2005b) and includes the South Fork Eel River and Redwood Creek.

Chinook salmon in the California coastal ESU exhibit life history characteristics of the fall-run ecotype. In California, most adult fall-run Chinook enter streams from August through November, with peak arrival usually occurring in October and November. Spawning occurs from early October through December. Upon arrival at the spawning grounds, adult females dig shallow depressions or pits in gravel and cobble substrate, deposit eggs in the bottom during the act of spawning, and then cover them with additional gravel. Female fall-run Chinook deposit an average of about 5,500 eggs. Egg incubation generally lasts between 40 to 90 days at water temperatures of 42.8 to 53.6°F, and the alevins remain in the gravel for two to three weeks before emerging from the gravel. Fall-run Chinook salmon fry usually begin migrating downstream soon after emergence in February or March, with outmigration continuing into late-July. Chinook spend two or more years at sea before migrating back to their natal streams to spawn.

Suitable habitat for Chinook salmon spawning and rearing may be present in the West Fork Sproul Creek.

6.2.1.3 Steelhead, Northern California Coast DPS

The Northern California Coast steelhead DPS was listed as threatened in 2006 under the federal ESA (NMFS 2006). The Northern California Coast steelhead DPS extends from Redwood Creek in Humboldt County to the Gualala River in Mendocino County (inclusive). Critical habitat for the species was designated in 2005 (NMFS 2005b). Critical habitat includes the South Fork Eel River and its tributaries, including Redwood Creek.

Adult winter steelhead generally begin migrating to spawning areas in October, with the peak migration in December through February. Steelhead spawning occurs in mainstems, tributaries, and intermittent streams in December through May. Spawning occurs in gravel and cobble substrates where the female digs an egg pocket and deposits her eggs, which are fertilized externally by one or more males. Redds typically consist of a series of egg pockets that excavated and subsequently covered during redd construction process. Unlike Chinook and Coho salmon, steelhead typically do not remain on the spawning grounds for extended periods to defend the completed redd to reduce the potential for superimposition. Egg development time is inversely proportional to water temperature and varies from about 19 days at 60°F to about 80 days at 42°F. Fry typically emerge from the gravel two to three weeks after hatching. Upon emerging from the gravel, fry move to shallow edgewater habitats to rear, and gradually move into deeper habitats as they grow. During winter, when water temperatures are cold, juveniles are less active and hide in the interstitial spaces between cobbles and bounders. Juvenile steelhead typically rear in fresh water for two to three years prior to migrating downstream to the estuary and ocean. Steelhead spend between six months and three years at sea before returning to their natal streams to spawn. Unlike salmon, steelhead are capable of repeat spawning.

Suitable habitat for steelhead spawning and rearing is present for steelhead in the West Fork Sproul Creek. Young-of-the-year and Age 1+ steelhead were observed in West Fork Sproul Creek during an instream habitat inventory in 2016 (CDFW 2016).

6.2.1.4 Pacific lamprey

The Pacific lamprey is a large, widely distributed anadromous species that rears in fresh water before outmigrating to the ocean, where it grows to full size (approximately 16–28 inches) prior to returning to freshwater streams to spawn and ultimately die. The species is distributed across the northern margin of the Pacific Ocean, from central Baja California north along the west coast of North America to the Bering Sea in Alaska and off the coast of Japan. Adults migrate into and spawn in a wide range of river systems, from short coastal streams to tributaries of large rivers.

Pacific lampreys typically spawn from March through July depending on water temperatures and local conditions such as seasonal flow regimes (Kan 1975, Brumo et al. 2009, Gunckel et al. 2009). Spawning generally occurs at daily mean water temperatures from 50–64°F, with peak spawning around 57–59°F (Stone 2006, Brumo 2006). Redds are typically constructed by both males and females in gravel and cobble substrates within pool and run tailouts and low gradient riffles into which eggs are deposited (Stone 2006, Brumo et al. 2009, Gunckel et al. 2009).

Hatching occurs following about 15 days of incubation, the egg-sac larval stage spend another 15 days in the redd gravels during which time they absorb the remaining egg sac, until they emerge at night and drift downstream (Brumo 2006). After drifting downstream, the eyeless larvae, known as ammocoetes, settle out of the water column and burrow into fine silt and sand substrates that often contain organic matter. Within the stream network they are generally found in low-velocity, depositional areas such as pools, alcoves, and side channels (Torgensen and Close 2004). Depending on factors influencing growth rates, they rear in these habitats from 4 to 10 years, filter-feeding on algae and detrital matter prior to metamorphosing into the adult form (Pletcher 1963, Moore and Mallatt 1980, van de Wetering 1998). During metamorphosis, Pacific lampreys develop eyes, a suctoral disc, sharp teeth, and more-defined fins (McGree et al. 2008).

After metamorphosis, smolt-like individuals known as macrophthalmia migrate to the ocean—typically in conjunction with high-flow events between fall and spring (van de Wetering 1998, Goodman et al. 2015). In the ocean, Pacific lampreys feed parasitically on a variety of marine fishes (Richards and Beamish 1981, Beamish and Levings 1991, Murauskas et al. 2013). They are thought to remain in the ocean, feeding for approximately 18–40 months before returning to fresh water as sexually immature adults, typically from winter to early summer (Kan 1975, Beamish 1980, Starcevich et al. 2014, Stillwater Sciences and Wiyot Tribe Natural Resources Department 2016).

Pacific lamprey are known to occur in the South Fork Eel River and its tributaries. The West Fork Sproul Creek has suitable spawning and rearing habitat for this species.

6.2.2 Wildlife

6.2.2.1 Foothill yellow-legged frog

The Foothill yellow-legged frog is a California species of special concern in Humboldt County. Within California, foothill yellow-legged frogs were historically found in the Sierra Nevada foothills, up to elevations of approximately 6,000 ft, and in the Coast Range from the Oregon state border south to the San Gabriel River in southern California (Stebbins 2003). Currently, populations are thought to have disappeared from the southern Sierra Nevada foothills, in areas south of the Transverse ranges, and along the coast south of Monterey County (Jennings and Hayes 1994).

Foothill yellow-legged frogs are typically found in perennial streams or rivers, and intermittent creeks with pools. The species often breeds in open and sunny, low-gradient stream reaches near junctions with tributary streams, due to the proximity of adult overwintering habitat in tributaries and to the presence of boulders and cobbles in these locations. Egg deposition usually occurs in cobble bars or under large boulders in areas of low-velocity flow. Tadpoles show affinity to the oviposition site, remaining in edgewater habitat with substrate interstices, vegetation, and/or detritus for cover. Adults prefer areas with exposed basking sites and cool, shady areas adjacent to the water's edge.

No foothill yellow-legged frogs were observed within or adjacent to the Project area during the field survey in February 2022. Suitable habitat for foothill yellow-legged frog breeding occurs in the South Fork Eel River where the channel widens and the tree canopy opens to allow sun to reach the channel for several hours a day. Suitable breeding and larval rearing habitat for foothill yellow-legged frog may be present in some locations in Sproul Creek. No suitable breeding habitat is in the Project area. However, dispersal habitat may be present in La Doo Creek.

6.2.2.2 Coastal tailed frog

The coastal tailed frog is a California species of special concern. The current distribution of coastal tailed frogs in California extends from the Oregon border to approximately Anchor Bay, Mendocino County and about as far east as near Big Bend, Shasta County (Stebbins 2003, Jones et. al. 2005).

Males of this species have a cloacal "tail", which is used for copulation and internal fertilization. Coastal tailed frog mating occurs in the summer and early fall, while oviposition is delayed until the following June or early July (Sever et al. 2001). Coastal tailed frogs inhabit cold (41–65°F [5–18.5°C]) (Brown 1975), fast-flowing, high gradient, perennial mountain streams that flow through Douglas-fir, coast redwood, Sitka spruce, western hemlock, and ponderosa pine stands from sea level to near timber line (Stebbins 2003). Tailed frogs forage along streams and in adjacent forest stands at night and rest during the day in interstitial spaces of large submerged substrate of high gradient riffles or on moist stream banks (Daugherty and Sheldon 1982, Leonard et al. 1993). Inland, higher elevation, or higher latitude populations may seek cover under large, downed logs and boulders for overwintering sites during cold periods (Daugherty and Sheldon 1982). In milder, coastal climates, coastal tailed frogs may remain active year-round.

There are no records of coastal tailed frogs inhabiting La Doo Creek, but potential habitat may be present in the perennial flow reach downstream of the intermittent tributary containing the diversion release location.

6.2.2.3 Red-bellied newt

The red-bellied newt is a California species of special concern. In California, this species is found along the coast from near Bodega, Sonoma County, to near Honeydew, Humboldt County, and inland to Lower Lake and Kelsey Creek, Lake County. It lives in coastal woodlands, especially redwood forests.

Adults are terrestrial and become aquatic when breeding. Terrestrial animals spend the dry summer in moist habitats under woody debris, rocks, in animal burrows. Adults forage on the forest floor for a variety of invertebrates. Adults move toward streams in late February at the start of the breeding season, which extends into May. Females lay eggs under rocks or attached to submerged roots in rocky streams and rivers with moderate to fast flow. Incubation takes between two weeks to one month. Larval development to metamorphosis occurs in about four to six months, at which time they emerge from the streams and go terrestrial. Juveniles spend most of their time underground and are not active on the surface until near sexual maturity, which occurs at about four to six years of age.

Suitable habitat may be present within the Project area. However, no records exist on this species being within several miles of the Project area.

6.2.2.4 Southern Torrent Salamander

Southern torrent salamander is California species of special concern and is distributed in California along the humid coastal drainages from the Oregon border to approximately Point Arena in Mendocino County (Stebbins 2003). Southern torrent salamanders are found in rocky headwater streams in mesic late-successional forest or nearby riparian forests, though the species may be found in younger stage forests in coastal northern California (Welsh and Lind 1996, Jones et al. 2005).

Reproduction likely occurs along the shallow margins of streams, springs, and seeps (Jones et al. 2005). Egg development time is very slow; eggs from salamander species in the same genus generally take around 200 days to hatch (Jones et al. 2005). Larval development takes 3–3.5 years, and an additional 1–1.5 years is needed to reach sexual maturity (Jones et al. 2005). Larvae generally occur in cold (44–59°F [6.5–15°C]), low-velocity flows over loose, coarse rock or rubble substrates with low sedimentation (Welsh and Lind 1996). Adults are usually found in contact with cold water though may occasionally be found in moist upland areas (Jones et al. 2005). In previously logged forests, southern torrent salamanders have been found to be more abundant in higher-gradient reaches (Corn and Bury 1989, Diller and Wallace 1996), whereas in old-growth forests the species does not show as strong an association (Corn and Bury 1989; Welsh et al. 1998).

CDFG (1992) reported intermittent flow conditions in La Doo Creek beginning 962 ft upstream of its mouth. Suitable habitat may occur in La Doo Creek within seep locations or the perennial flow reach downstream of the intermittent tributary containing the diversion release location.

6.2.2.5 Coastal giant salamander

The coastal giant salamander is a CDFW species of special concern and is the largest terrestrial salamander in North America. This species occurs from northern Mendocino County to southwestern British Columbia. This species occurs in wet, humid coastal forests, particularly in Douglas fir, redwood, red fir, and montane and valley-foothill riparian habitats with cold permanent and semi-permanent rocky streams and seepages.

Breeding takes place mostly in the spring, usually in May, within hidden water-filled nest chambers beneath logs or stones. Males deposit up to 16 spermatophores. Females pick up one to a few of the sperm caps with their cloacas and deposit their entire clutch of 135 to 200 eggs (larger females deposit more eggs) in the nest chamber. The eggs are attached singly, side-by-side, usually on the roof of the nest chamber (Nussbaum et al. 1983). The female guards the nest. Larvae hatch in six to eight months. The larval period lasts for 18–24 months, depending on environmental conditions. Adults can be either aquatic or terrestrial forms. Aquatic adults use stream habitats and terrestrial adults use cover objects such as logs, leaf litter, rocks, or subterranean tunnels (Nussbaum et al. 1983). Terrestrial adults are active migrating on rainy nights (Zeiner et al. 1988).

Habitat is present within the Sproul Creek and its tributaries downstream from the Project area.

6.2.2.6 Northern spotted owl

The northern spotted owl is federally and state-listed as threatened. Critical habitat has been designated for this species, but it is not present within or adjacent to the Project area. Northern spotted owls are uncommon year-round residents in the northern California coastal ranges from Marin County north, as well as within the Cascade Range in northern California, southeast to the Pit River in Shasta County below 7,600 ft (Harris 1993, Gutiérrez et al. 1995, USFWS 2010). South of Burney in the southern Cascade Range and Sierra Nevada, the northern spotted owl is replaced by the California spotted owl (*Strix occidentalis occidentalis*) (Gutiérrez et al. 1995).

Northern spotted owls are typically associated with complex mature or old-growth stands dominated by conifers, particularly redwoods with hardwood understories (Pious 1994, USFWS 2011). Roosting sites are characterized by dense canopy cover dominated by large-diameter trees (i.e., greater than 30-in diameter at breast height [dbh]), multiple canopy layers, and north-facing slopes, often in cool shady areas (Gutiérrez et al. 1995, Courtney et al. 2004). Nests tend to be found in tree or snag cavities, on platforms (e.g., abandoned raptor or raven nests, squirrel nests, mistletoe brooms, or debris accumulations), or on broken-top snags (Zeiner et al. 1990a). Northern spotted owls are generally monogamous, forming long-term pair bonds that often last for life (Courtney et al. 2004). In late February or early March, pairs begin roosting in cavities, the tops of broken trees, or abandoned nests; nesting is followed by peak breeding in April and May (Zeiner et al. 1990a, Gutiérrez et al. 1995, Courtney et al. 2004). Northern spotted owls generally lay a single clutch of one to four eggs (Gutiérrez et al. 1995). A pair may use the same nesting location for several years, although breeding may not occur every year (Zeiner et al. 1990a).

Primary prey items for northern spotted owls are small mammals, but birds and insects are also taken (Forsman et al. 1984, Zeiner et al. 1990a). Foraging habitats vary more than roosting and nesting habitats, but are similarly characterized by high canopy closure and complex structure (Thomas et al. 1990). Open areas are also important foraging areas in northern California, as the abundance and diversity of prey is higher in early successional habitats (Folliard et al. 2000). Spotted owls are likely to forage in stands that are young enough to contain an abundance of prey, such as woodrats, but are old enough to allow the owls to fly under the canopy (Thome et al. 1999).

Suitable nesting habitat for northern spotted owl may be present adjacent to the Project area. Suitable foraging habitat is present in the Project area. The forest to the southwest of the Project area is dominated by a stand of 12- to 30-inch dbh Douglas-fir with lesser amounts of hardwoods. No evidence (pellets, nests, whitewash on trees or forest floor, etc.) of owl nesting or occupancy was observed in this area. The nearest NSO activity center (HUM0282) is located 0.5 miles west-southwest of the diversion structure area. A pair of owls were recorded at this activity center in 2019 by Green Diamond Resource Company biologists. A single male was identified at this same activity center in 2022. However, a nest and young were not observed during either observation (CDFW 2022c).

6.2.2.7 Sonoma tree vole

The Sonoma tree vole is a California species of special concern. In California, the Sonoma tree vole is restricted to coastal forests in the humid fog belt from Sonoma County north to the

Klamath mountains (Williams 1986, Jameson and Peeters 2004, Adam and Hayes 1998). Distribution of Sonoma tree voles in many parts of their range is patchy (Hall 1981), but this species can be locally common (Williams 1986).

The Sonoma tree vole is a nocturnal rodent that is active year-round (Zeiner et al. 1990b). This species lives, nests, and feeds within the forest canopy, though males are rarely terrestrial (Williams 1986). The home range usually consists of one or more trees (Brown 1985, as cited in Carey 1991). Both sexes construct nests of Douglas-fir needles, typically located 6–18 m (20–60 ft) above the ground in branches or against trunks of Douglas-fir trees (Williams 1986). In cases where nests were found in species other than Douglas-fir, grand fir, and redwood, nests were on branches interlocking with branches of Douglas-fir. Breeding occurs throughout the year, peaking from February through September. The young are weaned at 30–40 days (Zeiner et al. 1990b). The diet of the red tree vole consists of needles, buds, and the tender bark of twigs of Douglas-fir, western hemlock, grand fir, and Bishop pine (Williams 1986, Wooster 1996). Needle resin ducts are removed before the remaining part is eaten. Young needles may be consumed entirely (Harris 1990). Tree voles obtain water from food or by licking dew or rainwater from coniferous trees (Maser 1965). Where present, tree voles are a common component of spotted owl diets (Forsman et al. 2004).

In Mendocino County, nests have occasionally been located on open ridge tops and in previously heavily logged and/or grazed areas (Wooster 1996). The predominant tree species used by Sonoma tree voles is Douglas-fir, with larger trees able to support colonies of tree voles (Meiselman 1987, Carey 1991, Wooster 1996, Thompson and Diller 2002, Jones 2003). Based on a study by Thompson and Diller (2002), tree voles are hypothesized to start colonizing in tree stands as young as around 20 years old. Density of active vole nests increases significantly as stands mature beyond 20 years old (Thompson and Diller 2002). Tree voles have also been documented nesting in tanoak, presumably due to its common occurrence in many Douglas-fir stands (Thompson and Diller 2002).

Although a stand search for nests and resin ducts (discarded after feeding on fir needles and used for nesting material) did not yield evidence of occupancy by this species, suitable habitat for Sonoma Tree vole is present in the Douglas-fir-dominated forest surrounding the Project area.

6.2.2.8 Pallid bat

Pallid bat is a California species of special concern. This species occurs year-round in California. Pallid bats are associated with a variety of habitats from desert to coastal regions. At low- to mid-elevations, they are particularly associated with oak habitat (oak savannah, black oak, and oak grasslands) (Pierson and Rainey 2002). In natural settings, day and night roosts are in rock crevices and cliffs, but can also be found in trees (underneath exfoliating bark of pine and oak and in hollows) and caves (Sherwin and Rambaldini 2005, Hermanson and O'Shea 1983, Pierson et al. 2001, Pierson and Rainey 1996). However, in more urban settings (e.g., Central Valley and western Sierran foothills), day and night roosts are frequently associated with human structures such as abandoned buildings, old mine workings, and bridges (Sherwin and Rambaldini 2005, Pierson and Rainey 1996, Pierson et al. 2001). Overwintering roosts require relatively cool and stable temperatures out of direct sunlight. Pallid bats primarily forage in open spaces away from water. They can feed on the ground, on vegetation, and in the air by using a 'wing-cupping' method that forces the prey to the ground (Sherwin and Rambaldini 2005). Their generalist diet consists primarily of large ground-dwelling or slow flying insects and arachnids (Zeiner et al. 1990b), but can also include scorpions (pallid bats are immune to the sting), small rodents, and lizards.

The Project area does not contain tunnels, caves, or mines for roosting; however, suitable roosting habitat for the species occurs within the forest south of the Project area. Suitable foraging habitat for pallid bat occurs throughout the Project area.

7 POTENTIAL EFFECTS AND MINIMIZATION MEASURES

7.1 Special-status Plants and Sensitive Natural Communities

No special-status plant species were observed during the late summer botanical survey conducted in the Project area on 23 September 2022. An additional comprehensive floristic survey will be conducted in June 2023 to further determine whether any special-status plants occur within the Project area. There are no records of special-status plant occurrences within the Project area based on the 2022 CDFW CNDDB queries (Section 4.1) (CDFW 2022b) and collection records in the Consortium of California Herbaria (ucjeps.berkeley.edu/consortium).

In our region, grassland alliances featuring a dominant component of *Danthonia californica* (California oatgrass) are listed as sensitive natural communities. An additional vegetation assessment in Spring will determine the grassland alliance. If the vegetation classification determines a sensitive grassland community is present, the extent will be mapped to determine whether project impacts will affect this sensitive natural community. Measures to minimize impacts on the sensitive grassland would be to increase California oatgrass cover in suitable areas outside of the project action area by broadcasting seed procured from an approved seed vendor.

Furthermore, an additional action option to enhance the existing *Quercus chrysolepis* forest alliance, an intact mature forest community in the Project area, would be to decrease Douglas-fir encroachment. Douglas-fir encroachment inhibits oak growth by piercing the canopy and out-competing oaks as oaks are shade intolerant and thrive in an open canopy with full sunlight. Cutting back/thinning Douglas-fir in the Project area would open the canopy and allow for more canyon live oak recruitment. An open tree canopy will become important for providing conditions to facilitate seedling establishment (Caldeira et al. 2014).

The following minimization measures will be implemented to reduce potential impacts on sensitive natural communities during Project activities:

- The Project footprint will be minimized to the extent possible.
- Ground disturbance and vegetation clearing and/or trimming will be confined to the minimum amount necessary to facilitate Project implementation.
- Heavy equipment and vehicles will use existing access roads to the extent possible.
- Construction materials will be stored in designated staging areas.
- Measures to prevent the spread of invasive weeds and sudden oak death pathogens will be taken, including, where appropriate, inspecting equipment for soil, seeds, and vegetative matter, cleaning equipment, utilizing weed-free materials and native seed mixes for revegetation, and proper disposal of soil and vegetation. Prior to entering and leaving the work site, workers will remove all seeds, plant parts, leaves, and woody debris (e.g., branches, chips, bark) from clothing, vehicles, and equipment.

7.2 Wetlands and Waters

Construction activities associated with the proposed streamflow enhancement Project (i.e., point of diversion location) have the potential to affect preliminary waters of the U.S. as some of the work will take place within the active stream channel. The following minimization measures will be implemented to minimize any potential negative impacts on these waters and avoid impacting waters outside of the Project footprint:

- The Project footprint will be minimized to the extent possible.
- Heavy equipment and vehicles will use existing access roads to the extent possible.
- Work will be conducted during the dry season to the extent possible.
- Construction materials will be stored in designated staging areas.
- The following erosion, sediment, material stockpile, and dust control best management practices will be employed on-site:
    - Locate temporary storage areas away from vehicular traffic
    - Locate stockpiles a minimum of 50 ft away from concentrated flows of storm water, drainage courses, and inlets
    - Protect all stockpiles from storm water run-on using a temporary perimeter sediment barrier such silt fences, compost socks, or sandbag barriers.
    - Keep stockpiles covered or protected with soil stabilization measures to avoid direct contact with precipitation and to minimize sediment discharge.
    - Implement wind erosion control practices as appropriate on all stockpiled material.
- All construction equipment will be well maintained to prevent leaks of fuels, lubricants, or other fluids and extreme caution will be used when handling chemicals (fuel, hydraulic fluid, etc.). Service and refueling procedures will not be conducted where there is potential for fuel spills to seep or wash into wetlands or waters. Appropriate materials will be on-site to prevent and manage any spills.

7.3 Special-status Fish and Wildlife

7.3.1 Fish

Coho and Chinook salmon, and steelhead are special-status fish species known to occur in the West Fork Sproul Creek, downstream of the Project area and La Doo Creek. No direct impacts on these species would occur from Project construction activities. Indirect Project-related impacts on these species could result from discharge of sediment from reservoir and infiltration gallery excavation, and diversion construction. However, long-term beneficial impacts would accrue Coho salmon and steelhead from water entering La Doo and West Fork Sproul Creek from reservoir/infiltration gallery inputs. Benefits for juvenile Chinook salmon would be limited since they typically migrate to the ocean prior to the planned water releases associated with the Project.

The following measures will be employed by the Project to avoid, minimize, or mitigate indirect sediment-related impacts on special-status fish species and their habitat.

- Excavation of the pond may expose groundwater. Turbid water produced during the Project would be contained within the Project area, thereby avoiding impacts on downstream salmonids. Any turbid water within the confined work areas would be pumped to a receiving site outside the channel or to frak tanks.
- Discharge of sediment will be controlled and minimized with the implementation of best management practices (BMPs) on all disturbed soils that have the potential to discharge

into area watercourses. Applicable BMPs include, but are not limited to, installation of silt fences, straw wattles, and placement of seed-free rice straw. BMPs will be installed at all access points to the work sites, which will minimize the potential for sediment delivery and deleterious effects on salmonids.

There is also the potential for accidental release of hydrocarbons into La Doo Creek during construction operations. The following measures will be implemented to minimize the accidental release of hydrocarbons.

- All fueling and servicing of heavy equipment will occur at least 100 ft from any watercourse.
- Spill kits will be on-site in case of an accidental release of fuels, lube oil, or hydraulic fluids from equipment.

7.3.2 Wildlife

7.3.2.1 Foothill yellow-legged frog

The construction of the reservoir, diversion structure, and water augmentation release structures will take place in open meadow and intermittent flow areas not utilized by foothill yellow-legged frogs.

Water releases associated with the Project would result in the persistence of surface flows, which should benefit foothill yellow-legged frogs by maintaining and potentially expanding the amount of instream habitat available for any frogs that disperse into La Doo Creek after breeding and metamorphosis.

If water flow is present in the construction areas while operations are underway, the following species-specific conservation measures will be employed to avoid or minimize the potential for impacts on foothill yellow-legged frogs:

- A visual observation survey of the Project areas will be conducted within two weeks prior to the start of operations to determine if adult and juvenile foothill yellow-legged frogs are present in the Project area.
- If foothill yellow-legged frogs are present, then a qualified CDFW-approved biologist will be present immediately prior to the start of operations to remove any frogs and relocate them to suitable habitat.
- The Project manager or qualified designee will conduct daily morning inspections of the area slated for work to determine if foothill yellow-legged frogs entered the areas overnight. Any individuals will be captured and relocated by a CDFW-approved biologist prior to the start of the construction work for the day.

The following additional general conservation measures will be employed to further avoid or minimize the potential impacts on foothill yellow-legged frogs:

- Erosion control BMPs will be implemented to reduce any sediment delivery-related impact on frog habitat.
- All fueling and servicing of heavy equipment will occur at least 100 ft from any watercourse.
- Spill kits will be on-site in case of an accidental release of fuels, lube oil, or hydraulic fluids from equipment.

7.3.2.2 Coastal tailed frogs

The construction of the reservoir, diversion structure, and water augmentation release structures will take place in open meadow and intermittent flow areas not utilized by tailed frogs.

Water releases associated with the Project would result in the persistence of surface flows, which may provide some benefit to tailed frogs by maintaining and potentially expanding the amount of instream habitat available for any frogs that may occupy La Doo Creek.

If water flow is present in the construction areas while operations are underway, the following species-specific conservation measures will be employed to avoid or minimize the potential for impacts on tailed frogs:

- A visual observation survey of the Project areas will be conducted within two weeks prior to the start of operations to determine if adult and juvenile tailed frogs are present in the Project area.
- If tailed frogs are present, then a qualified CDFW-approved biologist will be present immediately prior to the start of operations to remove any frogs and relocate them to suitable habitat.
- The Project manager or qualified designee will conduct daily morning inspections of the area slated for work to determine if tailed frogs entered the areas overnight. Any individuals will be captured and relocated by a CDFW-approved biologist prior to the start of the construction work for the day.

The following additional general conservation measures will be employed to further avoid or minimize the potential impacts on tailed frogs:

- Erosion control BMPs will be implemented to reduce any sediment delivery-related impact on frog habitat.
- All fueling and servicing of heavy equipment will occur at least 100 ft from any watercourse.
- Spill kits will be on-site in case of an accidental release of fuels, lube oil, or hydraulic fluids from equipment.

7.3.2.3 Red-bellied newt

Adult and juvenile red-bellied newts would likely be occupying terrestrial areas during the operation period and could be affected by heavy equipment that collapses burrows or moves woody debris.

The following conservation measures will be employed to avoid or minimize the potential for take of red-bellied newt:

- Terrestrial woody debris will be left in place to the greatest extent practicable during operations within the riparian areas.
- The Project manager or qualified designee will conduct daily morning inspections of the area slated for work to determine if adult newts are present on the ground surface. Any newts will be captured and relocated prior to the start of the day’s work. Prior to the initiation of any instream work in areas with surface water, a qualified biologist will survey the site to determine larval newt presence. If red-bellied newts are present, then a qualified CDFW-approved biologist will be present immediately prior to the start of operations to remove any individuals and relocate them in suitable habitat.

The Project would result in the persistence of surface flow, which may benefit red-bellied newts by maintaining and potentially expanding the amount of instream habitat available for breeding and larval development.

7.3.2.4 Southern torrent and coastal giant salamanders

The construction of the reservoir, diversion structure, and water augmentation release structures will take place in open meadow and intermittent flow areas not utilized by southern torrent salamanders.

Water releases associated with the Project would result in the persistence of surface flows, which may provide some benefit to southern torrent salamanders by maintaining and potentially expanding the amount of instream habitat available for any salamanders that may occupy La Doo Creek. If flow releases are too warm, there is potential for negative impacts which will be mitigated as described below.

If water flow is present in the construction areas while operations are underway, the following species-specific conservation measures will be employed to avoid or minimize the potential for impacts on southern torrent salamanders:

- A visual observation survey of the Project areas will be conducted within two weeks prior to the start of operations to determine if adult and juvenile southern torrent salamanders are present in the Project area.
- If salamanders are present, then a qualified CDFW-approved biologist will be present immediately prior to the start of operations to remove any salamanders and relocate them to suitable habitat.
- The Project manager or qualified designee will conduct daily morning inspections of the area slated for work to determine if salamanders entered the areas overnight. Any individuals will be captured and relocated by a CDFW-approved biologist prior to the start of the construction work for the day.

The following additional general conservation measures will be employed to further avoid or minimize the potential impacts on southern torrent salamanders:

- Erosion control BMPs will be implemented to reduce any sediment delivery-related impact on salamander habitat.
- All fueling and servicing of heavy equipment will occur at least 100 ft from any watercourse.
- Spill kits will be on-site in case of an accidental release of fuels, lube oil, or hydraulic fluids from equipment.

The long-term operations of the flow augmentation project has the potential to adversely impact salamander habitat in the immediate vicinity of the flow release if water temperature of the released flow is too high. The following construction, long-term operations and adaptive management approaches will be utilized to avoid or minimize potential impacts:

- Flow augmentation will be released from the bottom of the pond and through a buried water line typically providing flow release temperatures of approximately 60 degrees F.
- The project will include continuous water temperature measurements in the pond and at the point of flow release.

- A minimum of one secondary flow release point upslope from the primary flow release point will be included in the project design to facilitate hyporheic flow prior to the flow augmentation entering salamander habitat.
- The flow releases will be adaptively managed to minimize water temperature impacts to salamanders to the greatest extent feasible.

7.3.2.5 Northern spotted owls

The closest northern spotted owl activity center (HUM0282) is approximately 0.5 miles away from the Project area and recent surveys (i.e., within the last four years) have not documented nesting within this activity center. Nesting habitat does not occur within the Project area but does within in the adjacent forest. The Project activities do not include removal of any trees that could provide habitat for owls. Therefore, there will not be any direct impacts on northern spotted owls or their habitat. However, there is the potential for construction-related noise to affect northern spotted owls that may be on adjacent properties or away from the Project area.

The potential for Project construction to indirectly impact nesting northern spotted owls was preliminary evaluated using USFWS (2006) guidelines. Owls can be affected by noise-related, visual, or physical disturbances, such as created by heavy equipment. USFWS (2006) estimated the distance that sound associated with different types of construction equipment could disturb northern spotted owls during the breeding season, relative to ambient noise levels. Most types of standard construction equipment (e.g., backhoes, bulldozers, construction vehicles, etc.) would require disturbance buffers of 330–1,320 ft from nesting spotted owl activity centers. No Project activities utilizing these types of equipment are expected to occur within 1,320 ft of a northern spotted owl nest. In addition, as stated above, recent surveys have not found nesting northern spotted owls with the closest known activity center. Therefore, northern spotted owls are unlikely to be indirectly affected by the Project.

7.3.2.6 Sonoma tree vole

Suitable habitat for Sonoma tree voles is present in the timber stand adjacent to the Project area. The Project will not occur within the forest nor remove any trees; therefore, there will be no impact on this species.

7.3.2.7 Pallid bat

Suitable habitat for pallid bats is present in the timber stand adjacent to the Project area. The Project will not occur within the forest nor remove any trees or structures that could be occupied by this species; therefore, there will be no impact on pallid bat.

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Appendices

Appendix A

Scoping List of CNDDB Special-status Plant Species in the Project Vicinity

Table A-1. Comprehensive scoping list of special-status plants in the Project vicinity.

Scientific name (common name)	Lifeform	Status (Federal, State, CRPR[1])	Habitat associations and blooming period[2]	Source	Likelihood of occurrence
Antennaria suffrutescens (evergreen everlasting)	perennial stoloniferous herb	None/None/4.3	Serpentine in lower montane coniferous forest; 1,640–5,250 ft. Blooming period: January–July	CNPS	**None:** Serpentine soils not present within Project area.
Arabis Macdonaldian (McDonald's rockcress)	perennial herb	FE/CE/1B.1	Serpentine soils of lower and upper montane coniferous forest; 445–5,905 ft. Blooming period: May-July	USFW	**None:** Serpentine soils not present within Project area.
Astragalus agnicidus (Humboldt County milk-vetch)	perennial herb	None/CE/1B.1	Openings, disturbed areas, and sometimes roadsides in broadleaf upland forest and north coast coniferous forest; 390–2,625 ft. Blooming period: April–September	CNPS, CDFW	**Moderate:** Broadleaf upland and north coast coniferous forest habitats present within Project area. Two occurrences within 5–10 miles of the Project area.
Calamagrostis bolanderi (Bolander's reed grass)	perennial rhizomatous herb	None/None/4.2	Mesic bogs and fens, broadleaf upland forest, closed-cone coniferous forest, coastal scrub, mesic meadows and seeps, freshwater marshes and swamps, and north coast coniferous forest; 0–1,495 ft. Blooming period: May–August	CNPS	**Low:** Broadleaf upland and north coast coniferous forest habitats present within Project area. No occurrences within 10 mi of the Project.
Calamagrostis foliosa (leafy reed grass)	perennial herb	None/CR/4.2	Rocky coastal bluff scrub and north coast coniferous forest; 0–4,005 ft. Blooming period: May–September	CNPS, CDFW	**Low: N**orth coast coniferous forest habitats present within Project area, but most observations are along coastal bluffs, in open landscapes, or on rocky substrate. Two coastal occurrences within 10 miles of Project area.
Carex arcta (Northern clustered sedge)	Perennial herb	None/None/2B.2	Bogs, fens, and mesic areas of North Coast coniferous forest; 195–4,595 feet. Blooming period: June - September	CNPS, CDFW	**Low: N**orth coast coniferous forest habitats present within Project area, but mesic areas are of little quantity. One occurrence within 5-10 miles of the Project area.

Scientific name (common name)	Lifeform	Status (Federal, State, CRPR[1])	Habitat associations and blooming period[2]	Source	Likelihood of occurrence
Castilleja litoralis (Oregon coast paintbrush)	perennial herb (hemiparasitic)	None/None/2B.2	Sandy coastal bluff scrub, coastal dunes, and coastal scrub; 45–330 ft. Blooming period: June	CNPS, CDFW	**None**: Two coastal occurrences ~ 10 miles from Project area, but Project area does not have suitable habitat and is outside of the known elevation range.
Castilleja mendocinensis (Mendocino Coast paintbrush)	perennial herb (hemiparasitic)	None/None/1B.2	Coastal bluff scrub, closed-cone coniferous forest, coastal dunes, coastal prairie, and coastal scrub; 0–525 ft. Blooming period: April–August	CNPS, CDFW	**None**: No suitable habitat present within the Project area, and Project area is outside of the known elevation range.
Ceanothus gloriosus var. *exaltatus* (glory brush)	perennial evergreen shrub	None/None/4.3	Chaparral; 95–2,000 ft. Blooming period: March–June (August)	CNPS	**None:** No suitable habitat present within the Project area.
Clarkia amoena subsp. *whitneyi* (Whitney's farewell-to-spring)	annual herb	None/None/1B.1	Coastal bluff scrub and coastal scrub; 30–330 ft. Blooming period: June–August	CNPS, CDFW	**None:** No suitable habitat present within the Project area, and Project area is outside of the known elevation range.
Coptis laciniata (Oregon goldthread)	perennial rhizomatous herb	None/None/4.2	Mesic meadows and seeps and streambanks in north coast coniferous forest; 0–3,280 ft. Blooming period: (February) March–May (September–November)	CNPS, CDFW	**Moderate:** North coast coniferous forest habitat present within Project area. Two occurrences approximately 4.5 miles from the Project area.
Epilobium septentrionale (Humboldt County fuchsia)	perennial herb	None/None/4.3	Serpentine slopes and rocky/sandy ledges of broadleaf upland forest and North Coast coniferous forest. Blooming period: July–September	CNPS	**None:** No suitable habitat present within the Project area.
Erigeron biolettii (streamside daisy)	perennial herb	None/None/3	Rocky, mesic areas in broadleaf upland forest, cismontane woodland, and north coast coniferous forest; 95–3,610 ft. Blooming period: June–October	CNPS	**None:** No suitable habitat present within the Project area.
Erythronium oregonum (giant fawn lily)	perennial herb	None/None/2B.2	Sometimes serpentinite, rocky, openings in cismontane woodland and meadows and seeps; 325–3,775 ft. Blooming period: March–June (July)	CNPS, CDFW	**None:** No suitable habitat present within the Project area.

Scientific name (common name)	Lifeform	Status (Federal, State, CRPR[1])	Habitat associations and blooming period[2]	Source	Likelihood of occurrence
Erythronium revolutum (coast fawn lily)	perennial bulbiferous herb	None/None/2B.2	Mesic, streambanks, bogs and fens, broadleaf upland forest, and north coast coniferous forest; 0–5,250 ft. Blooming period: March–July (August)	CNPS, CDFW	**Moderate:** Broadleaf upland and north coast coniferous forest habitats present within Project area. Two occurrences within 5–10 miles of the Project area.
Gilia capitata subsp. *pacifica* (Pacific gilia)	annual herb	None/None/1B.2	Coastal bluff scrub, openings in chaparral, coastal prairie, and valley and foothill grassland; 15–5,465 ft. Blooming period: April–August	CNPS, CDFW	**None:** No suitable habitat present within the Project area.
Hemizonia congesta ssp. *tracyi* (Tracy's tarplant)	annual herb	None/None/4.3	Coastal prairie, openings in lower montane coniferous forest and North Coast coniferous forest, sometimes on serpentine; 395–3,395 ft. Blooming period: (Mar)May–Oct	CNPS	**Low:** the species' known distribution or elevation range overlaps with the Project area, but the species' required habitat is of very low quantity in the Project area.
Hosackia gracilis (harlequin lotus)	perennial rhizomatous herb	None/None/4.2	Broadleaf upland forest, cismontane woodland, closed-cone coniferous forest, coastal bluff scrub, coastal prairie, coastal scrub, marshes and swamps, meadows and seeps, North Coast coniferous forest, valley and foothill grassland; 0–2,295 ft. Blooming period: Mar–Jul	CNPS	**Low:** the species' known distribution or elevation range overlaps with the Project area, but the species' required habitat is of very low quantity in the Project area. No occurrences within 10 miles of the Project.
Howellia aquatilis (water howellia)	annual herb (aquatic)	FD/None/2B.2	Freshwater marshes and swamps; 3,650–4,230 ft. Blooming period: June	CDFW	**None:** No suitable habitat present within the Project area.
Kopsiopsis hookeri (small groundcone)	perennial rhizomatous herb (parasitic)	None/None/2B.3	North coast coniferous forest; 295–2,905 ft. Blooming period: April–August	CNPS, CDFW	**Low:** North coast coniferous forest habitat present within Project area. No occurrences within 10 miles of the Project.
Lasthenia burkei (Burke's goldfields)	annual herb	FE/CE/1B.1	Mesic meadows and seeps and vernal pools; 45–1,970 ft. Blooming period: April–June	USFWS	**None:** No suitable habitat present within the Project area.
Lasthenia californica subsp. *macrantha* (perennial goldfields)	perennial herb	None/None/1B.2	Coastal bluff scrub, coastal dunes, and coastal scrub; 15–1,705 ft. Blooming period: January–November	CNPS, CDFW	**None:** No suitable habitat present within the Project area.

Scientific name (common name)	Lifeform	Status (Federal, State, CRPR[1])	Habitat associations and blooming period[2]	Source	Likelihood of occurrence
Lasthenia conjugens (Contra Costa goldfields)	annual herb	FE/None/1B.1	Mesic cismontane woodland, alkaline playas, valley and foothill grassland, and vernal pools; 0–1,540 ft. Blooming period: March–June	USFWS	**None:** No suitable habitat present within the Project area.
Lathyrus palustris (marsh pea)	perennial herb	None/None/2B.2	Mesic bogs and fens, coastal prairie, coastal scrub, lower montane coniferous forest, marshes and swamps, and north coast coniferous forest; 0–330 ft. Blooming period: March–August	CNPS, CDFW	**None**: One coastal occurrence ~ 10 miles from Project area, but Project area is outside of the known elevation range.
Leptosiphon aureus (bristly leptosiphon)	annual herb	None/None/4.2	Chaparral, cismontane woodland, coastal prairie, valley and foothill grassland; 180–4,920 ft. Blooming period: April–July	CNPS	**None:** No suitable habitat present within the Project area.
Leptosiphon latisectus (broad-lobed leptosiphon)	annual herb	None/None/4.3	Broadleaf upland forest, cismontane woodland; 590-4,920 ft. Blooming period: April–June	CNPS	**Low:** Broadland upland forest present within Project area. No occurrences within 10 miles of the Project area.
Lilium rubescens (redwood lily)	perennial bulbiferous herb	None/None/4.2	Sometimes serpentinite, sometimes roadsides, broadleaf upland forest, chaparral, lower montane coniferous forest, north coast coniferous forest, and upper montane coniferous forest; 95–6,265 ft. Blooming period: April–August (September)	CNPS	**Low:** Broadleaf upland forest, lower montane coniferous forest, and north coast coniferous forest habitats present within Project area. No ultramafic soils mapped or observed in Project area. No occurrences within 10 miles of the Project.
Listera cordata (heart-leaved twayblade)	perennial herb	None/None/4.2	Bogs and fens, lower montane coniferous forest, and north coast coniferous forest; 15–4,495 ft. Blooming period: February–July	CNPS	**Low:** North coast coniferous and lower montane coniferous forest habitats present within Project area. No occurrences within 10 miles of the Project.
Lycopus uniflorus (Northern bugleweed)	perennial herb	None/None/4.3	Bogs and fens, marshes and swamps; 15–6,650. Blooming period: July–September	CNPS	**None:** the species' required habitat is lacking from the Project area

Scientific name (common name)	Lifeform	Status (Federal, State, CRPR[1])	Habitat associations and blooming period[2]	Source	Likelihood of occurrence
Mitellastra caulescens (leafy-stemmed mitrewort)	perennial rhizomatous herb	None/None/4.2	Mesic, sometimes roadsides broadleaf upland forest, lower montane coniferous forest, meadows and seeps, and north coast coniferous forest; 15–5,575 ft. Blooming period: (March) April–October	CNPS, CDFW	**Low:** Broadleaf upland, lower montane coniferous, and north coast coniferous forest habitats present within Project area. No occurrences within 10 miles of the Project.
Montia howellii (Howell's montia)	annual herb	None/None/2B.2	Vernally mesic, sometimes roadsides in meadows and seeps, north coast coniferous forest, and vernal pools; 0–2,740 ft. Blooming period: (February) March–May	CNPS, CDFW	**Moderate:** North coast coniferous forest habitat present within Project area. Two occurrences approximately 3.6 miles from the Project area.
Piperia candida (white-flowered rein orchid)	perennial herb	None/None/1B.2	Sometimes serpentinite in broadleaf upland forest, lower montane coniferous forest, and north coast coniferous forest; 95–4,300 ft. Blooming period: (March) May–September	CNPS, CDFW	**Moderate:** Broadleaf upland, lower montane coniferous, and north coast coniferous forest habitats present within Project area. No ultramafic soils mapped or observed, yet multiple occurrences approximately one mile from the Project area.
Pityopus californicus (California pinefoot)	perennial herb (achlorophyllous)	None/None/4.2	Mesic broadleaf upland forest, lower montane coniferous forest, north coast coniferous forest, and upper montane coniferous forest; 45–7,300 ft. Blooming period: (March–April) May–August	CNPS	**Low:** Broadleaf upland, lower montane coniferous, and north coast coniferous forest habitats present within Project area. No occurrences within 10 miles of the Project.
Pleuropogon hooverianus (North Coast semaphore grass)	perennial rhizomatous herb	None/None/1B.1	Mesic areas and openings in broadleaf upland forest, meadows and seeps, and North Coast coniferous forest; 35–2,200 ft. Blooming period: April–June	CNPS	**Low:** Openings in broadleaf upland forest and North Coast coniferous forest present, but in low quantity within the Project area. No occurrences within 10 miles of the Project.

Scientific name (common name)	Lifeform	Status (Federal, State, CRPR[1])	Habitat associations and blooming period[2]	Source	Likelihood of occurrence
Sidalcea malachroides (maple-leaved checkerbloom)	perennial herb	None/None/4.2	Often in disturbed areas in broadleaf upland forest, coastal prairie, coastal scrub, north coast coniferous forest, and riparian woodland; 0–2,395 ft. Blooming period: (March) April–August	CNPS, CDFW	**Low:** Broadleaf upland forest, riparian woodland, and north coast coniferous forest habitats present within Project area. No occurrences within 10 miles of the Project.
Sidalcea malviflora ssp. *patula* (Siskiyou checkerbloom)	perennial rhizomatous herb	None/None/1B.2	Often on roadsides of coastal bluff scrub, coastal prairie, and North Coast coniferous forest; 50–4,035 ft. Blooming period: (March) May–August	CNPS, CDFW	**Moderate:** North coast coniferous forest habitats present within Project area. Several occurrences within 5-10 miles of the Project area.
Silene bolanderi (Bolander's catchfly)	perennial rhizomatous herb	None/None/1B.2	Usually grassy openings, sometimes dry rocky slopes, canyons, serpentine, or roadsides of chaparral (edges), cismontane woodland, lower montane coniferous forest, meadows and seeps, North Coast coniferous forest; 1,380–3,775 ft. Blooming period: May–June	CDFW	**Low:** Grassy openings in north coast coniferous forest present in Project area, but in low quantity. No occurrences within 10 miles of the Project area.
Tiarella trifoliata var. *trifoliata* (trifoliate laceflower)	perennial rhizomatous herb	None/None/3.2	Edges and streambanks of lower montane coniferous forest and North Coast coniferous forest; 500–4,920 ft. Blooming period: (May) June - August	CNPS	**Low:** Edges and streambanks of lower montane coniferous forest and North Coast coniferous forest are present within project vicinity, but of low quantity within project area. No occurrences within 10 miles of the Project area.
Tracyina rostrata (beaked tracyina)	annual herb	None/None/1B.2	Chaparral, cismontane woodland, and valley and foothill grassland; 295–4,165 ft. Blooming period: May–Jun	CDFW	**None:** the species' required habitat is lacking from the Project area
Trifolium amoenum (two-fork clover)	annual herb	FE/None/1B.1	Coastal bluff scrub and sometimes serpentinite in valley and foothill grassland; 15–1,360 ft. Blooming period: April–June	USFWS	**None:** the species' required habitat is lacking from the Project area

Scientific name (common name)	Lifeform	Status (Federal, State, CRPR[1])	Habitat associations and blooming period[2]	Source	Likelihood of occurrence
Trifolium trichocalyx (Monterey clover)	annual herb	FE/CE/1B.1	Sandy, burned areas in openings of closed-cone coniferous forest; 100–1,000 ft. Blooming period: April–June	USFW	**None:** the species' required habitat is lacking from the Project area
Usnea longissima (Methuselah's beard lichen)	fruticose lichen (epiphytic)	None/None/4.2	On tree branches, usually on old growth hardwoods and conifers in broadleaf upland forest and north coast coniferous forest; 160–4,790 ft. Blooming period: N/A (lichen)	CNPS, CDFW	**Moderate:** Broadleaf upland and north coast coniferous forest habitats present within Project area. Multiple occurrences within 5–10 mi of the Project area.
Viburnum ellipticum (oval-leaved viburnum)	perennial deciduous shrub	None/None/2B.3	Chaparral, cismontane woodland, and lower montane coniferous forest; 705 - 4,595 ft. Blooming period: May–Jun	CDFW	**Low:** Lower montane coniferous forest present within Project area, but in low quantity. No occurrences within 10 mi of the Project.

[1] Status:

Federal:
FE Federally endangered
FD Federally delisted

State:
CE California endangered
CR California rare

California Rare Plant Rank (CRPR):
1B Plants rare, threatened, or endangered in California and elsewhere
2B Plants rare, threatened, or endangered in California, but more common elsewhere
3 Plants about which more information is needed
4 Plants of limited distribution, on watchlist

CRPR Threat Ranks:
0.1 Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat)
0.2 Moderately threatened in California (20–80% occurrences threatened / moderate degree and immediacy of threat)
0.3 Not very threatened in California (less than 20% of occurrences threatened / low degree and immediacy of threat or no current threats known)

[2] Months in parentheses are uncommon; N/A = Not applicable

Appendix B

List of Plant Species Observed in the Project Area

Table B-1. Plant species observed during the September 23, 2022 botanical survey.

Scientific name (common name)	Family	Native status	Cal-IPC rating	WMVC wetland indicator status[1]
Agrostis stolonifera (creeping bent grass)	Poaceae	Naturalized	Limited	FAC
Ailanthus altissima (tree of heaven)	Simaroubaceae	Naturalized	Moderate	FACU
Aira caryophyllea (silver hair grass)	Poaceae	Naturalized	None	FACU
Anthoxanthum odoratum (sweet vernal grass)	Poaceae	Naturalized	Limited	FACU
Arbutus menziesii (Pacific madrone)	Ericaceae	Native	None	Not listed-UPL
Baccharis pilularis (coyote brush)	Asteraceae	Native	None	Not listed-UPL
Briza maxima (ratlesnake grass)	Poaceae	Naturalized	Limited	Not listed-UPL
Bromus diandrus (ripgut brome)	Poaceae	Naturalized	Moderate	Not listed-UPL
Bromus hordeaceus (soft brome)	Poaceae	Naturalized	Limited	FACU
Bromus sitchensis var. *carinatus* (California brome)	Poaceae	Native	None	Not listed-UPL
Carduus pycnocephalus subsp. *pycnocephalus* (Italian thistle)	Asteraceae	Naturalized	Moderate	Not listed-UPL
Ceanothus parryi (Parry ceanothus)	Rhamnaceae	Native	None	Not listed-UPL
Cynosurus echinatus (bristly dogstail grass)	Poaceae	Naturalized	Moderate	Not listed-UPL
Danthonia californica (California oatgrass)	Poaceae	Native	None	FAC
Daucus carota (wild carrot)	Apiaceae	Naturalized	None	FACU
Elymus elymoides (squirreltail)	Poaceae	Native	None	FACU
Elymus glaucus subsp. *glaucus* (blue wildrye)	Poaceae	Native	None	FACU
Epilobium brachyacrpum (tall annual willow herb)	Onagraceae	Native	None	FAC
Holcus lanatus (common velvet grass)	Poaceae	Naturalized	Moderate	FAC

Scientific name (common name)	Family	Native status	Cal-IPC rating	WMVC wetland indicator status[1]
Hypochaeris glabra (smooth cat's ear)	Asteraceae	Naturalized	Limited	Not listed-UPL
Iris douglasiana (Douglas iris)	Iridaceae	Native	None	Not listed-UPL
Juncus bolanderi (Bolander's rush)	Juncaceae	Native	None	OBL
Linum bienne (pale flax)	Linaceae	Naturalized	None	Not listed-UPL
Mentha pulegium (pennyroyal)	Lamiaceae	Naturalized	Moderate	OBL
Notholithocarpus densiflorus (tanoak)	Fagaceae	Native	None	Not listed-UPL
Plantago lanceolata (English plantain)	Plantaginaceae	Naturalized	Limited	FACU
Pseudotsuga menziesii var. *menziesii* (Douglas-fir)	Pinaceae	Native	None	FACU
Pteridium aquilinum var. *pubescens* (hairy brackenfern)	Dennstaedtiaceae	Native	None	FACU
Quercus chrysolepis (canyon live oak)	Fagaceae	Native	None	Not listed-UPL
Stachys rigida var. *rigida* (rough hedgenettle)	Lamiaceae	Native	None	Not listed-UPL
Vaccinium ovatum (California huckleberry)	Ericaceae	Native	None	FACU

[1] Wetland indicator status (Lichvar et al. 2014 and 2016):
OBL (Obligate Wetland Plants)—Almost always occur in wetlands.
FACW (Facultative Wetland Plants)—Usually occur in wetlands, but may occur in non-wetlands.
FAC (Facultative Wetland Plants)—Occur in wetlands and non-wetlands.
FACU (Facultative Upland Plants)—Usually occur in non-wetlands, but may occur in wetlands.
UPL (Upland Plants)—Almost never occur in wetlands
Not Listed – UPL (Upland Plants)—Plant species not listed in the *2016 National Wetland Plant List* were considered upland (UPL) species.

La Doo Meadow MND Attachment B

Project Emissions Background Documentation

(CalEEMod)

Marshall Ranch Flow Enhancement

Humboldt County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Recreational Swimming Pool	140.00	1000sqft	3.21	140,000.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	103
Climate Zone	1			**Operational Year**	2022
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - This project does not fit the pre-defined land use types or subtypes so the nearest possible landuse was selected - recreational swimming pool.

Grading -

Construction Phase - Modified construction start time so all work will occur in one year. Modified proportion of grading vs proportion of building to better align with this project type. Overlapped grading and building phases to match reality of likely construction sequencing. Minimized days of paving and architectural coating because this project only involves a minor amount of those tasks.

Off-road Equipment - Modifed equipment to match equipment that will be used for this project.

Off-road Equipment - Modified equipment based on what will be used for this project.

Off-road Equipment - Modifed equipment to match equipment that will be used for this project.

Off-road Equipment - Modifed equipment to match equipment that will be used for this project.

Off-road Equipment -

Off-road Equipment -

Stationary Sources - Emergency Generators and Fire Pumps - For this analyses, diesel fire pump substituted for electric pump with similar horsepower; Assumes pump runs 30 days/year.

Road Dust -

Water And Wastewater - Energy used for pumping and cooling water entered seperately.

Solid Waste - Project will generate minimal solid waste.

Stationary Sources - User Defined -

Stationary Sources - Process Boilers - For this analyses, diesel boiler substituted for electric water chiller with similar energy usage; Assumes that it runs 7 days/year.

Land Use Change -

Energy Mitigation -

Vehicle Trips - There is no actual recreation at this pool.

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	8.00	181.00
tblConstructionPhase	NumDays	230.00	67.00
tblConstructionPhase	NumDays	18.00	1.00
tblConstructionPhase	NumDays	18.00	1.00

Marshall Ranch Flow Enhancement - Humboldt County, Annual

tblConstructionPhase	PhaseEndDate	2/16/2021	10/15/2021
tblConstructionPhase	PhaseEndDate	1/4/2022	10/15/2021
tblConstructionPhase	PhaseEndDate	1/28/2022	10/16/2021
tblConstructionPhase	PhaseEndDate	2/23/2022	10/18/2021
tblConstructionPhase	PhaseStartDate	2/17/2021	7/15/2021
tblConstructionPhase	PhaseStartDate	1/5/2022	10/15/2021
tblConstructionPhase	PhaseStartDate	1/29/2022	10/17/2021
tblGrading	AcresOfGrading	90.50	4.00
tblGrading	AcresOfGrading	7.50	0.00
tblOffRoadEquipment	HorsePower	84.00	81.00
tblOffRoadEquipment	HorsePower	212.00	247.00
tblOffRoadEquipment	HorsePower	212.00	247.00
tblOffRoadEquipment	HorsePower	158.00	97.00
tblOffRoadEquipment	LoadFactor	0.74	0.73
tblOffRoadEquipment	LoadFactor	0.43	0.40
tblOffRoadEquipment	LoadFactor	0.43	0.40
tblOffRoadEquipment	LoadFactor	0.38	0.37
tblOffRoadEquipment	LoadFactor	0.50	0.50
tblOffRoadEquipment	OffRoadEquipmentType	Concrete/Industrial Saws	Generator Sets
tblOffRoadEquipment	OffRoadEquipmentType	Rubber Tired Dozers	Crawler Tractors
tblOffRoadEquipment	OffRoadEquipmentType	Rubber Tired Dozers	Crawler Tractors
tblOffRoadEquipment	OffRoadEquipmentType	Tractors/Loaders/Backhoes	Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Bore/Drill Rigs
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblSolidWaste	LandfillCaptureGasFlare	94.00	0.00
tblSolidWaste	LandfillNoGasCapture	6.00	0.00

tblSolidWaste	SolidWasteGenerationRate	798.00	1.00
tblStationaryBoilersUse	AnnualHeatInput	0.00	24.02
tblStationaryBoilersUse	BoilerRatingValue	0.00	1.43
tblStationaryBoilersUse	DailyHeatInput	0.00	0.07
tblStationaryBoilersUse	NumberOfEquipment	0.00	1.00
tblStationaryGeneratorsPumpsEF	CH4_EF	0.07	0.07
tblStationaryGeneratorsPumpsEF	ROG_EF	2.2480e-003	2.2477e-003
tblStationaryGeneratorsPumpsUse	HorsePowerValue	0.00	7.50
tblStationaryGeneratorsPumpsUse	HoursPerDay	0.00	2.00
tblStationaryGeneratorsPumpsUse	HoursPerYear	0.00	720.00
tblStationaryGeneratorsPumpsUse	NumberOfEquipment	0.00	1.00
tblTripsAndVMT	HaulingTripNumber	0.00	625.00
tblTripsAndVMT	WorkerTripNumber	23.00	15.00
tblTripsAndVMT	WorkerTripNumber	35.00	18.00
tblVehicleTrips	ST_TR	9.10	0.00
tblVehicleTrips	SU_TR	13.60	0.00
tblVehicleTrips	WD_TR	33.82	0.00
tblWater	IndoorWaterUseRate	8,280,040.17	0.00
tblWater	OutdoorWaterUseRate	5,074,863.33	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	0.5062	4.7807	3.4721	8.0300e-003	0.6498	0.2078	0.8576	0.3401	0.1921	0.5322	0.0000	708.1022	708.1022	0.1967	0.0000	713.0190
Maximum	**0.5062**	**4.7807**	**3.4721**	**8.0300e-003**	**0.6498**	**0.2078**	**0.8576**	**0.3401**	**0.1921**	**0.5322**	**0.0000**	**708.1022**	**708.1022**	**0.1967**	**0.0000**	**713.0190**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	0.5062	4.7807	3.4720	8.0300e-003	0.6498	0.2078	0.8576	0.3401	0.1921	0.5322	0.0000	708.1014	708.1014	0.1967	0.0000	713.0183
Maximum	**0.5062**	**4.7807**	**3.4720**	**8.0300e-003**	**0.6498**	**0.2078**	**0.8576**	**0.3401**	**0.1921**	**0.5322**	**0.0000**	**708.1014**	**708.1014**	**0.1967**	**0.0000**	**713.0183**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**1-1-2021**	**3-31-2021**	1.5314	1.5314
2	**4-1-2021**	**6-30-2021**	1.3076	1.3076
3	**7-1-2021**	**9-30-2021**	2.0627	2.0627
		Highest	2.0627	2.0627

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.1300e-003	1.0000e-005	1.2900e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-003	2.5000e-003	1.0000e-005	0.0000	2.6700e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Stationary	4.1600e-003	0.0222	0.0248	4.0000e-005		1.3000e-003	1.3000e-003		1.2400e-003	1.2400e-003	0.0000	3.8648	3.8648	2.9000e-004	0.0000	3.8720
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**5.2900e-003**	**0.0222**	**0.0261**	**4.0000e-005**	**0.0000**	**1.3000e-003**	**1.3000e-003**	**0.0000**	**1.2400e-003**	**1.2400e-003**	**0.0000**	**3.8673**	**3.8673**	**3.0000e-004**	**0.0000**	**3.8747**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.1300e-003	1.0000e-005	1.2900e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-003	2.5000e-003	1.0000e-005	0.0000	2.6700e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	-3.7819	-3.7819	-0.0002	0.0000	-3.7967
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Stationary	4.1600e-003	0.0222	0.0248	4.0000e-005		1.3000e-003	1.3000e-003		1.2400e-003	1.2400e-003	0.0000	3.8648	3.8648	2.9000e-004	0.0000	3.8720
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**5.2900e-003**	**0.0222**	**0.0261**	**4.0000e-005**	**0.0000**	**1.3000e-003**	**1.3000e-003**	**0.0000**	**1.2400e-003**	**1.2400e-003**	**0.0000**	**0.0855**	**0.0855**	**1.3000e-004**	**0.0000**	**0.0780**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**97.79**	**97.79**	**56.67**	**0.00**	**97.99**

2.3 Vegetation

Vegetation

	CO2e
Category	MT
Vegetation Land Change	-17.2400
Total	**-17.2400**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2021	1/28/2021	5	20	
2	Site Preparation	Site Preparation	1/29/2021	2/4/2021	5	5	
3	Grading	Grading	2/5/2021	10/15/2021	5	181	
4	Building Construction	Building Construction	7/15/2021	10/15/2021	5	67	
5	Paving	Paving	10/15/2021	10/16/2021	5	1	
6	Architectural Coating	Architectural Coating	10/17/2021	10/18/2021	5	1	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 4

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 300; Non-Residential Outdoor: 100; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Marshall Ranch Flow Enhancement - Humboldt County, Annual

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Generator Sets	1	8.00	81	0.73
Demolition	Crawler Tractors	2	8.00	247	0.40
Demolition	Excavators	3	8.00	158	0.38
Grading	Excavators	1	8.00	158	0.38
Site Preparation	Crawler Tractors	3	8.00	247	0.40
Site Preparation	Excavators	4	8.00	97	0.37
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Paving	Cement and Mortar Mixers	2	6.00	9	0.56
Paving	Pavers	1	8.00	130	0.42
Paving	Paving Equipment	2	6.00	132	0.36
Paving	Rollers	2	6.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Architectural Coating	Air Compressors	1	6.00	78	0.48
Grading	Off-Highway Trucks	2	8.00	402	0.38
Building Construction	Bore/Drill Rigs	1	8.00	221	0.50
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Rubber Tired Dozers	2	8.00	247	0.40
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	9	15.00	0.00	0.00	16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	14	18.00	0.00	0.00	16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Grading	8	20.00	0.00	625.00	16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	10	59.00	23.00	0.00	16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Paving	8	20.00	0.00	0.00	16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	12.00	0.00	0.00	16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Demolition - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0470	0.4956	0.3035	6.2000e-004		0.0228	0.0228		0.0212	0.0212	0.0000	54.3293	54.3293	0.0147	0.0000	54.6963
Total	**0.0470**	**0.4956**	**0.3035**	**6.2000e-004**		**0.0228**	**0.0228**		**0.0212**	**0.0212**	**0.0000**	**54.3293**	**54.3293**	**0.0147**	**0.0000**	**54.6963**

3.2 Demolition - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.6700e-003	1.5000e-003	0.0118	2.0000e-005	1.8000e-003	2.0000e-005	1.8200e-003	4.8000e-004	2.0000e-005	4.9000e-004	0.0000	1.6014	1.6014	1.0000e-004	0.0000	1.6040
Total	**1.6700e-003**	**1.5000e-003**	**0.0118**	**2.0000e-005**	**1.8000e-003**	**2.0000e-005**	**1.8200e-003**	**4.8000e-004**	**2.0000e-005**	**4.9000e-004**	**0.0000**	**1.6014**	**1.6014**	**1.0000e-004**	**0.0000**	**1.6040**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0470	0.4956	0.3035	6.2000e-004		0.0228	0.0228		0.0212	0.0212	0.0000	54.3293	54.3293	0.0147	0.0000	54.6963
Total	**0.0470**	**0.4956**	**0.3035**	**6.2000e-004**		**0.0228**	**0.0228**		**0.0212**	**0.0212**	**0.0000**	**54.3293**	**54.3293**	**0.0147**	**0.0000**	**54.6963**

3.2 Demolition - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.6700e-003	1.5000e-003	0.0118	2.0000e-005	1.8000e-003	2.0000e-005	1.8200e-003	4.8000e-004	2.0000e-005	4.9000e-004	0.0000	1.6014	1.6014	1.0000e-004	0.0000	1.6040
Total	**1.6700e-003**	**1.5000e-003**	**0.0118**	**2.0000e-005**	**1.8000e-003**	**2.0000e-005**	**1.8200e-003**	**4.8000e-004**	**2.0000e-005**	**4.9000e-004**	**0.0000**	**1.6014**	**1.6014**	**1.0000e-004**	**0.0000**	**1.6040**

3.3 Site Preparation - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0452	0.0000	0.0452	0.0248	0.0000	0.0248	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0159	0.1759	0.0948	1.9000e-004		8.2600e-003	8.2600e-003		7.6000e-003	7.6000e-003	0.0000	16.6522	16.6522	5.3900e-003	0.0000	16.7868
Total	**0.0159**	**0.1759**	**0.0948**	**1.9000e-004**	**0.0452**	**8.2600e-003**	**0.0534**	**0.0248**	**7.6000e-003**	**0.0324**	**0.0000**	**16.6522**	**16.6522**	**5.3900e-003**	**0.0000**	**16.7868**

3.3 Site Preparation - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.0000e-004	4.5000e-004	3.5300e-003	1.0000e-005	5.4000e-004	1.0000e-005	5.4000e-004	1.4000e-004	0.0000	1.5000e-004	0.0000	0.4804	0.4804	3.0000e-005	0.0000	0.4812
Total	**5.0000e-004**	**4.5000e-004**	**3.5300e-003**	**1.0000e-005**	**5.4000e-004**	**1.0000e-005**	**5.4000e-004**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**0.0000**	**0.4804**	**0.4804**	**3.0000e-005**	**0.0000**	**0.4812**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0452	0.0000	0.0452	0.0248	0.0000	0.0248	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0159	0.1759	0.0948	1.9000e-004		8.2600e-003	8.2600e-003		7.6000e-003	7.6000e-003	0.0000	16.6521	16.6521	5.3900e-003	0.0000	16.7868
Total	**0.0159**	**0.1759**	**0.0948**	**1.9000e-004**	**0.0452**	**8.2600e-003**	**0.0534**	**0.0248**	**7.6000e-003**	**0.0324**	**0.0000**	**16.6521**	**16.6521**	**5.3900e-003**	**0.0000**	**16.7868**

3.3 Site Preparation - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.0000e-004	4.5000e-004	3.5300e-003	1.0000e-005	5.4000e-004	1.0000e-005	5.4000e-004	1.4000e-004	0.0000	1.5000e-004	0.0000	0.4804	0.4804	3.0000e-005	0.0000	0.4812
Total	**5.0000e-004**	**4.5000e-004**	**3.5300e-003**	**1.0000e-005**	**5.4000e-004**	**1.0000e-005**	**5.4000e-004**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**0.0000**	**0.4804**	**0.4804**	**3.0000e-005**	**0.0000**	**0.4812**

3.4 Grading - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.5471	0.0000	0.5471	0.2998	0.0000	0.2998	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.3169	3.1913	2.0875	5.0700e-003		0.1399	0.1399		0.1287	0.1287	0.0000	445.7200	445.7200	0.1442	0.0000	449.3239
Total	**0.3169**	**3.1913**	**2.0875**	**5.0700e-003**	**0.5471**	**0.1399**	**0.6870**	**0.2998**	**0.1287**	**0.4285**	**0.0000**	**445.7200**	**445.7200**	**0.1442**	**0.0000**	**449.3239**

3.4 Grading - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.7900e-003	0.0953	0.0155	2.5000e-004	5.1400e-003	4.3000e-004	5.5700e-003	1.4100e-003	4.2000e-004	1.8300e-003	0.0000	23.5520	23.5520	7.2000e-004	0.0000	23.5700
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0202	0.0181	0.1422	2.1000e-004	0.0217	2.0000e-004	0.0219	5.7800e-003	1.9000e-004	5.9700e-003	0.0000	19.3236	19.3236	1.2600e-003	0.0000	19.3550
Total	**0.0230**	**0.1134**	**0.1577**	**4.6000e-004**	**0.0268**	**6.3000e-004**	**0.0275**	**7.1900e-003**	**6.1000e-004**	**7.8000e-003**	**0.0000**	**42.8756**	**42.8756**	**1.9800e-003**	**0.0000**	**42.9249**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.5471	0.0000	0.5471	0.2998	0.0000	0.2998	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.3169	3.1913	2.0875	5.0700e-003		0.1399	0.1399		0.1287	0.1287	0.0000	445.7195	445.7195	0.1442	0.0000	449.3233
Total	**0.3169**	**3.1913**	**2.0875**	**5.0700e-003**	**0.5471**	**0.1399**	**0.6870**	**0.2998**	**0.1287**	**0.4285**	**0.0000**	**445.7195**	**445.7195**	**0.1442**	**0.0000**	**449.3233**

3.4 Grading - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.7900e-003	0.0953	0.0155	2.5000e-004	5.1400e-003	4.3000e-004	5.5700e-003	1.4100e-003	4.2000e-004	1.8300e-003	0.0000	23.5520	23.5520	7.2000e-004	0.0000	23.5700
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0202	0.0181	0.1422	2.1000e-004	0.0217	2.0000e-004	0.0219	5.7800e-003	1.9000e-004	5.9700e-003	0.0000	19.3236	19.3236	1.2600e-003	0.0000	19.3550
Total	**0.0230**	**0.1134**	**0.1577**	**4.6000e-004**	**0.0268**	**6.3000e-004**	**0.0275**	**7.1900e-003**	**6.1000e-004**	**7.8000e-003**	**0.0000**	**42.8756**	**42.8756**	**1.9800e-003**	**0.0000**	**42.9249**

3.5 Building Construction - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0724	0.6857	0.6251	1.2200e-003		0.0352	0.0352		0.0330	0.0330	0.0000	105.4553	105.4553	0.0277	0.0000	106.1486
Total	**0.0724**	**0.6857**	**0.6251**	**1.2200e-003**		**0.0352**	**0.0352**		**0.0330**	**0.0330**	**0.0000**	**105.4553**	**105.4553**	**0.0277**	**0.0000**	**106.1486**

3.5 Building Construction - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	3.5600e-003	0.0907	0.0247	2.0000e-004	4.4700e-003	3.7000e-004	4.8400e-003	1.3000e-003	3.5000e-004	1.6500e-003	0.0000	18.7699	18.7699	9.7000e-004	0.0000	18.7940
Worker	0.0221	0.0198	0.1552	2.3000e-004	0.0237	2.2000e-004	0.0239	6.3100e-003	2.0000e-004	6.5200e-003	0.0000	21.1011	21.1011	1.3700e-003	0.0000	21.1354
Total	**0.0256**	**0.1105**	**0.1799**	**4.3000e-004**	**0.0282**	**5.9000e-004**	**0.0288**	**7.6100e-003**	**5.5000e-004**	**8.1700e-003**	**0.0000**	**39.8710**	**39.8710**	**2.3400e-003**	**0.0000**	**39.9294**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0724	0.6857	0.6251	1.2200e-003		0.0352	0.0352		0.0330	0.0330	0.0000	105.4552	105.4552	0.0277	0.0000	106.1484
Total	**0.0724**	**0.6857**	**0.6251**	**1.2200e-003**		**0.0352**	**0.0352**		**0.0330**	**0.0330**	**0.0000**	**105.4552**	**105.4552**	**0.0277**	**0.0000**	**106.1484**

3.5 Building Construction - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	3.5600e-003	0.0907	0.0247	2.0000e-004	4.4700e-003	3.7000e-004	4.8400e-003	1.3000e-003	3.5000e-004	1.6500e-003	0.0000	18.7699	18.7699	9.7000e-004	0.0000	18.7940
Worker	0.0221	0.0198	0.1552	2.3000e-004	0.0237	2.2000e-004	0.0239	6.3100e-003	2.0000e-004	6.5200e-003	0.0000	21.1011	21.1011	1.3700e-003	0.0000	21.1354
Total	**0.0256**	**0.1105**	**0.1799**	**4.3000e-004**	**0.0282**	**5.9000e-004**	**0.0288**	**7.6100e-003**	**5.5000e-004**	**8.1700e-003**	**0.0000**	**39.8710**	**39.8710**	**2.3400e-003**	**0.0000**	**39.9294**

3.6 Paving - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	5.5000e-004	5.4200e-003	6.1300e-003	1.0000e-005		2.9000e-004	2.9000e-004		2.7000e-004	2.7000e-004	0.0000	0.8185	0.8185	2.6000e-004	0.0000	0.8250
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**5.5000e-004**	**5.4200e-003**	**6.1300e-003**	**1.0000e-005**		**2.9000e-004**	**2.9000e-004**		**2.7000e-004**	**2.7000e-004**	**0.0000**	**0.8185**	**0.8185**	**2.6000e-004**	**0.0000**	**0.8250**

3.6 Paving - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.1000e-004	1.0000e-004	7.9000e-004	0.0000	1.2000e-004	0.0000	1.2000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.1068	0.1068	1.0000e-005	0.0000	0.1069
Total	**1.1000e-004**	**1.0000e-004**	**7.9000e-004**	**0.0000**	**1.2000e-004**	**0.0000**	**1.2000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.1068**	**0.1068**	**1.0000e-005**	**0.0000**	**0.1069**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	5.5000e-004	5.4200e-003	6.1300e-003	1.0000e-005		2.9000e-004	2.9000e-004		2.7000e-004	2.7000e-004	0.0000	0.8185	0.8185	2.6000e-004	0.0000	0.8250
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**5.5000e-004**	**5.4200e-003**	**6.1300e-003**	**1.0000e-005**		**2.9000e-004**	**2.9000e-004**		**2.7000e-004**	**2.7000e-004**	**0.0000**	**0.8185**	**0.8185**	**2.6000e-004**	**0.0000**	**0.8250**

3.6 Paving - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.1000e-004	1.0000e-004	7.9000e-004	0.0000	1.2000e-004	0.0000	1.2000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.1068	0.1068	1.0000e-005	0.0000	0.1069
Total	**1.1000e-004**	**1.0000e-004**	**7.9000e-004**	**0.0000**	**1.2000e-004**	**0.0000**	**1.2000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.1068**	**0.1068**	**1.0000e-005**	**0.0000**	**0.1069**

3.7 Architectural Coating - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	2.3200e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.1000e-004	7.6000e-004	9.1000e-004	0.0000		5.0000e-005	5.0000e-005		5.0000e-005	5.0000e-005	0.0000	0.1277	0.1277	1.0000e-005	0.0000	0.1279
Total	**2.4300e-003**	**7.6000e-004**	**9.1000e-004**	**0.0000**		**5.0000e-005**	**5.0000e-005**		**5.0000e-005**	**5.0000e-005**	**0.0000**	**0.1277**	**0.1277**	**1.0000e-005**	**0.0000**	**0.1279**

3.7 Architectural Coating - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0000e-005	6.0000e-005	4.7000e-004	0.0000	7.0000e-005	0.0000	7.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0641	0.0641	0.0000	0.0000	0.0642
Total	**7.0000e-005**	**6.0000e-005**	**4.7000e-004**	**0.0000**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0641**	**0.0641**	**0.0000**	**0.0000**	**0.0642**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	2.3200e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.1000e-004	7.6000e-004	9.1000e-004	0.0000		5.0000e-005	5.0000e-005		5.0000e-005	5.0000e-005	0.0000	0.1277	0.1277	1.0000e-005	0.0000	0.1279
Total	**2.4300e-003**	**7.6000e-004**	**9.1000e-004**	**0.0000**		**5.0000e-005**	**5.0000e-005**		**5.0000e-005**	**5.0000e-005**	**0.0000**	**0.1277**	**0.1277**	**1.0000e-005**	**0.0000**	**0.1279**

3.7 Architectural Coating - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0000e-005	6.0000e-005	4.7000e-004	0.0000	7.0000e-005	0.0000	7.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0641	0.0641	0.0000	0.0000	0.0642
Total	**7.0000e-005**	**6.0000e-005**	**4.7000e-004**	**0.0000**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0641**	**0.0641**	**0.0000**	**0.0000**	**0.0642**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Recreational Swimming Pool	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Recreational Swimming Pool	14.70	6.60	6.60	33.00	48.00	19.00	52	39	9

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Recreational Swimming Pool	0.489041	0.045286	0.209606	0.134980	0.040724	0.006674	0.014654	0.046205	0.003398	0.001529	0.005553	0.001505	0.000846

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Kilowatt Hours of Renewable Electricity Generated

Percent of Electricity Use Generated with Renewable Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	-3.7819	-3.7819	-0.0002	0.0000	-3.7967
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Recreational Swimming Pool	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Recreational Swimming Pool	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Recreational Swimming Pool	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Recreational Swimming Pool	-13000	-3.7819	-0.0002	0.0000	-3.7967
Total		**-3.7819**	**-0.0002**	**0.0000**	**-3.7967**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.1300e-003	1.0000e-005	1.2900e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-003	2.5000e-003	1.0000e-005	0.0000	2.6700e-003
Unmitigated	1.1300e-003	1.0000e-005	1.2900e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-003	2.5000e-003	1.0000e-005	0.0000	2.6700e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	2.3000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	7.8000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.2000e-004	1.0000e-005	1.2900e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-003	2.5000e-003	1.0000e-005	0.0000	2.6700e-003
Total	**1.1300e-003**	**1.0000e-005**	**1.2900e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.5000e-003**	**2.5000e-003**	**1.0000e-005**	**0.0000**	**2.6700e-003**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	2.3000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	7.8000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.2000e-004	1.0000e-005	1.2900e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-003	2.5000e-003	1.0000e-005	0.0000	2.6700e-003
Total	**1.1300e-003**	**1.0000e-005**	**1.2900e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.5000e-003**	**2.5000e-003**	**1.0000e-005**	**0.0000**	**2.6700e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Recreational Swimming Pool	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Recreational Swimming Pool	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Recreational Swimming Pool	1	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Recreational Swimming Pool	1	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
Fire Pump	1	2	720	7.5	0.73	Diesel

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type
Boiler	1	0.07	24.02	1.43	Diesel

User Defined Equipment

Equipment Type	Number

10.1 Stationary Sources

Unmitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	tons/yr										MT/yr					
Boiler - Diesel (0 - 9999 MMBTU)	3.0000e-005	6.2000e-004	4.3000e-004	2.0000e-005		9.0000e-005	9.0000e-005		2.0000e-005	2.0000e-005	0.0000	1.9456	1.9456	2.0000e-005	0.0000	1.9460
Fire Pump - Diesel (0 - 11 HP)	4.1300e-003	0.0216	0.0243	2.0000e-005		1.2200e-003	1.2200e-003		1.2200e-003	1.2200e-003	0.0000	1.9192	1.9192	2.7000e-004	0.0000	1.9259
Total	**4.1600e-003**	**0.0222**	**0.0248**	**4.0000e-005**		**1.3100e-003**	**1.3100e-003**		**1.2400e-003**	**1.2400e-003**	**0.0000**	**3.8648**	**3.8648**	**2.9000e-004**	**0.0000**	**3.8720**

11.0 Vegetation

	Total CO2	CH4	N2O	CO2e
Category	MT			
Unmitigated	-17.2400	0.0000	0.0000	-17.2400

11.1 Vegetation Land Change

Vegetation Type

	Initial/Final	Total CO2	CH4	N2O	CO2e
	Acres	MT			
Grassland	20 / 16	-17.2400	0.0000	0.0000	-17.2400
Total		**-17.2400**	**0.0000**	**0.0000**	**-17.2400**

La Doo Meadow MND Attachment C

Bullfrog Management Plan

(CDFW)

EXHIBIT A.

BULLFROG MONITORING AND MANAGEMENT PLAN FOR GROUNDWATER RECHARGE PONDS

GENERAL BULLFROG INFORMATION

The American bullfrog (*Lithobates catesbeianus* = *Rana catesbeiana*); hereafter bullfrog, is an invasive non-native species in California and poses a significant threat to California's native fish and wildlife resources. Bullfrogs were introduced in California over 100 years ago from eastern parts of the United States as a food supply, but have since caused substantial ecological consequences. Bullfrogs are considered highly invasive and are well documented to be prey upon a variety of fish and wildlife species, including some that are rare, threatened, and endangered. Human modifications to the environment provide favorable condition to bullfrogs such as artificially created agricultural ponds, canals and ditches where warm still water occurs. As a result bullfrogs have spread throughout California.

Efforts to control bullfrogs have been met with varying degrees of success because: 1) bullfrogs can be difficult to detect and go dormant from fall through winter, 2) bullfrogs often take cover in difficult areas to manage (e.g. dense vegetation), 3) they can travel long distances to colonize and re-colonize areas, 4) they have high reproductive output, 5) they are weary and readily flee perceived threats, and 6) they can survive physical trauma remarkably well. CDFW scientific staff recognizes there is an urgent and immediate need to develop improved bullfrog management strategies to protect California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. Public support and implementation of bullfrog control in California is an important conservation strategy that will help protect natural resources for future generations.

MONITORING

The Project reservoir(s) shall be monitored for bullfrog presence on an annual basis with a minimum of five total surveys, no less than two weeks apart, throughout the months of May-July

- All pond survey effort must be made by a person knowledgeable in bullfrog identification (see Appendix A for reference photos);
- Survey efforts shall include listening for bullfrog calls and slowly walking the complete perimeter of the pond at night* (dusk or later) while shining a flashlight to detect movement and eye-shine

If bullfrogs are not detected upon completion of five total surveys, or at any other time of the year incidentally, removal efforts are not required that year.

*Day time monitoring can also be conducted to aid detection but is not required under this plan.

SUCCESS CRITERIA

The level of effort needed to successfully manage bullfrog populations varies with infestation levels. This plan shall be considered successfully implemented if sufficient effort is provided to prevent adult bullfrogs from reproducing in the reservoir(s) each year, and no bullfrog life-stages can be detected. Bullfrogs are capable of traveling long distances over-land, and on-going efforts will be required to ensure dispersing bullfrogs do not colonize the reservoir(s) at a future time.

OPTIONS FOR MANAGEMENT

Two removal methods may by employed for controlling bullfrogs under this plan and include:

- Manual direct removal
- Reservoir de-watering (Hydro-modification)

Implementing both reservoir de-watering and manual direct removal is currently believed to be the most effective method of managing bullfrog infestations. For reservoirs that are heavily infested with juvenile bullfrogs and/or tadpoles, reservoir dewatering may be necessary to break the bullfrog's life cycle and prevent on-going reproduction. Prior to conducting reservoir dewatering activities, please coordinate with CDFW Environmental Scientist David Manthorne by phone at (707) 441-5900 or via email at david.manthorne@wildlife.ca.gov.

Direct Removal

All direct removal efforts must be made by a person knowledgeable in bullfrog identification.

- Removal efforts must occur during, but are not be limited to the active/breeding season, occurring May – July;
- A minimum of ***five*** efforts throughout the season are considered necessary;
- Direct removal efforts are typically most effective when conducted at night with use of lights but can also be conducted during the day;
- Direct removal must include working the entire perimeter of the reservoir;
- A rubber raft or small boat may be necessary to successfully remove some individuals;
- A team of two individuals or more is often helpful, one person for shining lights and/or operating a boat and the other person to perform removal efforts;
- Bullfrog tadpoles must be removed and dispatched and must not be relocated or kept as pets.

Management Authorization

Take of bullfrogs is specifically allowed in the California Code of Regulations (CCR), Title 14 (T-14) section 5.05(a)(28), under the authority of a sport fishing license. There is no daily bag limit, possession limit or hour restriction, but bullfrogs can only be taken by hand, hand-held dip net, hook and line, lights, spears, gigs, grabs, paddles, bow and arrow or fish tackle.

Alternatively, FGC Section 5501 allows CDFW, as limited by the commission, to issue a permit to destroy fish that are harmful to other wildlife. The regulations have addressed this under Section CCR T-14 226.5 Issuance of Permits to Destroy Harmful Species of Fish in Private Waters for Management Purposes. This allows the CDFW to issue free permits to destroy harmful aquatic species by seining and draining.

Pond Dewatering

Pond dewatering may be appropriate if the reservoir can be successfully dewatered without adversely affecting stream resources. Careful planning and coordination with CDFW, is necessary to ensure potential impacts to stream resources can be addressed, prior to commencing with pond draining. Discharge of polluted water to waters of the state may require permitting from other agencies with permitting authority, such as the Regional Water Quality Control Board.

In general, bullfrog tadpoles require two years to develop into frogs, whereas native amphibians only require one year. Therefore, draining a reservoir every two years (or less) is intended to interrupt bullfrog tadpole development, dramatically decrease bullfrog populations and allow for reduced efforts as a measure of adaptive management. Typically in Northern California, reservoir draining should occur in September through October to avoid impacts to sensitive native amphibian and fishery resources. While draining occurs, direct removal efforts should be employed as described above if possible.

REPORTING

A written log shall be kept of monitoring and management efforts and shall be provided to CDFW **each year** by December 31. The written log shall include: 1) date and time of each monitoring and management effort, 2) approximate number of each bullfrog life stage detected and/or removed per effort, and 3) amount of time spent for each monitoring and management effort.

APPENDIX A. BULLFROG REFERENCE PHOTOS

This is a photo of a Bullfrog tadpole. (Photo taken by Mike van Hattem).

The photos shown in this Appendix demonstrate a medium sized adult bullfrog that was removed from Ten Mile Creek, Mendocino County. Note the bullfrog has a large tympanum, (circular ear drum shown with an arrow) and **does not** have distinct ridges along its back (dorsolateral folds). Photo taken by Wes Stokes.

The bullfrog has somewhat distinct mottling and **<u>the underside of the bullfrogs hind legs are not shaded pink or red.</u>**