Posting Date: 12-13-2021

NOTICE OF MEETING
WATERSHED COMMITTEE/BOARD OF DIRECTORS (WATERSHED)

(Per paragraph 3 on page 10 under subsection *Committee Meetings* of the Board Handbook: The Board, as a practice, generally does not take final action on items during committee meetings, unless District staff determines the urgency of the item requires immediate action that cannot be delayed until a subsequent regular bi-monthly Board meeting.**)**

MEETING DATE: 12-16-2021

TIME: Meeting begins at **1:30 p.m. (Public)**

LOCATION: This meeting will be held virtually, pursuant to Assembly Bill (AB) 361.

To participate online, go to https://us06web.zoom.us/j/82198370942. You can also participate by phone by calling **1-669-900-6833** and entering the **webinar ID#: 821 9837 0942**.

PARTICIPATION DURING MEETINGS**:** During the public comment periods, the public may comment by clicking the "raise hand" button on the bottom of the Zoom screen; if you are joining by phone and would like to comment, press *9 and we will call on you as appropriate.

EMAILED PUBLIC COMMENTS: You may submit your comments in advance of the meeting by emailing them to BoardComment@MarinWater.org. All emailed comments received by 11:00 a.m. on the day of the meeting will be provided to the Board of Directors prior to the meeting. All emails will be posted on our website. **(Please do not include personal information in your comment that you do not want published on our website such as phone numbers and home addresses.)**

AGENDA ITEMS	RECOMMENDATIONS
Call to Order and Roll Call	
Adopt Agenda	*Approve*
Public Comment *Members of the public may comment on any items not listed on the agenda during this time. Comments will be limited to three minutes per speaker, and time limits may be reduced by the Committee Chair to accommodate the number of speakers and ensure that the meeting is conducted in an efficient manner.*	

AGENDA ITEMS	RECOMMENDATIONS
Calendar	
1. Minutes of the Watershed Committee/Board of Directors (Watershed) Meeting of September 16, 2021 *(Approximate time 1 minute)*	*Approve*
2. 2022-2023 Draft One Tam Work Plan and Amendment No. 7 to the Cooperative Agreement *(Approximate time 5 minutes)*	*Review and Refer to Board for Approval*
3. Award of Contract No. 1967 for Forestry Services to Bay Area Tree Specialists *(Approximate time 3 minutes)*	*Review and Refer to Board for Approval*
4. California Conservation Corps Forestry, Fuels and Trails Contract *(Approximate time 5 minutes)*	*Review and Refer to Board for Approval*
5. Other Power Driven Mobility Device (Including Class 1 E-Bikes) Proposed Ordinance, Administrative Policy and Procedures for use of Other Power-Driven Mobility Devices, Device Registration, and Administrative Policy on the District's ADA Grievance Process *(Approximate time 30 minutes)*	*Review and Refer to Board for Approval*
6. Lagunitas Creek Watershed Enhancement Plan – Progress Update *(Approximate time 10 minutes)*	*Information*
Adjournment *(2:24 p.m. - Time Approximate)*	

ADA NOTICE AND HEARING IMPAIRED PROVISIONS:
In accordance with the Americans with Disabilities Act (ADA) and California Law, it is Marin Water's policy to offer its public programs, services, and meetings in a manner that is readily accessible to everyone, including those with disabilities. If you are an individual with a disability and require a copy of a public hearing notice, an agenda, and/or agenda packet in an appropriate alternative format, or if you require other accommodations, please contact Board Secretary Terrie Gillen at 415.945.1448, at least two days in advance of the meeting. Advance notification will enable the Marin Water to make reasonable arrangements to ensure accessibility.

AGENDAS ARE AVAILABLE FOR REVIEW AT THE CIVIC CENTER LIBRARY, CORTE MADERA LIBRARY, FAIRFAX LIBRARY, MILL VALLEY LIBRARY, MARIN WATER OFFICE, AND ON THE MARIN WATER WEBSITE (MARINWATER.ORG)

FUTURE BOARD MEETINGS:

- Friday, December 17, 2021
  Operations Committee/Board of Directors (Operations) Meeting
  9:30 a.m.

- Tuesday, January 4, 2022
  Joint Board of Directors/Financing Authority/and Financing Corporation Meeting
  7:00 p.m.

Board Secretary

Item Number: 01
Meeting Date: 12-16-2021
Meeting: Watershed Committee/Board of Directors (Watershed)

Approval Item

TITLE
Minutes of the Watershed Committee/Board of Directors (Watershed) Meeting of September 16, 2021

RECOMMENDATION
Approve the adoption of the minutes.

SUMMARY
On September 16, 2021, the Watershed Committee/Board of Directors (Watershed) held its quarterly meeting. The minutes of that meeting are attached.

DISCUSSION
None

FISCAL IMPACT
None

ATTACHMENT(S)
1. Minutes of September 16, 2021, Meeting of the Watershed Committee/Board of Directors (Watershed)

DEPARTMENT OR DIVISION	DIVISION MANAGER	APPROVED
Communications & Public Affairs Department	Terrie Gillen Board Secretary	Ben Horenstein General Manager

Item Number: 01
Attachment: 01

MARIN MUNICIPAL WATER DISTRICT
WATERSHED COMMITTEE /BOARD OF DIRECTORS (WATERSHED) MEETING

MINUTES

Thursday, September 16, 2021

Via teleconference

(In accordance with Governor Gavin Newsom's Executive Order N-29-20)

DIRECTORS PRESENT: John Gibson, Monty Schmitt, and Larry Russell

DIRECTORS ABSENT: Larry Bragman and Cynthia Koehler

CALL TO ORDER: Vice Chair Schmitt called the meeting to order at 1:31 p.m.

ADOPT AGENDA:

On motion made by Director Gibson and seconded by Director Russell, the board approved the adoption of the agenda by the following roll call vote:

Ayes:	Directors Gibson, Russell, and Schmitt
Noes:	None
Absent:	Directors Bragman and Koehler

PUBLIC COMMENT:

There were three public comments.

CALENDAR ITEMS:

Item 1 Minutes of the Watershed Committee/Board of Directors (Watershed) Meeting of June 17, 2021

On motion made by Director Gibson and seconded by Director Russell, the board approved the minutes by the following roll call vote:

Ayes:	Directors Gibson, Russell, and Schmitt
Noes:	None
Absent:	Directors Bragman and Koehler

Item 2 2021 Annual Vegetation Management Report

Natural Resources Program Manager Carl Sanders along with Watershed Resources Manager Shaun Horne presented this item. Discussion followed.

There were no public comments.

The board did not take any formal action, because this was an informational item.

Item 3 Watershed Recreation Plan Update

Watershed Resources Manager Shaun Horne brought forth this item. Discussion followed.

There were 11 public comments.

This was also an informational item. No formal action was taken.

ADJOURNMENT

There being no further business, the Watershed Committee/Board of Directors (Watershed) meeting adjourned at approximately 3: 00 p.m.

_____

Board Secretary

Item Number: 02
Meeting Date: 12-16-2021
Meeting: Watershed Committee/Board of Directors (Watershed)

Review and Refer for Board Approval

TO: Watershed Committee/Board of Directors (Watershed)

FROM: Shaun Horne, Watershed Resources Manager

THROUGH: Ben Horenstein, General Manager

DIVISION NAME: Watershed

ITEM: One Tam Draft 2022-2023 Work Plan and Amendment No. 7 to the Cooperative Agreement MA 5311

RECOMMENDATION

1. Review and Refer for Board Approval the 2022-2023 One Tam Work Plan
2. Review and Refer for Board Approval Amendment No. 7 to the Cooperative Agreement MA 5311

SUMMARY

In 2014, Mt. Tam's four land management agencies: the Marin Municipal Water District, National Parks Service, California State Parks, Marin County Parks, and the Golden Gate National Parks Conservancy launched the Tamalpais Lands Collaborative-now called One Tam. One Tam is currently in its sixth year. Each year One Tam develops an Annual Work Plan (Work Plan) that is structured around areas of focus of the One Tam's 2019–2023 Strategic Plan. As the partnership is maturing, the partner agencies have agreed to transition to a work plan that covers a two year period, which would cover calendar years 2022 and 2023.

Staff is recommending that the Board of Directors review and refer to a future regularly scheduled Board of Directors meeting approval of the One Tam Bi-Annual work plan, and authorize the General Manager to sign Amendment No. 7 to the Cooperative Agreement to facilitate grant funding collaboration and funding transfers for the recently awarded Cal Fire Forest Health grant.

DISCUSSION

In accordance with the Memorandum of Understanding signed by the Tamalpais Lands Collaborative (TLC) partner agencies, a "5 Year List" of projects and programs that are compatible with the purpose and vision of the TLC was developed. The initial 5 Year List and a cooperative agreement with the Golden Gate National Parks Conservancy to support One Tam activities were approved by the District's Board of Directors on November 10, 2014. To frame

the overall development and operation of the One Tam initiative, a comprehensive 5- year vision document was developed at the same time. This 5-year document "One Mountain, One Vision" served as important guidance during the key early years, to the extent that all of its goals were met or exceeded. The pandemic and the growing impacts of a changing climate both highlight the fact that our challenges do not recognize jurisdictional borders. Recent fire seasons (including the Point Reyes fire in 2020), the historic drought, and sea level rise, has made climate resilience an even more urgent and pressing priority for our landscape. Forest health and drought resilience will be partnership priorities for the 2022/23 work plan.

One Tam 5-Year Strategy

The first 5 years as envisioned by the initial 5-year strategy was marked by *building and sustaining* the initiative focused on programs to engage the community and then increasing investment and expanding impact. The theme of the current 5-year strategy is on *strengthening and sustaining* our effort. At the March 5, 2019 Board of Directors meeting the updated 5-year strategy "One Tam the Next Five Years Going Farther, Together" was presented. Consistent with the principles of transparency and accountability embraced by the work leading to the formation of One Tam, and held to during the work of developing and growing the One Tam initiative, the development of the next 5-year strategy involved ongoing presentations and conversations with groups and organizations interested in the long-term health of Mt. Tamalpais.

The current strategy's organizational structure follows a similar structure as the first with the addition of a new chapter on Landscape-scale *Science and Management*, which was added to the original chapter framework of *Programs, Projects, Awareness and Engagement, Partnership and Collective Impact, and Philanthropy and Investment*. This new chapter recognizes the focus on science and conservation actions that came to the forefront during the initial 5 years. Another focus of the next five-year strategy is a refinement of vision, mission, and values. The goal is to sharpen the group's efforts and to better recognize the success of One Tam as born out of a strong collaboration with the community as well as collaboration among its partner agencies. Finally, the current strategy is intended to provide tactics to achieve greater goals and inform the development of future work plans and associated fund-raising, planning, implementation, and public stewardship.

One Tam 2022-23 Work Plan

The One Tam partnership provides a collaborative framework for meeting today's unprecedented challenges, which present opportunities to incubate new strategies for stewardship, activate long-lasting community support, and catalyze positive change. Though uncertainties remain in the year ahead, this 2022-23 work plan provides a framework to leverage the shared resources and maintain the trajectory of the partnership's strength, sustainability, and care for Mt. Tam with focus on the benchmarks laid out in the current five-year One Tam strategy. Each section of the 2022-23 work plan represents the collective efforts of all One Tam partners and speaks to how its work has been and will adapt to meet the changing conditions in these uncertain and unprecedented times.

The Work Plan is structured around the six organizational areas that are presented in the One Tam's 2019–2023 Strategic Plan. Those six areas include *Landscape-Scale Science* and *Management, Projects, Programs, Partnership and Collective Impact, Philanthropy and Investment, and Communication*. The proposed work plan also reflects the current priorities of each of these partners and adds capacity to existing programs to collectively increase the group's mountain-wide reach and impact. The work plan includes both program and project support for the District. Program support includes continuation and expansion of the mountain-wide stewardship and citizen science activities, volunteer stewardship and youth programs. These programs are integrally linked to, and add capacity to, the District's existing program areas. In the coming years, the partnership will integrate climate resilience as a common theme into the collective programming in the quest to understand how to improve the resilience of parks as ecosystems shift in response to changes in the climate.

One Tam priority projects continue to be founded on good science, robust community participatory design, and interdisciplinary teams of staff and consultants. All projects seek to have broad-reaching benefits for the care and enjoyment of Mt. Tam's natural and cultural resources. Key ongoing District projects include Forest Restoration Projects, and the Azalea Hill Trail Restoration Project. As a result of One Tam's ongoing collaboration around forest health a grant from Cal Fire's Forest Health Program was awarded in the amount of $3.5 million to support ongoing forest restoration and fuel reduction work.
Landscape scale science and management continues to be a focus of One Tam's cross jurisdictional collaboration in the 2022/23 Work Plan. Updating the ***Measuring the Health of a Mountain: A Report on Mount Tamalpais' Natural Resources*** continues to be a priority and will provide an assessment tool for understanding the current state of the mountain's ecosystems and iconic species. **The Mt. Tam Early Detection and Rapid Response (EDRR) Program** will continue to augment agency efforts to detect and eliminate small patches of high-priority weeds before they develop into large, firmly established nuisance populations. **Rare species protection and enhancement** efforts across the mountain will continue to receive One Tam support in 2022-23, particularly those that improve habitat for or supplement the populations of rare species including serpentine endemic plants, and fire-dependent maritime chaparral shrubs.

In addition to the programs and projects noted above, the One Tam Annual Work Plan outlines a robust strategy for continuing collaborative stewardship in a focused manner and is attached for Board review and consideration. Staff is recommending that the Board of Directors review and refer to a future regularly scheduled Board of Directors meeting approval of the One Tam Bi-Annual Work Plan, and authorize the General Manager to sign Amendment No. 7 to the Cooperative Agreement to facilitate grant funding collaboration and funding transfers for the recently awarded Cal Fire Forest Health grant.

FISCAL IMPACT
No anticipated fiscal impacts.

ATTACHMENT(S)

1. One Tam Work Plan
2. Amendment No. 7 to Cooperative Agreement MA 5311

ONE TAM

Work Plan, 2022-2023

Since 2014, the One Tam partnership has affirmed a shared commitment to, and effectively increased capacity for, the stewardship of Mt. Tamalpais. Through the development and implementation of our annual work plans, the One Tam partners—the National Park Service (NPS), California State Parks, Marin Water (formerly Marin Municipal Water District), Marin County Parks (MCP), and the Golden Gate National Parks Conservancy (Parks Conservancy)—have worked together to identify and pursue goals related to the collective stewardship of the mountain. This year, the work plan will move from an annual to a biannual format, which reflects the strong foundation upon which the partnership rests and our proven ability to flexibly meet our collective challenges and goals.

Each One Tam partner was tested through the COVID-19 pandemic, which upended nearly every aspect of our shared work. At the same time, the crisis has demonstrated our added agility brought about by our partnership. Through these trials, the partnership has demonstrated flexibility and creative problem solving that will continue beyond the pandemic. In the spring of 2020, we quickly pivoted to providing high school programs entirely online and conducted meetings and community surveys related to the Bothin Marsh sea level rise adaptation project online as well. We are now conducting community engagement, education, and community science programs using both in-person and online methods to reach more participants and stakeholders, while still maintaining a depth and breadth of content key to the partnership. While the increase in visitor use of our public lands due to the pandemic presented challenges, it also presents opportunities to reach and welcome new audiences, and stewards, to Mt. Tam.

The pandemic and the growing impacts of a changing climate both highlight the fact that our challenges do not recognize jurisdictional borders. Recent fire seasons (including the Point Reyes fire in 2020), the historic drought, and sea level rise, has made climate resilience an even more urgent and pressing priority for our landscape. Forest health and drought resilience will be partnership priorities in this work plan.

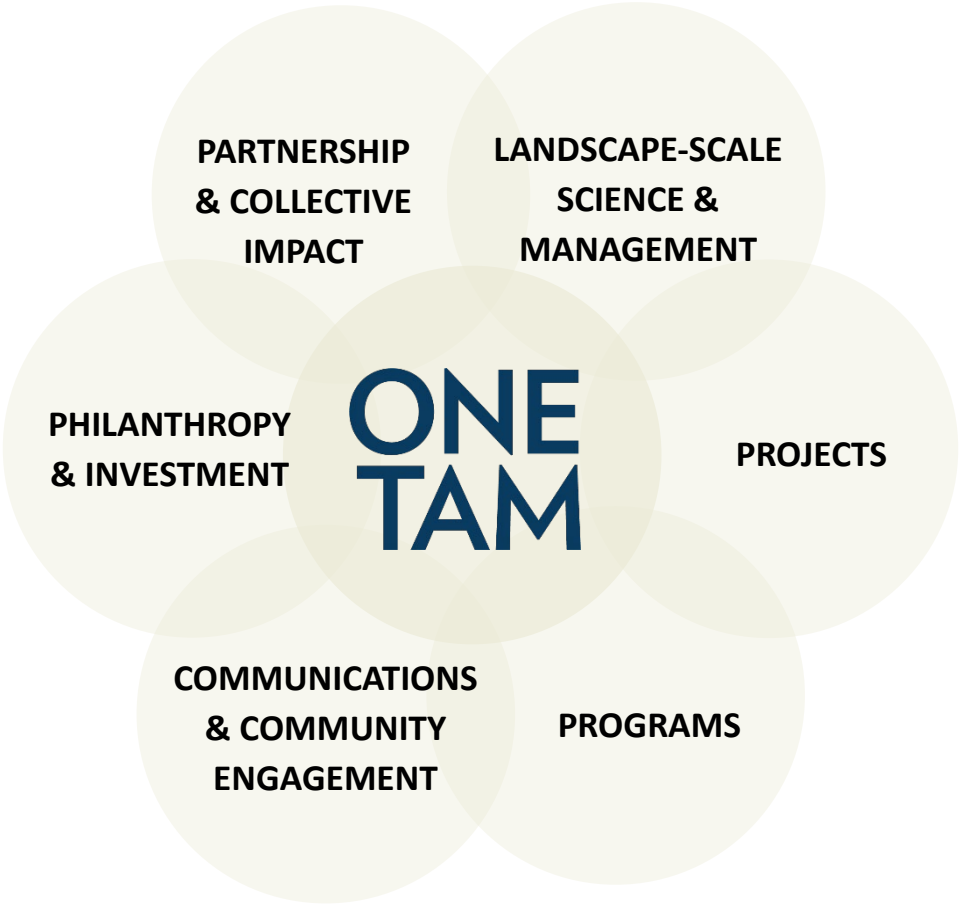
Budget reductions at the Parks Conservancy (due largely to reduced visitor income in 2020) coupled with an updated strategic plan has resulted in a leaner, more focused Parks Conservancy. As we focus our streamlined resources on these priorities, the partnership will also continue to expand parks as vehicles of social justice, ensuring that Mt. Tamalpais is accessible to those communities most impacted by climate change through opportunities including increased programmatic and public engagement. Building on the shared efforts of our partnership in 2021, we will continue to identify concrete steps that will make our work more open and equitable to all.

The One Tam partnership is essential to meeting today's unprecedented challenges, which we face as opportunities to incubate new strategies for stewardship, activate long-lasting community support, and catalyze positive change. Though uncertainties remain in the year ahead, this 2022-23 work plan provides a framework

to leverage the shared resources and maintain the trajectory of our partnership strength, sustainability, and care for Mt. Tam as we push forward on the benchmarks laid out in the five-year One Tam strategy. Each section of the 2022-3 work plan represents the collective efforts of all One Tam partners and speaks to how our work has been and will adapt to meet the changing conditions in these uncertain and unprecedented times.

The Six Primary Organizational Areas of One Tam's Work

This work plan is structured around the six organizational areas of One Tam's 2019–2023 Strategic Plan, illustrated below. As One Tam's communications and community engagement activities and planning are closely related, and a goal for 2022-23 is to ensure that our science communication and community engagement work further inform each other, we are reflecting this relationship more clearly in the figure below.



Programs

Overview

One Tam programs seek to connect the work of the partnership to local communities, and to connect communities to the mountain and to each other. Our community science programs strive to spark curiosity and engage a diverse cross-section of the local community as we collect the data needed to inform our conservation work. As an agency collective, we also work to provide relevant, fun, and informative educational programming, including nature walks, specialized trainings, and programs specifically geared to youth including internships. Our engagement team brings programming from our parks out to the communities that surround us and greets both seasoned and first-time users at a variety of trailheads and local gathering places adjacent to our public lands.

In the coming years, we will integrate climate resilience as a common theme into our collective programming in the quest to understand how to improve the resilience of our parks as ecosystems shift in response to changes in the climate.

Community Science

The Marin Wildlife Picture Index Project will undergo significant change as we actualize the promise of the data platform Wildlife Insights (https://www.wildlifeinsights.org/home), transitioning from an initial six-year period of data acquisition to data processing, exploration and public programming. Developed by an international consortium of conservation organizations and technology companies, Wildlife Insights stores and partially processes our wildlife images, provides public access, produces summary statistics, and places our work within a global context. During the fall of 2021, we will be developing new staff and volunteer protocols for using the platform and developing new opportunities for educators, researchers, and the general public to engage with this deep reservoir of wildlife information. We will complete a new round of wildlife trend analysis and integrate it into the update of Mt. Tamalpais Health Assessment in late 2022. Finally, we will revisit the goals of the study and resize its various components (number of cameras, seasonality, span and scale of staff and volunteer roles) to allow for more timely analysis and reporting.

BioBlitz events engage the public in resource-sensitive exploration of the diversity and distribution of the plants and animals around us. We will continue to host BioBlitz events that incorporate web-based instruction and the use of the iNaturalist app to engage new and returning volunteers in the detection and documentation of species on Mt. Tam and closer to home. We will also continue to host bioblitz events that focus on poorly documented groups of species (fungi, pollinators, and amphibians and reptiles). Special attention will be given to the popular mycoblitz series in the winter. We will collaborate with outreach and community engagement teams to participate in the international City Nature Challenge and statewide California Biodiversity Day. Additionally, we will develop web-based training modules to build community capacity for ecological and taxonomic expertise and iNaturalist proficiency in youth and adults. Lastly, the Community Science team will facilitate several workshops for land managers and researchers that are specifically designed to integrate these community-supported datasets into our understanding of the health of Mt. Tam.

Marin Milkweed Monitors is a community science initiative to understand the extent and condition of monarch breeding habitat in public lands managed by One Tam partners. Information from this project will be incorporated into selection of sites for habitat enhancement. Breeding habitat enhancement work will also incorporate information from a milkweed population genetics study conducted by Dr. Sarah Swope of Mills

College to determine if the monarchs are sensitive to any differences between nursery-sourced milkweed and local wild milkweed. This work will produce specific scientific outcomes through a participatory process for a diverse group of stakeholders. To broaden participation in community science and extend educational opportunities, a more casual milkweed and monarch watch program using the iNaturalist platform will also be implemented. Marin Milkweed Monitors will continue in 2022-2023 with continued recruitment and training of monitors during peak milkweed phenology in June, July, and August.

Youth and Education

Youth & Education programs are committed to promoting equity and inclusion in our public lands while providing educational and engaging experiences for our local youth. To do this, we foster future youth leaders by focusing on personal growth, civic engagement, conservation, career planning, and leadership development. We will continue to develop culturally relevant programming to engage the most underserved communities of students throughout Marin County and will continue to foster our relationship with key community partners including the MLK Academy in Marin City and the Canal Alliance in San Rafael through year-round youth programming for Middle School and High School youth, and may inform management plans for selected sites.

Linking Individuals to their Natural Community (LINC-Tam) is more than an outdoor adventure; for a diverse audience of local youth, it is a transformative summer program filled with learning and service. Participants in the six-week LINC program connect with their local public lands, build independence and self-awareness through hands on service projects in the parks, develop trust and partnership skills during camping trips, learn about ecology and stewardship techniques, and acquire relevant job skills. Through this combination of challenges and new experiences, LINC graduates are empowered to pursue the next level of leadership and career development opportunities. In 2022-3, we will return to in-person programming and increase participation to pre-pandemic levels. In addition, we will collaborate with the Marin County Office of Education, College of Marin and other partners to explore partnership opportunities.

Rising Environmental Youth Leaders (REYL) is an eight-month high school environmental leadership program connecting young people from underserved communities to their local parks and open space during the school year. Young adults learn the skills necessary to become strong environmental advocates and community leaders through service learning, environmental education, and outdoor trips. During this program, students will receive support and training to design and implement a Community Action Project to create climate change awareness in their local communities.

This youth leadership program is based in Marin County and connects all four agency partners. Using the mountain as a diverse and expansive classroom, young stewards restore high-priority native habitat, learn about the importance of public lands, develop valuable leadership skills, and create lasting connections to these special places. Projects and activities vary by month and can include habitat restoration, trail work and community science with a focus on fire ecology, sea level rise and biodiversity education.

The program includes a two-day overnight leadership training where the youth engage in team building & leadership skills, and a four-day camping trip to a national park.

Canal Alliance Middle School Program: One Tam staff will team up with Canal Alliance and the University Prep Program, to organize and facilitate several outdoor outings using the mountain as a diverse and expansive classroom to teach young stewards restoration practices, science, and leadership skills, and to create meaningful outdoor experiences that will last a lifetime.

NPS youth programs support: When capacity provides, One Tam will continue to work with the National Park Service by providing staff support for field trips and occasional education programs in partnership with local school districts and the public.

Marin Water youth programs support: One Tam will continue to partner with the Marin Water by providing limited staff support for field trips and occasional education programs, watershed fieldtrips and the Trout in the Classroom program.

Stewardship

We continue to provide the public with service opportunities on NPS, State Parks, MCP, and Marin Water lands. Stewardship projects emphasize actions that increase resilience in the face of climate change, including riparian, wetland, and floodplain restoration as well as work that increases forest health. Additional effort will also be made to increase connectivity and partner opportunities with the One Tam Community Science and Youth teams.

Projects

Overview

One Tam priority projects continue to be founded on good science, robust community participatory design, and interdisciplinary teams of staff and consultants. All projects seek to have broad-reaching benefits for the care and enjoyment of Mt. Tam's natural and cultural resources.

The previous year heralded many exciting milestones for One Tam's priority projects. Construction continued on the Redwood Creek Trail. The Forest Resiliency Working Group advanced a multi-agency strategy, with completion of the Marin Countywide Vegetation Map and Database providing foundation data for continued investigation and decision making. The State Wildlife Conservation Board and National Park Service awarded grants to advance habitat improvements for imperiled monarch butterflies. The California Department of Forestry and Fire Protection awarded a grant to fund Phase I of One Tam's Mt. Tamalpais Forest Health Initiative.

Climate Adaptation Planning

Climate adaptation planning will continue to grow as a focus of One Tam projects, particularly with planning at Stinson Beach kicking off in this 2022-23 work plan.

Legacy Projects

One Tam will continue to coordinate and advance its two Legacy Project areas. These areas represent a generation-long commitment to restoration and enhancement, with multiple projects comprising a larger vision.

- Dipsea Trail Corridor
- Redwood Creek

Adopted One Tam Projects

The table on the following page represents the One Tam projects currently adopted and included in the 2022-23 work plan, as well as where project support overlaps with other One Tam work areas. One focus of our support is ensuring high quality and thoughtful communication and community design when appropriate. As we continue to adjust to COVID-19 safety measures, we are both refining the use of new engagement tools and welcoming the return of in-person engagement when possible.

One Tam 2022/23 PRIORITY PROJECTS	AGENCY	STATUS	COMMUNICATION	ENGAGEMENT	DEVELOPMENT	SCIENCE
2022/23 IMPLEMENTATION: Portion of Project Constructed in 2022/23*						
Azalea Hill Trail Restoration	Marin Water	Construction Start 2020	✓	✓	✓	
Deer Park Fire Road Rehabilitation	CDPR	Continue as funding allows				
Redwood Creek Trail Realignment	CDPR	Phase 1 continues into 2022				
HIGH PRIORITY: Staff & Funding Focus						
Bothin Marsh Adaptation	MCP	Refining Alternatives	✓	✓	✓	
Forest Health & Resiliency	Marin Water	In Process	✓			✓
Roy's Redwoods Restoration & Access	MCP	Shovel ready spring 2022 pending funding		✓	✓	✓
Stinson Beach SLR Adaptation Planning	NPS & MCP	Planning Initiated 2021	✓	✓	✓	✓
MID PRIORITY: Primarily Agency Led & Funded; Pursue Opportunistic Funding Only						
Azalea Hill Trail Restoration	Marin Water	Construction Start 2020		✓	✓	
Bolinas Wye Restoration	MCP	Shovel ready pending funding	✓	✓	✓	✓
RC Trail Realignment	CDPR & NPS	Future Phases TBD			✓	
Dias Ridge Extension	CDPR &NPS	Future Phases TBD				
Redwood Creek Floodplain	CDPR	Feasibility Study in process			✓	
Dipsea Bridge Construction	NPS	Concept Design		✓	✓	
BACK BURNER: Revisit 2022						
Dipsea Trail	NPS & CDPR			✓	✓	
Potrero Meadow Restoration	Marin Water					
RC Juvenile Coho Habitat Creation	NPS	Phase II 2021	✓	✓	✓	
West Peak Restoration Feasibility Study	MMWD				✓	

Landscape-Scale Science and Management

Overview

Measuring the Health of a Mountain: A Report on Mount Tamalpais' Natural Resources is an assessment tool for the mountain's ecosystems and iconic species that has become a cornerstone of One Tam's work. Originally developed in 2016, it presents consensus findings on the status and trends of 27 biological indicators that include both individual species and entire communities. The report also identifies threats to Mt. Tam's health, concrete actions to mitigate these threats, and areas where more information is needed.

An update of the original report will be released in 2022-2023, under a simplified name: **Peak Health.** The update will summarize new findings related to the 27 biological indicators and provide an update on their overall condition and determine whether it is trending in a positive or negative direction. Where we have filled knowledge gaps, we will add new chapters: bats, bees, and monarchs will be included for the first time. We will also strengthen content related to climate change and climate vulnerability of specific indicators. Finally, the completion of the Marin County-wide Vegetation Map opens to door to a more robust and repeatable approach to assessing the health of our plant communities.

Peak Health is as much a process as a report. Each chapter update includes at least one workshop that draws in expertise from all One Tam partners as well as from regional scientists and community experts. We also encourage broad community engagement with the content through the development of web-based content, webinars, and gatherings. The summary of the update findings will be a primary focus of the next One Tam symposium.

During 2022-23 One Tam partners will continue to collect and synthesize data related to the health of Mt. Tamalpais. Some efforts will be modified to take advantage of new technologies that allow for faster analysis and more real-time assessments of conditions and trends.

Vegetation Management

The Mt. Tam Early Detection and Rapid Response (EDRR) Program augments agency efforts to detect and eliminate small patches of high-priority weeds before they develop into large, firmly established nuisance populations. The EDRR team has completed two three-year cycles of surveys, covering over 425 miles of roads, trails, and drainages in each cycle. The second cycle was completed in less time than the first, demonstrating the benefit of skill building and continual refinement of protocols. Results suggest that agency use of best management practices designed to minimize spread remains a priority. During 2022-2023, we will integrate findings from this work into the Peak Health Report and begin a third cycle of surveys.

Rare species protection and enhancement efforts across the mountain will continue to receive One Tam support in 2022-23, particularly those that improve habitat for or supplement the populations of rare species including serpentine endemic plants, and fire-dependent maritime chaparral shrubs.

Inventory and Monitoring Programs

Bat Inventory: Long-term monitoring of Marin County's bats continues in partnership with the U.S. Geological Survey. One Tam is using a combination of acoustic monitoring tracking and roost identification techniques that align that with standards from the North American Bat Monitoring Program. Mist netting and the use of radio transmitters for roost identification have been suspended due to the potential risk of a human-to-bat transfer of

COVID-19.

One Tam's Pollinator Inventory and Monitoring Program will continue into 2022-23. In collaboration with Dr. Gretchen LeBuhn and her lab at San Francisco State University, One Tam is continuing our efforts to monitor and understand more about Mt. Tamalpais' wild bees. We will continue to engage new and returning volunteers through Tamalpais Bee Lab events where they gain scientific collections management and insect identification skills. We have completed high resolution macro photography of identified bee specimens collected on Marin Water and California State Parks lands that can be used to create a scientific reference collection, outreach and fundraising materials, retail items, and other media products. The collection, identification, and photography work will continue on National Park Service land during 2022-23. We will also develop interpretive materials that can be used by retail, outreach, and community engagement teams.

Freshwater Spring Monitoring remains in development. A vegetation classification study of spring-fed micro-habitats as well as an isotope analysis have been postponed until the 2023 field season.

The Marin County-wide Vegetation Mapping and Landscape Database Project is near completion. Our 2022-23 efforts will focus on finalizing remaining datasets, including countywide impervious surfaces mapping, completing a formal accuracy assessment of the vegetation map, and compilation of the final report. Future work includes partnering with Marin County Department of Information Services and Technology Department to improve access to the datasets produced by the project, working with the One Tam communications teams to celebrate project outputs, and activating these new datasets as a tool for Peak Health as well as Forest Health and Resiliency work.

Forest Health and Resiliency

The Regional Forest Health Strategy for the public lands of Marin County is currently in process, with the initial finalized strategy document on track to be completed by the end of March 2022. Currently, the Forest Health Strategy project team of partners and consultants are working to analyze datasets developed as part of the Countywide Fine Scale Vegetation Map and Landscape Database project to conduct a comprehensive assessment of forest health for five key forest types. This assessment work will highlight areas that could benefit from future forest health and resiliency treatments and aid in targeting future project fundraising opportunities. Other important forest health work in 2022-23:

Completion of a Traditional Tribal Knowledge memo developed in partnership with the Federated Indians of Graton Rancheria, that will highlight ways that One Tam partners can learn from ingenious practices and values as well as opportunities to partner with tribes, and to elevate traditional tribal knowledge as part of our forest health and resiliency work and communications.

Development of an Existing Compliance Technical Memorandum that will summarize existing One Tam partner compliance documents and identify potential pathways for future work, including potential cross-jurisdictional forest health and resiliency treatments.

Further work on communications and community outreach to local stakeholders to both increase the impact of our forest health strategic planning efforts and ensure alignment with county and statewide priorities and funding opportunities.

Communications & Community Engagement

Overview

Improving collaborative and impactful communications and engagement will continue to be a focus of One Tam partners in 2022-23. While the continuation of the COVID-19 pandemic created unprecedented messaging complications for partners, we have continued to rely on and grow the following building blocks that support our communications and community engagement efforts.

Building Blocks

The "Tam Van", which serves as One Tam's mobile visitor center, welcomes and invites people from all backgrounds to enjoy and explore Mt. Tam. The Tam Van has a flexible suite of materials and programming content that adapts depending on the site and audience interests, and that complements One Tam partners' programs and projects. In addition to providing maps and trail information, in the years ahead, the Tam Van will offer a range of naturalist-themed topics that will include: the Wildlife of Mt. Tam; the Geologic Origins of Mt. Tam; the Rare Frogs of Carson Falls; and How to Become a Community Scientist.

The Tam Van also shares out priority information about One Tam partner programs and projects that will include: Climate Change Resilience & Addressing Sea Level Rise at Bothin Marsh; Living with in a Drought on Marin Water Lands; Protecting Redwood Forest Understory Health at Roy's Redwoods; Managing Mt. Tam's landscape for Fire and Fuel reduction; and highlighting volunteer programs and upcoming special events. In 2022-23, One Tam will expand the naturalist content offered from the Tam Van, with short walks and talks based from the Tam Van.

Over the past 18 months, the Tam Van's outings were limited due to COVID-19 restrictions. In the years ahead, we plan to bring the Tam Van back into the community, with appearances at community events, career fairs, and celebrations in the Bay Area that may include Biketoberfest, Día de los Muertos at Pickleweed Park, the Fairfax Festival, Wildcare Family Nature Day, REI Camping Happy Hour, Summerfest, and the College of Marin Career Fair.

Park Greeter Program: In 2020, following shelter-in-place orders, One Tam piloted a "park greeter" volunteer program to help staff the Tam Van and welcome visitors back to the parks. For 2022-23, we plan to expand this program to support the goals and scope of the Tam Van, thereby providing more assistance to land managers with public outreach and education.

Newsletter storytelling is a reliable way to message digitally to the people who support our work. It is the primary way we keep in touch with One Tam members and interested community members. In order to grow open rate and improve our reader engagement, we have begun weaving in regular community science features, profiles, virtual resources and topical introductions. We have also sent special members' announcements for virtual programs, which are among our best-performing emails since 2014. We continue to think of ways that the e-news can add value for readers, with a goal of increasing open rates and subscriber retention. We have seen an audience growth of about 1200 new subscribers in the last year (between 9/20-9/21), which we think is quite successful considering there have been fewer ways to participate in programs during that time period than in the past. New format flexibility will allow us to pivot more easily, share partner priorities as appropriate, and accommodate new ways to engage readers.

The *onetam.org* website saw its largest traffic spike ever in May of 2020 as our partner communications

representatives and the Conservancy's GIS Specialist teamed to create a map that provided closure information related to the COVID-19 pandemic, shattering our previous website traffic records. Visitor utility will become central as we connect people to our work through the website, and we will work to ensure that more of the content on the site connects readers to opportunities for membership and a lasting relationship One Tam.

Social media growth remains a priority to strengthen our shared tools, particularly Instagram. We are also seeing success in highlighting photography from the community, creating a positive feedback loop with a subset of Mt. Tam lovers. In alignment with the Conservancy's Communications Team, we will continue to prioritize growth on this platform while utilizing Twitter and Facebook for event posting and other utility needs.

Agency and community stakeholder group boards and subcommittees will continue to be engaged as appropriate to share project and program information, achievements, etc. Agency board and public meetings will also continue to serve as the forum for receiving CEQA/NEPA-based public comments.

Connectivity led to content in several instances in 2020 as communications teams worked in unison to promote our park closure map, City Nature Challenge, International Migratory Bird Day and other messages. This ability to share storytelling skills and unify messaging will allow us to greatly amplify priority messages going forward.

2022-23 Priorities

Speaking to our accomplishments for those who aren't yet familiar with our work is key to the long-term strength of One Tam. We've seen widespread interest in community science, bat research, youth programs and specific projects. As we build out a new MWPIP research database, map utilities and break ground on feature projects we must explain how that work builds upon the growing legacy of our young partnership and present those stories in a way that can be consumed by anyone who might be interested in our programs or membership.

Supporting Diversity Outdoors: The communications team will support the need for a stewardship approach in our collective One Tam effort that creates an equitable and inclusive environment by engaging with representatives at the One Tam-wide and agency levels to ensure our messaging mirrors best practices for making our workplaces and public lands welcoming to people of all backgrounds.

Clarifying public understanding will be a focus in the years ahead. In the early days of our partnership, we prioritized building the One Tam brand, which was challenging to balance with acknowledging the individual contributions of our partner agencies. In order to improve community understanding of our partners, access, and stewardship, we will increase efforts to explain how each agency enhances our collective value.

Science communication: With an emphasis on stories and information coming out of the Peak Health effort, we will use existing channels and test new tools to help share out what we are learning through our science work, in service of improving the health of the mountain and connecting community members to this work. We will work to connect our science communication and community engagement work so that they inform each other; similarly, we will seek to connect with partner interpretation staff on this work. The 2022 One Tam Symposium will provide a platform for sharing the results of our work with broad audiences.

Partnership and Collective Impact

Overview

Despite the continuing impacts of the COVID-19 pandemic, One Tam continues to build on our foundational

strengths to sustain and maximize the effectiveness of our partnership. 2022-23 activities will build on the unique talents and resources of the partners to prioritize efforts around climate change and environmental justice. Our initiatives, focused on sea level rise, fire, and drought resilience, will be best effectuated by strengthening the partnership's operations and staff support, increasing efficiencies and information exchange, sharing our work and best practices more broadly, and continuing to build key relationships with other organizations. Regularly coordinating and sharing information across the Executive, Advisory, and Steering, program, project and funding committees ensures that our partnership efficiently and effectively strives toward the common protection, monitoring, and stewardship of our park, natural, and cultural resources and consistently adapts those efforts when necessary.

In 2021 One Tam led and facilitated the work of the California Landscape Stewardship Network (CLSN), as we have done since its inception in 2017. One of the culminations of this leadership was an extensive online *Stewardship.2021* Spring Forum in April-May of 2021 which in part highlighted some of One Tam's systems change successes, collaborative leadership program development, and science-based work. It also shared ideas among a range of partners, practitioners, and state leaders regarding the future of landscape stewardship as a practice. While One Tam will no longer lead and facilitate the CLSN as of 2022, One Tam will remain an active member.

Ongoing Efforts

The Partnership Impact Model™ will continue to be used as a tool to monitor the health and progress of the One Tam partnership and its larger relationship network. We will continue working with California State University, Sacramento to develop a long-term partnership assessment strategy based upon this model. The foundations of the Partnership Impact Model are also being integrated into the development of a Collaborative Leadership Curriculum. This work is overseen by the California Landscape Stewardship Network in partnership with a number of state and national organizations. We anticipate the development of the initial pilot program in 2022.

The Park Academy and Training Portal supports cross-partnership engagement and professional development through shared training opportunities by offering virtual and in-person trainings through Park Academy. Topic areas include diversity, equity, and inclusion, safety, technology, volunteer management, community programming, and job specific trainings to increase efficiencies, peer exchange, and coordination. In 2022-23, we will increase the utilization of the Training Portal throughout the partnership, serving as the central hub for in-person, virtual, and on-demand learning opportunities.

Cultural Resources: In 2022-23 our partnership will identify appropriate cultural staff and tribal liaisons from partners to convene a Cultural Resources Working Group. Categorize concerns and needs across partners to determine methods for providing support to cultural resource projects and programs.

Career development opportunities: In 2022-23 our efforts will redouble to create career development opportunities for youth, interns, and seasonal staff through strengthening One Tam's workforce development program with agency partners.

Philanthropy and Investment

Overview

One Tam will secure agency and community support to meet the programmatic and infrastructure needs

outlined in this work plan. Fundraising is ongoing for projects depending on need and opportunity. Some of our main and growing tools for philanthropy are detailed below.

See the FY22-23 financial statement below for philanthropy and investment goals. This financial statement is updated quarterly and can be found at onetam.org/facts-figures. Project and capital fundraising activity is described in the projects chart on page 7 of this work plan.

One Tam Ambassadors are passionate community members who volunteer their time to spread the word about One Tam's work. Ambassadors represent One Tam at public events and community and business forums, and they assist with membership outreach and event planning. The Ambassador group will meet quarterly with additional meetings and activities for subcommittee members. There will also be a focus on One Tam Ambassador recruitment to expand the group from the current 21 to 25 participants.

Membership programs such as guided hikes, rides, and behind-the-scenes tours offer unique opportunities to individuals who support One Tam with their annual membership contributions. Though in-person events were cancelled in 2020 due to COVID-19 restrictions, we adapted the One Tam member webinars to an online format. In 2020, these member webinars were well received, and in fact, drew more attendees than our typical in-person events. In 2022-23, we will continue working with Ambassadors, agency partners, and community members to identify venues and activities to help connect members more deeply to our work with both in-person and virtual programs. We will design and launch a Corporate Giving strategy to strengthen the existing One Tam Business Club. We will also focus on upgrading members to our major donor program known as the One Tam Circle, and developing a signature event for this group.

TAMALPAIS LANDS COLLABORATIVE

FY2022-23 Parks Conservancy Proposed Budget

October 1, 2021 thru September 30, 2023

PROJECTS/PROGRAMS BREAKDOWN

INCOME	FY2022-23 Projects	FY2022-23 Programs
Individual Gifts	44,470	739,306
Events	-	50,000
Corporate Giving	35,714	100,000
Foundation Grants[2]	706,623	1,585,189
Government Grants[1]	4,450,594	273,000
Partnership Agreements[1]	608,934	497,550
Parks Conservancy Contributions	-	-
TOTAL INCOME	**5,846,335**	**3,245,045**
EXPENSES		
Programs		
Community Science	-	921,669
Youth and Education	-	317,558
	-	**1,239,227**
Priority Projects		
Redwood Creek Trail Re-alignment Implementation	15,000	-
Bothin Marsh Adaptation	420,000	-
Forest Heath & Resiliency (Implementation)	1,700,000	-
Roy's Redwoods Restoration & Access	541,857	-
Stinson Beach SLR Adaptation Planning	71,095	-
Bolinas Wye Restoration	47,231	-
Redwood Creek Floodplain	430,594	-
Dipsea Bridge	53,878	-
	3,279,655	**-**
Landscape Scale Science & Management		
Vegetation Management	-	798,459
Inventory & Monitoring	365,660	-
Forest Health & Resiliency (Planning)	346,778	-
	712,438	**798,459**
Communications & Community Engagement		
Building Blocks	-	435,111
Partnersnip Impact and CLSN	405,000	-
Park Academy & Training Portal	-	99,217
	405,000	**534,328**
TOTAL EXPENSES	**4,397,093**	**2,572,014**
NET OPERATING SURPLUS	**1,449,242**	**673,031**

[1]Includes reimbursable grants awarded in advance of expenditures.

[2]Includes only cash in hand.

REVISED 2021.11.09

Item Number: 03
Meeting Date: 12-16-2021
Meeting: Watershed Committee/Board of Directors (Watershed)

Review and Refer for Board Approval

TO: Watershed Committee/Board of Directors (Watershed)

FROM: Shaun Horne, Watershed Resources Manager

THROUGH: Ben Horenstein, General Manager

DIVISION NAME: Watershed

ITEM: Award of Contract No. 1967 for Forestry Services to Bay Area Tree Specialists

RECOMMENDATION

Review and refer to a future regular Meeting of the Board of Directors with the District Watershed Committee recommendation to approve a resolution to award Contract No. 1967 to Bay Area Tree Specialists.

SUMMARY

On October 31st, 2021, the District released a notice inviting bidders to submit proposals for a two-year forestry services contract. The District received three (3) bids on November 18th and Bay Area Tree Specialists was identified as the lowest qualified bidder. Staff is recommending that the Watershed Committee review and refer to a regularly scheduled Board of Directors Meeting approval of a Resolution awarding Contract No. 1967 to Bay Area Tree Specialists in the amount of **$1,856,789** for a two-year Forestry contract with a District option to extend services in one year increments for up to an additional two-years. Staff is also requesting that the Board authorize the General Manager to execute any and all future amendments to this contract, which he deems necessary, so long as they do not exceed 10% in total of the contract amount.

DISCUSSION

In October of 2019, the District adopted the Biodiversity, Fire, and Fuels Integrated Plan (BFFIP) which describes the actions the District will implement to reduce wildfire hazards and to maintain and enhance ecosystem function. Under the BFFIP there are 27 management actions that are being implemented to fulfill the goals and approach described in the plan. Vegetation management under the BFFIP aims to reduce fuel loads, maintain fuelbreak infrastructure, preserve defensible space, and reduce invasive weed species. Vegetation management is conducted continuously throughout the year with the chief goal of reducing fuel loads and maintaining the watershed's biological diversity. This contract will support the scaling up of vegetation management work and forest restoration on the Mt. Tamalpais watershed, which is

necessary to address fuel load issues and ensure maintenance of existing fuelbreak infrastructure.

In collaboration with One Tam, the District was awarded a grant from Cal Fire's Forest Health Program in the amount of $3,545,000 of which $3,166,000 will support the District's implementation of forest restoration, fuel reduction, fuelbreak maintenance, and invasive management work on the watershed over the next 3-4 years. Contract No. 1967 will implement this critical wildfire fuel reduction work and improve the health of the watershed through the management of invasive species and reduction of hazardous fuels. One Tam/GGNPC will support the District's work through community education, outreach, and capacity building.

The District has used similar contractors over the past five years to implement Resilient Forest Pilot Projects, which involved treating fuel load issues in forests impacted by sudden oak death. Additionally, the equipment capabilities of the forestry services contractor will support the maintenance of critical fuelbreaks and forestry work in wide area fuelbreaks. In accordance with Section 1000, Paragraph 1.5 of the contract "The district has the option to extend this contract in one (1) year increments for an additional two years". If the contractor is meeting the District's expectations, then the District may annually exercise the option to extend the contract to continue work in subsequent years for a total contract term of up to four-years.

Proposal Selection Process

On October 31st, 2021, the District released a notice inviting bidders to submit proposals for a two-year forestry contract. The notice was published in the local paper and posted on the District's external bid posting website to inform contractors of the opportunity. Sealed bids were received by the district on November 18th and the lowest qualified bidder was identified.

FISCAL IMPACT

The total project costs is **$1,856,789** for a two year period. For FY 22/23 there is currently $380,000 budgeted in Capital A1E07 'Green Infrastructure' and $600,000 in CalFIRE grant for forestry restoration, fuel load reduction, and fuelbreak maintenance.

ATTACHMENT(S)

None

Item Number: 04
Meeting Date: 12-16-2021
Meeting: Watershed Committee/Board of Directors (Watershed)

Review and Refer for Board Approval

TO: Watershed Committee

FROM: Shaun Horne, Watershed Resources Manager

THROUGH: Ben Horenstein, General Manager

DIVISION NAME: Watershed

ITEM: California Conservation Corps Forestry, Fuels and Trails Contract

RECOMMENDATION

Review and refer to a future regular Bi-Monthly Meeting of the Board of Directors with the District Watershed Committee recommendation to approve a FY 2021/2022 California Conservation Corps Contract

SUMMARY

On March 2, 2017, the District entered into a Sponsor Agreement (CCC-96) with the California Conservation Corps, which determined that there were mutual advantages and a public benefit to having CCC corps members complete agreed upon land management activities on the District's watershed lands. On an annual basis, the District enters into subsequent agreements/amendments to support critical vegetation, fuels, forestry and trails work. Staff is recommending that the Watershed Committee review and refer to a regularly scheduled Board of Directors Meeting approval of the FY 2021/2022 California Conservation Corps Contract in the amount of $210,000.

DISCUSSION

In October of 2019, the District adopted the Biodiversity, Fire, and Fuels Integrated Plan (BFFIP) which describes the actions the District will implement to reduce wildfire hazards and to maintain and enhance ecosystem function. Under the BFFIP there are 27 management actions that are being implemented to fulfill the goals and approaches described in the BFFIP. Vegetation management under the BFFIP aims to reduce fuel loads, maintain fuelbreak infrastructure, preserve defensible space, and reduce invasive weed species. Vegetation management is conducted continuously throughout the year with the chief goal of reducing fuel loads and maintaining the watershed's biological diversity. This contract will support the scaling up of vegetation management work and forest restoration on the Mt. Tamalpais watershed, which is necessary to address fuel load issues and ensure maintenance of existing fuelbreak infrastructure.

The CCC spike team is based out of Ukiah, California, and reports to sponsor work sites for an eight-day rotation or "spike". The CCC crew is composed of 10-13 corps members who work in 10-hour shifts. Corps members are working on the Mt. Tamalpais watershed lands to carry out fuel reduction, forest restoration, fuelbreak maintenance and trails work. Crews work under the direction and supervision of Watershed Maintenance staff as well as a CCC on-site supervisor. Over the past two years CCC crews have been camping at the Sky Oaks Ranger station in the old Girl Scout Camp. This arrangement maximizes the crew's time conducting work by reducing commute times and helps keep the overall contract costs lower. The Contract for FY 2021/2022 will fund 7 CCC spikes on the watershed.

Staff is recommending that the Watershed Committee review and refer to a regularly scheduled Board of Directors Meeting approval of the FY 2021/2022 California Conservation Corps Contract in the amount of $210,000.

FISCAL IMPACT
The total contract costs is $210,000 and is budgeted in Capital A1E07 'Green Infrastructure' and the CalFIRE grant for forestry restoration, fuel load reduction, and fuelbreak maintenance.

ATTACHMENT(S)

1. Proposed CCC Contract

Item Number: 04
Attachment: 01

STATE OF CALIFORNIA
AGREEMENT ADDENDUM: CCC-96A (Rev. 11/01/2019) page 1 of 3

CALIFORNIA CONSERVATION CORPS

CCC Agreement #	Index#	CCC Project Number
(CCC Contract Officer Assigns)	1715 (Center Index Code is Four digits)	R-21-1715-8892 (C3 Assigns)

A] The California Conservation Corps (CCC), agrees to provide crew labor for the project titled:

MMWD Trail Work and Fuel Reduction FY 21/22

See CCC-58: Project Evaluation Form for details.

B] The term of this agreement shall be:
Agreement Start Date: December 6, 2021 ☐ Check here if multi-year
Agreement Expiration Date: June 30, 2022

C] Sponsor agrees to reimburse the CCC for estimated costs in accordance with the Fiscal Summary. (Fiscal Year displays are shown on page 2 and page 3.)

NOTE TO SPONSOR: Budget detail will not be provided on performance based contracts.

Labor	Hours	Rate/Hr	Totals
CM Regular Time:	7280.00	$ 26.00	$ 189,280.00
CM Overtime:	0.00	$ -	$ -
Performance Based Labor:			$ -
Unspecified:			$ -
Staff Regular Time :			$ -
Staff Overtime :			$ 12,698.00
EXPENSES			
Equipment (greater than $5,000):			$ -
Tools (includes equipment less than $5,000):			$ -
Materials:			$ -
Vehicle Operations:			$ -
Consulting:			$ -
Other:			$ 8,022.00
D] The total amount payable by Sponsor to CCC under this agreement shall not exceed:			**$ 210,000.00**

E] The CCC shall forward billing for labor and/or operating expenses with supporting documentation to the sponsor:
[x] Monthly [ ] Quarterly [ ] At end of contract
F] Sponsor agrees to pay CCC within 35 days from receipt of invoice.

Sponsor	
Organization:	Marin Municipal Water District
Date:	
Signature:	
Print:	Ben Horenstein
Title:	General Manager
SPONSOR EMAIL ADDRESS	
bhorenstein@marinwater.org	
SPONSOR MAILING ADDRESS	
220 Nellen Ave Corte Madera, CA 94925	
SPONSOR BILLING ADDRESS:	
x *Check Here if Billing and Mailing Address are the same*	

STATE OF CALIFORNIA	
California Conservation Corps	
Date:	
Signature:	
Print:	Dawne Bortolazzo
Title:	Deputy Director, Administration
CCC CENTER VERIFICATION	
Date:	11.23.2021
Signature:	Cathy Barr
Print:	Cathy Barr
Title:	Conservation Supervisor
FORWARD PAYMENTS TO:	
California Conservation Corps Attention: Accounting/Receivables 1719 24th Street Sacramento, CA 95816	

First Fiscal Year Display			Labor	Hours	Rate/Hr	Totals
	FROM:	12/06/21	CM Regular Time:	7280.00	$ 26.00	$ 189,280.00
	TO:	06/30/22	CM Overtime:	0.00	$ -	$ -
			Performance Based Labor:			$ -
			Unspecified:			$ -
			Staff Regular Time :			$ -
			Staff Overtime :			$ 12,698.00
			EXPENSES			
			Equipment (greater than $5,000):			$ -
			Tools (includes equipment less than $5,000):			$ -
			Materials:			$ -
			Vehicle Operations:			$ -
			Consulting:			$ -
			Other:			$ 8,022.00
			First Fiscal Year TOTAL:			**$ 210,000.00**

Second Fiscal Year Display			Labor	Hours	Rate/Hr	Totals
	FROM:		CM Regular Time:	0.00	$ -	$ -
	TO:		CM Overtime:	0.00	$ -	$ -
			Performance Based Labor:			$ -
			Unspecified:			$ -
			Staff Regular Time :			
			Staff Overtime :			$ -
			EXPENSES			
			Equipment (greater than $5,000):			$ -
			Tools (includes equipment less than $5,000):			$ -
			Materials:			$ -
			Vehicle Operations:			$ -
			Consulting:			$ -
			Other:			$ -
			Second Fiscal Year TOTAL:			**$ -**

Third Fiscal Year Display			Labor	Hours	Rate/Hr	Totals
	FROM:		CM Regular Time:	0.00	$ 26.00	$ -
	TO:		CM Overtime:	0.00	$ -	$ -
			Performance Based Labor:			$ -
			Unspecified:			$ -
			Staff Regular Time :			$ -
			Staff Overtime :			$ -
			EXPENSES			
			Equipment (greater than $5,000):			$ -
			Tools (includes equipment less than $5,000):			$ -
			Materials:			$ -
			Vehicle Operations:			$ -
			Consulting:			$ -
			Other:			$ -
			Third Fiscal Year TOTAL:			**$ -**

Fourth Fiscal Year Display			Labor	Hours	Rate/Hr	Totals
	FROM:		CM Regular Time:	0.00	$ 26.00	$ -
	TO:		CM Overtime:	0.00	$ -	$ -
			Performance Based Labor:			$ -
			Unspecified:			$ -
			Staff Regular Time :			$ -
			Staff Overtime :			$ -
			EXPENSES			
			Equipment (greater than $5,000):			$ -
			Tools (includes equipment less than $5,000):			$ -
			Materials:			$ -
			Vehicle Operations:			$ -
			Consulting:			$ -
			Other:			$ -
			Fourth Fiscal Year TOTAL:			**$ -**

The total amount payable by Sponsor to CCC under this agreement shall not exceed:	**$ 210,000.00**

California Natural Resources Agency

CALIFORNIA CONSERVATION CORPS PROJECT EVALUATION FORM CCC 58

R-21-1715-8892

MMWD Trail Work and Fuel Reduction FY 21/22

Project Data

Project Title: MMWD Trail Work and Fuel Reduction FY 21/22 **Project Number:** R-21-1715-8892

Center Information: 1715 - Ukiah Center

Contract Information: -

Project Description:

Ukiah crew will work on various trail construction or maintenance projects such as invasive species removal ie Douglas Fire as directed by MMWD staff. Standing timber will have ladder fuels removed and be limbed. Felled trees will be limbed and boles will be left on the ground. Limbs will be piled for later burning.

The possibility of prescribed burns/ burn piles with CALFIRE and MMWD may be conducted if all safety trainings and requirements are met. Piles of Douglas fire made on previous spikes will be burned when there is a permissive burn day.

Budget costs include staff OT (Base salary covered by CCC), housing for crew, food costs.

7 spikes averaging 13 cms each rotation Winter- Spring/ early summer.

Sponsor Information

Agency Name: MARIN MUNICIPAL WATER DISTRICT **Agency Code:** 69009

Mailing Address	Mailing City	Mailing State	Mailing ZIP Code
220 Nellen Ave.	Corte Madera	CA	94925
220 Nellon Ave	Corte Madera	CA	94925

Sponsor Contact Information:

Contact type	Title	First name	Last name	Phone number	Email address
Sponsor Representative	General Manager	Ben	Horensteln	(415) 945-1460	bhorenstein@marinwater.org
Technical Advisor	Maintenance Supervisor	Carl	Sanders	(415) 945-1189	csanders@marinwater.org

Estimate Information

Estimated Number of Hours: 7,280 **Estimated Start and End Dates:** 12/6/21-6/30/22

Work Site Information:

Address	City	State	ZIP code	Geolocation latitude	Geolocation longitude
West Ridgecrest Blvd	Stinson Beach	CA	94970		

Direction to site location	Special instructions
101 south towards the Bay Area, exit 445B towards Stinson Beach. Continue on CA 1 Panoramic HWY to W. Ridgecrest Blvd	

Fiscal Summary

Total OE&E	Total CM labor amount	Total fiscal summary amount
$8,022.00	$189,280.00	$210,000.00

Equipment, Materials and Labor

Sponsor Supplied Materials, Equipment and Labor:

Materials: Burn Permits
Spike location- Sky Ranch 49 Sky Oaks Rd
Equipment: Water Tender
Labor: Technical oversight

BY SIGNING THIS DOCUMENT:

The CCC Representative agrees to the following:

- A Sponsor Agreement (CCC 96 or, where applicable, an Inter Agency Agreement or other Master Agreement) is on file at Headquarters (HQ).
- If the Sponsor is a non-profit entity, a Private Property/Sponsor Authorization form has been submitted to HQ.
- If the Sponsor is a for-profit entity, a Private Property/Sponsor Authorization form has been submitted to HQ.
- The project conforms to the CCC's Injury and Illness Prevention Program (IIPP).
- The signing CCC Representative has the authority to enter into a contractual agreement of this amount with the Sponsor.

The Sponsor Representative agrees to the following:

- Hazardous Materials
  - If there are hazardous materials present, the Sponsor has provided the location, identity, and amounts of any hazardous substances at the worksite and provided all Material Safety Data Sheets (MSDS) for hazards that are present at the worksite.
    - OR
  - To the best knowledge of the Sponsor, the worksite is free of any known hazardous materials.
- All applicable local, state, and federal permits, approvals, and clearances have been obtained.
- Project Funding
  - For projects funded by the Sponsor or entity other than the CCC, the Sponsor agrees to reimburse the CCC for estimated costs in accordance with the fiscal details shown in this document.
    - OR
  - For projects funded internally by CCC's Environmental Programs or other special fund, the Sponsor agrees to comply with all applicable program and eligibility criteria to fund the project.

- The signing Sponsor Representative has the authority to enter into a contractual agreement of this type (and, if any, this amount) with the CCC.

Sponsor Representative:

Print Name: _____

Title: _____

Signature: _____

Date: _____

CCC Representative:

Print Name: Cathy Barr

Title: Conservation Supervisor

Signature: C Barr

Date: 11/22/21

CCC Representative:

Print Name: _____

Title: _____

Signature: _____

Date: _____

Item Number: 05
Meeting Date: 12-16-2021
Meeting: Watershed Committee/ Board of Directors (Watershed)

Review and Refer for Board Approval

TO: Watershed Committee/Board of Directors (Watershed)

FROM: Shaun Horne, Watershed Resources Manager

THROUGH: Ben Horenstein, General Manager

DIVISION NAME: Watershed

ITEM: Other Power Driven Mobility Device (Including Class 1 E-Bikes) Proposed Ordinance, Administrative Policy and Procedures for use of Other Power-Driven Mobility Devices, Device Registration, and Administrative Policy on the District's ADA Grievance Process

RECOMMENDATION

Review and refer proposed Ordinance No. 457, to be implemented pursuant to new Administrative Policy and Procedures for use of Other Power-Driven Mobility Devices on District Lands including an OPDMD registration process for E-Bikes;
Review and refer the proposed repeal of Board Policies 31 and 31.1 to be replaced by an Administrative Policy on the District's ADA Grievance Process

SUMMARY

Despite District Code section 9.04.01, which prohibits the use of E-Bikes on District lands, there has been an increase in the general usage of electric bicycles (E-Bikes) and people interested in using them on Marin Water's lands. Staff has reviewed the requirements for accommodation of Other Power-Driven Mobility Device (OPDMD) pursuant to the Americans with Disabilities Act (ADA) and pertinent regulations and has found that accommodating E-Bikes as an OPDMD is consistent with these requirements.

Staff is requesting the Watershed Committee to review and refer to a future regularly scheduled Board of Directors' meeting the approval and adoption of Ordinance No. 457, which would clarify the District's position with respect to OPDMDs on District lands. Staff is proposing that the use of OPDMDs on District lands be regulated pursuant to a new Administrative Policy and Procedures for use of Other Power-Driven Mobility Devices on District Lands, which would require a request for accommodation and registration process for the use of E-Bikes as an OPDMD. Staff is further requesting that the Board review and refer to a future regular Board Meeting the repeal of Board Policies 31 and 31.1, which staff proposed will be replaced by a new Administrative Policy on the District's ADA Grievance Process.

DISCUSSION

Background

Marin Water has allowed conventional bikes on natural surface fire roads (but not on narrow, single track trails) for many years as part of a road and trail system that also supports hiking, horseback riding, and other uses. The fire roads systems is composed of existing facilities that were designed and constructed using rock armoring to support vehicles for facility maintenance and emergency response.

Assembly Bill (AB) 1096, adopted in 2016, authorized the use of Class 1 and Class 2 E-Bikes on paths or trails where bicycles are allowed and formalized specific categories of E-Bikes via additions to the California Vehicle Code (at section 312.5). AB 1096 also explicitly permits local authorities or governing bodies of public agencies having jurisdiction over paths or trails to establish conditions or prohibit the use of all classes of E-Bikes by ordinance. Authorization for recreational uses under the jurisdiction of Marin Water is governed by Part 5 of Board Policy 7 the *Mt. Tamalpais Watershed Management Policy* and Title 9 of Marin Water Code entitled *Regulations for Use of Marin Municipal Water District Lands*. Currently Title 9.04.01 of the District Code prohibits the use of motorized bicycles on District lands.

Over the last few years, public interest in the use of E-Bikes has grown and many community members have embraced them for transportation and recreation. Marin Water hosted a workshop and listening session in December of 2018 to solicit public comments relating to E-Bike access on watershed lands. To further inform the review process and discussion around E-Bikes, Marin Water formed a Community Advisory Committee (CAC). The E-Bike CAC process included seven meetings organized around major topics that were identified during the 2018 public workshop. Out of the process an E-Bike CAC Final Summary Report was developed which outlines the CAC process, key themes, and potential options discussed by participants. Based on the thoughtful input received from the E-Bike CAC members, the general public, the 2018 E-Bike workshop, agency partners, and the professional judgement of staff alternative approaches were developed by staff and presented to the Board of Directors for consideration. Based on feedback received during the May 12, 2020 Board of Directors meeting staff developed an E-Bike Access Assessment, which was presented to the Board of Directors, but to date E-Bikes are still not allowed on District lands.

Local Land Management Agencies

Currently, the public land management agencies in Marin are at different points in their individual review and approval processes. Marin County Parks and Open Space has not started their review of E-Bikes on the Open Space Preserves, however they are allowing E-Bikes on paved multi-use trails in their Park system. Golden Gate National Recreation Area has established conditional access for E-Bikes on some trails and service roads, which are open for bicycles, but is currently conducting additional review of that decision. California State Parks recently adopted a policy allowing e-bike access on paved roads, in areas with Superintendent's Order in State vehicle recreation areas, in areas with Superintendent's Order for research or demonstration, and for persons with disabilities.

Staff's Recommendation

In compliance with the Americans with Disabilities Act (ADA), staff is proposing the adoption of Ordinance No. 457, which would clarify that OPDMDs will be allowed on District lands in compliance with ADA requirements. Staff has also prepared an Administrative Policy and Procedures for use of Other Power-Driven Mobility Devices (OPDMD), including class 1 E-Bikes, on District Lands. To facilitate the safety of OPDMD users and other trail users and ensure enforcement of violations, staff is proposing an OPDMD registration program for Class I E-Bikes seeking accommodation, which would be administered in accordance with the Administrative Policy and Procedures for Use of Other Power-Driven Mobility Devices on District Lands. Both Ordinance No. 457 and the Administrative Policy are summarized below and attached to this report. Establishing a clear OPDMD Policy is consistent with the approach that many other land management agencies throughout the Bay Area have taken. The registration program would facilitate access for people with mobility disabilities, ensure that an E-Bike being used as an OPDMD complies with the OPDMD Policy, and require an identifying sticker to be placed on the frame of the E-Bike, which would allow Ranger's to identify E-Bikes being used as OPDMD. All other E-Bikes would continue to be regulated under Title 9 and would be prohibited from use.

Adoption of Ordinance No. 457

Ordinance No. 457 would amend Section 9.04.01 of the Marin Municipal Water District Code to allow the use of OPDMDs on District lands by individuals with mobility disabilities in accordance with applicable law and subject to limitations on their use as may be adopted by the District. The added language is underlined and bolded below:

> *No person shall operate any motor vehicle, including, but not limited to, cars, trucks, motorcycles, motor-driven cycle, motorized bicycle, motorized scooter, self-balancing motorized personal transportation vehicle or similar vehicles on district lands except upon public roads or parking lots. For purposes of this section, emergency vehicles and district maintenance vehicles are exempted* ***as are other power-driven mobility devices, as defined in Section 35.104 of the Code of Federal Regulations, being used by individuals with mobility disabilities in accordance with Title II of the Americans with Disabilities Act and applicable law and regulations. The foregoing are subject to limitations on their use in accordance with District policy and procedure, as may be amended from time to time.***

In addition to these proposed revisions to the District Code, staff has prepared an Administrative Policy and Procedures for the use of OPDMDs on District lands. These policies and procedures will establish limitations on the types and use of OPDMDs on District lands to ensure the safety of all user groups and protection of natural resources.

Administrative Policy and Procedures for use of Other Power-Driven Mobility Devices on District Lands

The Administrative Policy and Procedures will provide reasonable regulations on the use of OPDMDs on District lands and implement a registration process for E-Bikes that may be used as

an OPDMD. This registration process will accommodate access for qualifying individuals with mobility disabilities. The Policy and Procedures define the types of devices that would be authorized for use, outlines general standards and areas authorized for use, and details the registration process. The Policy also describes the penalty for violations consistent with existing rules and regulations and the District's ability to revoke or suspend access for users who violate District regulations.

Under the new Administrative Policy, prior to using an E-Bike as an OPDMD on District watershed lands, all E-Bikes must be inspected and registered with the District to confirm compliance with the District's OPDMD device requirements and the provisions of California Vehicle Code section 312.5. After District staff inspect the E-Bike and confirm compliance with the District's OPDMD policy and the California Vehicle Code, a registration sticker will be placed in a clearly visible location on the left side of the bike frame's top tube two inches from the stem or handle bars where staff can identify the registration number. Registration stickers shall be valid for the E-Bike and the OPDMD user for which they are issued for a period of five years from the date of issuance. Registration shall be renewed by the OPDMD user each time the user uses a new E-Bike as an OPDMD on District lands and after five years from the date of the registration issuance.

E-Bike Registration Process

- E-Bikes inspected and registered as OPDMD devices at the Sky Oaks Ranger's Station during regular hours of office operation.
- In order to register an E-Bike as an OPDMD, the registrant must provide State-issued disability parking placard or card, or other State-issued proof of disability, or a Federally-issued proof of disability pass or card, or verbal representation not contradicted by observable fact as a credible assurance that the use of the E-Bike as an OPDMD is for the individual's mobility disability consistent with the ADA.
- A valid manufacturer sticker that identifies the E-Bike being used as an OPDMD as a Class I E-Bike, as required by Vehicle Code Section 312.5. (Aftermarket modifications to a bicycle or E-Bike will not be approved for registration as OPDMD devices.)
- A registration form must be filled out and signed by the E-Bike user before an OPDMD registration sticker is issued for the E-Bike. This form will require the user of the device to certify under the penalty of perjury that the E-Bike is being used as an OPDMD for the for the user's mobility disability.

The registration program will be a new administrative process for the District and will require ongoing Ranger and administrative support. This will add to the overall duties of the Ranger department. As such, the District will need to manage the program adaptively and make adjustments as the program matures. Establishing an OPDMD policy will help to provide clarity around enforcement of E-Bike and OPDMD use on District lands. Once adopted, Ranger's will

focus on educating users regarding the updated regulations and enforcement of the new policy. As such Ranger's will need some time to roll out the new registration program.

Repeal Board Policies 31 and 31.1

During this process staff recommends repealing Board Policies 31 and 31.1, which will be replaced with a new administrative policy on the District's ADA Grievance Process. The New administrative policy will be updated to be consistent with current legal requirements and new District information. The new administrative policy will ensure that any individuals who are denied use of their requested OPDMD device or other accommodation, may seek administrative review of that denial.

CEQA Compliance

The recommended actions to adopt proposed Ordinance No. 457, to repeal Board Policies 31 and 31.1 in favor of a new administrative policy, as well as the implementation of an OPDMD registration program consistent with American Disabilities Act is exempt from the California Environmental Quality Act as follows:

CEQA Guidelines section 15061

The adoption of proposed Ordinance No. 457 clarifying the allowance of OPDMDs, the implementation of a registration process for the use of E-Bikes as an OPDMD, as well as the repeal of District Policies 31 and 31.1 in favor of an updated administrative policy will not change the use of OPDMDs or E-Bikes on District lands, but merely formalizes their use as an accommodation as already required under the ADA and thus, it can be seen with certainty that there is no possibility that the activities in question may have a significant effect on the environment, and therefore the actions are exempt from the CEQA.

FISCAL IMPACT

The FY 20-21 adopted budget includes sufficient funds in the Watershed fund center to support the initial costs to establish an OPDMD Registration Program for E-Bikes.

ATTACHMENT(S)

1. Proposed Ordinance No. 457
2. Administrative Policy and Procedures for use of Other Power-Driven Mobility Devices on District Lands
3. Application for use of E-Bikes as Other Power Driven Mobility Devices (OPDMD) under Title II of the Americans with Disability Act (ADA) as Reasonable Accommodation for Mobility Devices
4. Board Policies 31 and 31.1
5. Administrative Policy on the District's ADA Grievance Process

MARIN MUNICIPAL WATER DISTRICT

ORDINANCE NO. 457

AN ORDINANCE AMENDING CERTAIN PROVISIONS OF TITLE 9 CHAPER 9.04 ENTITLED "VEHICLE AND TRAFFIC REGULATIONS" OF THE MARIN MUNICIPAL WATER DISTRICT CODE REGARDING THE USE OF OTHER POWER DRIVEN MOBILITY DEVICES ON WATERSHED LANDS PURSUANT TO TITLE II OF THE AMERICANS WITH DISABILITIES ACT

BE IT ORDAINED BY THE BOARD OF DIRECTORS OF THE MARIN MUNICIPAL WATER DISTRICT AS FOLLOWS:

SECTION 1. Purpose: This ordinance reaffirms the District's practice of ensuring that individuals with disabilities may fully access and use District lands by permitting the use of specified other power driven mobility devices.

SECTION 2. Section 9.04.01 of the Marin Municipal Water District Code entitled "Motor vehicles" is hereby deleted in its entirety and amended to read as follows:

No person shall operate any motor vehicle, including, but not limited to, cars, trucks, motorcycles, motor-driven cycle, motorized bicycle, motorized scooter, self-balancing motorized personal transportation vehicle or similar vehicles on district lands except upon public roads or parking lots. For purposes of this section, emergency vehicles and district maintenance vehicles are exempted as are other power-driven mobility devices, as defined in Section 35.104 of the Code of Federal Regulations as may be amended and updated from time to time, being used by individuals with mobility disabilities in accordance with Title II of the Americans with Disabilities Act and applicable law and regulations. The foregoing are subject to limitations on their use in accordance with District policy and procedure, as may be amended from time to time.

SECTION 3. Findings. After considering all of the information, documents and testimony at the public hearing the Board of Directors finds as follows:

a. This ordinance reaffirms the District's practice and commitment of ensure that individuals with disabilities may participate fully in District activities and programs in compliance and consistent with Section 35.101 of the Code of Federal Regulations.

b. In compliance with Section 35.137 of the Code of Federal Regulations, this ordinance expressly illustrates the District's efforts to make reasonable modifications in its policies, practices, or procedures to permit the use of other power-driven mobility devices by individuals with mobility disabilities on District lands.

c. While permitting the use of qualifying other power-driven mobility devices by individuals with mobility disabilities on District lands, this ordinance reserves the

District's authority to limit the classes of devices that cannot be operated in accordance with the legitimate safety requirements consistent with Section 35.137 (b)(2) of the Code of Federal Regulations.

SECTION 4. Severability: If any section, subsection, sentence, clause, phrase, portion or part of this ordinance is for any reason held to be invalid or unconstitutional by any court of competent jurisdiction, such section shall not affect the validity of the remaining portions of this code. The Board of Directors hereby declares that it would have adopted this ordinance and each section, subsection, sentence, clause, phrase, part or portion thereof, irrespective of the fact that any one or more sections subsections, sentences, clauses, phrases, parts or portions be declared invalid or unconstitutional and, to that end, declares the provisions of this ordinance severable from one another.

SECTION 5. Effective Date: This ordinance shall take effect 30 days following its adoption.

SECTION 6. Reservation of Powers: Nothing in this Ordinance shall prevent the District from exercising any of its powers under the California Water Code or other applicable law including but not limited to its power to adopt ordinances, resolutions, rules or regulations in response thereto.

PASSED AND ADOPTED this ___ th day of _____, 20__, by the following vote of the Board of Directors:

AYES:

NOES:

ABSENT:

_____
President, Board of Directors

ATTEST:

_____
Board Secretary

DRAFT 12-16-21

MARIN WATER
ADMINISTRATIVE POLICY AND PROCEDURES FOR USE OF OTHER POWER-DRIVEN MOBILITY DEVICES ON DISTRICT LANDS

DEFINITIONS

A. **Other Power-Driven Mobility Device (OPDMD)** is defined as any mobility device powered by batteries, fuel, or other engines (whether or not designed for use by individuals with mobility disabilities) that is used by individuals with mobility disabilities for the purpose of locomotion, including golf cars, electronic personal assistance mobility devices (EPAMDs), such as the Segway PT, or any mobility device designed to operate in areas without defined pedestrian routes but that is not a wheelchair. (28 C.F.R. 35.104). ("Defined pedestrian" routes are those routes that are required to be wheelchair and disability accessible such as routes from parking to restrooms and public facilities.)

B. **Class 1 Electric Bicycle** is defined as a bicycle equipped with an electric motor that provides assistance only when the rider is pedaling, and that ceases to provide assistance when the bicycle reaches the speed of 20 miles per hour. (Vehicle Code §312.5(a)(1).)

STANDARDS AND AREAS OF AUTHORIZED USE

A. **Size.** OPDMDs shall not be wider than 36" or longer than 48", except for Class 1 and Class 2 electric bicycles which may exceed 48" in length. OPDMDs shall not exceed 550 lbs. including the weight of the operator.

B. **E-Bike and OPDMD Technology Standards** the use of E-Bikes or other OPDMD devices that have been modified from the manufacturers' original standards are prohibited on District lands, as defined in Section 9.01.01 of the Marin Municipal Water District Code. This includes do-it-yourself E-Bikes and the use of additional back up batteries. As required by Vehicle Code Section 312.5 (c), all E-Bikes shall contain a permanently affixed label in prominent location on the E-Bike that shall contain the classification number, top assisted speed, and motor wattage.

C. **Gas and or Fuel Powered OPDMDs Prohibited.** OPDMDs shall not exceed zero emissions during use. Only manually or battery/electricity operated devices are permitted. The use of gas or other fuel powered mobility devices is prohibited. The engine noise level from an OPDMD may not exceed 60 dB measured on the A-weighted scale at a distance of 50 feet.

D. **Speed Limit.**

- **Trails.**

No person shall operate an OPDMD at a speed in excess of 5 miles per hour, except for Class 1 electric powered bicycles which shall comply with all District regulations for the operation of bicycles, including the speed limits set forth in District Code 9.04.03, which limits bicycle speeds to 5 miles per hour on blind turns and when passing and to a maximum speed of 15 miles per hour.

- **Basic Speed Limit.**

Notwithstanding the above speed limits, pursuant to District Code 9.04.03, no person shall operate an OPDMD at a speed greater than is reasonable or prudent for safe operation or to protect the safety of others using District lands.

E. **Areas of Authorized OPDMD Use.**

OPDMDs Shall Only Be Used in the Following Areas:

- "Paths of Travel" (e.g., Sidewalks, Driveways, Parking Lots, Ramps, and Restrooms).
- Public Roads.
- Protection Roads (e.g. Fire Roads) Not Signed Against Use.
- Electric powered Class 1 bicycles shall only be allowed where regular bicycles are allowed.

USE OF CLASS 1 E-BIKE AS AN OPDMD; E-BIKE REGISTRATION

Prior to using a Class-1 E-Bike as an OPDMD on District lands, all E-Bikes must be inspected and registered by the District to confirm compliance with the District's OPDMD device requirements and the provisions of California Vehicle Code section 312.5. No other classes of E-Bikes shall be operated on District lands. After District staff inspect the E-Bike and confirm compliance with the District's OPDMD policy and the California Vehicle Code, a registration sticker will be placed clearly on the left side of the bike frame's top tube two inches from the stem or handle bars where staff can clearly identify the registration number. Registration stickers shall be valid for the E-Bike and OPDMD user for which they are issued for a period of 5 years from the date of issuance. Registrations shall be renewed each time an E-Bike user uses a new E-Bike on District lands and after 5 years from the date of the registration issuance.

E-Bike Registration Process

- E-Bikes can be inspected and registered as OPDMD devices at the Sky Oaks Ranger's Station during regular hours of office operation.
- In order to register an E-Bike as an OPDMD, the registrant must provide State-issued, disability parking placard or card, or other State-issued proof of disability, or a Federally-issued proof of disability pass or card, or verbal representation not

contradicted by observable fact as a credible assurance, not contradicted by observable fact that the use of the E-Bike as an OPDMD is for the individual's mobility disability.

- A valid manufacturer sticker that identifies the E-Bike as a Class I E-bike, as required by Vehicle Code Section 312.5. (Aftermarket modifications to a bicycle or E-bike will not be approved for registration as OPDMD devices.)
- An E-Bike registration form must be filled out and signed by the E-Bike user before an OPDMD registration sticker is issued for the E-Bike. This form will require the user of the device-Bike certifies under the penalty of perjury that the E-Bike is the for the user's mobility disability.

The District will not ask an individual using an OPDMD questions about the nature and extent of the individual's disability. (28 C.F.R. 35.137 (c) (1).)

Penalty for Violation of District Rules/ Regulations

If a visitor is using an OPDMD in a manner that violates District's rules and regulations the user's access to lands may be revoked or suspended.

Right to Appeal

If any individual requesting the use of an OPDMD on District lands believes that their request for accommodation was improperly denied, the individual may submit a District Complaint Form for Title II of the Americans with Disabilities Act, which is contained in Board Policy No. 31.1. The Complaint Form will be processed in accordance with the procedures set forth in Board Policy No. 31- Internal Grievance Procedure for Title II of ADA.

MARIN WATER

Item Number: 05
Attachment: 03

Application for use of E-Bike as
Other Power Driven Mobility Device (OPDMD) Under
Title II of the Americans with Disability Act (ADA) as Reasonable Accommodation for Mobility Disability

Name:_____

Address: _____

Email: _____

Phone: _____

Class of E-Bike (Circle One): 1 2
E-Bike bears manufacturer's sticker declaring class: Y N

Credible Assurance of Qualifying Mobility Disability (Initial at least ONE and present document(s) to staff (if applicable))

_____ Valid-State issue, disability placard or card

_____ Other valid State-issued proof of disability

_____ Verbal representation, not contradicted by observable fact that the E-Bike is required for a mobility disability

I certify that (1) I am a qualifying individual with mobility disability pursuant to Title II of the ADA, (2) the E-Bike being registered will be used as an OPDMD to assist with my mobility disability, (3) all information provided in this form and presented to staff is true and correct. I certify and declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct. Providing false information in this form may result in up to four (4) years imprisonment pursuant to Penal Code sections 126 and 1170 (h) respectively.

Print Name: _____ Signature: _____

Date: _____

_____

STAFF USE ONLY

Staff Approval: _____ Permit Number Issued:_____

MARIN MUNICIPAL WATER DISTRICT

COMPLAINT FORM
FOR
TITLE II OF AMERICANS WITH DISABILITIES ACT

NAME:

ADDRESS:

TELEPHONE:

DATE COMPLAINT OCCURRED:

DESCRIPTION OF COMPLAINT:

REMEDY SOUGHT:

SIGNED:_____ **DATED:**_____

MARIN MUNICIPAL WATER DISTRICT

BOARD POLICY

No.: 31

Date: 7-22-92

Reviewed 5-17-94

Subject: INTERNAL GRIEVANCE PROCEDURE FOR TITLE II OF AMERICANS WITH DISABILITIES ACT

Marin Municipal Water District has adopted an internal grievance procedure providing for prompt and equitable resolution of complaints alleging any action prohibited by the U.S. Department of Justice regulations implementing TITLE II of the Americans with Disabilities Act. TITLE II states, in part, that "no otherwise qualified disabled individual shall, solely by reason of such disability, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination" in programs or activities sponsored by a public entity.

Any disabled person who feels discriminated against under TITLE II has the right to file a complaint with the District. Complaints should be addressed to the District's ADA Coordinator: Jules Tham, Manager of Personnel and Public Information, Marin Municipal Water District, 220 Nellen Avenue, Corte Madera, CA 94925, (415) 924-4600.

1. A complaint should be filed in writing using a District ADA Complaint Form available from the District ADA Coordinator's office.

2. A complaint should be filed within ten (10) calendar days after the complainant becomes aware of the alleged violation.

3. An investigation, if appropriate, shall follow the filing of a complaint. The investigation shall be conducted by Jules Tham. As a part of an investigation, all interested persons and their representatives, if any, shall be given an opportunity to submit evidence relevant to the complaint.

4. A written determination as to the validity of the complaint and a description of the resolution, if any, shall be issued by Jules Tham and a copy forwarded to the complainant.

5. A complainant can request a reconsideration of the written determination in instances where there is dissatisfaction with the resolution. The request for reconsideration should be made in writing to Jules Tham within ten (10) calendar days after receipt of the written determination. The ADA Coordinator of the District will review the request. The decision of the ADA Coordinator shall be final.

6. The ADA Coordinator shall maintain the files and records of the Marin Municipal Water District relating to complaints filed.

7. The right of a person to a prompt and equitable resolution of the complaint filed shall not be impaired by the person's pursuit of other remedies such as the filing of an ADA complaint with the responsible federal department or agency. Use of this grievance procedure is not a prerequisite to the pursuit of other remedies.

8. These rules shall be construed to protect the rights of the disabled and to assure that Marin Municipal Water District complies with implementing ADA regulations under TITLE II. This procedure is not applicable to complaints emanating from TITLE I pertaining to equal employment opportunity for individuals with disabilities.

Grievance Procedures for Resolution of Complaints under Title II of the Americans with Disabilities Act

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Administrative Policy #___

Effective Date: (date)

Approved by: _____ Date: _____
Bennett Horenstein, General Manager

Purpose

Marin Municipal Water District has adopted an internal grievance procedure providing for prompt and equitable resolution of complaints alleging any action prohibited by the U.S. Department of Justice regulations implementing Title II of the Americans with Disabilities Act (herein referenced as ADA or Title II). Title II states, in part, that "…no qualified individual with a disability shall, by reason of such disability, be excluded from participation in or be denied the benefits of services, programs, or activities of a public entity, or be subjected to discrimination by any such entity." This policy will establish clear procedures for the prompt and equitable resolution of complaints alleging any violation of Title II of the ADA.

Scope

This policy shall be applicable to all complaints alleging violations of Title II.

Procedure for Resolution of Complaints

Any individual with a disability who feels discriminated against under Title II has the right to file a complaint with the District. Complaints should be addressed to the applicable ADA Coordinator identified below.

1. A complaint shall be filed in writing using the District's Complaint Form Regarding Title II of the Americans with Disabilities Act, which is attached hereto and may be request from the applicable ADA Coordinator.

2. A complaint should be filed within sixty (60) calendar days after the complainant becomes aware of the alleged violation.

3. An investigation, if deemed appropriate by the applicable District ADA Coordinator, shall follow the filing of a complaint. The investigation shall be conducted by the ADA Coordinator or designee. As a part of an investigation, all interested persons and their representatives, if any, shall be given an opportunity to submit evidence relevant to the complaint.

4. A written determination as to the validity of the complaint and a description of the resolution, if any, shall be issued by the applicable District ADA Coordinator and a copy forwarded to the complainant.

5. A complainant may request a reconsideration of the written determination in instances where there is dissatisfaction with the resolution. The request for reconsideration should be made in writing to the District's General Manager within ten (10) calendar days after receipt of the written determination. The General Manager or designee will review the request. The decision of the General Manager or designee shall be final.

6. The applicable ADA Coordinator shall maintain the files and records of the Marin Municipal Water District relating to complaints filed in their respective areas.

7. The right of the person to a prompt and equitable resolution of the complaint filed shall not be impaired by the person's pursuit of other remedies such as the filing of an ADA complaint with the responsible federal and state departments or agencies. Use of this grievance procedure is not a prerequisite to the pursuit of other remedies.

8. These rules shall be construed to protect the rights of the individual with disabilities and to assure that Marin Municipal Water District complies with all applicable laws, rules and regulations, including Title II. This procedure is not applicable to complaints emanating from Title I of the ADA pertaining to equal employment opportunity for individuals with disabilities. Complaints under Title I shall be directed to the District's Human Resources Department.

ADA Coordinators

Below are the District's ADA Coordinators for the respective areas listed below:

Watershed- Shaun Horne, Watershed Resources Manager, 415-945-1190

Board/ Committee Meetings- Terrie Gillen, Board Secretary, 415-945-1448

All Other Title II Complaints- Vikkie Garay, Human Resources Manager, 415-945-1430

Complainants may contact the respective ADA coordinator listed above by phone or by mailing the attached "Form for Resolution of Complaints under Title II of the Americans with Disabilities Act" addressed to the applicable ADA Coordinator above to: 220 Nellen Avenue, Corte Madera, CA 94925.

Attachment:
Form for Resolution of Complaints under Title II of the Americans with Disabilities Act

Legal Authorities: 42 U.S.C.A. Section 12132; 28 C.F.R. Section 35.107

Form for Resolution of Complaints under Title II of the Americans with Disabilities Act

NAME: _____

ADDRESS: _____

TELEPHONE: _____

EMAIL: _____

DATE OF OCCURRANCE: _____

DESCRIPTION OF COMPLAINT (Attach additional pages if needed):

REMEDY SOUGHT:

SIGNED: _____ DATED: _____

PLEASE MAIL A COPY OF THE COMPLETED FORM TO THE APPLICABLE ADA COORDINATOR BELOW:

Watershed- Shaun Horne, Watershed Resources Manager, 415-945-1190

Board/Committee Meetings- Terrie Gillen, Board Secretary, 415-945-1448

All Other Title II Complaints- Vikkie Garay, Human Resources Manager, 415-945-1430

Complainants may contact the respective ADA coordinator by phone or by mailing a letter addressed to the applicable ADA Coordinator above to:
220 Nellen Avenue, Corte Madera, CA 94925.

Item Number: 06
Meeting Date: 12-16-2021
Meeting: Watershed Committee/Board of Directors (Watershed)

Informational Item

TO: Watershed Committee/Board of Directors (Watershed)

FROM: Shaun Horne, Watershed Resources Manager

THROUGH: Ben Horenstein, General Manager

DIVISION NAME: Watershed

ITEM: Lagunitas Creek Watershed Enhancement Plan – Progress Update

SUMMARY
In 2020, the District was awarded a $300,000 grant from the California Department of Fish and Wildlife (CDFW) Proposition 68 Rivers and Streams Program to develop the Lagunitas Creek Watershed Enhancement Plan (Plan). The District selected Environmental Sciences Associates (ESA) to conduct preliminary planning and develop 30% restoration design plans for sites on publicly owned lands along Lagunitas Creek. The District and ESA have been working closely and collaboratively with watershed stakeholders and agencies during the past year to complete a set of draft 30% design plans and supporting documents. District staff are applying for additional grant funding from CDFW and the US Bureau of Reclamation to complete environmental review and take these designs to the 100% level for future implementation.

DISCUSSION
The purpose of this Plan is to expand upon past restoration efforts by developing enhancement concepts that address salmonid limiting factors in the Lagunitas Creek watershed. The scope of work includes regular presentations to the Lagunitas Technical Advisory Committee (TAC), an extensive literature review, restoration and reach prioritization, and development of 30% design plans and cost estimates. The final Plan will include a basis of design as well as constraints and considerations for future planning and implementation.

Progress to Date
ESA has completed approximately 90% of the scope of work for this Plan. The grant has an end date of March 2022, and the District is on schedule to complete and submit all grant deliverables on time. District staff have been collaboratively engaging stakeholders and resource agencies throughout the process, including California Department of Parks and Recreation (State Parks), Lagunitas Creek TAC, CDFW, National Marine Fisheries Service, and the San Francisco Bay Regional Water Quality Control Board. These agencies and groups have

been integrally involved in developing the Plan and have provided guidance and feedback that has been incorporated throughout the project.

Draft 30% design plans (attached) have been developed for 13 sites in Lagunitas Creek within Samuel P. Taylor State Park. Habitat enhancement approaches for these sites include installation of log and boulder structures, addition of spawning gravel, and improving flow and sediment transport at tributary junctions. In total, these 13 sites comprise approximately 4,450 linear feet of stream channel. The full group of enhancement areas are broken into Phase 1 (7 sites) and Phase 2 (6 sites) to allow the District to design and implement individual projects incrementally, as grant funding becomes available.

Next Steps
Agency staff and other watershed stakeholders are reviewing the draft plans and supporting documents and will provide comments by the end of December. Suggestions and modifications will be reviewed and incorporated into the final 30% designs by March 2022 to complete the grant.

District staff are applying to the CDFW Cutting the Green Tape (North Coast Coho Recovery) Grant Program to complete environmental review and develop 100% design plans for the seven Phase 1 sites. The District successfully applied for the pre-proposal round of this grant and was invited to submit a full proposal, which is due December 17. Additionally, District staff are applying for a US Bureau of Reclamation grant, which would include implementing two of the Phase-1 sites, following completion of design and environmental review.

FISCAL IMPACT
None at this time

ATTACHMENT(S)
1. Lagunitas Creek Enhancement Plan Draft Report

2. Lagunitas Creek Enhancement Plan Draft 30% Design Plans

3. Lagunitas Creek Enhancement Plan Draft Cost Estimates

Item Number: 06
Attachment: 01

LAGUNITAS CREEK WATERSHED ENHANCEMENT PLAN

Draft Report

Prepared for
Marin Water

November 2021

ESA

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SECTION 1
Introduction

The Lagunitas Creek watershed is critical to the recovery Central California Coast coho salmon and Central California Coast Steelhead, currently listed as endangered and threatened respectively under the Endangered Species Act. Marin Water currently manages four dams in the watershed for water supply and flows in the mainstem of Lagunitas Creek under a State Water Resources Control Board water rights order (WR 95-17). As part of their watershed stewardship efforts Marin Water was awarded a CDFW Proposition 68 grant to develop the Lagunitas Creek Watershed Enhancement Plan (Plan) to address the salmonid limiting factors within the Lagunitas Creek watershed. Environmental Science Associates (ESA) was hired by Marin Water to expand upon previous restoration efforts by Marin Water and others through evaluating restoration and enhancement opportunities proximal to Marin Water infrastructure, tributary confluences, and other ecologically significant areas, to identify the next phases of restoration sites. State Parks (Samuel P. Taylor State Park) is a key participating landowner and partner. The overall goal of the Plan is to develop 30%-complete restoration designs (30% design) for five to ten sites within two priority reaches, through the following steps:

1. Review of available background literature relevant to salmonid habitat enhancement in Lagunitas and San Geronimo Creek.

2. Desktop analysis developing and organizing baseline project data.

3. Geomorphic and habitat field reconnaissance to identify enhancement opportunities.

4. Identify two reaches in the Project Area within which to focus restoration actions.

5. Identify between ten and twenty potential restoration sites, for which a restoration opportunities and constraints analysis is conducted.

6. Perform a feasibility assessment of the potential restoration sites and prioritize them for design advancement.

7. Develop a 30%-complete Basis of Design report and restoration plans for five to ten sites.

Two priority reaches were identified in Lagunitas Creek mainstem: one extending from Peters Dam to just downstream of Irving Road Bridge, and a second reach extending through Camp Taylor. Thirteen potential sites were identified and evaluated within the two reaches, and conceptual restoration approaches were developed. This report provides the rationale for specific restoration actions that focus on geomorphic processes and increase structurally complex habitat for juvenile coho salmon and steelhead.

1.1 Location and Setting

The Project Area for the Plan is located in the middle of the Lagunitas Creek watershed in west Marin County. Lagunitas Creek drains an 83 square mile watershed to the Pacific Ocean through Tomales Bay (**Figure 1**). Significant portions of the watershed are dammed. Seeger Dam cuts off 36 square miles of Nicasio Creek, the largest tributary in the Lagunitas Creek watershed. Peters Dam impounds the 22 square miles of the Lagunitas Creek headwaters. Just 25 square miles of Lagunitas Creek remains undammed, including the downstream most 12 miles of Lagunitas Creek and all of San Geronimo Creek, the largest undammed tributary to Lagunitas Creek. The majority of the remaining undammed 16 square miles of Lagunitas Creek is within publicly owned open-space, consisting of the Golden Gate National Recreation Area and Samuel P. Taylor State Park. The 9 square mile San Geronimo Creek watershed contains a mixture of rural and urban development, including the communities of Lagunitas, Forest Knolls, San Geronimo, and Woodacre.

The Project Area includes the four miles of Lagunitas Creek downstream of Peters Dam to Big Bend (just below the Devils Gulch confluence), and the four miles of San Geronimo Creek immediately upstream of the confluence with Lagunitas Creek to Marin Water's San Geronimo Treatment Plant (**Figure 1**). The Lagunitas Creek segment of the Project Area consists of four continuous miles of Lagunitas Creek in the Samuel P. Taylor State Park, and the Marin Water protected watershed downstream of Peters Dam. These four miles of Lagunitas Creek are largely bounded by Sir Francis Drake Boulevard and the Cross Marin Trail/Taylor Park Rd. The San Geronimo Creek segment of the Project Area is limited to parcels which Marin Water owns or has easements. These small access areas on San Geronimo Creek are separated by large stretches the creek that are privately owned.

1.2 Restoration Need

The Lagunitas Creek watershed provides habitat for three State or Federally listed species: coho salmon (*Oncorhynchus kisutch*) and California freshwater shrimp (*Syncaris pacifica*) (listed as State and Federally Endangered Species) and steelhead (*Oncorhynchus mykiss*) (listed as a Federally Threatened Species). Coho salmon in particular are a priority target for restoration efforts; the watershed is listed by California Department of Fish and Wildlife (CDFW) as one of four high priority watersheds for recovery of this species. Coho and steelhead spawning and rearing in Lagunitas Creek are constrained by Seeger and Peters dams in that they cut off habitat upstream and that they block the transport of coarse sediment and large wood downstream. As a result, salmonid habitat is reduced in both quantity and quality, with most spawning occurring in the Project Area. Overall population of California Central Coast coho salmon has dropped from 40,000-125,000 spawning adult coho (historical estimate) to less than 5,000 (PCI, 2010). The Plan will address the following Recovery Actions identified in the Central California Coast Coho Salmon Recovery Plan for Lagunitas Creek (NOAA, 2012):

- LagC-CCC-3.1.1 Improve pool shelter rating
- LagC-CCC-3.1.3 Improve pool:riffle:flatwater ratio

Figure 1
Lagunitas Creek Watershed and Study Boundary

- LagC-CCC-3.1.4.1 Increase large wood frequency throughout the watershed to improve conditions for adults, and winter/summer rearing juveniles

- LagC-CCC-3.1.4.5 Install structures with multiple logs and root balls because they are more effective than structures with only one log.

- LagC-CCC-9.1.1 Improve instream gravel quality and food productivity.

Additionally, the Plan will address recommendations by San Francisco Bay Regional Water Quality Control Board's (Water Board) Fine Sediment Reduction and Habitat Enhancement Plan (page 85), to increase wood loading in Lagunitas Creek to 300 m^3/ha on public lands, breaking up glides and runs to create more riffles and pools (Napolitano, 2014).

1.4 Project Goals and Objectives

The habitat enhancement goal of the Plan is to improve adult spawning and juvenile rearing habitat for coho salmon, in a manner that is as self-sustaining as possible given the location downstream of a dam (i.e. recognizing that natural hydrographs as well as inputs of coarse sediment and large wood are limited to those from San Geronimo Creek). Actions that improve spawning and rearing for coho salmon are expected to also provide benefits for steelhead spawning and rearing, and other life stages and species.

The Plan's habitat enhancement goal will be achieved through the following enhancement objectives (identified through the Restoration Prioritization and Feasibility Assessment tasks):

- Add the amount of large wood that results in densities that are appropriate for the system (e.g. San Francisco Bay Regional Water Quality Control Board TMDL target of 300 m^3/ha).

- Place large wood in configurations that increase trapping, sorting, and storage of gravel in a manner that increases the quantity and quality of spawning and rearing habitat.

- Add sufficient gravel of suitable sizes for coho and steelhead spawning to overcome a bedload deficit of around 1,700 tons per year (Stillwater Sciences, 2010) caused by upstream impoundments.

- Reconnect tributaries that contribute large volumes of coarse sediment to the creek relative to fine sediment.

- Avoid or minimize impacts to existing biological, cultural, and recreational resources.

SECTION 2
Literature Review of Existing Conditions

A review of available literature and data was conducted to understand existing habitat conditions for salmonids within the Project Area. The literature review covered a wide range of topics including: infrastructure, hydrology, sediment supply, large wood, geomorphology, topography, geotechnical conditions, hydraulic conditions, salmonid habitat, and restoration completed. The complete literature review is provided as an attached to this report (Attachment A). The exist data compiled is presented in field maps in Attachment B. This section provides an overview of the literature and data review as it directly informs existing conditions and the basis of design.

The existing conditions of Lagunitas Creek downstream of Peters Dam is significantly altered compared with its historic condition, in ways that impact salmonid habitat across a range of life stages. The dams on Lagunitas Creek directly cut off a large area of potential spawning and rearing habitat upstream of Peters Dam. In addition, Peters Dam has greatly reduced the supply of coarse sediment and large wood downstream. Based on the literature review, some key lessons regarding existing conditions are the need to raise the density of large wood in Lagunitas Creek to levels more typical in undisturbed watersheds, the value in trapping coarse sediment to reverse channel bed incision and create more complex riffle-pool formation, and the need for large wood structures to be more securely anchored than some previous projects so as to prolong the benefits of placement.

2.1 Topography

Two topographic (topo) data sets were obtained that cover the Project Area. The first topo data set is a 2009 Light Detection and Ranging (LiDAR) data set provided by the Marin Municipal Water District (MMWD). The second topo data set was collected for all or Marin County, including the Project Area, using LiDAR methods June 13, 14, 21, and 23, 2018. Both data set units are in US Survey Feet. The horizontal projection of both data sets is State Plane, California Zone III, FIPS Zone 0403, and the horizontal datum is North American Datum of 1983 (NAD83). The vertical datum is the North American Vertical Datum 1988 (NAVD88). The 2018 LiDAR topo was obtained at a 1.5-foot grid GeoTiffs hydroflattened bare earth model for use in the 30% Design (One Tam, 2020). ESA used both topo sets to develop hydraulic models and observed that the 2018 topo surface appears more accurate at representing riffles and surrounding channel banks, though does not capture bathymetric data. Neither topo set has been ground-truthed under the tree canopy near the creek to test for accuracy, so additional survey or at least spot-checking is recommended for at least the construction access routes prior to commencing the 65% design phase.

ESA performed detailed topographic and bathymetric surveys of four reaches of Lagunitas Creek during April to June 2021. The surveys were conducted for habitat suitability modeling as part of the Lagunitas Creek Instream Flow Study (ESA, 2021) for Marin Water. Four reaches were chosen to model in detail, focusing on the upper river between Big Bend and Peters Dam where the majority of salmonid spawning and fry rearing occurs. The four study sites encompass about one-quarter of the coho and steelhead spawning sites along Lagunitas Creek observed in 2021. For each of the four sites ESA performed a detailed topographic and bathymetric survey using a total station. Survey limits ranged from 575 to 800 feet for a combined length of 2,090 feet. The lateral extent of the survey was typically the edge of the actively scoured winter channel about 2 feet above the water surface elevation at the time of the survey. Approximately 3000 topographic and bathymetric points were surveyed at each site, which were processed in AutoCAD to create a highly detailed topographic surface for each site. Topographic survey data for Sites 1, 2 and 3 are reported in arbitrary horizontal and vertical coordinates, in feet. Each of the three sites are referenced to their own arbitrary coordinates, and should not be compared to the other sites. At Site 4, topographic survey data are reported in the horizontal coordinate system NAD83, State Plane Zone 3, Feet and vertical datum NAVD88, Feet, relative to control points set by ESA with Real-Time Kinematic GPS (RTK-GPS). Site 4 coordinates are relative to the Leica SmartNet base station network.

Site 2 detailed topographic survey was used to inform ideal riffle geometry. Site 2, the Canyon Site, is located 1500 feet upstream of Irving Road Bridge and about 2.5 miles downstream of the San Geronimo Creek confluence, and is typical of the confined, relatively straight canyon reaches between the San Geronimo Creek confluence and the upstream end of Camp Taylor. It contains a series of glides and riffles and has been one of the most heavily used areas for steelhead and coho spawning in recent years, with 11 coho redds and three steelhead redds in WY 2021.

The topography within the project area is generally a steep confined valley with a creek corridor that is straight and uniform width (KHE, 2013). The valley width widens in the downstream reaches Project Area providing space for the development of an inset floodplain.

2.2 Hydrology

The watershed area for Lagunitas Creek is 103 mi^2 at the mouth at Tomales Bay with 38 mi^2 above the downstream boundary of the project area in Camp Taylor. The watershed experiences a Mediterranean climate with cool, wet winters and warm, dry summers. Average annual rainfall in the headwaters of Lagunitas Creek is 48 inches (MMWD, Lagunitas Lake gage) with most falling between November and March. Flows within the project reach come primarily from two sources: unregulated flow from the 9.4 mi^2 San Geronimo Creek watershed and regulated flow releases from the 22 mi^2 watershed above Kent Lake controlled by Peters Dam. Since 1995, flow releases from Kent Lake have been regulated by State Board Order 95-17, which requires a summer minimum baseflow of 8 cfs (6 cfs in a dry year), a winter baseflow of 20-25 cfs between November and March, stepping down to the summer baseflow over the next two and a half months (**Figure 2**). Superimposed on the winter baseflow are three required migration pulses of at least 35 cfs for 3 days, to trigger salmonid migration and facilitate upstream passage.

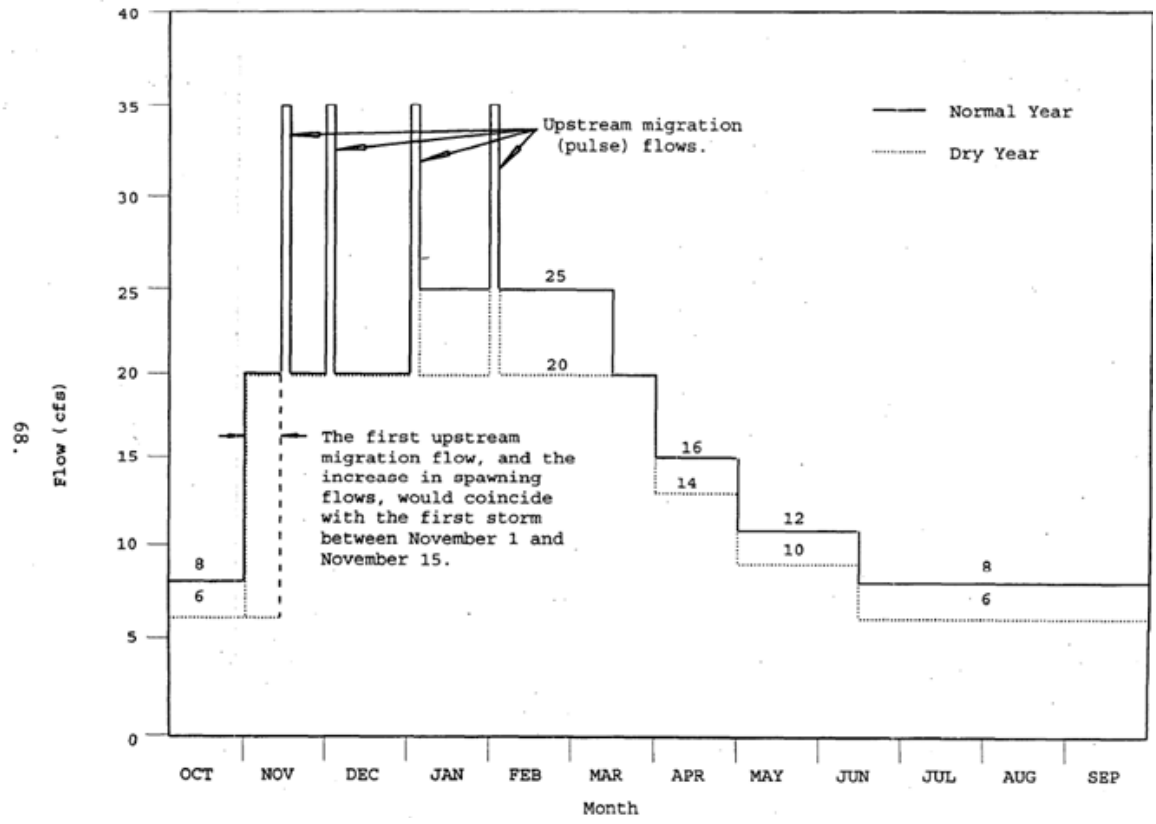

Figure 2
Peters Dam Flow Release Schedule

KHE (2013) investigated the influence of Peters Dam on the hydrology of Lagunitas Creek and developed a flood frequency curve using the Samuel P. Taylor gage data collected after raising of Peters Dam in 1982, to estimate the magnitude of different return period flood events (**Table 1**). They estimated that the dam has increased the magnitude and duration of flows below 30 cfs and decreased the magnitude and duration of flows above 30 cfs as well as reduced the magnitude of any given return period flood event by approximately 50%. In other words, compared to pre-dam conditions, summer baseflows are higher, annual peak flows are lower, and winter baseflows are lower. ESA came to similar conclusions using a pair of watershed rainfall-runoff models built in HEC-HMS; one with existing conditions including dam operations and water supply diversions from Kent, Alpine, and Bon Tempe Lakes, and a second model that assumed there were no reservoirs or diversions upstream of S.P. Taylor State Park. Each model was run for characteristic "type years" that were very wet, average, dry and critically dry. The "with reservoirs and diversions" scenario had higher baseflow than the "without reservoirs and diversions" scenario from (depending on the year type) sometime between April and July through the end of the water year on September 30th. Flow exceedance curves for the different year types show that the reservoirs reduce the frequency of flows above around 20 cfs and increase the frequency of flows at and below that value. Reservoir operations increased flows for about half the year in average water years, rising to two thirds of the year in wet years. Reservoir operations increased flows from 60 to 80% of the time during dry and critically dry years.

TABLE 1
LAGUNITAS CREEK FLOW RECURRENCE INTERVALS AT S.P. TAYLOR STATE PARK USGS GAUGE

Summer Baseflow cfs	Winter Baseflow cfs	Q1.01 cfs	Q1.5 cfs	Q2 cfs	Q5 cfs	Q10 cfs	Q25 cfs	Q50 cfs	Q100 cfs
6-8	20-25	300	1360	1850	3280	4380	5930	7190	8520

SOURCE: KHE, 2014

ESA (2018) performed an ecohydrology analysis for Salmon Protection and Watershed Network's (SPAWN) Lagunitas Creek Floodplain and Riparian Enhancement. The analysis was performed using the Hydrologic Engineering Center Ecosystem Functions Model (HEC-EFM) to analyze the relationship between flow discharge, frequency and duration during the assumed winter rearing period of February to May. HEC-EFM performs rule based statistical analyses of a hydrologic time series. The analysis was performed on the nearest gage, the USGS Samuel P. Taylor gage (USGS Gage Station 11460400) for the period 12/21/1982 to 01/09/2017. The analysis calculated statistically significant flows for 2- and 4-week rearing durations. Overall, for the periods analyzed, key juvenile coho winter rearing flows range anywhere from 20 to 155 cfs, with a 65 cfs middle range target.

2.3 Hydraulic Conditions

Hydraulic conditions in Lagunitas Creek have been analyzed via two sets of hydraulic models.

ESA (2019) developed a 2D HEC RAS model for SPAWN on Lagunitas Creek from the San Geronimo Creek confluence to Point Reyes Station to better understand floodplain activation of winter habitat conditions for Central California Coast Coho Salmon. This model does not capture channel bathymetry below the low flow water level at the time the LiDAR was flown, meaning it is not suitable for analyzing detailed hydraulic conditions and habitat suitability at low flows. However, the model is considered suitable for characterizing reach-scale hydraulic changes and channel-floodplain connectivity along the creek, as well as the forces acting on large wood structures at typical design flows. The model is described in more detail in Section 5.1. The model was run for the following winter flow conditions:

- 65 cfs: Avg. 2- and 4-week flow duration for Feb-Mar; mid-range winter flow
- 155 cfs: Max. 2-week flow duration; high-range winter flow
- 200 cfs: high-range winter flow
- 346 cfs: 1.0-year event
- 1570 cfs: 1.5-year event

The modeling found that in the confined conditions of the priority reaches provides very little readily accessible floodplain area beyond the channel during winter rainfall event-driven flows. The model also found the confined conditions caused velocities to increase as flow increases, thereby decreasing winter habitat suitable for coho rearing making it much less suitable winter

rearing beyond mid-range winter base flows as compared to downstream reaches. Simple actions that create velocity breaks and hydraulic diversity in confined channels such as adding large wood are the optimal actions to improve winter rearing conditions in the priority reaches.

ESA developed more detailed 2D HEC RAS models of four heavily used coho spawning reaches within the project area for Marin Water's Instream Flow Study (ESA, 2021). These models have very detailed channel bathymetry within the reaches (each about 500-800 feet long) and were used to assess habitat suitability for coho and steelhead at a range of winter baseflows. The four habitat suitability reaches were located between proposed restoration sites (which lack good existing habitat) so these models cannot be used directly to model conditions in the proposed restoration sites. However, they shed light on flow conditions at a small scale in reaches that have relatively good spawning and rearing conditions, providing reference conditions for restoration planning.

2.4 Sediment Supply and Transport

Notable sediment studies in Lagunitas Creek watershed have been performed by the San Francisco Bay Regional Water Quality Control Board (RWQCB) and by Stillwater Sciences, and by Balance Hydrologics and O'Connor Environmental (OEI) on behalf of Marin Water. A key finding is that Peters Dam has cut off the majority of the coarse sediment in Lagunitas Creek within the project reach, while human impacts such as road construction in the unregulated San Geronimo Creek watershed have accelerated the delivery of fine sediment (Stillwater Sciences, 2010; Napolitano, 2014). This shift in the balance of fine and coarse sediment has reduced the amount of spawning gravel while, depending on flow conditions in a given water year, often created embedded conditions that further reduce spawning suitability. The combination of less coarse and more fine sediment has also increased bed mobility in the creek, leading to scour close to or to bedrock in the canyon reach (Napolitano, 2014).

Stillwater Sciences (2010) estimated that Peters Dam traps 17,400 tons per year of sediment from upstream. Assuming that 10% of the total sediment load is bedload (as estimated by Balance Hydrologics based on their measurements of bedload and suspended load in San Geronimo Creek) this suggests that Peters Dam traps approximately 1,700 tons of bedload per year. This volume is the equivalent of adding 3 feet thickness of gravel to the entire bankfull width of the channel (approximately 50 feet) over a length of 300 feet every year. However, San Geronimo Creek still contributes a significant load of coarse sediment suitable for salmonid spawning and to support benthic communities; Stillwater Sciences (2010) estimated that the San Geronimo Creek watershed contributes 47% (9,400 tons/yr) of the total sediment produced from the unregulated portion of the Lagunitas Creek watershed (20,100 tons/yr) despite draining only 38% of the watershed area. The delivery of coarse sediment from San Geronimo Creek is critical to restoration efforts in the canyon reach of Lagunitas Creek as it supplies some spawning-size sediment that can potentially be retained by log structures. At the same time, the deficit of coarse sediment points to the need to supplement large wood structures with additional sediment where possible, to avoid the risk of structures 'cannibalizing' sediment that would otherwise have been trapped further downstream.

The size distribution of streambed deposits in Lagunitas Creek between San Geronimo Creek and Devils Gulch that are both relatively abundant and significantly mobilized during periods of peak flow can be inferred from monitoring data developed by Balance Hydrologics for the period 1995-2007 (Balance Hydrologics 2008) and by O'Connor Environmental for 2004-2005 (O'Connor Environmental 2006) and 2012-2017 (O'Connor Environmental 2019). Balance Hydrologics documented subsurface sediment size distribution in depositional zones between pools and riffles described as glides; the median diameter of these deposits were typically 5 to 25 mm. O'Connor Environmental monitoring data found that the median diameter of the streambed surface sediment is about 11-14 mm and median subsurface diameter in spawning gravel is similar with a 95% confidence interval of about 11 to 17 mm in 2016. The subsurface median sediment diameter is in the same range as surface median diameter, further suggestive of relatively high mobility of sediment despite the retention of sediment behind Peters Dam.

The size distribution of bed load sediment in transport in Lagunitas Creek below San Geronimo Creek is centered on medium gravel (8-16 mm) and generally spans the range from fine to coarse gravel (4-32 mm). Relevant to this restoration project, these are the sizes of sediment that can be expected to be retained by large wood structures along with patches of finer sediment (< 4 mm) that typically occupy up to about 30% of the channel bed. The coarser portion of the sediment size distribution between about 45 and 256 mm appears relatively stable and insensitive to annual variation in sediment transport capacity, and may be interpreted to represent the size range of sediment that is relatively immobile in this reach of Lagunitas Creek. This size range of sediment (> 45 mm) presumably will comprise bed armor that may develop as a manifestation of the imbalance between long-term sediment supply and long-term sediment transport capacity. Sediment sizes that would be expected to accumulate with the addition of large wood to this reach range from sand to approximately 32 mm, and is centered around 10-15 mm diameter.

2.5 Large Wood

Lagunitas Creek is observed to have a very low wood loading in the project reaches (Stillwater Sciences, 2010; Napolitano, 2014; OEI, 2019). The lack of wood is due to a combination of factors including Peters Dam trapping wood from the headwaters, and a history of removing in-channel wood that only ended in the last few decades. Additionally, confined reaches such as those upstream of Irving Bridge are highly efficient at transporting wood and store wood for less time (Ruiz-Villanueva et al., 2016b; Ruiz-Villanueva et al., 2016c; Kramer and Wohl, 2017). Reaches in Lagunitas Creek with an inset floodplain store larger volumes of wood than the confined reaches (Lawrence et al., 2013). However, the confined reaches do have some large wood in the bankfull channel due past restoration projects. (Lawrence et al., 2013). Forest management and land use practices have likely diminished natural wood loading in these confined reaches where large redwoods and other conifers (such as Douglas fir) were delivered through mass wasting processes such as landslides and debris flows (Lawrence et al., 2013).

The RWQCB (Napolitano, 2014) recommended that Lagunitas Creek should have a large wood load of around 300 m^3/ha based on reference conditions in less disturbed watersheds with comparable ecosystems. By comparison, OEI (2019) and Marin Water surveyed large wood in Lagunitas Creek between 2012 and 2017 and found it to be between a third and half of the Water

Board target load. In the priority restoration reaches, 20-50% of the large wood has been placed by past restoration projects (Lawrence et al, 2013). Between the San Geronimo Creek confluence and Big Bend wood load values were mostly in the zero to 50 or the 50-100 m^3/ha class. These values suggest that, for reaches that currently have no large wood, approximately 10 pieces or more of large wood would be needed for every 300 feet of channel length to reach target wood loads. (Large wood is defined as 1.5-2 feet in diameter and 20-30 feet long.)

2.6 Geomorphology

A reduced supply of coarse sediment and large wood is believed to have triggered channel incision on the mainstem (Napolitano, 2014). Chanel incision has eroded the former alluvial channel down to bedrock in some places, and to a shallow gravel bed in others, with several repercussions for aquatic habitat. Erosion to bedrock removed spawning gravel in many areas, directly reducing salmonid habitat as well as substrate that supports benthic macro invertebrates and so the food web for rearing salmonids. Erosion of alluvial gravel also removed or simplified riffle and pool forms that support several life stages for salmonids and other species. The resulting channel incision also reduced access to floodplain areas in the canyon bottom, reducing the area of winter high flow refugia for juvenile salmonids. Pools that do exist are likely a result of the large wood structures placed by past restoration projects (Lawrence et al., 2013).

During field reconnaissance by ESA and Marin Water, the project area from Peters Dam down to mile 10 was found to contain multiple long glides and few riffle-pool units. This not considered a naturally-occurring condition, since the average bed slope of 0.4% is within the gradient range for both free formed riffle-pool morphology (approximately 0.1 to 1.5%) and riffle-pool morphology forced by high densities of large wood (up to approximately 3%) (Montgomery and Buffington, 1997). A lack of coarse sediment supply and highly confined conditions may impede the development of prominent alternate bars and associated free formed riffle-pool morphology as evidenced by the extensive glides with shallow gravel and bare bedrock beds. Low valley alignment curvature in this reach starves the channel of a riffle-pool forcing agent as pronounced bends imposed on the channel by the valley could otherwise yield secondary flows that help maintain riffle-pool morphology (Thompson, 1986). Several constructed large wood structures and bedrock outcrops in this reach demonstrate the ability of local forcing agents to induce riffle-pool morphology in spite of the valley topography by creating zones of flow acceleration and deceleration that scour and deposit sediment, respectively, but large wood density is overall low in this reach and is partially responsible for the scarcity of riffle-pool units.

2.7 Geotechnical Conditions

It is expected the underlying geotechnical conditions, particularly within the stream corridor, are predominantly shallow bedrock. Several studies have observed the active channel throughout the Project Area contains bedrock expressions (KHE, 2013; OEI, 2015; ESA, 2016). Streambed facies mapping performed by O'Connor Environmental Inc. (OEI) throughout Lagunitas Creek and San Geronimo Creek that found a significant portion of the streambed within the Project Area consists of bedrock (OEI, 2015). The presence of shallow bedrock on the bed and banks is an important

design consideration for the placement of large wood structures in Lagunitas Creek, since it greatly limits the degree to which burial or keying in of logs can be used to stabilize structures.

2.8 Salmonid Habitat

Generally, adult salmonids enter the Lagunitas Creek watershed from Tomales Bay and travel up to the Project Reaches in the late fall and winter (concentrated in October through February) after storm events. Depending on precipitation, adults may arrive in late November or December to spawn. Juvenile coho and steelhead typically spend more than a year in their natal creek, overwintering the year following their hatching. Juvenile rearing is an important life stage distinction to consider in addition to passage when developing salmonid enhancement designs. Since rearing habitat has been identified as a limiting factor to the survival of coho in the Lagunitas Creek watershed (Stillwater Sciences, 2008), its expansion should provide a significant benefit to these species.

Juvenile coho salmon generally smolt at age 1+, spending at least one summer and winter in fresh water prior to outmigrating to the sea (Stillwater, 2008). Emergence occurs as early as February (Stillwater, 2008). Over the winter rearing/refuge habitat is limiting do to a lack of places to escape high winter velocities that can displace juvenile coho (Stillwater, 2008). High velocities in spring are an issue as well, with rain events that can occur through May (Stillwater, 2008). While coho will rear in San Geronimo Creek year-round, trapping data shows most emigration occurs by June (Stillwater, 2008).

Steelhead trout have a slightly different life history from coho salmon. Steelhead fry generally hatch later in the spring and spend anywhere between one and two years in the stream before undergoing the smolting process and migrate to the ocean. Steelhead generally spend anywhere from six months to two years in the ocean before migrating upstream to spawn.

Winter salmonid rearing habitat is most productive when it includes diverse channel morphology and plenty of cover, so that under different flow conditions there are different potential refuges. In particular, winter habitat benefits from the presence of pools, large wood, and floodplain areas that are well connected to the main channel so that fish can move out of fast flowing water during floods.

Stillwater Sciences (2008) conducted a Limiting Factors Analysis (LFA) for coho and steelhead in Lagunitas Creek, and Marin Water informally evaluates limiting conditions annually in response to changing ocean and watershed conditions. For both coho and steelhead, spawning or larval survival/emergence are not believed to be limiting factors in most years, because redd superimposition is rare (indicating that there is usually more spawning area available than demand from adult spawners) and because experiments have shown larval emergence levels that are considered typical-to-good in most years. There have however been some years where steelhead redds or late season coho redds are superimposed on coho redds produced earlier in the spawning season. By contrast to spawning and emergence, the number of 1+ year juvenile salmonids appears to be low in many years, even following years where the 0+ year population

was estimated to be relatively high. This discrepancy highlights winter and spring rearing as likely limiting factors in most years.

For coho, lack of suitable winter rearing habitat was found to be the most likely factor limiting the population. A secondary factor was a general lack of high velocity refugia for several life stages, especially fry rearing during March/April when fry can be involuntarily entrained and displaced. While there is less data on steelhead limiting factors than coho, it appeared likely that lack of winter rearing habitat was also the most probable explanation for the low observed number of 1+ year steelhead.

It should be noted that limiting factors can vary from year to year in response to changing cohort size, watershed conditions and climate change, and that there is great value in developing restoration actions that benefit multiple life stages to ensure that the creek is resilient across a range of conditions. Channel incision and confinement, the lack of large wood for cover, lack of channel complexity, and the high ratio of fine to coarse sediment were highlighted by several studies as factors that limit multiple life stages of salmonid habitat.

2.9 Previous Restoration Work

Most previous restoration actions in the Project Area have focused on adding large wood, with approximately 40 sites constructed by 2011 (MMWD, 2011). Through all of Lagunitas Creek Marin Water has constructed over 60 large wood structures since 1997. Much of the large wood currently found (as surveyed by O'Connor Environmental Inc.) was placed by Marin Water, SPAWN, and Marin Resource Conservation District during restoration projects (OEI, 2015). Balance Hydrologics (2008) summarized the influence of forty-three large wood installations implemented by Marin Water to improve habitat conditions over the period 1998-2006, 40 of which were placed upstream of Devils Gulch. Balance Hydrologics also noted substantial natural recruitment of large wood, primarily in the form of limbs and trunks of deciduous trees near the channel. Large wood was observed to interact with the streambed and with other large wood and to create microhabitats and flow complexity believed beneficial to salmonids. Large wood was observed to be dynamic with changes occurring year-to-year and storm-to-storm in some cases; the movement of large wood during periods of high flow is suspected to cause transient scour and deposition of bed sediment.

Research by Marin Water has shown that wood enhancement has been effective in increasing habitat. For example, channel bathymetric surveys have shown placed logs to greatly increase channel complexity and specifically to create deep scour pools in areas that were previously glides or runs. Structures that spanned the whole channel or that constricted it from both sides were found to be most effective at creating scour pools, while smaller structures were found to be less effective (MMWD, 2017). Following implementation of large wood placement projects, snorkel surveys found that coho juvenile densities doubled in restored areas. Over the study period 2006-2015 coho fry and smolt survival both also increased approximately in proportion to the increase in wood loading, though it is recognized that there are many factors influencing survival (MMWD, 2017). These studies in Lagunitas Creek, and similar findings from creeks elsewhere on the West Coast, suggest that increasing wood loading will have a beneficial effect on coho and steelhead populations.

At the same time, many of the constructed log structures have become displaced by high flows, often because of the presence of shallow bedrock (making anchoring and embedding logs challenging) or because rock ballast was insufficient to stabilize logs. Compared to more alluvial creeks where log structures can be keyed into the banks or driven into a deeper channel bed, the shallow bedrock conditions of Lagunitas Creek upstream of Big Bend is a challenging environment for large wood placement and retention. For several large wood structure installations, stabilizing means were limited to attaching boulders. As the OEI (2015) report states, it appears that a substantial proportion of the large wood installations from 1998-2006 have been removed or reduced by flood flows, and that natural large wood recruitment from surrounding forest stands is insufficient to maintain or improve large wood load. Assessments by Marin Water found several constructed large wood structures have rotated, moved short distances downstream, or have completely washed away. Marin Water documented three low-profile staggered wood structures like the one shown in **Figure 3a** that rotated or moved a short distance during moderate peak flows ranging between 2,360 cfs and 4,390 cfs, within the range of 2- and 5-year events (**Table 1**). During an extremely large peak flow of 10,000 cfs, >100-year event (**Table 1**), Marin Water documented two high-profile obstruction wood structures such as the one shown in **Figure 3b** that washed away. Additionally, during this extremely large event two low-profile wood structures were also documented as having rotated or moved a small distance, but not completely washing away. Marin Water estimated that low-profile staggered wood structures (**Figure 3a**) had about 3-6 tons of boulders attached per log, while the high-profile obstruction wood structures had about 5-6 tons of boulders attached per log.

Figure 3a
Low-Profile Staggered Wood Structure
Installed in the Project Area by Marin Water in 2001

Figure 3b
High-Profile Obstruction Wood Structure
Installed in the Project Area by Marin Water in 2001

In addition to large wood placement there have been a series of efforts to improve the volume and composition of channel bed sediment. Marin Water has also conducted some gravel augmentation, with creek gravel placed directly into Lagunitas Creek between Peters Dam and Shafter Bridge. This effort was described in the Lagunitas Creek Stewardship Plan (MMWD, 2011) as fairly limited and only somewhat successful.

Efforts to reduce fine sediment input into Lagunitas Creek have including repairing and replacing culverts on the Cross Marin Trail in Samuel P. Taylor State Park with rolling dips, critical dips, and install armored fill crossings (MMWD, 2011).

2.9.1 Lessons Learned

The Marin Water data, while not a quantitative force-balance analysis, provides a valuable line of 'real world' field evidence on the need for a substantial amount of ballast on log structures in the canyon reach of Lagunitas Creek, especially for those that have a high profile within the creek flow path. Several of the low-profile staggered wood structures installed by Marin Water moved for a full range of moderate to extremely large flows but did not fully wash away. While the two of the high-profile obstruction wood structures held up to the more moderate, and geomorphically significant flows, but then completely washed away during the extremely large peak flow. Additionally, it seems 6 tons of boulders was adequate in keeping the low-profile staggered wood structures but not the high-profile obstruction wood structures from washing away during an extremely large event.

2.10 Infrastructure

Infrastructure is an important consideration in assessing project feasibility, site footprints, construction access and the need to avoid impacting steep banks and bridges downstream of habitat restoration sites. Infrastructure has also influenced existing conditions in the creek by affecting the flows, sediment supply and sediment size distribution.

There are three instream dams on Lagunitas Creek upstream of the project reach that are operated by Marin Water for water supply; Peters Dam immediately upstream detains Kent Lake, while Alpine and Bon Tempe Lake detain flows further upstream. Nicasio Reservoir is located on Nicasio Creek, which joins Lagunitas Creek downstream of the project reach. There is a small privately owned dam on Devils Gulch, just before the downstream limit of the project reach.

There are 598 miles of roads within the entire Lagunitas Creek watershed consisting of 430 miles of unpaved roads and 168 miles of paved roads (MMWD, 2011). More than half of the unpaved roads are publicly owned and/or maintained by Marin Water, National Park Service, California State Parks, the County of Marin, Marin County Open Space District, and Marin County Resource Conservation District to minimize the amount of sediment entering the streams (MMWD, 2011). Marin Water is responsible for the maintenance and management of the following unpaved roads on their property: Shafter Grade runs along the west side of Lagunitas Creek from Shafter Bridge to Bolinas Ridge; Peters Dam Road runs along the east side of Lagunitas Creek from Shafter Bridge up onto Peters Dam (MMWD, 2011). Sir Francis Drake Boulevard is the main paved road that runs through the Project Area, typically adjacent Lagunitas Creek upstream to Shafter Bridge, then adjacent to San Geronimo Creek from Shafter Bridge to Woodacre. Additionally, the Cross Marin Trail runs adjacent to Lagunitas Creek the length of the Project Area, typically on the opposite side of Sir Francis Drake.

There are nine existing bridges on Lagunitas Creek from Peter's Dam to Tomales Bay. Marin Water collected details regarding bridge dimensions for the nine bridges (**Table 2**). Additional details for the seven public bridges were obtained from the Federal Highway Administration FHWA National Bridge Inventory database (**Table 2**). For more bridge details see Attachment D.

In addition to the bridges on Lagunitas Creek, within the Project Area there are several bridges that cross San Geronimo Creek and Devils Gulch Creek. Also, there are numerous culverts throughout the Project Area that connect named and unnamed drainages to Lagunitas Creek and San Geronimo Creek, many of which beneath Sir Francis Drake Boulevard and the Cross Marin Trail.

Marin Water routes raw water through their Nicasio Transmission Pipeline from Nicasio Reservoir to the San Geronimo Treatment Plant in Woodacre with help from the Lagunitas Booster Station (MMWD, 2011). The 33-inch water transmission pipeline runs under Lagunitas Creek, then beneath the old railroad grade/Cross Marin Trail to the Inkwells Bridge, where it joins with the pipeline from Kent Lake and continues along Sir Francis Drake Boulevard to the San Geronimo Treatment Plant. Along the way the pipeline crosses several named and unnamed streams, including San Geronimo Creek at several locations in town of Lagunitas. There are also several valves along the water pipe can drain segments of the transmission lines.

TABLE 2
EXISTING LAGUNITAS CREEK BRIDGES

Bridge	River Mile	Max Height[1] (ft)	Total Length[1] (ft)	Owner[2]	Year Built[2]	Bridge Condition[2]	Rating[2] (US tons)
Shafter	11.3	24	74	County Highways	1982	Good	33.2
Irving	10	22	53	County Highways	1929	Fair	36.8
Cross Marin Trail (Camp Taylor)	9.8	35	83	State Parks			
Camp Taylor	9.2	23	117	State Parks	1947	Fair	24.7
Swimming Hole	8	29	108	State Parks	1947	Fair	19.3
Sir Francis Drake (Tocaloma)	5.8	32	187	County Highways	1964	Poor	38.3
Cross Marin Trail (Tocaloma)	5.8	21	154	National Parks	1927	Poor	14
Gallagher Ranch	2.3	81		Private			
Highway 1 (Point Reyes Station)	0	19	125	State Highways	1929	Poor	37.1

NOTES:

1. Inventory conducted July 2021 by Jaclyn Sherman and Annabelle Howe (Marin Water - Watershed Stewards Program Members). Max height measured from bottom of bridge deck to streambed. Total width measured between abutments.
2. Federal Highway Administration FHWA National Bridge Inventory

Other noteworthy infrastructure includes overhead powerlines, water service pipe, and sanitary sewer pipes along portions of Cross Marin Trail within Samuel P. Taylor State Park, as well as overhead powerlines along Peters Dam Road. Several of these features are potential construction access considerations and will need to be located during later design stages.

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SECTION 3
Restoration Prioritization and Basis of Design

This section describes the Plan's prioritization process including the restoration opportunities analysis and design basis for all proposed enhancement actions. The restoration opportunities analysis included identifying priority reaches, potential restoration sites, and recommended enhancement actions. A total of thirteen restoration sites were selected across two identified priority reaches. For these thirteen restoration sites, three key enhancement actions are proposed:

- *Riffle-Pool-Wood Structures*: adding instream large wood and gravel to create complex self-maintaining riffle-pool-wood habitat structure with cover
- *Gravel Augmentation*: regularly adding coarse sediment to account a deficit downstream of Peters Dam
- *Tributary Confluence Modification*: modifying tributary confluences with the mainstem to improve coarse sediment conveyance from tributaries to the mainstem

For each of these enhancement actions, the design basis, including approach and criteria, is described in detail in this section.

3.1 Restoration Opportunities Analysis

Upon review of available literature and data, several field reconnaissance visits were made covering the entire project area to identify two priority reaches. The initial field reconnaissance visits included biologists, fluvial geomorphologists, and restoration designers from Marin Water and ESA. Later reconnaissance visits included staff from the San Francisco Bay Regional Water Quality Control Board (Water Board) and California Department of Fish and Wildlife. The background for the field reconnaissance was provided through the review of available literature and data. Field maps were developed from available data to support the field reconnaissance (Attachment B).

From the initial field reconnaissance, several San Geronimo Creek reaches were determined to be low priority because opportunities were considered to be small relative to the constraints. Most of the San Geronimo Creek within the Project Area is on private land. Of the locations where Marin Water has easements, many of the sites were assessed as having good existing creek conditions. At the few Marin Water easement locations where limited restoration opportunities exist, significant site constraints were identified such as insufficient access.

Based on the restoration opportunities analysis, in consultation with the Lagunitas Creek Technical Advisory Committee (Lagunitas TAC) and the Water Board, Marin Water and ESA identified two priority reaches:

- *Priority Reach 1*: Irving Bridge upstream to the Leo T. Cronin Fish Viewing Area to the upstream
- *Priority Reach 2*: Camp Swimming Hole Bridge upstream to Cross Marin Trail Bridge (Camp Taylor)

3.1.1 Priority Reach and Enhancement Site Selection

Within the two priority reaches thirteen potential restoration sites were selected, of which ten were instream habitat restoration sites, one was a tributary confluence modification that included some instream restoration, and two were potential gravel injection sites. Sites were grouped into potential construction phases based on their relative priority. Preference was given to sites that provided more area of restored creek relative to the access constraints. The recommended sites and their phasing are listed in **Table 3** and location shown in **Figure 4**. Sites were prioritized as either Phase 1 sites, recommended to be immediately advanced for implementation as part a single project, and Phase 2 sites, to be implemented as part of one or more subsequent projects.

TABLE 3
LIST OF SELECTED RESTORATION SITES

Site	Enhancement Action	Priority Ranking	Site Length (ft)	Logs Added (#)	Gravel Added (tons)
1	Riffle-Pool-Wood Structure	Phase 2	250	9	651
2	Riffle-Pool-Wood Structure	Phase 1	400	26	733
3	Riffle-Pool-Wood Structure	Phase 1	550	39	950
4	Riffle-Pool-Wood Structure	Phase 1	400	26	765
5	Riffle-Pool-Wood Structure	Phase 1	350	26	708
6	Riffle-Pool-Wood Structure	Phase 1	550	39	1025
7	Riffle-Pool-Wood Structure	Phase 2	450	26	845
8	Riffle-Pool-Wood Structure; Tributary Confluence Modification	Phase 2	150	10	402
9	Riffle-Pool-Wood Structure	Phase 2	350	26	768
10	Pool-Wood Structure	Phase 2	200	12	184
11	Riffle-Pool-Wood Structure	Phase 2	550	39	1161
12	Gravel Augmentation	Phase 1	150	0	1000
13	Gravel Augmentation	Phase 1	100	0	700
		Phase 1 Subtotal	2500	156	5698
		Phase 2 Subtotal	1950	122	4011
		TOTAL	**4450**	**278**	**9892**

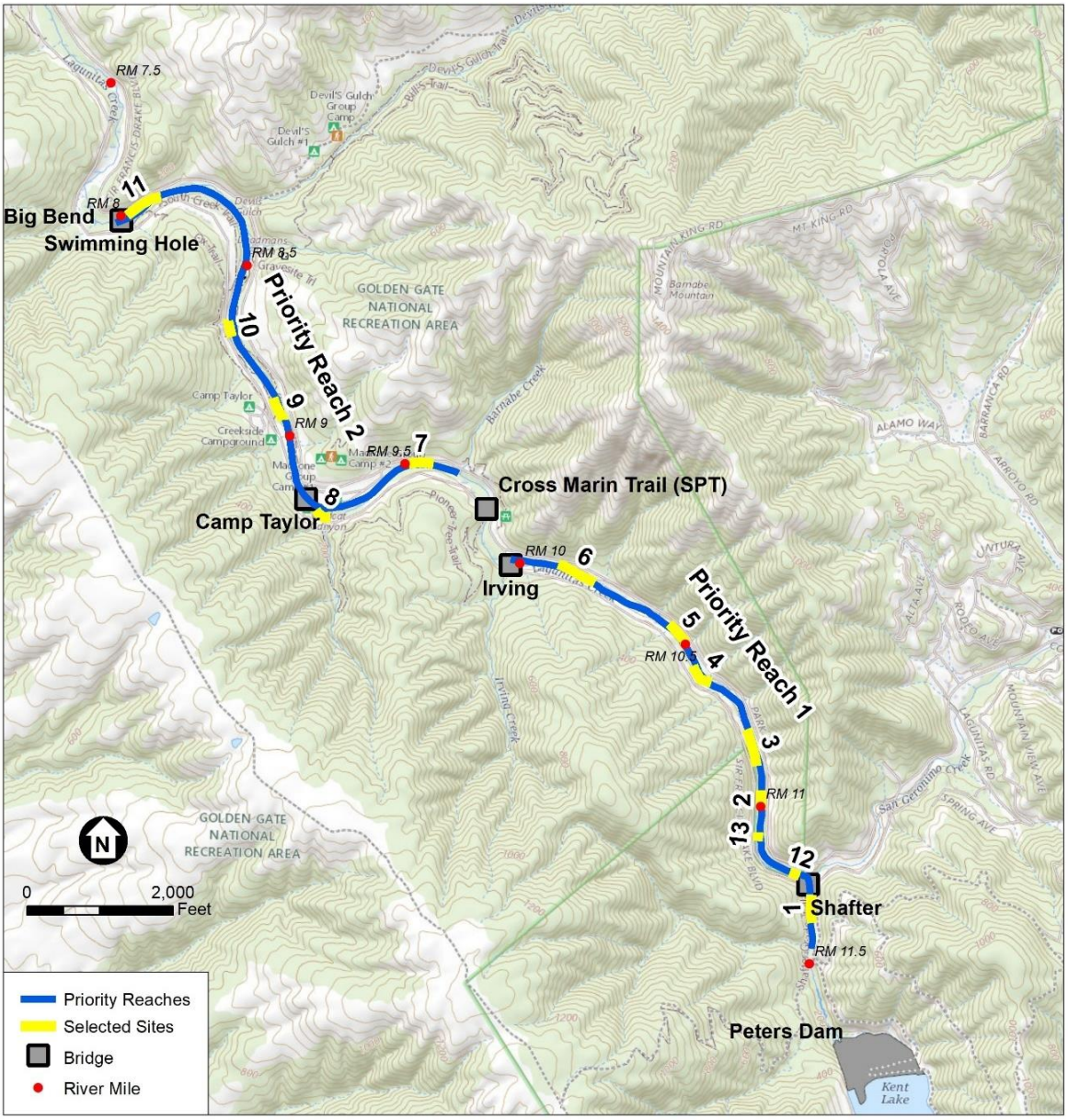

Figure 4
Priority Reaches and Proposed Sites

For each potential site a conceptual design sketch was developed, along with an opportunities and constraints sheet (Attachment D). Potential constraints included construction access challenges and the presence of known cultural or biological resources.

3.1.1.1 Riffle-Pool-Wood Sites

Eleven sites were selected for Riffle-Pool-Wood Structures. These sites were identified for Riffle-Pool-Wood Structures because they contained long homogenous glides or pools that lacked existing spawning habitat and cover in the form of large wood or overhanging vegetation. Potential site boundaries were located to avoid areas of good existing spawning or rearing habitat,

though a few sites contain small areas of good quality habitat separated by long area of poor habitat. (Good spawning habitat was generally characterized by bed morphology and historic records of redds.) The instream sites mostly ranged from 250 to 550 feet long, with one about 150 foot long, for a cumulative length of 4200 linear feet. Some potential sites were considered but not selected because of likely construction access challenges (e.g. known cultural resources) or for sites which would have been very close to Sir Francis Drake Boulevard and carried a risk of deflecting flows against steep banks.

Phasing priority for individual sites was determined based on the balance of opportunities and constraints. Sites 2-6 and 12-13 were prioritized as Phase 1 sites due to their relatively long footprint and ease of access, meaning that a relatively large area of creek could be enhanced with a relatively small temporary impact due to staging and construction access. Sites 1 and 7-11 are still considered worthwhile for restoration in Phase 2, especially if the Marin Water wishes to complete as smaller projects but would have a lower ratio of benefit to temporary construction impact than the Phase 1 sites.

Site 1 is located immediately upstream of Shafter Bridge and the San Geronimo Creek confluence. This site does not have the full range of natural flows that are found downstream, and gravel placed here would only mobilize during high flows when Peters Dam overtops and spills (typically every 1-2 years). Gravel placed at this site would be mobilized less frequently than from sites downstream of the confluence with San Geronimo Creek. A consideration for this site is the risk of channel dewatering, since flows from Peters Dam can be reduced to as low as 2 cfs in the winter when flows from San Geronimo Creek are high enough to meet the Marin Water's instream flow requirements. However, the downstream most 1-200 feet of Lagunitas Creek backwaters from San Geronimo Creek under these flow conditions, and so is considered a low risk for dewatering. In addition to directly placing gravel in the channel prior to winter flows, gravel could potentially be sluiced into Lagunitas Creek directly under Shafter Bridge during high flows, to mobilize downstream

3.1.1.2 Gravel Augmentation Sites

Two Gravel Augmentation sites were selected, in addition to placement of gravel at all the Riffle-Pool-Wood Structures sites. Potential Gravel Augmentation sites were sought out at the upstream end of the project reach so that gravel could be mobilized to benefit as much downstream habitat as possible, including the Riffle-Pool-Wood Structures sites. Site 12 is immediately downstream of the San Geronimo Creek confluence, which provides the greatest potential flow for mobilizing gravel and almost the maximum benefit from the length over which gravel might be trapped into habitat features. Site 12 is about 150 feet in length. Site 13 is just downstream of Site 12 to provide additional 100 feet in space needed to add the amount of gravel that meets the enhancement objectives.

3.1.1.3 Tributary Confluence Sites

Two tributary confluence sites were examined, and one was selected for enhancement. The selected site is where Wildcat Canyon joins Lagunitas Creek in Samuel P. Taylor State Park. Wildcat Canyon is separated from Lagunitas Creek by the Cross Marin Trail and the Marin Water

Transmission Pipeline. Water from Wildcat Canyon is meant to be conveyed through an undersized hanging culvert that runs beneath the Cross Marin Trail and discharges down onto a riprap bank. Upstream of the culvert is a sediment basin that traps incoming sediment.

A second site was considered but rejected at the confluence between Lagunitas Creek and San Geronimo Creek. This was rejected as a potential restoration site because of constraints including Shafter Bridge, the proximity of Sir Francis Drake Boulevard and the popular swimming area at the Ink Wells.

3.2 Enhancement Actions Basis of Design

The Restoration Opportunities Analysis found the Plan's habitat enhancement goal can be accomplished by converting poor quality glide habitat at many of the selected sites within the priority reaches into high quality self-sustaining riffle-pool habitat through the addition of large wood and coarse sediment (gravel). In order support self-sustaining riffle-pool habitat, Restoration Opportunities Analysis also found a supply of coarse sediment is needed. It was determined this can be accomplished through augmenting the coarse sediment deficit caused by the upstream Peters Dam though placement of gravel, and with modifying the Wildcat Canyon confluence with Lagunitas Creek to improve coarse sediment conveyance from the tributary. Thus, the three key enhancement actions identified Restoration Opportunities Analysis were Riffle-Pool-Wood Structures, Gravel Augmentation, and Tributary Confluence Modification.

3.2.1 Riffle-Pool-Wood Structure

Basis of the Riffle-Pool-Wood Structure design (**Figure 5**) is to meet the enhancement objectives:

- Adding the amount of large wood that results in densities greater than Water Board's TMDL target of 300 m^3/ha.
- Placing wood in configurations that increases trapping, sorting, and storage of gravel in a manner that increases the quantity and quality of spawning and rearing.

3.2.1.1 Design Approach

The design approach for the Riffle-Pool-Wood Structures is to use the following combination of large wood and gravel structures to create complex self-maintaining riffle-pool habitat:

- *Riffle Forcing Wood Structure*: a series of two logs with rootwads that extend laterally from opposing banks to trap coarse bedload and force the formation of a riffle.
- *Riffle Gravel*: Spawning sized gravel placed upstream of the Riffle Forcing Wood Structure to "jump start" riffle formation.
- *Pool Habitat Wood Structure*: alternating series of three logs add in the pool created upstream of the Riffle Forcing Wood Structure to provide cover and promote complexity through local scour and downstream sediment sorting and storage (includes gravel placed downstream to "jump start" bar formation).

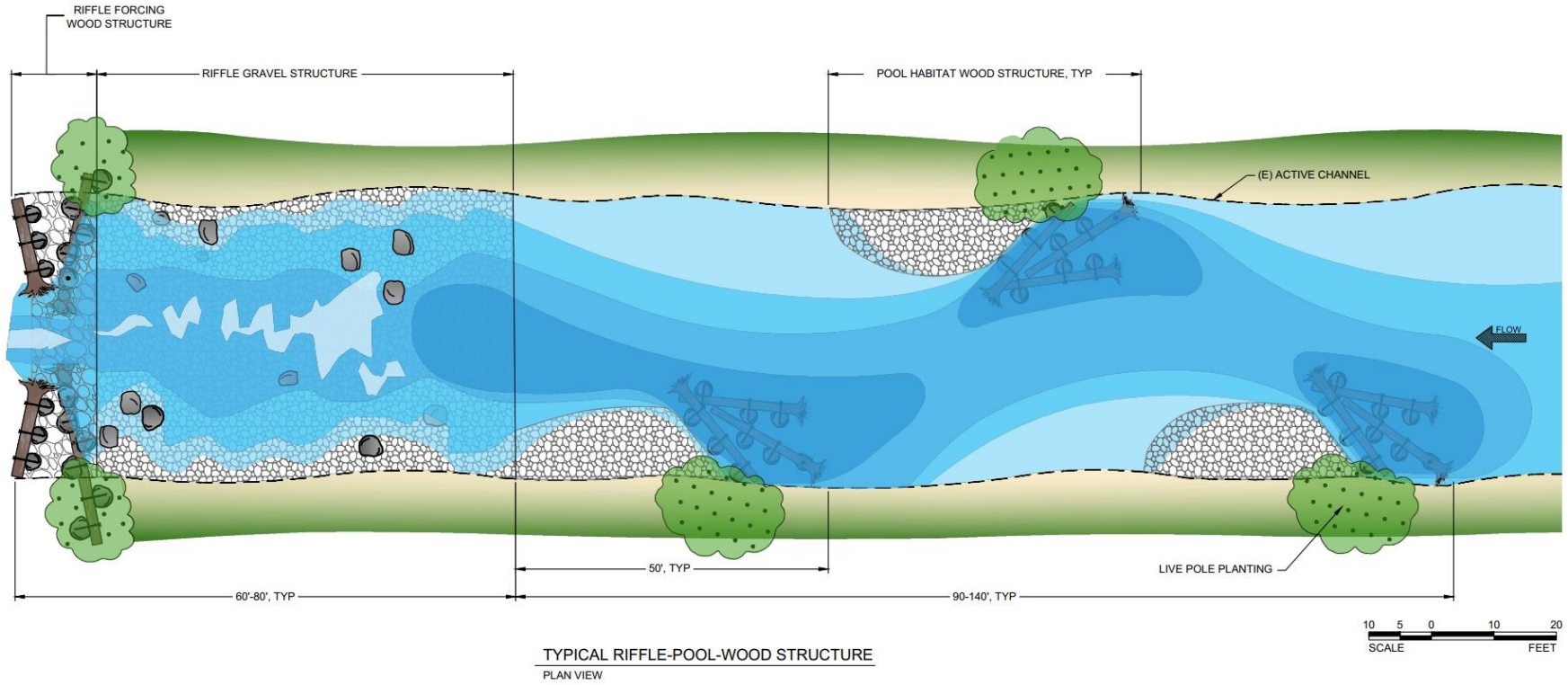

Figure 5
Riffle-Pool-Wood Structure
Design Detail

Collectively the Riffle-Pool-Wood Structures are intended to:

- **Convert long reaches of homogeneous glide or pool into shorter, more numerous, riffles and pools**. Bratovich and Kelley (1988) showed that 90% of coho redds in Lagunitas Creek are located on pool or glide tails located within 25 feet upstream of a riffle crest, so creating additional riffles should increase the available salmonid spawning area. Creating shorter but more heterogeneous and deeper pools with greater cover is expected to create higher value summer and winter salmonid rearing habitat than the existing long glides and pools.

- **Trap gravel that currently is transported through sites, partially reversing channel incision and creating suitable habitat for coho and steelhead spawning, and winter refugia**. Fieldwork in Lagunitas Creek has shown that large, channel-spanning wood structures and their natural analogues can trap bedload and create riffles upstream, creating salmonid spawning habitat, and fry rearing habitat. Furthermore, partially reversing incision by depositing coarse sediment increases the connectivity of the bankfull channel to surrounding floodplain areas, alcoves and velocity refugia at high flows. Finally, creating a thicker gravel bed over areas of bedrock or shallow gravel will allow for deeper pools to be scoured locally within those deposits, creating better winter and summer rearing habitat.

- **Increase the total coarse sediment loading in the creek**. Adding gravel will provide an immediate local benefit, and a longer term benefit as gravel is transported downstream to other spawning and rearing areas. It will partially offset the trapping of gravel by Peters Dam, and will improve the ratio of coarse to fine sediment in the creek.

- **Create cover and scour pools**. Several studies have shown that spawning is more likely where there is cover near to the potential spawning site, and that Lagunitas Creek has much less wood than reference conditions. Large wood structures in pools and near spawning riffles should provide shelter, and should also create local scour pools that support salmonid rearing, including deeper pools that provide winter velocity refugia and summer thermal refugia.

- **Add hydraulic heterogeneity, creating micro habitats**. Increased wood loading is likely to break up homogeneous hydraulic conditions, sorting bed sediment and creating micro habitats that benefit salmonids and other aquatic species.

- **Provide a direct source of nutrients into the aquatic wood web by adding large wood.**

3.2.1.2 General Design Criteria

The Riffle-Pool-Wood Structure design is based largely on functioning existing riffles-pools and large wood (natural and engineered) features found in Lagunitas Creek.

Prior Restoration Projects

Several large wood structures that have been constructed over the past couple decades by Marin Water within the priority reaches. Observations of the performance of these structures helped inform the current design. Specific large wood configurations, logs with rootwads on opposing banks constricting flow, were found to effectively and naturally covert glides to riffles (**Figures 6a-b**). The design of the Riffle Forcing Wood Structures was informed by these specific functioning wood structures. Other large wood structures constructed by Marin Water,

which extend from just one bank, provide cover while promoting course sediment deposition (**Figures 8a-b**).

General Risk Assessment and Safety Factors

Placing large wood in Lagunitas Creek poses an indirect risk to existing infrastructure, most notably the nine bridges within and/or downstream of the Project Area. To reduce risk, the large wood structures are engineered to resist specific types of movement. The criteria for resistance to movement is expressed as a combination of target design floods and associated factor of safety. The factor of safety is the ratio of net stabilizing force to net destabilizing force and typically ranges from 1 to 2 depending on risk and uncertainty. There are four factors of safety critical for large wood design: resistance to flotation, overturning, sliding, and rotation. The memorandum entitled "Large Wood Risk to Lagunitas Creek Bridges to Inform Design Criteria" (Large Wood Risk memo) was prepared to examine various aspects of the risk and uncertainty in Lagunitas Creek. **During the future 60% design stage, this Large Wood Risk memo (Attachment D) is intended to inform Marin Water's and State Parks' selection of the appropriate factor of safety for the wood structures.**

Wood Structure Stabilization

Various stabilization methods were considered. The lack of adjacent floodplain and presence of shallow bedrock in many reaches means that keying logs into the bed and banks is less viable in the canyon reach of Lagunitas Creek (from Camp Taylor upstream) than in the more alluvial channels downstream. While previous Marin Water restoration projects have opportunistically wedged logs into existing trees to provide stability, there are limited locations where this approach can be used given the goal of greatly increasing the number and spatial density of log structures in this current project. As a result, logs will need to be ballasted by attaching multiple boulders using rust-resistant pins and high strength epoxy. Chains may also be considered.

Cables will not be used due to their potential to fray and break from the vibration of water. Also logs will not be attached to each other so that if one log moves, it will not affect the other logs. Knutson and Fealko (2014) noted that when multiple logs are attached together, if one log fails, it has the potential to take the remaining logs with it, causing a catastrophic failure. Logs chained or cabled together can float downstream as large mass and have a much higher likelihood of getting stuck on a bridge or other infrastructure than individual logs (Knutson and Fealko, 2014).

Riffle-Pool Dimensions

To inform the dimensions and spacing of riffle-pool features, ESA utilized a high resolution survey of four reaches of Lagunitas Creek within the project area. The survey was conducted by ESA for Marin Water as part of the Lagunitas Creek Instream Flow Study (ESA 2021). The survey covered areas in Lagunitas Creek where 20-25% of coho spawning in the mainstem of Lagunitas Creek has occurred in recent years. The spacing and dimensions of several riffles and pools were assessed from the surveys, and are summarized in **Table 4**. These dimensions and spacing will be used to inform the Riffle-Pool-Wood design.

TABLE 4
LAGUNITAS CREEK – TYPICAL SPAWNING RIFFLE DIMENSIONS (ESA, 2021)

Parameter	Typical Dimensions
Riffle Length	60-80 feet
Riffle Height	1-2 feet
Pool Length	120-170 feet
Bankfull Channel Width	40 – 50 feet

SOURCE: ESA, 2021

3.2.1.3 Design Criteria by Element

Riffle Forcing Wood Structure

These structures are designed to intrude into the channel from both banks and constrict flow sufficiently to create a backwater that traps bedload and maintains a riffle upstream while creating a jet that scours a pool downstream. Previous studies (see Literature Review) and field observations by the project team of existing log structures and natural log jams in Lagunitas Creek (**Figures 6a-b**) suggest that they should block at least 75% of the bankfull channel width. To induce gravel deposition, these structures are designed to have a significant hydraulic effect on flows that transport gravel (estimated to be from 1600 cfs upwards). Consequently, these structures are designed to be large, and will consist of four (4) 24-inch diameter logs, placed as follows:

- Two logs will project from each side of the channel, angled slightly.
- The two upstream opposing logs will be 20-30 feet long (depending on overbank space and hill slopes) and sit about 3-4 feet above the existing bed.
- The two downstream logs will be about 16 feet long and sit on the existing bed to block sediment from moving beneath the upstream logs.

Unplanned movement of these structures (e.g. reorientation during high flows) is likely to reduce their gravel trapping function. These larger logs may also pose a potential risk to downstream bridge if they are to be entrained, transported, and deposited against abridge pier (see Attachment D). Thus, the Riffle Forcing Wood Structure should be designed to have a relatively high factor of safety for relatively large design flows. These structures are similar to the high-profile obstruction wood structure constructed by Marin Water shown in Figure 3b that with 5-6 tons of boulders held up to moderate flows but washed away during a flow exceeding the 100-year event.

Figure 6a
Functioning Riffle Forcing Wood Structure in Lagunitas Creek

Figure 6b
Functioning Riffle Forcing Wood Structure in Lagunitas Creek

Riffle Gravel

While the log structures are intended to trap gravel that is currently transported through the reaches, additional riffle gravel will be placed directly in each log complex during construction to "jump start" the process and to avoid interrupting gravel transport to existing habitat downstream of the complexes. Gravel will be placed across the entire width of the channel upstream of the channel constricting Riffle Forcing Wood Structures. General dimensions for gravel placement were derived from ESA's measurements of the Lagunitas Creek reference reach where coho spawning is commonly observed (see **Table 4** and **Figure 7**).

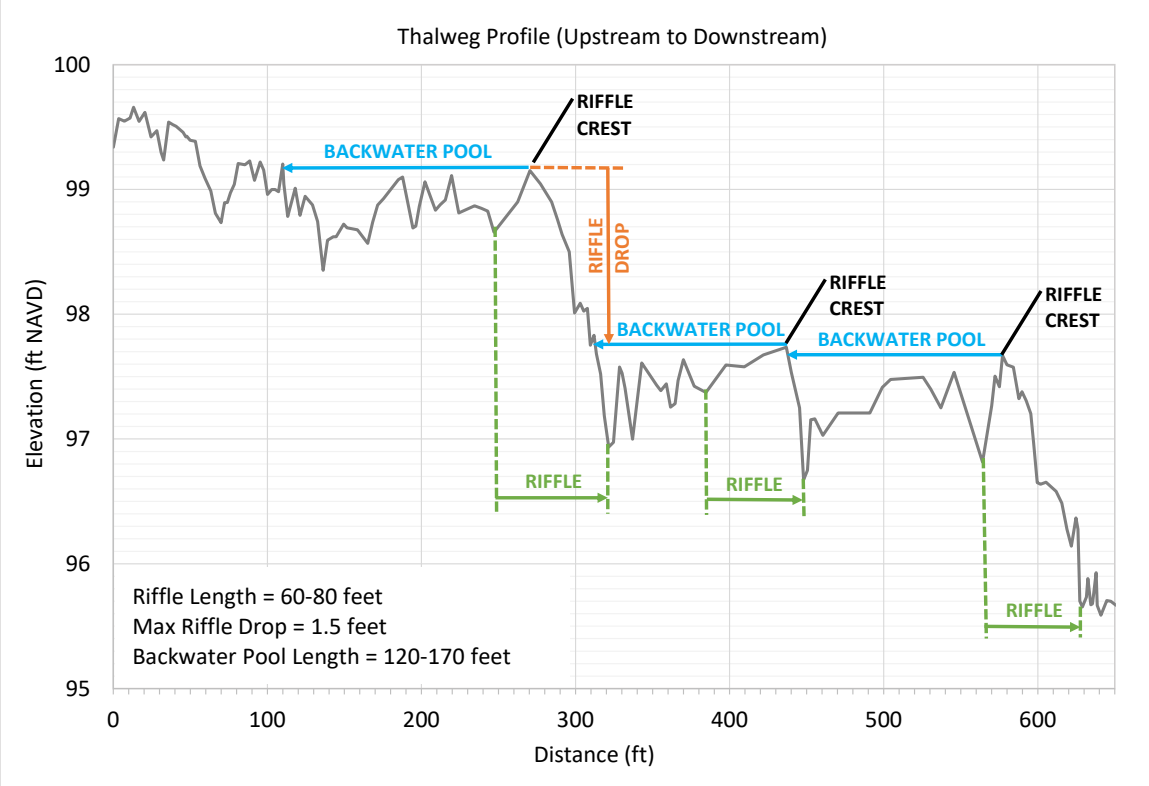

Figure 7
Lagunitas Creek Reference Reach Profile for Riffle-Pool Measurements

The basic design criteria for Riffle Gravel are summarized in **Table 5**. Gravel will be sized based on Bratovitch and Kelley's (1988) study of gravel adjacent to coho redds in the mainstem of Lagunitas Creek. Gravel will be sloped gently from the crest upstream to the existing channel bed over a distance of at least 25 feet to form the pool tail, consistent with Bratovich and Kelley's observation that around 90% of coho spawning in Lagunitas Creek occurs in the area 25 feet upstream of the riffle crest.

TABLE 5
DESIGN CRITERIA FOR RIFFLE GRAVEL

Parameter	Typical Dimensions	Source
Riffle Length	60-80 feet	ESA, 2021
Maximum Water Surface Drop	1.5 feet	ESA, 2021
Spacing	Create pools 120-170 feet in length	ESA, 2021
Riffle Width	Bankfull Width (approx 40 – 50 ft)	ESA, 2021
Gravel Size	D16 = 2-23mm	Bratovich and Kelley, 1988
	D50 = 8-45 mm	
	D84 = 23-64mm	

Pool Habitat Wood Structure

These structures will be located in the pool upstream of the Riffle Forcing Wood Structure and will have a lower hydraulic profile. Each structure will intrude approximately 30-50% of the channel width, based on observations of similar features in Lagunitas Creek that appear to have resulted in good quality habitat (**Figures 8a-b**). There logs will likely be smaller, approximately 18-inch in diameter and 20 feet in length. The entire of length of the log will be as low to the channel possible optimize contact with water and summer rearing cover. Within each pool section, habitat structures will be placed on alternating sides of the channel, with a spacing of around one channel bankfull width, or 50 feet. Additionally, mounds of gravel will be placed on the lee side of Pool Habitat Wood Structures to kick start bar formation.

Movement of these smaller logs is acceptable provided they remain in the wetted channel providing their primary function of cover. Therefore Pool Habitat Wood Structures could be designed with a lower factor of safety relative to the Riffle Forcing Wood Structure. The advantage of using less ballast for stability is greater ease of construction, which lowers costs and temporary construction impacts. The Pool Habitat Wood Structure will also incorporate several natural factors that have been found to contribute to the stability of "non-engineered" logs:

- Logs will be oriented as close to parallel to flow as possible. Logs that are horizontally oriented parallel to flow tend to be more stable (Braudrick and Grant, 2000; Merten et al., 2010; Schenk et al., 2013).

- Relatively short logs with rootwads will be used. Logs with rootwads are more stable through added streambed friction and entangling with rocks, trees, or wood jams. Rootwads will also act as rudder reorienting logs to be parallel to flow (rootwad facing upstream), which further adds to the stability of a single log (Braudrick and Grant, 2000; Merten et al., 2010; Schenk et al., 2013). Davidson, et al. (2015) also found that in flume experiments that the shortest pieces with rootwads moved significantly shorter distances.

- Logs will be partially to fully submerged in water, which will increase their density as they become saturated. Logs with higher density have decreased buoyancy and increased weight and friction, and thus travel shorter distances (Ruiz-Villanueva et al., 2016a; Ruiz-Villanueva et al., 2016c; Kramer and Wohl, 2017).

These structures are similar to the low-profile staggered wood structure constructed by Marin Water shown in Figure 3a that with 3-6 tons of boulders only rotated or moved short distances from moderate flows extremely large flows.

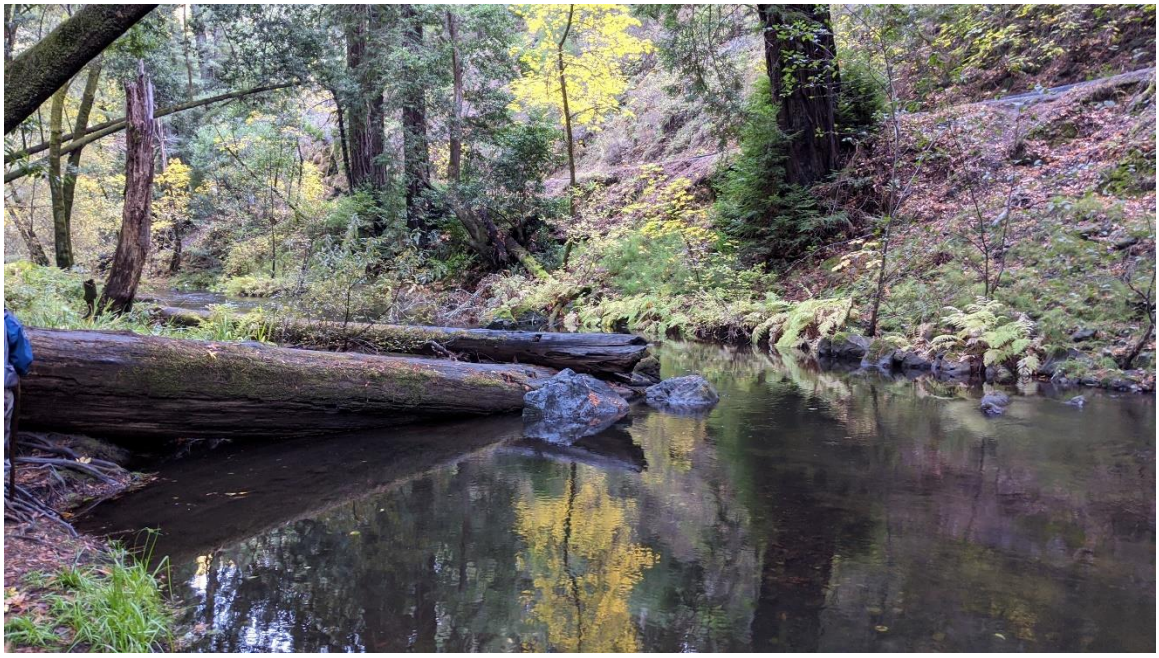

Figure 8a
Functioning Pool Habitat Wood Structure in Lagunitas Creek

Figure 8b
Functioning Pool Habitat Wood Structure in Lagunitas Creek

3.2.2 Gravel Augmentation

Basis of the Gravel Augmentation design is to meet the enhancement objectives of adding sufficient gravel of suitable sizes for coho and steelhead spawning to overcome a bedload deficit caused by upstream impoundments of around 1,700 tons per year.

3.2.2.1 Design Approach

In addition to gravel placement in as part of Riffle-Pool-Wood Structure complexes during construction, ESA proposes adding gravel at the upstream end of the priority reaches. The overall Gravel Augmentation design approach is to:

- Increase the overall loading of coarse sediment in Lagunitas Creek to partially offset sediment trapped by Peters Dam, and to provide gravel that can be trapped by the newly installed log complexes.
- Increase the ratio of coarse to fine sediment.
- Partially offset channel incision by creating thicker layer of alluvium over bedrock or shallow alluvial creek beds to provide such benefits as deeper pools and hyporheic flow.

A thicker layer of alluvium supports biological processes that depend on coarse sediment and hyporheic flow, including salmonid spawning, fry rearing, and production of benthic macro invertebrates.

3.2.2.2 Design Criteria

Gravel will be placed in Lagunitas Creek at augmentation sites by placing approximately 3 feet thickness of gravel over an area approximately 250 feet long by 45 feet wide, which is approximately 1,700 tons (yearly deficit impounded by Peters Dam). A 1-foot-deep low flow channel will be incorporated into the placed gravel to maintain fish passage. Ideally Gravel Augmentation will occur annually. All sediment placed for Gravel Augmentation will be sorted to meet ideal spawning sizes and washed of fine sediment. The depositional fans within Marin Water's reservoirs may serve as potential source Gravel Augmentation provide it is processed (sorted and washed) before being placed.

3.2.3 Tributary Confluence Modifications

Basis of the Tributary Confluence Modifications design is to meet the enhancement objectives of reconnecting tributaries that contribute large volumes of coarse sediment to the creek relative to fine sediment.

3.2.3.1 Design Approach

As Lagunitas Creek has incised and trails have been constructed along its banks creating hard points in the profile, several tributaries have become disconnected and now discharge down riprap banks or via by hanging culverts. The largest such tributary within the project reaches is

Wildcat Canyon, which joins Lagunitas Creek from the left bank in Camp Taylor. The tributary has a sediment basin that was created where it passes via a culvert under the Cross Marin Trail. The basin was created to prevent fine sediment from reaching Lagunitas Creek, but it appears to be trapping a large volume of coarse gravel currently. The approach of the Tributary Confluence Modification is to restore a supply of coarse sediment from Wildcat Canyon to Lagunitas Creek, especially as a source of sediment to replenish the Riffle-Pool-Wood Structures placed downstream.

3.2.3.2 Design Criteria

The proposed restoration design would replace the existing small culvert with a larger bridge or bottomless arch culvert that would carry the Cross Marin Trail and the Nicasio Transmission Pipeline, while eliminating the sediment basin and reconnecting Wildcat Canyon to Lagunitas Creek via a regraded profile. The existing riprap-covered bank may also be modified.

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SECTION 4
Feasibility Assessment

This section describes the various aspects that were assessed to ensure the proposed priority reaches, selected sites, and enhancement actions are feasible. Below we describe how various factors, including Stakeholder Input, Land Ownership, Environmental Compliance, Existing Infrastructure, Construction Equipment, Site Access and Staging, and Dewatering Approach, were considered in the design.

4.1 Land Ownership

A feasible restoration plan requires landowners/managers that agree to restoration occurring on their property. The priority reaches and selected sites all fall within land owned/managed by State Parks or Marin Water. Sites 2-11 are all inside the Samuel P. Tayler State Park boundary limits. Site 1 is located within the Marin Water Protected Watershed, the upper Lagunitas Creek watershed land managed by Marin Water. Given the proximity of Lagunitas Creek to Sir Francis Drake Boulevard, there are sites that may be adjacent to Marin County/Caltrans right-of-way. This may require additional flood analyses to ensure the proposed enhancement actions do not adversely affect flooding within such right-of-ways.

Given State Parks role in the project, their input is crucial at every step and design stage of the project. State Parks should have input on the risk assessment to existing infrastructure and approve of selected safety factors for wood structures. A State Parks biologist and cultural resource specialist reviewed and provided input to all selected sites, access routes, and staging areas. The same State Parks biologist and cultural resource specialist will be consulted during future stages of design, resource surveys, CEQA compliance, and permitting. Any restoration worked to be constructed will require a Right of Entry Agreement between State Parks and Marin Water.

4.2 Stakeholder Input

Stakeholder consultation, suggestions and feedback on the existing and historic conditions, proposed restoration locations, sites, and actions have been integral to development of the Project. The Lagunitas Creek watershed is a highly valued watershed in the region, and as such there are numerous stakeholder groups engaged in the watershed. Many of the stakeholders in the watershed, including Marin Water and State Parks, are part of the Lagunitas Creek Technical Advisory Committee (Lagunitas TAC). The Water Board (San Francisco Bay Region), also a member of the Lagunitas TAC, has been heavily engaged in the watershed for decades and is

relied upon as key resource for planning restoration in the watershed. Selection of the priority reaches went through several iterations based on consultations with the Lagunitas TAC, and additional field reconnaissance with staff from California Department of Fish and Wildlife and the Water Board. Additionally, site selection, enhancement actions, and the 30% design plans and their basis have all been presented to the Lagunitas TAC for review and input.

4.3 Environmental Compliance and Permitting

Planning feasible implementation of restoration requires environmental compliance and permitting. Given the project located on State and locally owned properties, the restoration implementation will need to comply with CEQA. Additionally, restoration within Lagunitas Creek will likely require the following permits: The CEQA compliance and permitting also includes performing the needed resource surveys and ensuring implementation of the project includes protection of identified biological and cultural resources. Nothing have been discovered that prevents the proposed work from being able to comply CEQA and acquire the needed permits.

4.3.1 Biological Resources

The project will involve construction in the channel of Lagunitas Creek. Construction will include measures that protect existing biological resources. Review of the CNDDB and discussions with Marin Water and State Park biologists revealed the following species habitat potential at all sites:

- California giant salamander, but observation in 2015 within tributary at Site 8
- Foothill yellow-legged frog (possibly extirpated in the area)
- California red-legged frog
- Marbled Murrelet (there is critical habitat, but no known nesting)
- California freshwater shrimp occurrence showing up over every site
  - Specific habitat requirements shown in journal article (Martin et al. 2009): *A total of 1773 S. pacifica was counted during this study, all of which were captured along vegetated banks in Lagunitas Creek. Syncaris pacifica was most numerous in glides (64%), then in pools (31%), and lastly in riffles (5%). According to logistic regression analysis, S. pacifica was mostly associated with submerged portions of streambank vegetation (especially overhanging vegetation such as ferns and blackberries, emergent vegetation such as sedge and brooklime, and fine roots associated with water hemlock, willow, sedge, and blackberries) along with low water current velocity and a sandy substrate. These seemingly favorable habitat conditions for S. pacifica were present in glides and pools in Lagunitas Creek.*
- Several bat species
- Point Reyes Mountain Beaver
- American badger
- Several rare plant species
- Woodrat

- Fish
  - coho salmon - central California coast ESU
  - steelhead - central California coast DPS
  - chinook salmon - California coastal ESU
  - Tomales roach
  - Pacific lamprey

At this stage of design the project limits are sufficiently defined to support future biological resource surveys including Habitat Assessment, Wetland Assessment, Jurisdictional Delineation, USFWS Biological Assessment, NMFS Biological Assessment of Essential Fish Habitat, and Botanical Survey. Additionally, the enhancement actions are sufficiently defined to develop a draft Project Description. All of which will support CEQA compliance and permitting.

4.3.2 Cultural Resources

There are known cultural resources along Lagunitas Creek, including a historic paper mill site in Camp Taylor, and the potential for additional resources near or within the selected sites. ESA reviewed available data for the area, and conducted field walks with cultural resource specialists from California State Parks to assess the potential for cultural resources. The cultural resource data gathered is summarized in **Table 6**.

TABLE 6
CULTURAL RESOURCES IN THE VICINITY OF THE SELECTED SITES

Trinomial	Primary #	P/H	Site Type	Distance from Project Component	National Register-eligibility Potential
CA-MRN-478	P-21-000430	P	Lithic concentration	500 feet E of Site 11	Not evaluated
CA-MRN-542	P-21-000473	P	Lithic concentration	200 feet SW of Site 7	Not evaluated
CA-MRN-543H	P-21-000474	H	Irving Fur Tannery boarding house/mess hall location	200 feet S of Site 7	Not evaluated
CA-MRN-546H	P-21-000477	H	Irving Fur Tannery location	Adjacent to Site 7	Not evaluated
CA-MRN-547H	P-21-000478	H	Concrete bulkhead for historic railroad bridge	150 feet N of Site 7	Not evaluated
CA-MRN-548H	P-21-000479	H	Early 1900s bridge remnants	300 feet E of Site 7	Not evaluated
CA-MRN-549H	P-21-000480	H	Artifact concentration/dump	400 feet E of Site 11	Not evaluated
N/A	N/A	H	Pioneer Paper Mill (SHL #552 and Property #090416)	Adjacent to Site 11	Listed on California Register

P – Prehistoric / H – Historic-era

Construction sites and site access routes have been designed to avoid known cultural resources. As mentioned at this stage of design the project limits are sufficiently defined to support future cultural resource surveys and evaluation to support CEQA compliance and permitting. As part of

the next 60% design stage, additional plans for avoiding resources if possible and/or monitoring are likely to be required.

4.4 Infrastructure Risk

A feasible restoration plan avoids risk to infrastructure. The primary infrastructure at risk from the proposed enhancement actions of place in large wood in the channel are the nine bridges along the length of Lagunitas Creek (**Table 1**). Review of previous large wood installations in Lagunitas Creek has shown several that were moved or realigned at high flows despite being ballasted with two to three 2-ton boulders, suggesting that a large weight of rock is needed for stability. Conversely, the more rock is used the more the access and construction challenges will increase.

Marin Water will need to make a determination of stability (and potential design life) versus risk, cost and construction impact. The appropriate design flow and Factor of Safety will vary from site to site depending on the risk to safety or of property damage from shifting logs, the risk of logs becoming jammed under bridges, and the potential for movement of logs to undermine the habitat function of the restoration site. These factors should be weighed against the cost and construction impact of increasing log stability.

4.5 Construction Methods

A feasible restoration plan should consider methods for construction. We first gathered information on prior restoration efforts, and then considered likely construction methods and equipment for the proposed design. An ESA restoration designer and an experienced restoration contractor walked all proposed sites to assess staging areas, construction access routes, and likely construction methods and equipment.

4.5.1 Prior Restoration Projects

Since 1997 the Marin Water has constructed nearly 60 large wood structures in Lagunitas Creek. The first structures were built by bringing in boulders and logs with a helicopter, but since 2000 almost all structures have been built using the techniques described here. Logs and boulders were loaded onto a flatbed trailer at Peters Dam using an excavator with a thumb. A second excavator unloads materials at the site. Heavy equipment operates from the bank, although steep banks have necessitated operating equipment up to 200 feet away from the placement site. With a few exceptions dewatering the creek wasn't necessary during construction. Boulders were rolled from the location of the flatbed trailer down to the creek. They were positioned by wrapping them with chain and pulling them using the excavator, ropes, and pulleys. Logs were carried or pulled to the creek by the excavator and then positioned using ropes and pulleys. Logs were then lifted onto structures by using a pulley or second piece of equipment on a high opposite bank. Whenever possible, logs were secured to trees using threaded rebar. Metal cable was attached to boulders by drilling into the rock, flushing out the hole, and filling with epoxy before pushing the cable in. The attachment point on the boulder needed to be lower than the attachment point on the log. Threaded rebar was inserted through the log and a loop in the metal cable. Thick metal plates and nuts were used to pull the cable loop to the log. Marin Water had two crews: one for placement

and one for anchoring. A crew of four would place a three-log structure in a day and the anchoring crew of three needed a day, for two days per structure.

4.5.2 Likely Construction Methods and Equipment

Construction of the designed large wood structures is going to require the handling of large materials such logs and boulders that weight 1 to 2 tons each. During implementation, it is common to attach boulders to logs in a staging area and transport them by excavator to the installation site already assembled. According to experienced construction operators, a 314 hydraulic excavator that is 8 feet wide can carry a 1-ton log with 3 tons of boulders attached. A 336 hydraulic excavator that is 10.5 wide can carry a 1.5-ton log with 6 tons of boulders attached. Anything larger will need to be constructed at the channel location, which may be difficult depending on the confinement of the site, and which may create additional construction impacts to sensitive aquatic and riparian areas. Additionally, gravel will be added for the Riffle Gravel Structure and Habitat Pool Wood Structure, which will require transport and placement into the sites by heavy equipment. Other heavy equipment that may be used includes tracked dozers, tracked loaders, rubber tired skidders, mini excavators and dump trucks. There is also specialized equipment that can work on steep slopes such an All-Terrain Spyder Walking Excavator, Minzi Muck Walking Excavator, or a small Tambocor Feller Buncher with extendable boom. For certain applications, a hydraulic truck crane, all terrain crane or RT crane (3-ton capacity) may be appropriate.

Placement of gravel for the Gravel Augmentation is assumed to be done without the need of heavy equipment access from the Cross Marin Trail to the selected sites through the use of specialized methods. Gravel has been placed downstream of Englebright Dam in the Yuba River from steep slopes well above the river through the two following means (**Figure 9**):

- TB 135 truck-mounted gravel conveyor was used to reach out over the river and pour gravel into the river below (Pasternack, 2009)

- Sluicing system consisting of a frontloader, hopper, sluice pipe, ropes and pulleys. Sediment is placed in a hopper, blended with water, and sluiced down the hillside to the river below (Brown and Pasternack, 2013)

SOURCE: Pasternack, 2009; Brown and Pasternack, 2013

Figure 9
Gravel Augmentation Methods on the Yuba River

4.5.3 Staging and Storage Areas

The construction of several sites, such as all of Phase 1 or 2, in a construction season or two will likely require a contractor to use several pieces of large construction equipment listed above. This will require large staging areas to store such equipment, plus large amounts of materials such as logs and boulders, storage sheds, and other needed equipment/material/facilities to efficient complete the job. More importantly, this will require designated and landowner approved access routes from staging areas to the construction sites.

Three large staging areas were identified at the Irving Group Picnic Area parking lot (Sites 2-6, 12-13), Redwood Grove Group Picnic Area parking lot (Site 7-8), and the horse trailer parking just off the Cross Marin Trail (Sites 9-11). These large staging areas will be used to store the bulk of the materials such as logs and boulders. The two group picnic areas are revenue generators for the Samuel P. Taylor State Park and will likely need to be reserved by the contractor for use during construction. Smaller temporary construction staging areas were identified at various locations in close proximity to several sites. These staging areas are sufficient to place small amount of materials or temporary park a single piece of heavy equipment.

4.5.4 Construction Access

Construction access to Lagunitas Creek is possible from either Sir Francis Drake Boulevard or from the Cross Marin Trail, both of which run adjacent to Lagunitas Creek for the majority of the priority reaches. Sir Francis Drake Boulevard has relatively heavy vehicle traffic, a narrow shoulder, and only a few unpaved turnouts. Therefore, the Cross Marin Trail was determined to be the more feasible route from which to access the selected sites. The Cross Marin Trail is a narrow pedestrian path heavily used for recreation, with an overhead powerline running along much of the alignment and the Nicasio Transmission Pipeline running under the trail. The Cross Marin Trail also provides access for emergency vehicles for fires or maintenance vehicles for the powerline or water transmission pipeline. As result open pathways will need to be designated and traffic control required.

Temporary construction access from the Cross Marin Trail to Lagunitas Creek will require traversing confined, steep, densely wooded hillslopes. Additionally, there is very limited overbank areas along the Lagunitas Creek from which to travel and stage equipment/materials or work. Many of these hillslopes are so steep that some grading may be needed to create a viable access route for heavy equipment. The constrained access limits the size and type of construction equipment that can be used, as well as the size of construction materials (i.e. logs and boulders).

Temporary access routes from Cross Marin Trail to Lagunitas Creek have been identified for each site within Samuel P. Taylor State Park. Temporary access routes were identified, delineated, and mapped with a Global Positioning System (GPS) device. Proposed access routes are shown on the Preliminary Design Drawings (Attachment E) and summarized as follows.

- Site 1 is not within the State Park and therefore was not assessed.
- Clear access routes were identified for Sites, 2, 3, 4, 6, 8, 9, and 11.

- Site 5 did not have a clear access path, however, was determined to be close enough to be accessed from Site 4 via Lagunitas Creek.
- Site 7 was moved downstream to a viable access path.
- Site 10 enhancement design was modified to only consist of Pool Habitat Wood Structures that can be placed by a crane from the Cross Marin Trail above.
- Sites 12 and 13 are expected to have Gravel Augmentation performed through sluicing methods and not require heavy equipment down into the creek.

Because construction access is a such a critical component of feasibility, the identified access routes were reviewed by State Parks for acceptability. Both the selected restoration sites and their associated temporary access routes were reviewed by State Parks biologist and cultural resource specialist. All routes were deemed acceptable by State Parks provided the following measures are followed:

- For any required grading, there should be limited import and no export of graded material.
- Restore all graded access routes to their original condition.
- Surface detritus, referred to as duff, should be removed, temporarily stockpiled and replaced. Where needed, removal of trees may be acceptable, pending review of specific trees.
- Protect existing stands of mature coastal redwoods by maintaining a buffer of 5 times the trunk diameter from the base of the tree.
- If the specified tree buffer is not possible due to constraints, protect tree roots using crane mats or similar measures to reduce the direct pressure and compaction within this buffer from heavy equipment traffic.

4.5.5 Dewatering

Construction of the large wood structures in Lagunitas Creek may require full or partial dewatering of Lagunitas Creek. Anticipated summer baseflow rates in the Lagunitas Creek will range between 6 and 8 cubic feet per second (cfs) or less. Isolated work areas will be dewatered as needed to maintain a reasonably dry work environment for the work. The contractor will locally dewater active work zones as they deem necessary to satisfactorily complete the work in accordance with all applicable permits, and as needed to allow surveying and to verify design compliance. The contractor will need to design and install temporary water diversion/dewatering systems as needed to isolate work areas from flows.

Prior to construction, the contractor will submit a Water Control Plan that satisfies the requirements of all applicable permits. At a minimum, the plan shall describe the Contractor's proposed methods and equipment for isolating work areas from river flows, scheduling of fish rescue operations, controlling surface water and groundwater entering the work area, and protecting river water quality. The Water Control Plan will describe how the Contractor will maintain a generally dry work environment, or sufficiently isolate and control water within the

work site as needed to perform the work consistent with permit conditions and to prevent any permit violations. All in-channel activities will be scheduled to minimize the length of time during which the dewatering and flow diversion/isolation will be necessary, so as to minimize impacts to aquatic resources. Pipe and pump inlets drawing from surface waters will need to be screened in conformance with California Department of Fish and Wildlife (CDFW) and National Marine Fisheries Service (NMFS) fish screening criteria for "fry-size," and all applicable permits.

As applicable, any dewatering systems in the active channel shall include coffer dams installed along the channel bank, and/or at upstream and downstream ends of the system, to isolate the work zone from Lagunitas Creek and prevent flow or backflow into the active work area. Coffer dams will need to be constructed starting at the upstream project limit to allow fish to move downstream out of the work area. Coffer dam materials will need to be clean, water tight and sufficiently stable to resist washout or displacement by river flows. Acceptable coffer dam materials are likely to include the use of sandbags, bladder dams and/or K-rails. The Contractor will need to discharge the removed water in an environmentally acceptable manner, in accordance with project permits, applicable law, and such that property is not damaged and in a manner that prevents discharge of turbid water to the active flowing river or existing drainages. Removed water will be contained and treated as needed to adequately remove suspended sediment prior to disposal.

SECTION 5
Design Analyses

This section describes specific preliminary analyses and assessment that were performed at the 30% design stage to ensure feasible enhancement actions were being proposed. Given large wood is central to the proposed enhancement actions a preliminary large wood analysis was performed. A preliminary hydraulic analysis was also performed to support the large wood analysis. Additionally, given the steep confined topography, site access routes and staging areas were assessed and determined for each site selected, as described in Section 4.5.4.

5.1 Preliminary Hydraulic Analysis

ESA developed a two-dimensional hydraulic model for the project reach using the Hydrologic Engineering Center's River Analysis System (HEC-RAS) hydraulic modeling software. At the 30% design stage, the purpose of the hydraulic analysis was to generate the design parameters used in the large wood structure stability analysis.

The model domain encompassed all potential enhancement sites in one continuous domain extending from the San Geronimo Creek confluence to the state park boundary just downstream of Big Bend (**Figure 10**). The topographic data source for the model was the 2018-2019 Marin County bare-earth LiDAR surface, captured by Quantum Spatial, Inc. (QSI) between Dec 2018 and March 2019 (QSI, 2019) and downloaded from MarinMap. While this does not include bathymetric data for deep pools, many riffle crests appear to be visible in the surface that were likely only shallowly inundated during the LiDAR flights. This topographic dataset was considered appropriate for this high flow hydraulic analysis, since the large spatial coverage and relatively high spatial resolution captures how the channel geometry influences the hydraulics throughout all the enhancement sites.

A model mesh cell size of 5 ft was used to balance model run time with the ability to resolve variation in the hydraulics across the width of the channel. Manning's n roughness of 0.045 was uniformly applied to the channel region as consistent with other modeling studies in the watershed (Stillwater Sciences, 2016), and a roughness value of 0.1 was uniformly applied to the overbank region to reflect the generally dense vegetation conditions. A normal depth slope of 0.4% was set for the downstream boundary condition based on the average reach bed slope, and a model time step of 1 second was used.

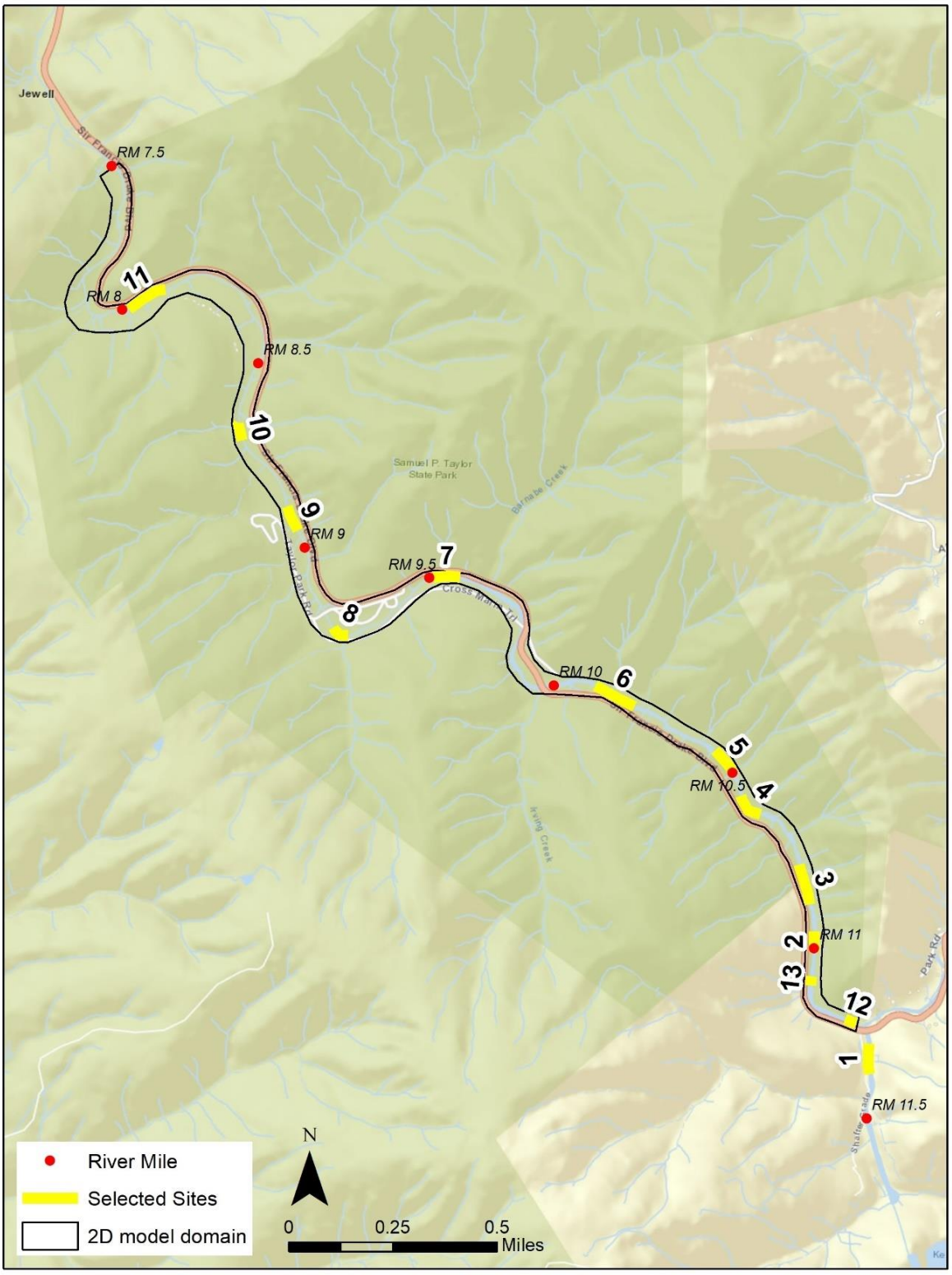

Figure 10
2D Hydraulic Model Domain

Table 7 presents the design flows included in ESA's preliminary hydraulic analysis (source of hydrology: KHE, 2014). The selected design flow rates range from the 2-year to the 100-year storm and represent the typical range of hydraulic conditions used to calculate drag and lift forces in log stability analyses. For each design flow, the model was run for sufficient time to equilibrate to this steady flow throughout the model domain. No calibration was performed given the preliminary stage of this modeling analysis.

TABLE 7
DESIGN FLOW RATES (KHE, 2014)

Recurrence Interval	Flow Rate (cfs)
2-year (Q2)	1,850
10-year (Q10)	4,380
50 year (Q50)	7,190
100-year (Q100)	8,520

Figures 11a-b show the 100-year (Q100) model results for the Manning's n = 0.045 model run. Due to the fairly uniform water depth and velocity conditions across the sites, we assumed a representative force analysis for the two structure types would be applicable throughout the entire project reach.

The main hydraulic parameter used in log stability analysis is flow velocity. For each of the modeled recurrence intervals, the peak velocity was identified for each of the eleven Riffle-Pool-Wood sites for the modeled 2-, 10-, 50-, and 100-year flows (25-year flow was not modeled). For this simplified analysis, the average velocity from the eleven sites was used as the peak velocity for the 2-, 10-, 50-, and 100-year flows. Average peak velocity for the 25-year flow was estimated.

TABLE 8
PEAK VELOCITY

Recurrence Interval	Peak Velocity for Sites 1 through 11 (ft/s)	Average Peak Velocity (ft/s)
2-year (Q2)	5.5 – 7.0	6.6
10-year (Q10)	7.5- 9.5	8.8
25-year (Q25)	not modeled	9.5 (estimated)
50 year (Q50)	9.0 – 11.5	10.5
100-year (Q100)	9.5 – 12.5	11.0

More detailed hydraulic modeling is recommended at the 60% design stage to refine the large wood analysis and assess hydraulic and geomorphic effects of the enhancement actions at each site.

Figure 11a
2D Hydraulic Model Results (Downstream)

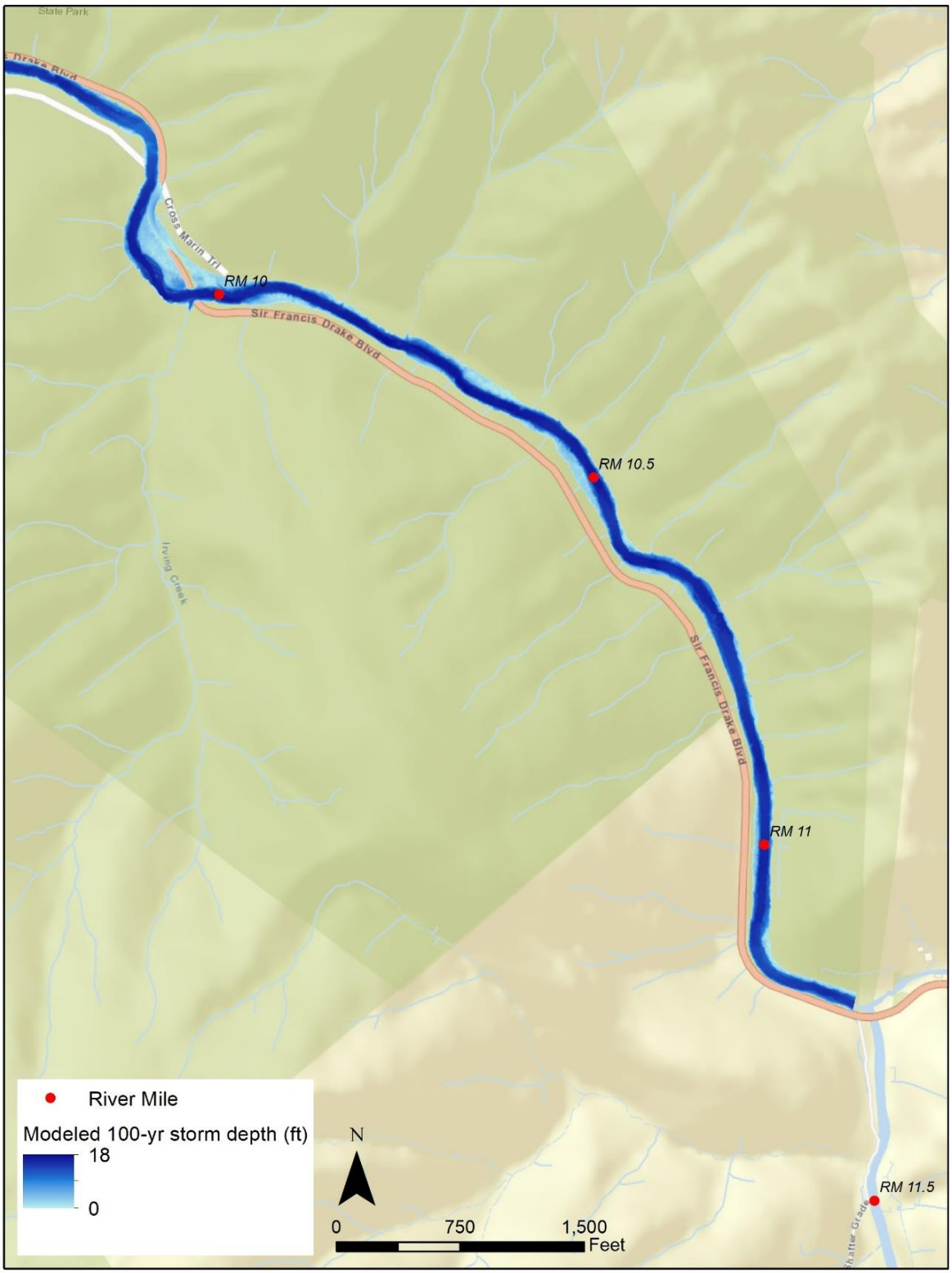

Figure 11b
2D Hydraulic Model Results (Upstream)

5.2 Preliminary Large Wood Analysis

To assess the feasibility of the large wood structures, ESA developed design criteria and performed a preliminary large wood stability analysis of the two structure types, Riffle Forcing Wood Structure and Pool Habitat Wood Structure. The wood structures are presented in Attachment E, Sheets D02 and D03, respectively.

ESA developed the design criteria and calculated the force balance using recommended guidance from various publications including the U.S. Bureau of Reclamation (USBR) and U.S. Army Engineer Research and Development Center (ERDC) *National Large Wood Manual* (USBR and ERDC, 2016). At the 30% design stage, our objective was to estimate the destabilizing forces acting on each structure, and what anchoring forces may be needed to resist those forces. This preliminary large wood analysis focused on factors of safety related for the vertical forces (resistance to flotation) and the horizontal forces (resistance to sliding). In the future 60% design stage, the more detailed large wood analysis will also consider factors of safety related to the vertical moments (resistance to overturning) and the horizontal moments (resistance to rotation).

5.2.1 Design Assumptions

The following design assumptions informed our log stability calculations:

- *Anchoring Techniques*: Throughout the project reach, the presence of shallow bedrock and the steep channel banks preclude the use of typical engineered wood anchoring methods such as vertical log piles or embedment. We assume the primary ballast approach will be boulders pinned and/or chained to the logs.

- *Log Species and Density*: For the Riffle Forcing Wood Structures, the buoyant force is calculated using a conservative dry density of 33 pounds per cubic foot for imported douglas fir (Miles and Smith, 2009). For the Pool Habitat Wood Structures, the logs are expected to be completely or partially submerged year-round based on their elevation on the channel bed. For these structures, the green weight of douglas fir was used as a rough approximation of the expected actual (semi-saturated) log density.

- *Log Dimensions*:
  - Riffle Forcing Wood Structure: 24-inch log diameter x 30-ft log length, rootwad diameter 5’ x 1’ rootwad length, rootwad porosity of 0.2.
  - Pool Habitat Wood Structure: 18-inch log diameter x 20-ft log length, rootwad diameter of 3.75’ x 1’ rootwad length, rootwad porosity of 0.2

- *Coefficient of Lift*: Lift coefficient approaches zero as the gap between the bed and bottom of the log exceeds half the log diameter (Rafferty, 2016). We assume some flow beneath the Riffle Forcing Wood Structure, and a lift coefficient of 0.2. For the Pool Habitat Wood Structure, we used a 0.45 lift coefficient, the is maximum lift coefficient for a cylinder placed perpendicular to the flow, with cylinder in contact with the bed.

- *Coefficient of Drag*: 0.9 for a fully submerged structure (USBR and ERDC, 2016). For the Pool Habitat Wood Structures oriented parallel to flow, we assumed there was some flow

separation between the rootwad and the trunk of the log. Therefore we assumed drag force was acting on 2/3 of the total log length.

5.2.2 Factors of Safety

The USBR and ERDC (2016) guidance were used to identify a range of appropriate safety factors for the Project. Using the risk matrix shown in USBR (2014), the site is considered to have low public safety risk since Lagunitas Creek has low recreational (e.g. boating and/or swimming) use (see Attachment D). The site is also considered to have moderate to high property damage risk. While the project is located in a State Park and there no homes or other floodplain structures at risk of flooding or damage, there are bridges locating within and downstream of the Project Site. Also, the stream response potential includes some higher risk factors given its relatively confined conditions and flashy hydrology. The USBR (2014) recommended safety factors for the project conditions are presented in **Table 9**.

TABLE 9
RECOMMENDED FACTORS OF SAFETY FOR ENGINEERED LARGE WOOD STRUCTURES (USBR, 2014)

Scenario	Public Safety Risk	Property Damage Risk	Stability Design Flow Criteria	Minimum Factor of Safety		
				Sliding	Buoyancy	Rotation & Overturning
A Upper End Recommended	Low	High	100-year	1.75	2.0	1.75
B Lower End Recommended	Low	Moderate	25-year	1.5	1.75	1.5
C Lowest End (for reference)	Low	Low	10-year	1.25	1.5	1.25

However, for the Habitat Pool Structures, a lower safety factor for sliding - between 1.0 and 1.5 – could be also be supported for the following reasons:

- Some movement of the Habitat Pool Structures is considered acceptable provided it does not present significant downstream risk.
- Bridge failure is primarily a function of flotation transport (Zevenbergen et al., 2006; Schalko et al., 2018; De Cicco et al., 2018), rather than traction.
- Distances transported by traction are significantly shorter than by flotation (Bocchiola et al., 2006).
- D'Aoust and Millar (2000) observed a factor of safety for sliding of as low as 1 sufficient to prevent entrainment of single large wood structures.
- The Pool Habitat Structures include rootwads and are placed parallel to flow, which gives the logs some natural stabilizing elements (Braudrick and Grant, 2000; Merten et al., 2010; Schenk et al., 2013).

Ultimately, the selection of the specific safety factors for the design should balance Marin Water's risk tolerance with other considerations such as habitat goals, cost and ease of construction. The higher the safety factor, the more ballasting rock needs to be attached to a single log. A lower factor of safety could be considered to significantly reduce the amount of rock and improve cost and ease of construction. This cost savings should be evaluated against the likelihood, and estimated cost, of any potential damage to existing infrastructure.

5.2.3 Preliminary Calculation Results

For each structure a series of calculations were performed to estimate the total weight of ballast boulders needed for stability against buoyancy and sliding. We estimated the amount of ballast needed to meet the high and low end of recommended safety factors based on low safety risk and medium-to-high property risk (Scenarios A and B in **Table 9**). We also included Scenario C, which is the lowest protective level recommended by USBR based on low safety and property risk, as a point of reference.

The preliminary calculation results for the Riffle Forcing and Pool Habitat structures are presented in **Tables 10** and **11**, respectively. As noted, achieving the recommended safety factors within the project reach requires a considerable tonnage of ballast boulders per log. Based on the preliminary calculations, the Riffle Forcing Wood Structure requires between 11 and 16 tons of ballast is needed to meet the recommended safety factors. For the Pool Wood Habitat Structure, the corresponding required ballast is 7 to 10 tons. Adding this amount of rock to the 300 proposed logs will be labor intensive and costly. Therefore, we have also considered designing the Pool Wood Habitat Structure with a lower safety factor for sliding, for reasons stated in 5.3.2 above. Between 4.5 and 6 tons of ballast is needed to meet the reduced safety factor against sliding for the Pool Wood Habitat Structure.)With this amount of ballast, the structure would have a relatively high safety factor of 2.8 to 3.4 against buoyancy.)

ESA has prepared a Large Wood Risk Assessment (Attachment D) to help Marin Water and other project stakeholders understand the specific infrastructure risks associated with wood placement in Lagunitas Creek, and inform selection of appropriate safety factors as the project moves to detailed design.

As noted, these calculations are preliminary and subject to further refinement during the future 60% design phase. Items to be further refined include:

- Including analysis for overturning and rotating moments.
- Refining hydraulic analysis, particularly estimates of peak velocity at each site.
- Refine calculation of lift and drag forces on the logs.
- Refine estimates of log density due to partial or complete saturation.

TABLE 10
RIFFLE FORCING WOOD STRUCTURE

Scenario	A Upper End Recommended	Intermediate	B Lower End Recommended	C Lowest End (for reference)
Design Stability Flow Event	100-year	50-year	25-year	10-year
Design Velocity (feet per second; fps)	11.0 fps	10.5 fps	9.5 fps (estimated)	8.8 fps
Public Safety Risk	Low	Low	Low	Low
Property Damage Risk	High	Medium-High	Medium	Low
Minimum Factor of Safety: Buoyancy	2.0	1.75 – 2.0	1.75	1.5
Estimated Factor of Safety: Buoyancy	4.4	3.7	3.3	3.1
Minimum Factor of Safety: Sliding	1.75	1.50 – 1.75	1.50	1.25
Estimated Factor of Safety: Sliding	1.81	1.52	1.50	1.32
Preliminary Ballast Boulder Weight per Log	16 tons	13 tons	11 tons	9 tons

NOTE: Assumes dry density of log, 0.2 lift coefficient and log oriented perpendicular to flow.

TABLE 11
POOL HABITAT WOOD STRUCTURE

Scenario	A Upper End Recommended	Intermediate	B Lower End Recommended	B Modified Reduced FOS for Sliding	C Lowest End (for reference)	C Modified Reduced FOS for Sliding
Design Stability Flow Event	100-year	50-year	25-year	25-year	10-year	10-year
Design Velocity (feet per second; fps)	11.0 fps	10.5 fps	9.5 fps (estimated)	9.5 fps (estimated)	8.8 fps	8.8 fps
Public Safety Risk	Low	Low	Low	Low	Low	Low
Property Damage Risk	High	Medium-High	Medium		Low	Low
Minimum Factor of Safety: Buoyancy	2.0	1.75 – 2.0	1.75	1.75	1.5	1.5
Estimated Factor of Safety: Buoyancy	4.5	3.85	3.91	3.35	3.4	2.8
Minimum Factor of Safety: Sliding	1.75	1.50	1.50	1.25	1.25	1.0
Estimated Factor of Safety: Sliding	1.81	1.46	1.57	1.27	1.37	1.02
Preliminary Ballast Boulder Weight per Log	10 tons	8 Tons	7 tons	6 tons	5.5 tons	4.5 tons

NOTE: Assumes green density of log, 0.45 lift coefficient and log oriented parallel to flow.

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SECTION 6
Construction Cost Estimate

The Draft 30% opinion of probable construction costs is provided in Attachment F.

For planning purposes, we have provided order of magnitude estimates to allow cost comparison of alternatives. Construction costs have been estimated at this 30% phase to assist with site advancement selection, budget planning, and project funding. These cost estimates are intended to provide an approximation of total project construction costs appropriate for the conceptual level of design. These cost estimates are considered to be approximately +/-30% accurate and include a 35% contingency to account for project uncertainties (such as final design, permitting restrictions and bidding climate). Note that these costs are for construction only and do not include estimated project costs for permitting, design, construction management, monitoring, or ongoing maintenance.

Estimates are subject to refinement and revisions as the design is developed into future stages of the project. The actual costs of construction may be impacted by the time of construction, availability of construction equipment and crews, and fluctuation of supply prices when the work is bid. In providing opinions of probable construction costs, ESA has no control over the actual costs. Estimated costs are presented in 2024 dollars assuming a 3% annual escalation from 2021 dollars.

Quantities are based on the Draft 30% Design Drawings in Attachment E. All earthwork quantities are provided in bank cubic yards with no account for swell or shrinkage. The unit pricing utilized is generally based on ESA's previous project experience and bid prices from similar projects. Assumptions for select construction items are as follows:

- Cost for the SWPPP and compliance is based on a shared construction general permit with the State Water Resources Control Board for all sites and temporary BMP application and maintenance at each site. The item includes preparation of the SWPPP, filing and submitting payment for the NOI, completing all necessary inspections, monitoring, and reporting, filing the NOT, and complying with all applicable requirements for stormwater protection through the use of maintained temporary BMPs throughout construction.

- Water control and diversion assumes one (1) construction season and separate stagings at each site that will not exceed a maximum length of 500 feet per staging.

- Staging area restoration assumes disturbed surfaces will be returned to their original, pre-project condition with native materials stockpiled from the staging area during mobilization.

- Existing utility, structure, and trail facility protection includes gravel and structure import, placement, and removal. A minimum six-inch thick gravel protection layer is included for placement over existing utilities and structures, and a double railcar bridge is assumed for placement over an existing pedestrian bridge at Site 11. Temporary crane staging and access preparation as well as temporary channel bed protection for site 5 inter-site access also includes gravel import, placement, and removal of a minimum 6-inch thick gravel protection layer.

- Temporary access road construction and restoration includes stockpiling of native surface materials, access road grading, import of necessary materials for access road construction and compaction, off-haul of any imported material, restoring the original grade slope of the impacted banks, restoring native cover material over disturbed surfaces, and placement of erosion control fabric and straw wattles on the disturbed surfaces.

- Wood structure unit costs include the material cost of logs assuming procurement of Douglas fir trees meeting the detail specifications.

- Costs assume that construction would be performed under one or two bid packages. If construction is phased over different years and performed under three or more bid packages, costs of mobilization and other general elements would likely increase (in addition to escalation).

SECTION 7
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Attachment E

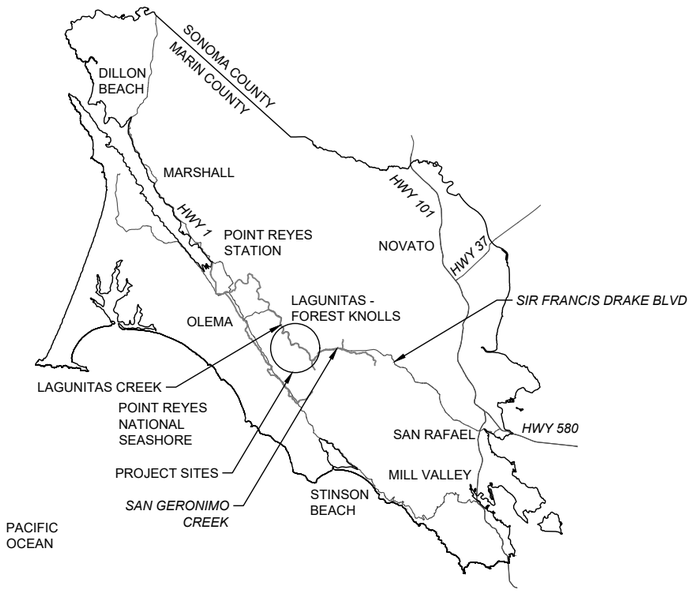
30%-Complete Design Drawings

ESA

MARIN WATER
LAGUNITAS CREEK WATERSHED ENHANCEMENT PLAN
DRAFT 30% DESIGN DRAWINGS

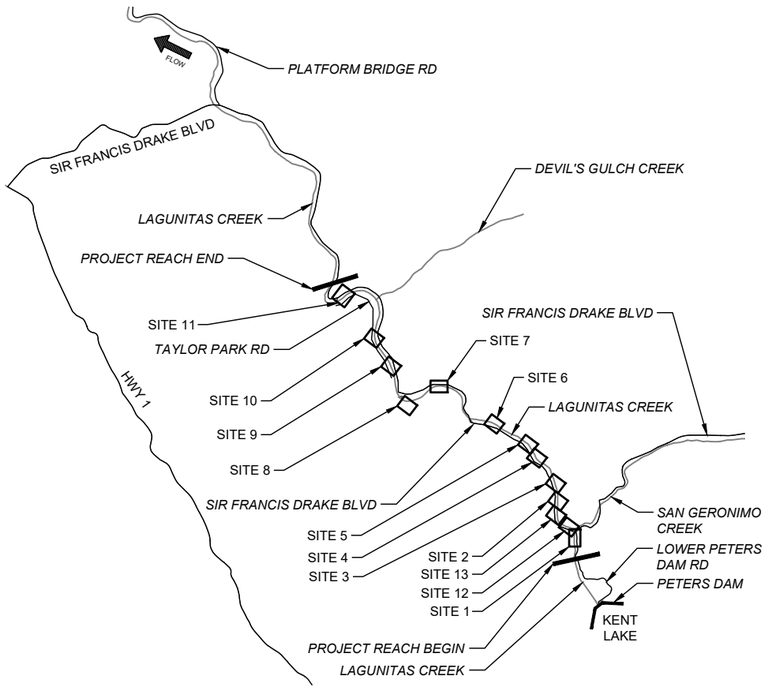
MARIN COUNTY, CALIFORNIA

NOVEMBER, 2021



VICINITY MAP

MARIN COUNTY NOT TO SCALE



LOCATION MAP

SCALE: 1" = 1500'

SHEET INDEX

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MARIN WATER

PROJECT NAME

MW LAGUNITAS CREEK WATERSHED ENHANCEMENT PLAN

MARIN COUNTY
CALIFORNIA

REVISIONS

#	DATE	DESCRIPTION

DESIGNED	LMW/JQW
DRAWN	SVC
CHECKED	AEB
IN CHARGE	M. LANDICHO C86515
PROJECT NUMBER	202000650.00
ISSUE DATE	11/12/2021

SCALE IS AS SHOWN WHEN PLOTTED TO FULL SIZE (22"x34")

PHASE

DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

TITLE SHEET

SHEET NUMBER

G01

SHEET 1 OF 36

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GENERAL NOTES

1. ELEVATIONS ARE IN FEET AND REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
2. BASIS OF BEARINGS REFERENCES THE CALIFORNIA STATE PLANE ZONE III COORDINATE SYSTEM (FIPS 0403) NORTH AMERICAN DATUM OF 1983 NAD83 (2011 ADJUSTED US FEET).
3. EXISTING GRADE TOPOGRAPHY SOURCE WAS OBTAINED IN 2021 VIA MARIN MAP FROM MARIN COUNTY HIGH RESOLUTION LIGHT DETENTION AND RANGING (LIDAR) SURVEY COMPLETED IN 2018 AND 2019.
4. AERIAL IMAGERY SHOWN WAS OBTAINED IN 2021 VIA MARIN MAP FROM MARIN COUNTY IMAGERY STUDY ORTHOIMAGERY DATA COLLECTED IN 2018 AND 2019.
5. DRAWING UNITS ARE IN US SURVEY FEET.
6. EXISTING BUILDING FOOTPRINTS, ROADS, AND TRAIL SYSTEM ARE APPROXIMATE.
7. UTILITY LOCATIONS SHOWN ARE APPROXIMATE BASED ON FIELD OBSERVATIONS, RECORD DRAWINGS, AND AERIAL PHOTOGRAPHS.
8. UTILITY INVERT ELEVATIONS ARE PER RECORD DRAWINGS AND CONVERTED FROM NGVD29 TO NAVD88 BY ADDING 2.7 FEET FOR THE PROJECT LOCATION.
9. THE CONTRACTOR MUST VERIFY THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING WORK. THE CONTRACTOR MUST CONTACT ALL APPROPRIATE AGENCIES, LANDOWNERS, AND THE UNDERGROUND SERVICE ALERT (1-800 227-2600 OR 811) TO FIELD LOCATE ALL UNDERGROUND UTILITIES.
10. PARCEL AND EASEMENT LINES SHOWN ARE BASED ON MARIN COUNTY ASSESSOR MAP DATA AS OBTAINED IN 2021 VIA MARIN MAP. PARCEL AND EASEMENT LINES ARE APPROXIMATE AND DO NOT REPRESENT BOUNDARY SURVEYS.
11. DEWATERING, INCLUDING FISH PROTECTION, IS ANTICIPATED FOR A PORTION OF THE PROJECT SITES. FISH PROTECTION MEASURES INCLUDE ISOLATION AND REMOVAL PRIOR TO PLACEMENT OF TEMPORARY DEWATERING FACILITIES.
12. PROTECTIVE GRAVEL LAYER WILL BE PLACED ON CHANNEL BED AS NEEDED FOR ACCESS TO AND BETWEEN SITES IN THE CHANNEL.

ABBREVIATIONS

ALT	ALTERNATIVE
APN	ASSESSOR'S PARCEL NUMBER
APPROX	APPROXIMATE
BLVD	BOULEVARD
C	CURVE
CFS	CUBIC FEET PER SECOND
CMP	CORRUGATED METAL PIPE
CP	CONTROL POINT
DG	DESIGN GRADE
DIA	DIAMETER
D/S	DOWNSTREAM
DWG	DRAWING NUMBER
EL	ELEVATION
(E), EX	EXISTING
F/L	FLOWLINE
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MW, MMWD	MARIN WATER, MARIN MUNICIPAL WATER DISTRICT
OC	ON CENTER
OVHD, OH	OVERHEAD UTILITIES
PIP	PROTECT IN PLACE
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
SS	SANITARY SEWER
ST	STREET
STA	STATION
TYP	TYPICAL
U/S	UPSTREAM
VAR	VARIES
VIF	VERIFY IN FIELD
W/	WITH
W	MMWD WATER TRANSMISSION PIPELINE
WS	WATER SERVICE PIPING
WSE	WATER SURFACE ELEVATION
YR	YEAR
+/-	PLUS/MINUS

LEGEND

- PARCEL LINES
- MAINTENANCE & MONITORING EASEMENT
- CONSTRUCTION ACCESS ROUTE
- PROJECT LIMIT
- 2+00 — ALIGNMENT STATIONING
- FLOW — FLOW DIRECTION
- 74 — EXISTING MINOR CONTOUR
- 75 — EXISTING MAJOR CONTOUR
- OH OH — OVERHEAD UTILITY
- W W — MMWD WATER TRANSMISSION PIPELINE
- WS — WATER SERVICE PIPE
- SS SS — SANITARY SEWER PIPE
- EXISTING BUILDING
- ROUNDED GRAVEL-COBBLE MIX
- GRAVEL AUGMENTATION
- TEMPORARY ACCESS ROAD
- EXISTING BRIDGE
- CONSTRUCTION STAGING AREA
- SEDIMENT REMOVAL AREA
- SURFACE RESTORATION AREA
- POOL HABITAT WOOD STRUCTURE
- RIFFLE FORCING WOOD STRUCTURE

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#	DATE	DESCRIPTION

DESIGNED	LMW/JQW
DRAWN	SVC
CHECKED	AEB
IN CHARGE	M. LANDICHO C86515
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ISSUE DATE	11/12/2021

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SHEET TITLE

NOTES, LEGEND, AND ABBREVIATIONS

SHEET NUMBER

G02

SHEET 2 OF 36

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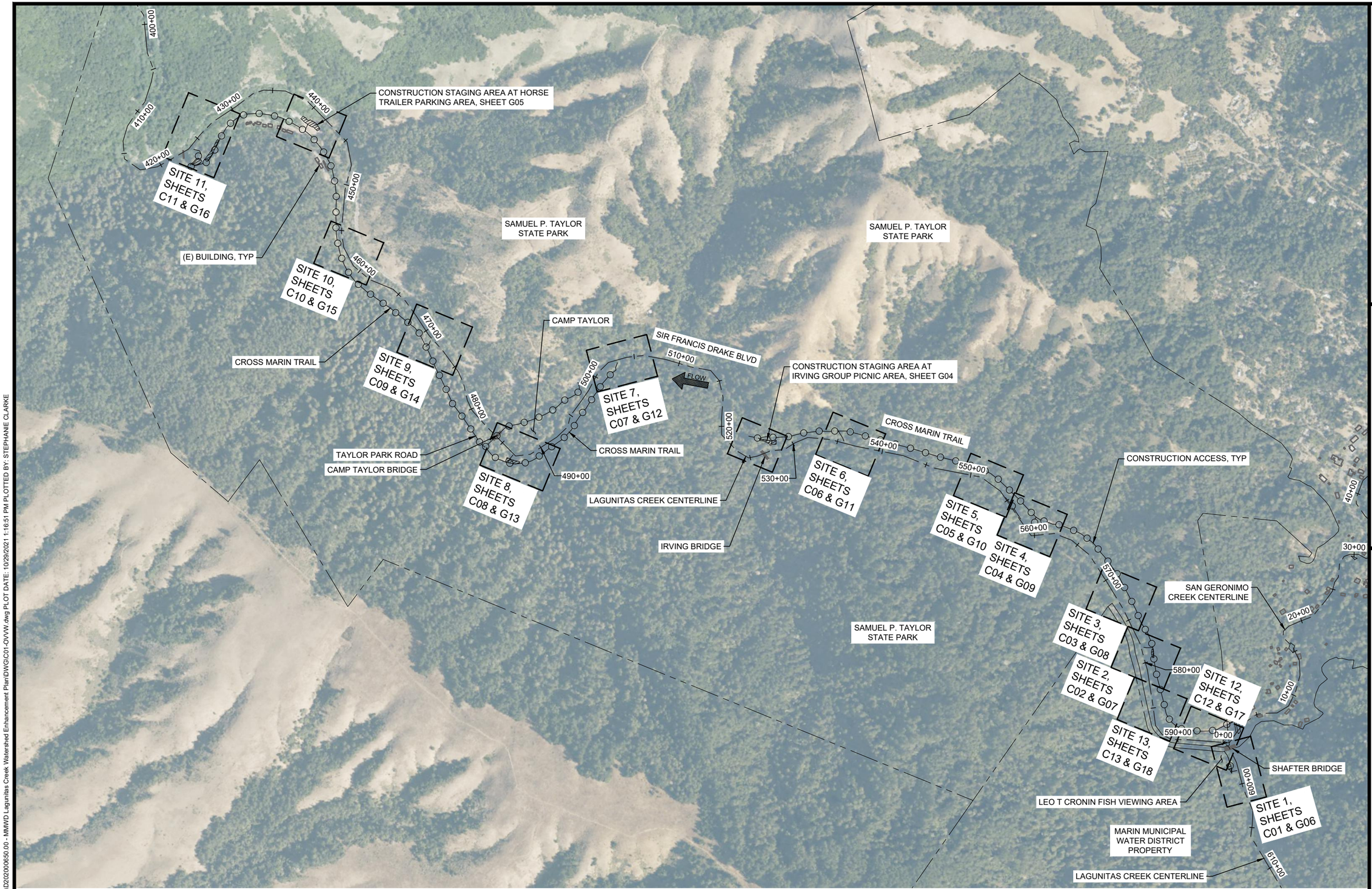

OVERVIEW

PLAN SCALE: 1" = 500'

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PHASE
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SHEET TITLE

OVERVIEW

SHEET NUMBER

G03

SHEET 3 OF 36

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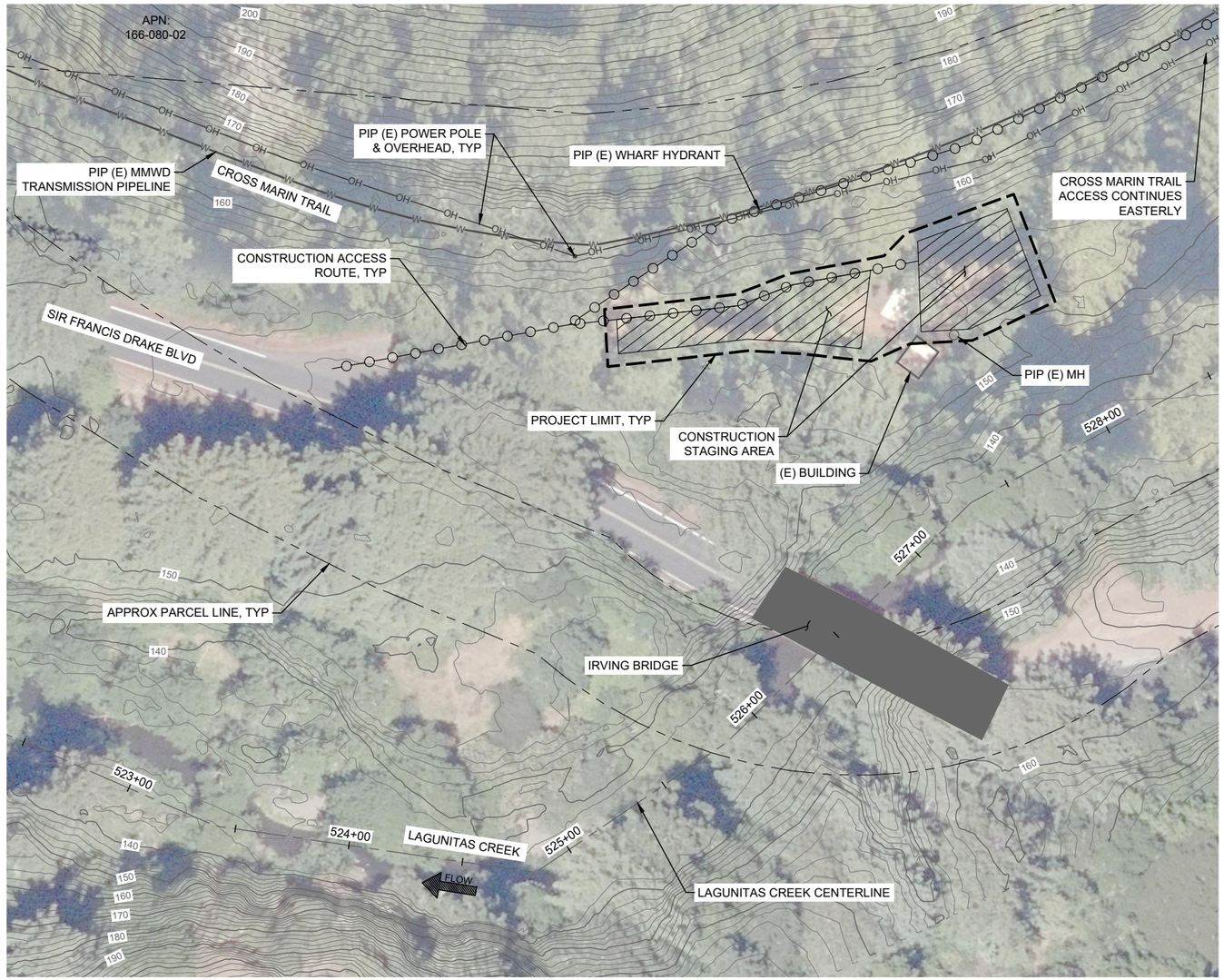

CONSTRUCTION STAGING AREA - IRVING GROUP PICNIC AREA

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N

1"=30' 30 15 0 30 60

SCALE FEET

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DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

CONSTRUCTION STAGING AREA - IRVING GROUP PICNIC AREA

SHEET NUMBER

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SHEET 4 OF 36

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CONSTRUCTION STAGING AREA - HORSE TRAILER PARKING AREA

PLAN SCALE: 1" = 30'

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1"=30' 30 15 0 30 60

SCALE FEET

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SCALE IS AS SHOWN WHEN PLOTTED TO FULL SIZE (22"x34")

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CONSTRUCTION STAGING AREA - HORSE TRAILER PARKING AREA

SHEET NUMBER

G05

SHEET 5 OF 36

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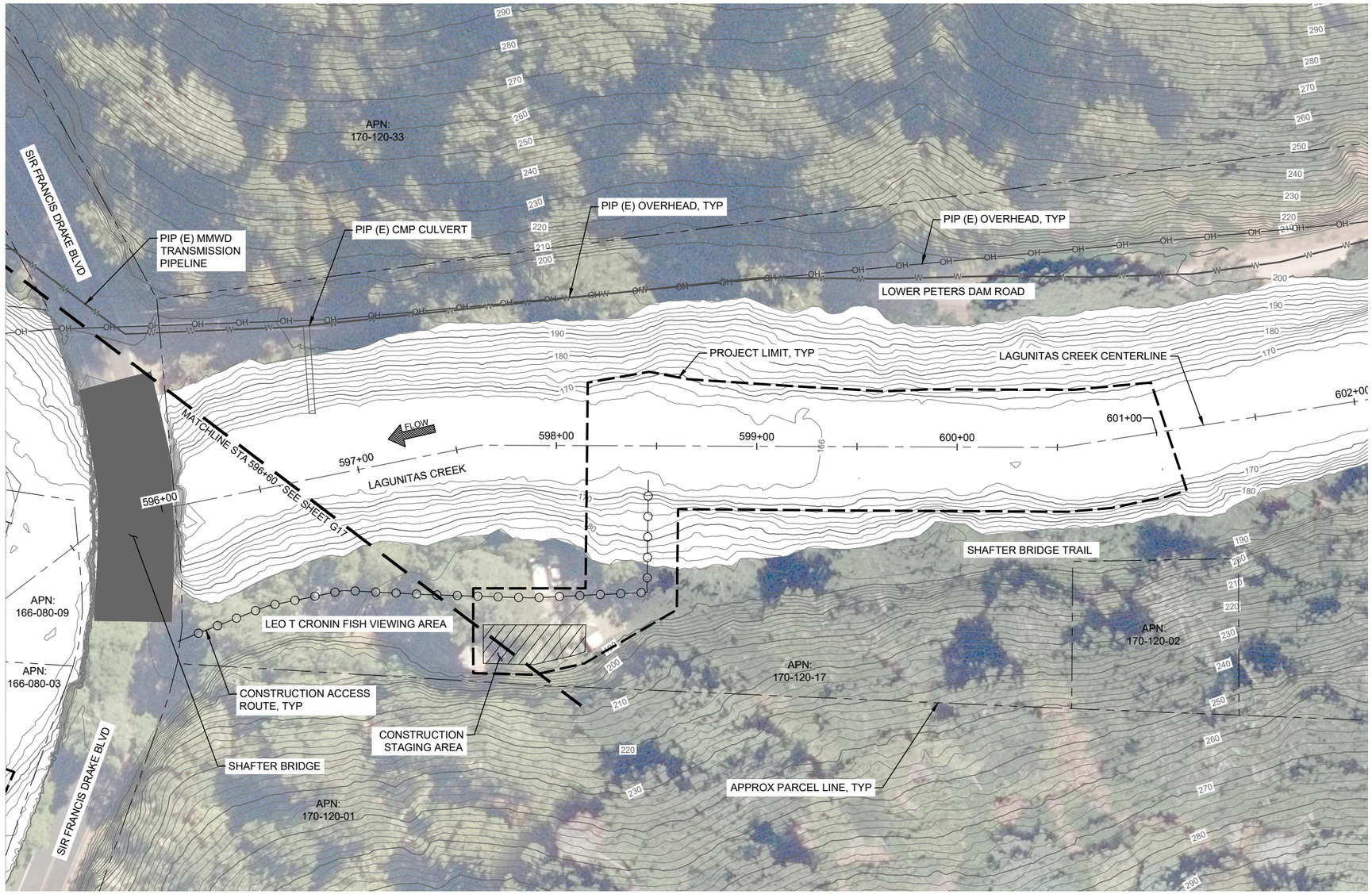

SITE 1 EXISTING CONDITIONS

PLAN SCALE: 1" = 30'

1"=30' 30 15 0 30 60

SCALE FEET

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MW LAGUNITAS CREEK WATERSHED ENHANCEMENT PLAN

MARIN COUNTY
CALIFORNIA

REVISIONS

#	DATE	DESCRIPTION

DESIGNED	LMW/JQW
DRAWN	SVC
CHECKED	AEB
IN CHARGE	M. LANDICHO C86515
PROJECT NUMBER	202000650.00
ISSUE DATE	11/12/2021

SCALE IS AS SHOWN WHEN PLOTTED TO FULL SIZE (22"x34")

PHASE

DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

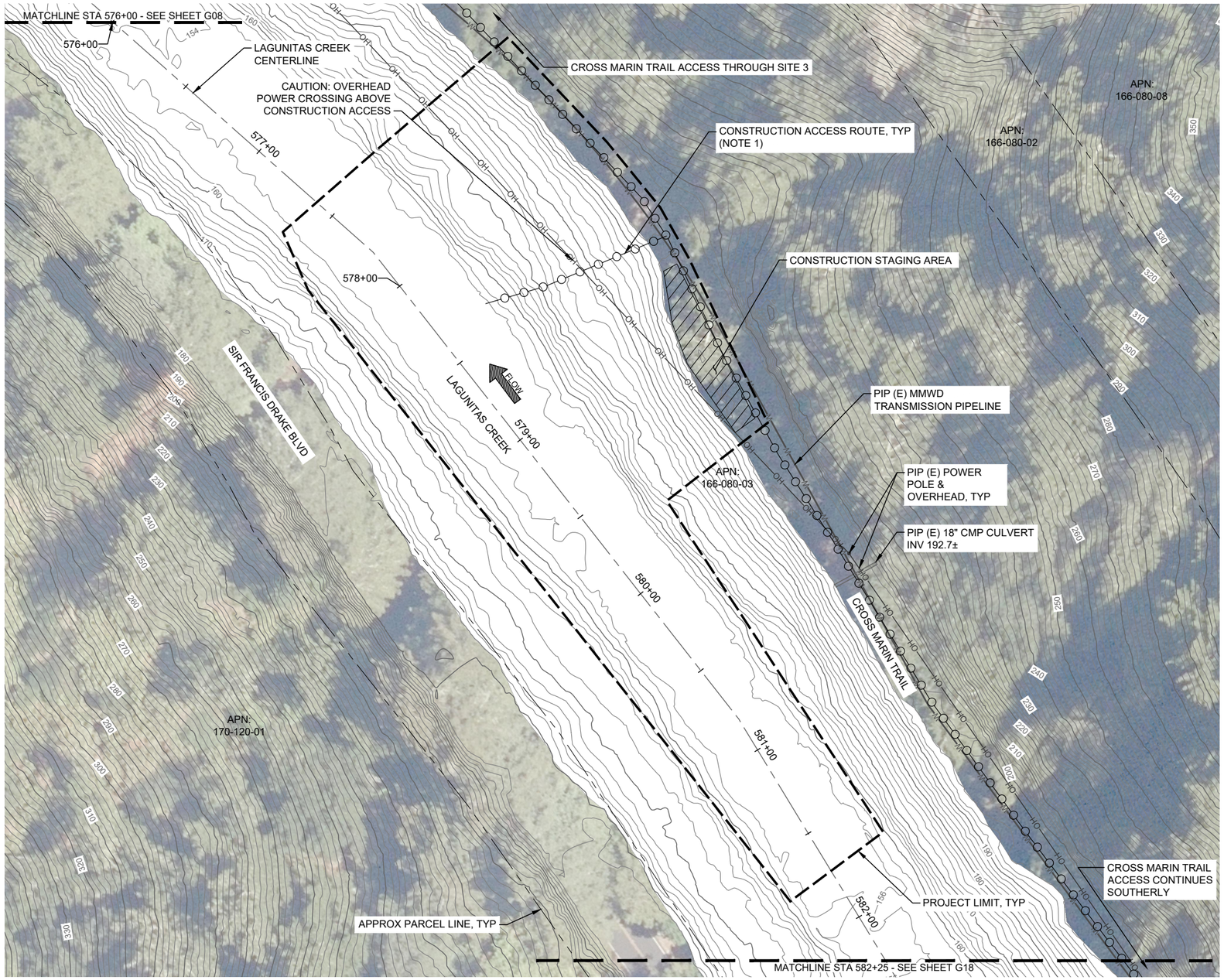
SITE 1 EXISTING CONDITIONS

SHEET NUMBER

G06

SHEET 6 OF 36

FILE: P:\01 CAD\2020xxxxx\D2020006650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\G-EXIST-COND-SITE1.dwg PLOT DATE: 10/29/2021 1:18:50 PM PLOTTED BY: STEPHANIE CLARKE



NOTES

1. ACCESS VIA EXISTING ARIZONA CROSSING THAT SHALL BE RESTORED TO PRE-PROJECT CONDITION.

SITE 2 EXISTING CONDITIONS

PLAN SCALE: 1" = 30'

ESA
180 GRAND AVENUE,
SUITE 1050
OAKLAND, CA 94612
OFFICE - 415.896.5900
WWW.ESASSOC.COM

STAMP

PRELIMINARY
-
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CLIENT

MARIN WATER

PROJECT NAME

MW LAGUNITAS CREEK WATERSHED ENHANCEMENT PLAN

MARIN COUNTY
CALIFORNIA

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PROJECT NUMBER	202000650.00
ISSUE DATE	11/12/2021

SCALE IS AS SHOWN WHEN PLOTTED TO FULL SIZE (22"x34")

PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

SITE 2 EXISTING CONDITIONS

SHEET NUMBER

G07

SHEET 7 OF 36

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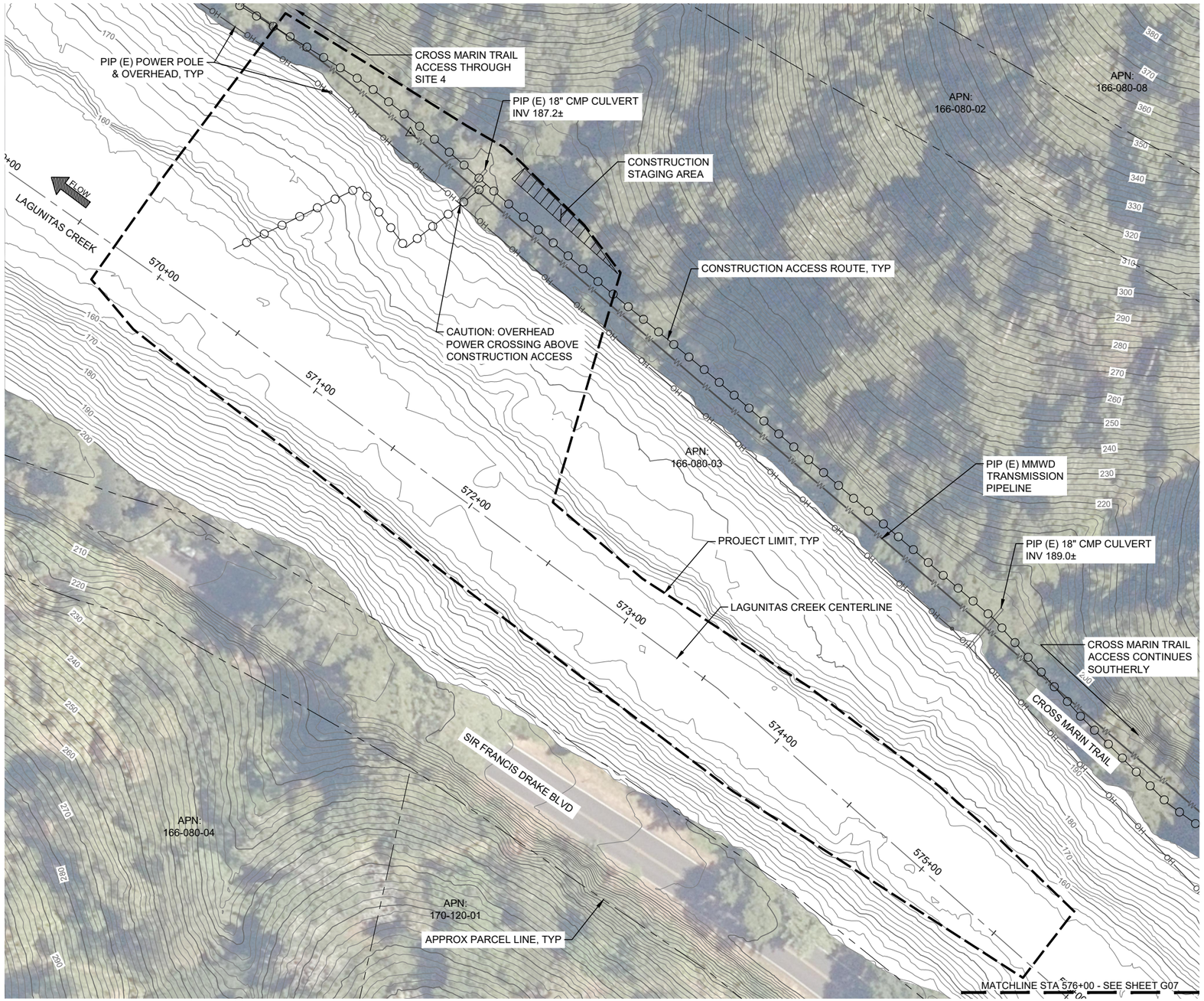

NOTES

1. ACCESS VIA EXISTING ARIZONA CROSSING THAT SHALL BE RESTORED TO PRE-PROJECT CONDITION.

SITE 3 EXISTING CONDITIONS
PLAN SCALE: 1" = 30'

N

1"=30' 30 15 0 30 60
SCALE FEET

ESA
180 GRAND AVENUE,
SUITE 1050
OAKLAND, CA 94612
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SCALE IS AS SHOWN WHEN PLOTTED TO FULL SIZE (22"x34")

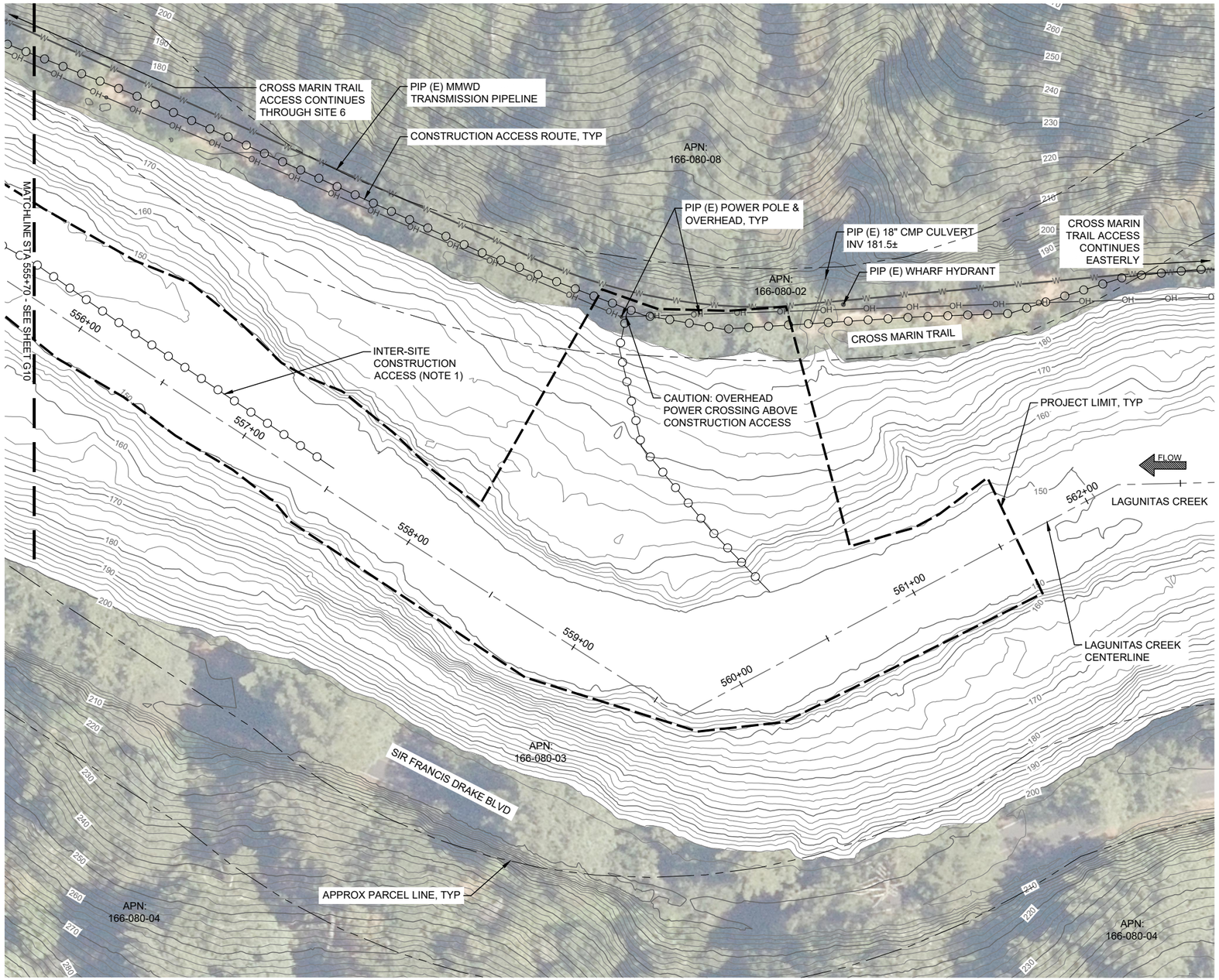
PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE
SITE 3 EXISTING CONDITIONS

SHEET NUMBER
G08

SHEET 8 OF 36

FILE: P:\01 CAD\2020xxxx\D2020006650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\G06-EXIST-COND-SITE3.dwg PLOT DATE: 10/29/2021 1:20:36 PM PLOTTED BY: STEPHANIE CLARKE



NOTES

1. INTER-SITE ACCESS VIA CHANNEL FROM SITE 4 TO SITE 5 WITH CHANNEL BED PROTECTION MEASURES IN PLACE.
2. CONSTRUCTION STAGING AREA AT IRVING GROUP PICNIC AREA (SHEET G04) OFF CROSS MARIN TRAIL ON NORTH SIDE OF SIR FRANCIS DRAKE NEAR STA 523+50.

SITE 4 EXISTING CONDITIONS

PLAN SCALE: 1" = 30'

N

1"=30' 30 15 0 30 60

SCALE FEET

ESA
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SUITE 1050
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PROJECT NUMBER	202000650.00
ISSUE DATE	11/12/2021

SCALE IS AS SHOWN WHEN PLOTTED TO FULL SIZE (22"x34")

PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

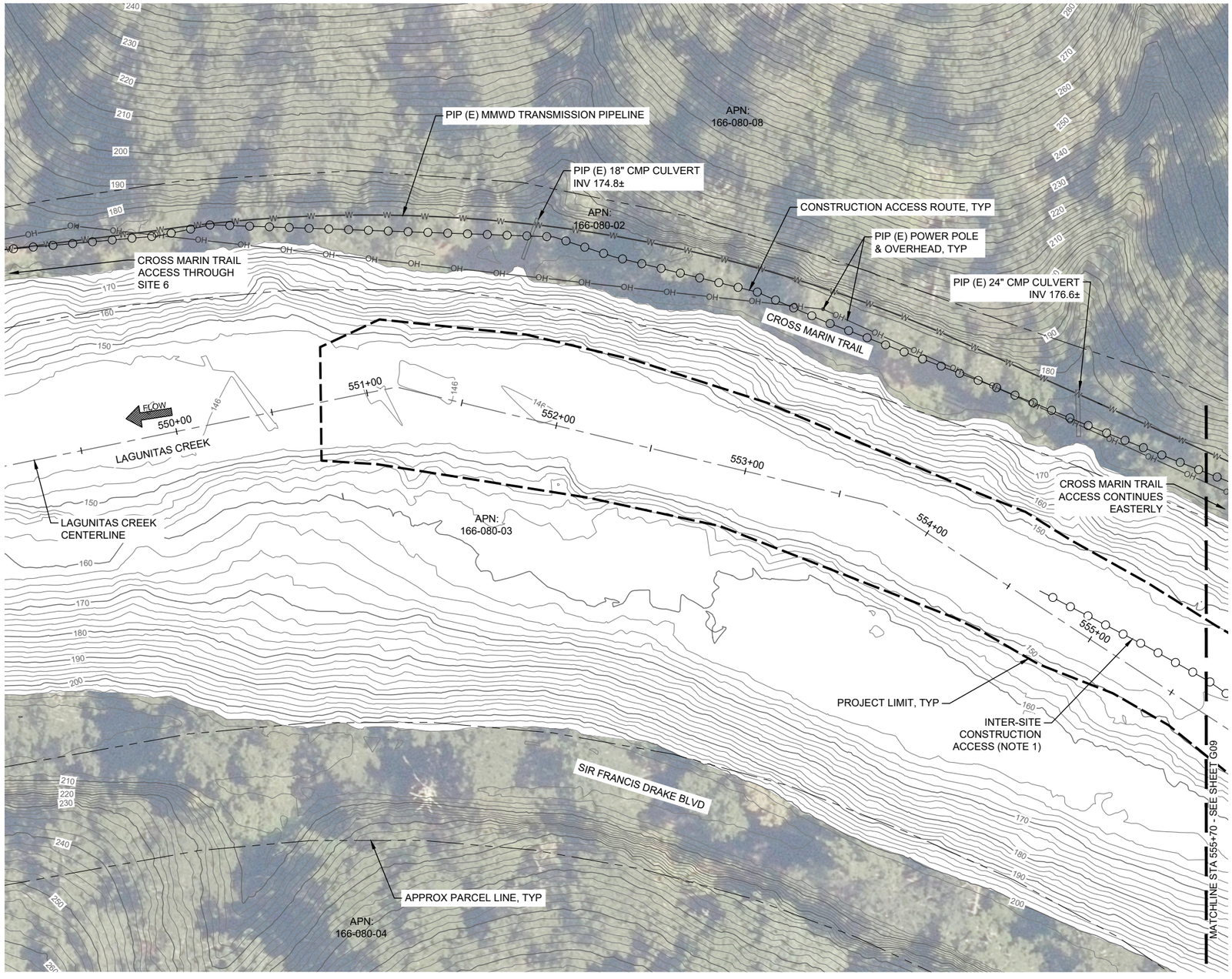
SITE 4 EXISTING CONDITIONS

SHEET NUMBER

G09

SHEET 9 OF 36

FILE: P:\01 CAD\2020xxxxx\[20202000650.00 - MMWD Laguinitas Creek Watershed Enhancement Plan\DWG\G07-EXIST-COND-SITE4.dwg PLOT DATE: 10/29/2021 1:21:32 PM PLOTTED BY: STEPHANIE CLARKE



NOTES

1. INTER-SITE ACCESS VIA CHANNEL FROM SITE 4 TO SITE 5 WITH CHANNEL BED PROTECTION MEASURES IN PLACE.
2. CONSTRUCTION STAGING AREA AT IRVING GROUP PICNIC AREA (SHEET G04) OFF CROSS MARIN TRAIL ON NORTH SIDE OF SIR FRANCIS DRAKE NEAR STA 523+50.

SITE 5 EXISTING CONDITIONS

PLAN SCALE: 1" = 30'

N

1"=30' 30 15 0 30 60

SCALE FEET

ESA
180 GRAND AVENUE,
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PROJECT NAME

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CREEK WATERSHED
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MARIN COUNTY
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IN CHARGE	M. LANDICHO C86515
PROJECT NUMBER	202000650.00
ISSUE DATE	11/12/2021

SCALE IS AS SHOWN WHEN PLOTTED TO FULL SIZE (22"x34")

PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

SITE 5 EXISTING CONDITIONS

SHEET NUMBER

G10

SHEET 10 OF 36

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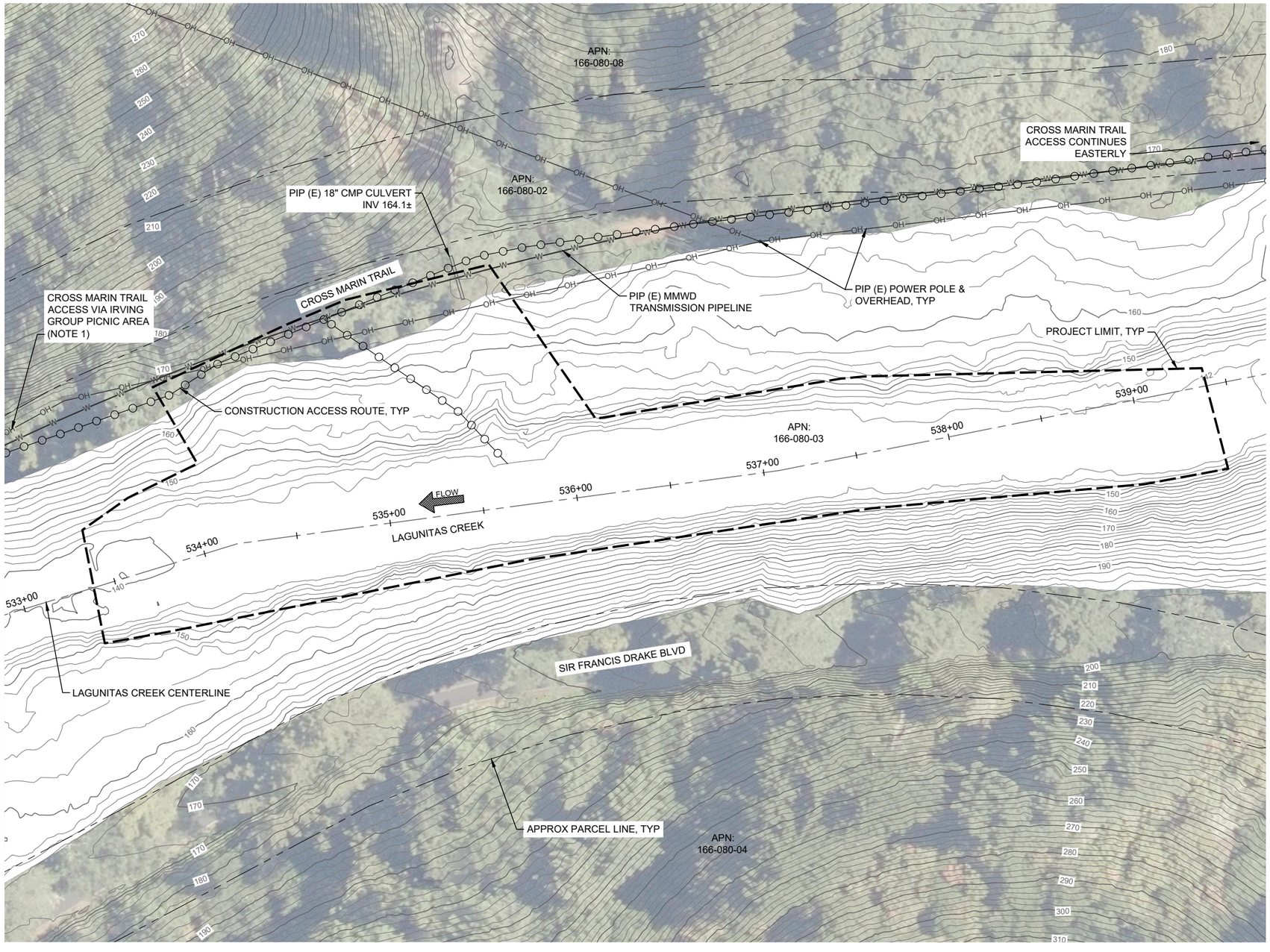

NOTES

1. CROSS MARIN TRAIL ACCESS FROM IRVING GROUP PICNIC AREA (SEE SHEET G04) ON NORTH SIDE OF SIR FRANCIS DRAKE BLVD NEAR STA 523+50.
2. CONSTRUCTION STAGING AREA AT IRVING GROUP PICNIC AREA (SHEET G04) OFF CROSS MARIN TRAIL ON NORTH SIDE OF SIR FRANCIS DRAKE NEAR STA 523+50.

SITE 6 EXISTING CONDITIONS
PLAN SCALE: 1" = 30'

N

30 15 0 30 60
1"=30' SCALE FEET

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ISSUE DATE	11/12/2021

SCALE IS AS SHOWN WHEN PLOTTED TO FULL SIZE (22"x34")

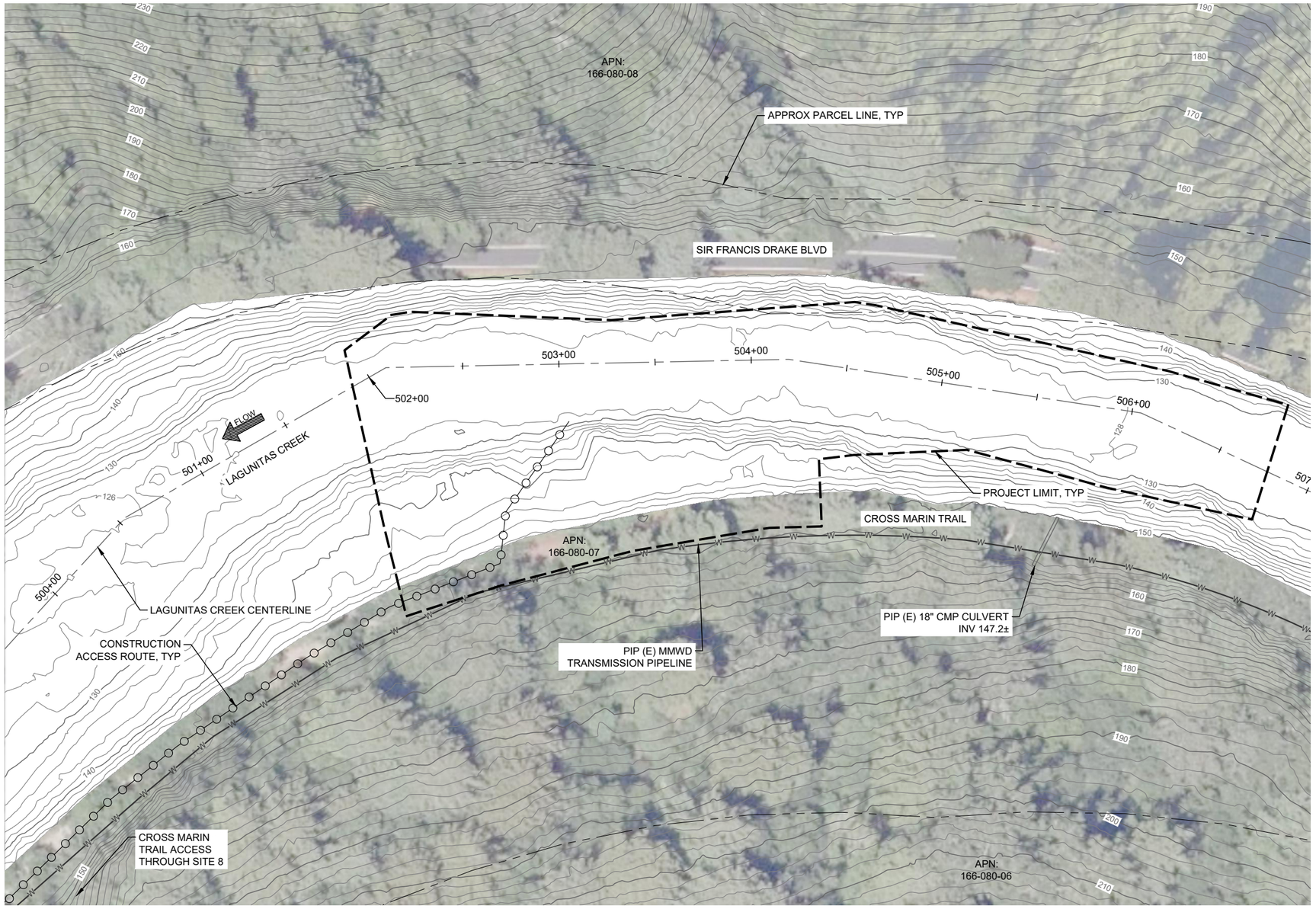
PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE
SITE 6 EXISTING CONDITIONS

SHEET NUMBER
G11

SHEET 11 OF 36

FILE: P:\01 CAD\2020xxxx\[20202006650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\G09-EXIST-COND-SITE6.dwg PLOT DATE: 10/29/2021 1:23:20 PM PLOTTED BY: STEPHANIE CLARKE



SITE 7 EXISTING CONDITIONS

PLAN SCALE: 1" = 30'

NOTES

1. CONSTRUCTION STAGING AREA AT SITE 8 (SHEET G13) IN REDWOOD GROVE GROUP PICNIC AREA ADJACENT TO UPSTREAM SIDE OF CAMP TAYLOR BRIDGE OFF TAYLOR PARK ROAD NEAR STA 487+00.
2. POTENTIAL CULTURAL AND HISTORICAL STRUCTURES AND RESOURCES ARE YET TO BE LOCATED AND IDENTIFIED IN FUTURE PROJECT PHASES.

N

1"=30' 30 15 0 30 60
SCALE FEET

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OAKLAND, CA 94612
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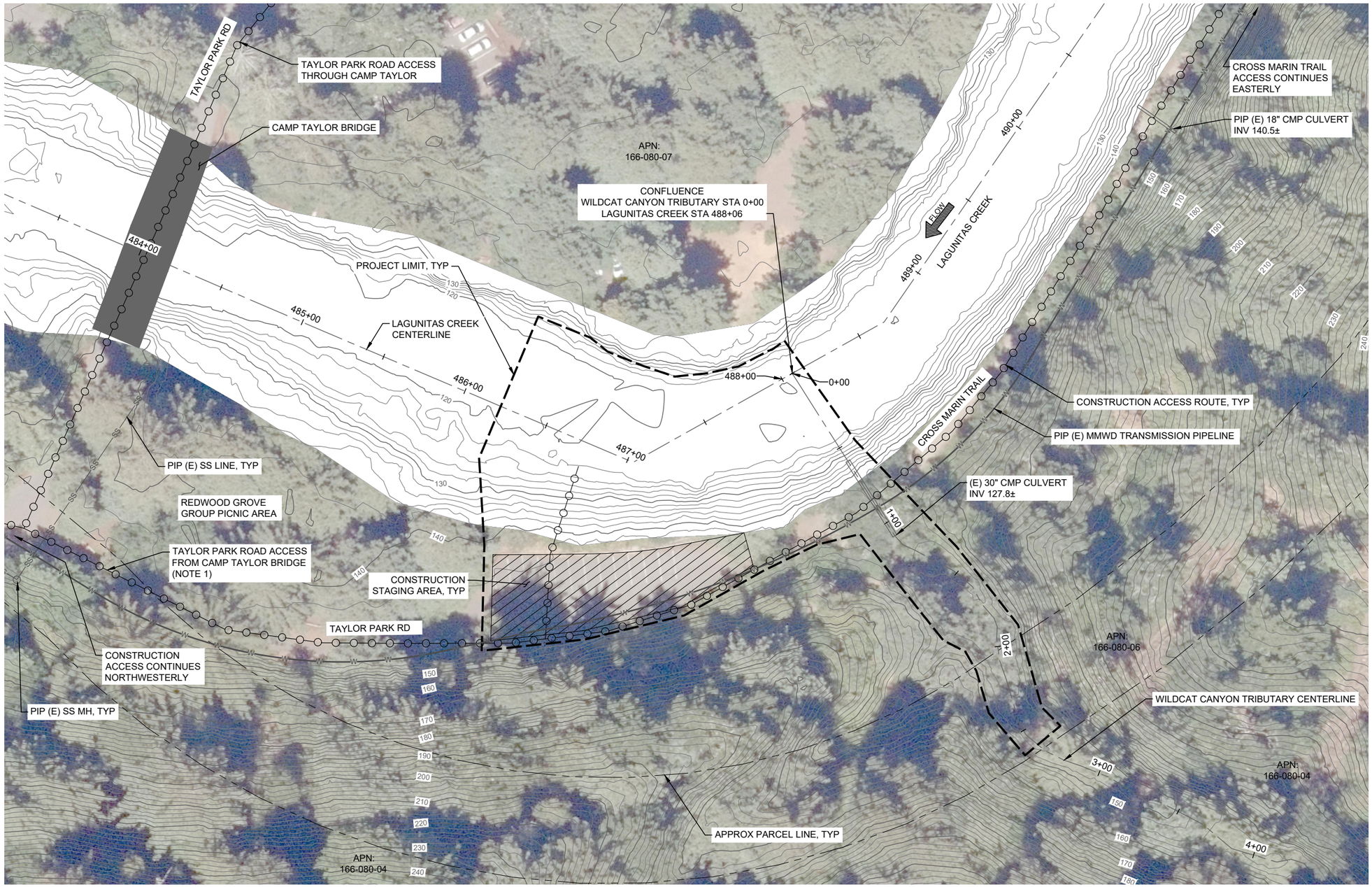
PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

SITE 7 EXISTING CONDITIONS

SHEET NUMBER
G12

SHEET 12 OF 36



SITE 8 EXISTING CONDITIONS

PLAN SCALE: 1" = 30'

NOTES

1. CAMP TAYLOR BRIDGE ACCESS THROUGH CAMP TAYLOR, SOUTH FROM SIR FRANCIS DRAKE BLVD.

N

1"=30' 30 15 0 30 60

SCALE FEET

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PHASE

DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

SITE 8 EXISTING CONDITIONS

SHEET NUMBER

G13

SHEET 13 OF 36

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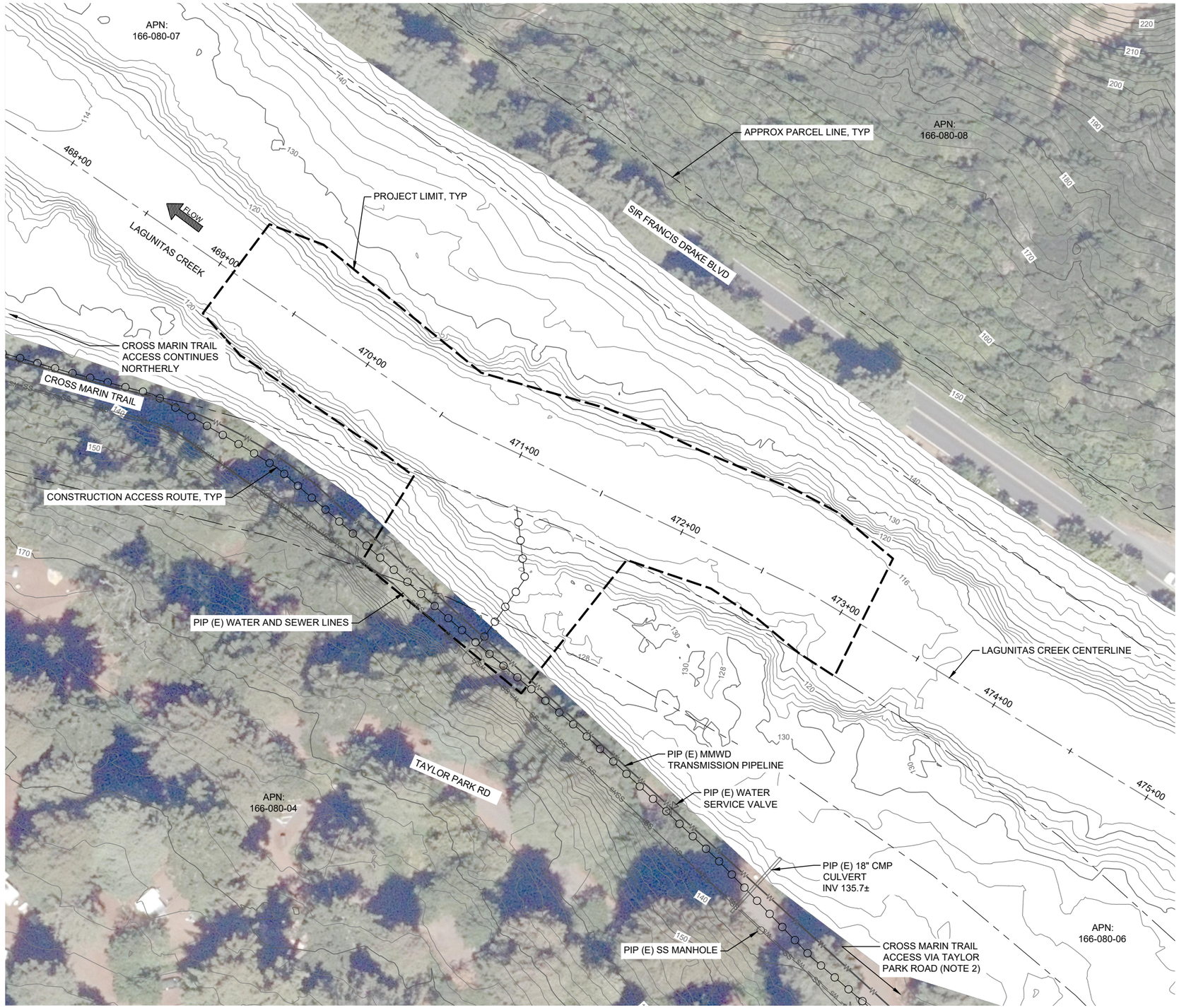

SITE 9 EXISTING CONDITIONS

PLAN SCALE: 1" = 30'

NOTES

1. CONSTRUCTION STAGING AREA AT HORSE TRAILER PARKING AREA (SHEET G05) NEAR THE END OF DEVIL'S GULCH ACCESSED VIA CROSS MARIN TRAIL NEAR STA 441+00
2. TAYLOR PARK ROAD ACCESS FROM CAMP TAYLOR BRIDGE THROUGH CAMP TAYLOR, SOUTH FROM SIR FRANCIS DRAKE BLVD.

N

30 15 0 30 60

1"=30' SCALE FEET

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180 GRAND AVENUE,
SUITE 1050
OAKLAND, CA 94612
OFFICE - 415.896.5900
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PROJECT NUMBER	202000650.00
ISSUE DATE	11/12/2021

SCALE IS AS SHOWN WHEN PLOTTED TO FULL SIZE (22"x34")

PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

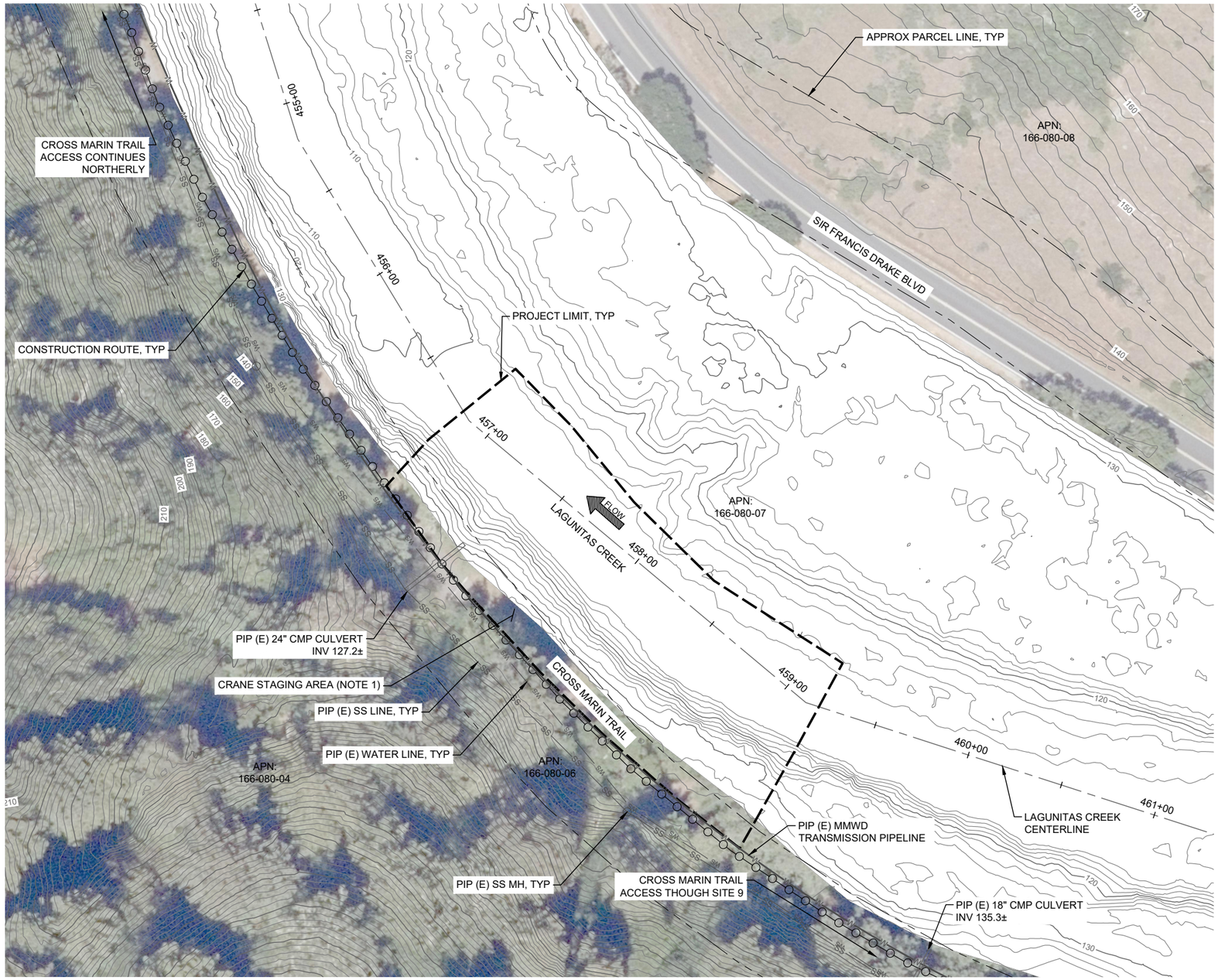
SITE 9 EXISTING CONDITIONS

SHEET NUMBER

G14

SHEET 14 OF 36

FILE: P:\01 CAD\2020\xxxxx\D2020000650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\G12-EXIST-COND-SITE9.dwg PLOT DATE: 10/29/2021 1:25:53 PM PLOTTED BY: STEPHANIE CLARKE



SITE 10 EXISTING CONDITIONS

PLAN SCALE: 1" = 30'

NOTES

1. LIMITED SITE ACCESS. SITE MUST BE ACCESSED BY CRANE AND/OR SLUICING. CRANE STAGING AREA TO BE A MINIMUM OFFSET FRO MMWD TRANSMISSION PIPELINE. OFFSET WILL BE DETERMINED IN FUTURE DESIGN PHASES.
2. CONSTRUCTION STAGING AREA AT HORSE TRAILER PARKING AREA (SHEET G05) NEAR THE END OF DEVIL'S GULCH ACCESSED VIA CROSS MARIN TRAIL NEAR STA 441+00

N

1"=30' 30 15 0 30 60
SCALE FEET

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PHASE

DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

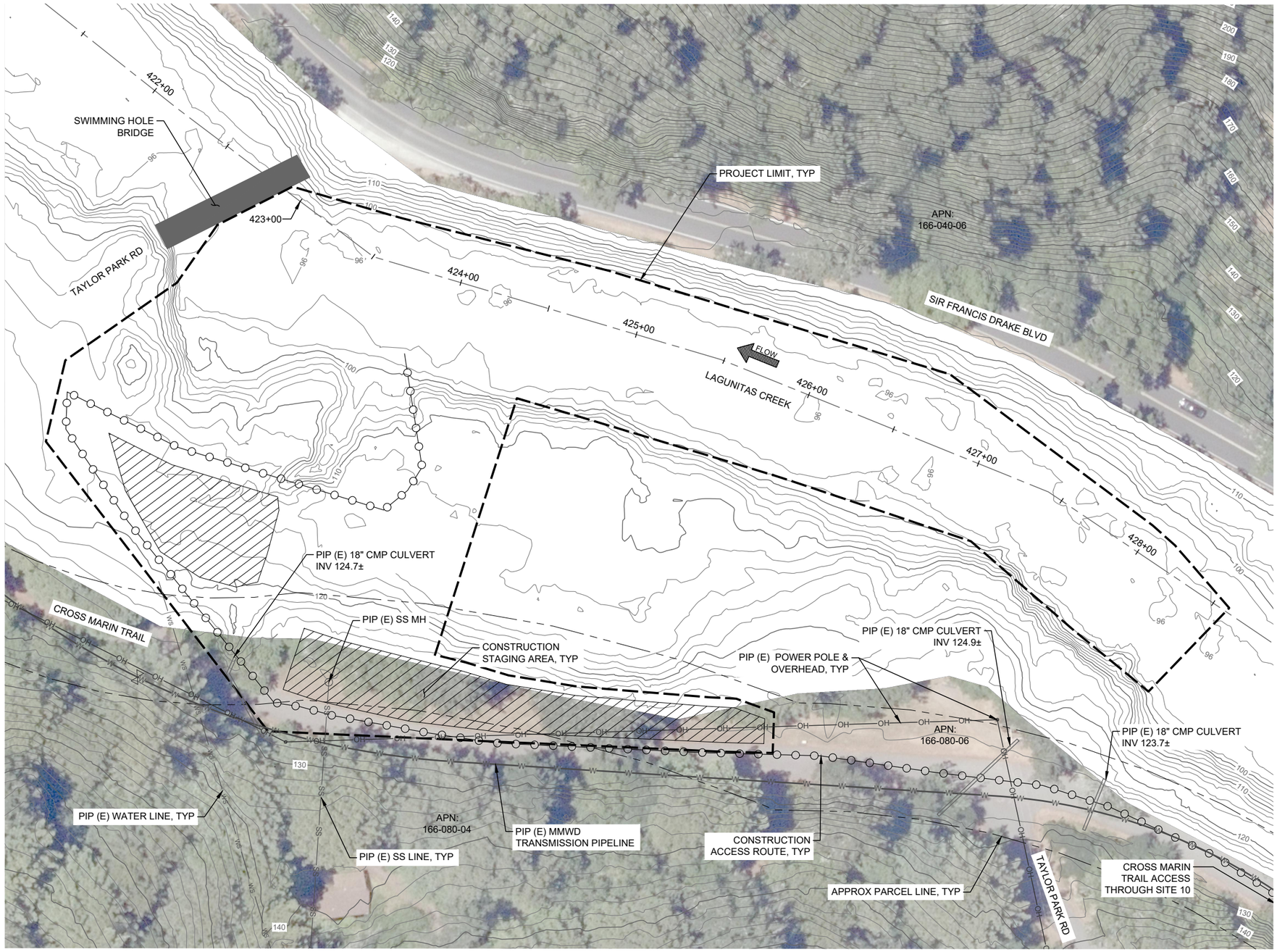
SITE 10 EXISTING CONDITIONS

SHEET NUMBER

G15

SHEET 15 OF 36

FILE: P:\01 CAD\2020\xxxxx\D2020006S0.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\G13-EXIST-COND-SITE10.dwg PLOT DATE: 10/29/2021 1:26:44 PM PLOTTED BY: STEPHANIE CLARKE



SITE 11 EXISTING CONDITIONS

PLAN SCALE: 1" = 30'

NOTES

1. POTENTIAL CULTURAL AND HISTORICAL STRUCTURES AND RESOURCES ARE YET TO BE LOCATED AND IDENTIFIED IN FUTURE PROJECT PHASES.

1"=30' SCALE 30 15 0 30 60 FEET

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SCALE IS AS SHOWN WHEN PLOTTED TO FULL SIZE (22"x34")

PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

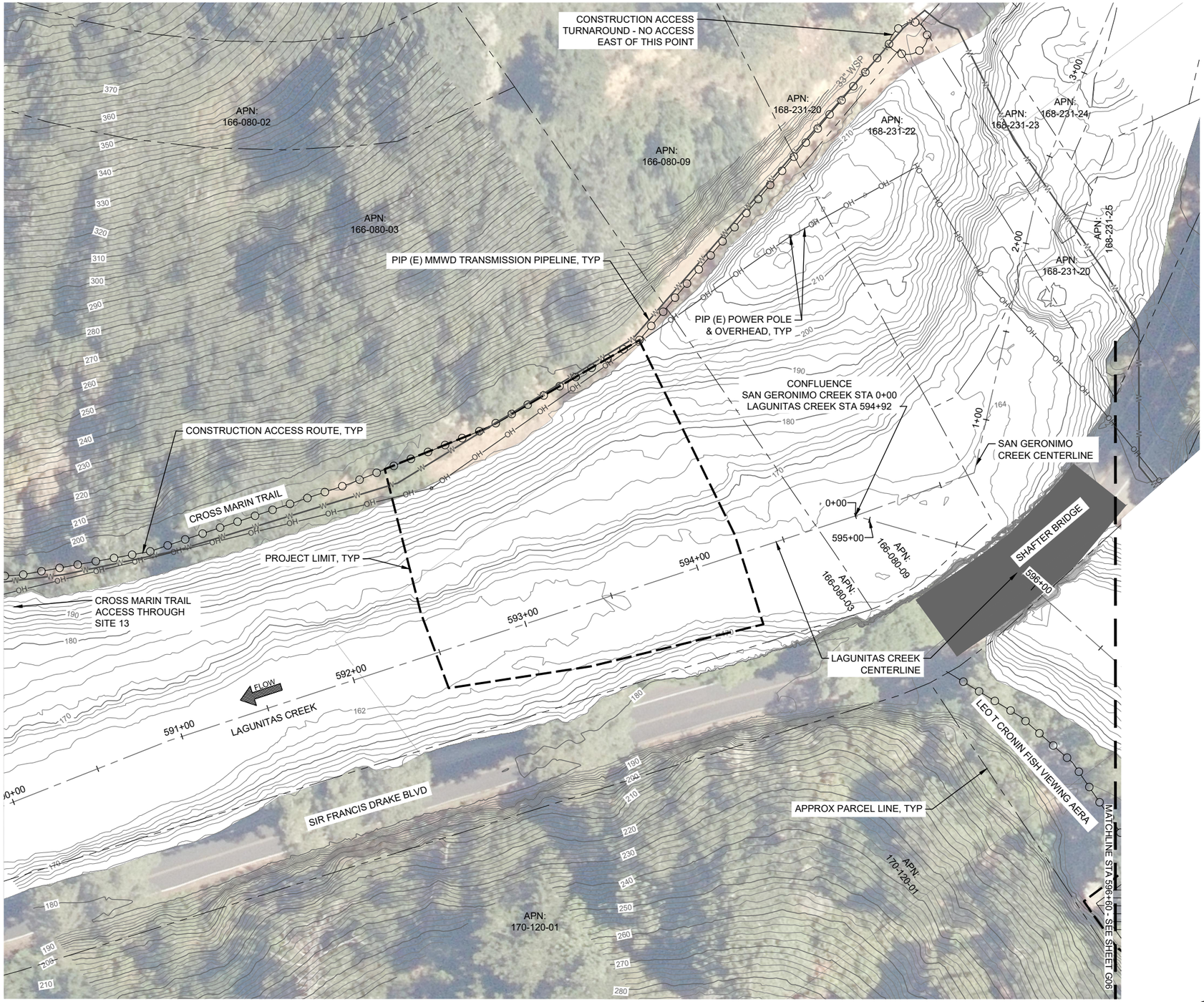
SITE 11 EXISTING CONDITIONS

SHEET NUMBER

G16

SHEET 16 OF 36

FILE: P:\01 CAD\2020\xxxxx\D2020006650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\G14-EXIST-COND-SITE11.dwg PLOT DATE: 10/29/2021 1:27:34 PM PLOTTED BY: STEPHANIE CLARKE



NOTES

1. LIMITED SITE ACCESS. SITE MUST BE ACCESSED BY CRANE AND/OR SLUICING. CRANE AND/OR GRAVEL SLUICE EQUIPMENT STAGED ON CROSS MARIN TRAIL. EQUIPMENT TO BE A MINIMUM OFFSET FROM MMWD TRANSMISSION PIPELINE. OFFSET WILL BE DETERMINED IN FUTURE DESIGN PHASES.
2. CONSTRUCTION STAGING AREA AT IRVING GROUP PICNIC AREA (SHEET G04) OFF CROSS MARIN TRAIL ON NORTH SIDE OF SIR FRANCIS DRAKE NEAR STA 523+50.

SITE 12 EXISTING CONDITIONS

PLAN SCALE: 1" = 30'

N

1"=30' 30 15 0 30 60

SCALE FEET

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PHASE
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SHEET TITLE

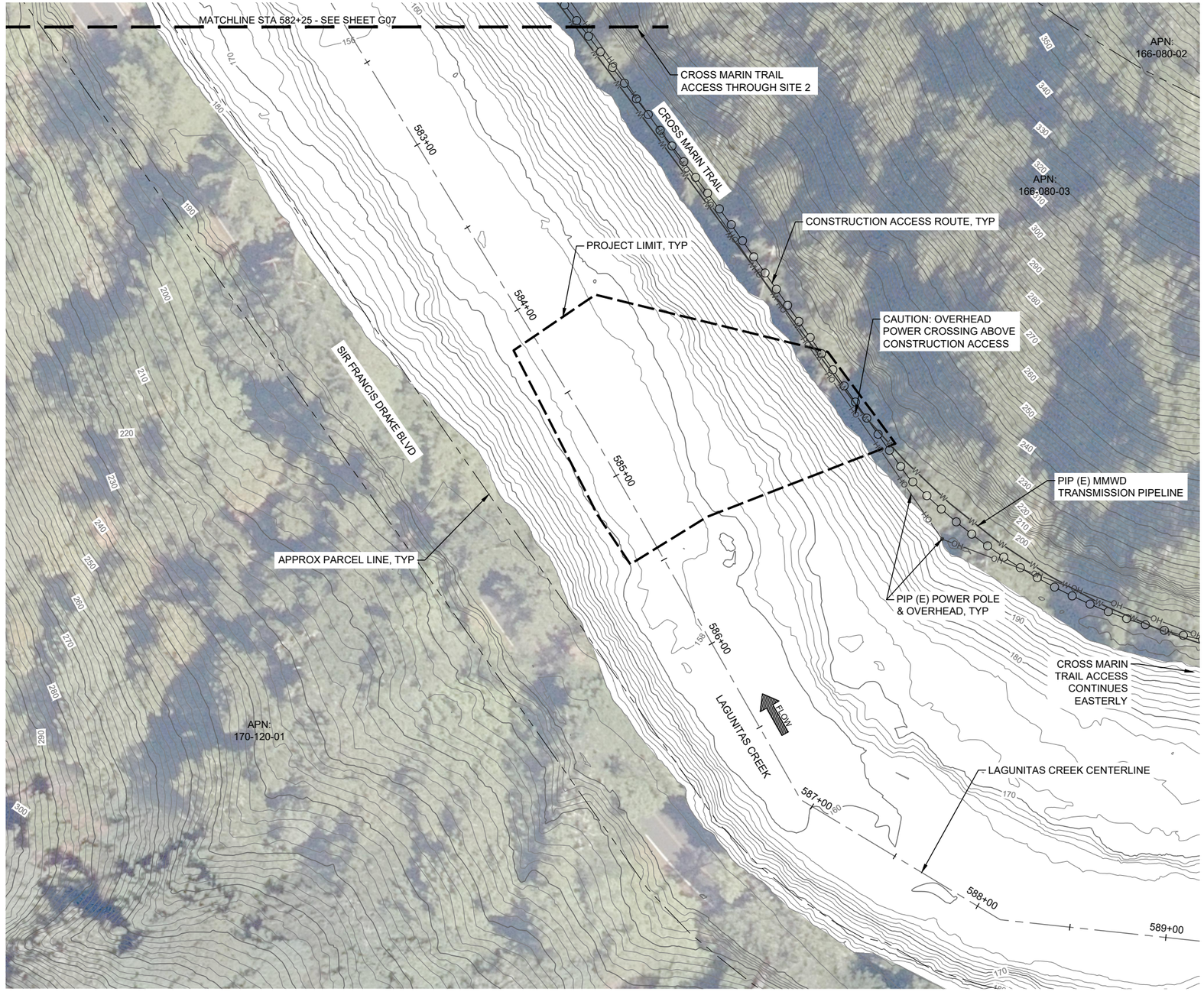
SITE 12 EXISTING CONDITIONS

SHEET NUMBER

G17

SHEET 17 OF 36

FILE: P:\01 CAD\2020xxxxx\D2\202000650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\G04-EXIST-COND-SITE1A.dwg PLOT DATE: 10/29/2021 1:28:31 PM PLOTTED BY: STEPHANIE CLARKE



SITE 13 EXISTING CONDITIONS

PLAN SCALE: 1" = 30'

N

1"=30' 30 15 0 30 60

SCALE FEET

NOTES

1. LIMITED SITE ACCESS. SITE MUST BE ACCESSED BY CRANE AND/OR SLUICING. CRANE AND/OR GRAVEL SLUICE EQUIPMENT STAGED ON CROSS MARIN TRAIL. EQUIPMENT TO BE A MINIMUM OFFSET FROM MMWD TRANSMISSION PIPELINE. OFFSET WILL BE DETERMINED IN FUTURE DESIGN PHASES.
2. CONSTRUCTION STAGING AREA AT IRVING GROUP PICNIC AREA (SHEET G04) OFF CROSS MARIN TRAIL ON NORTH SIDE OF SIR FRANCIS DRAKE NEAR STA 523+50.

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PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

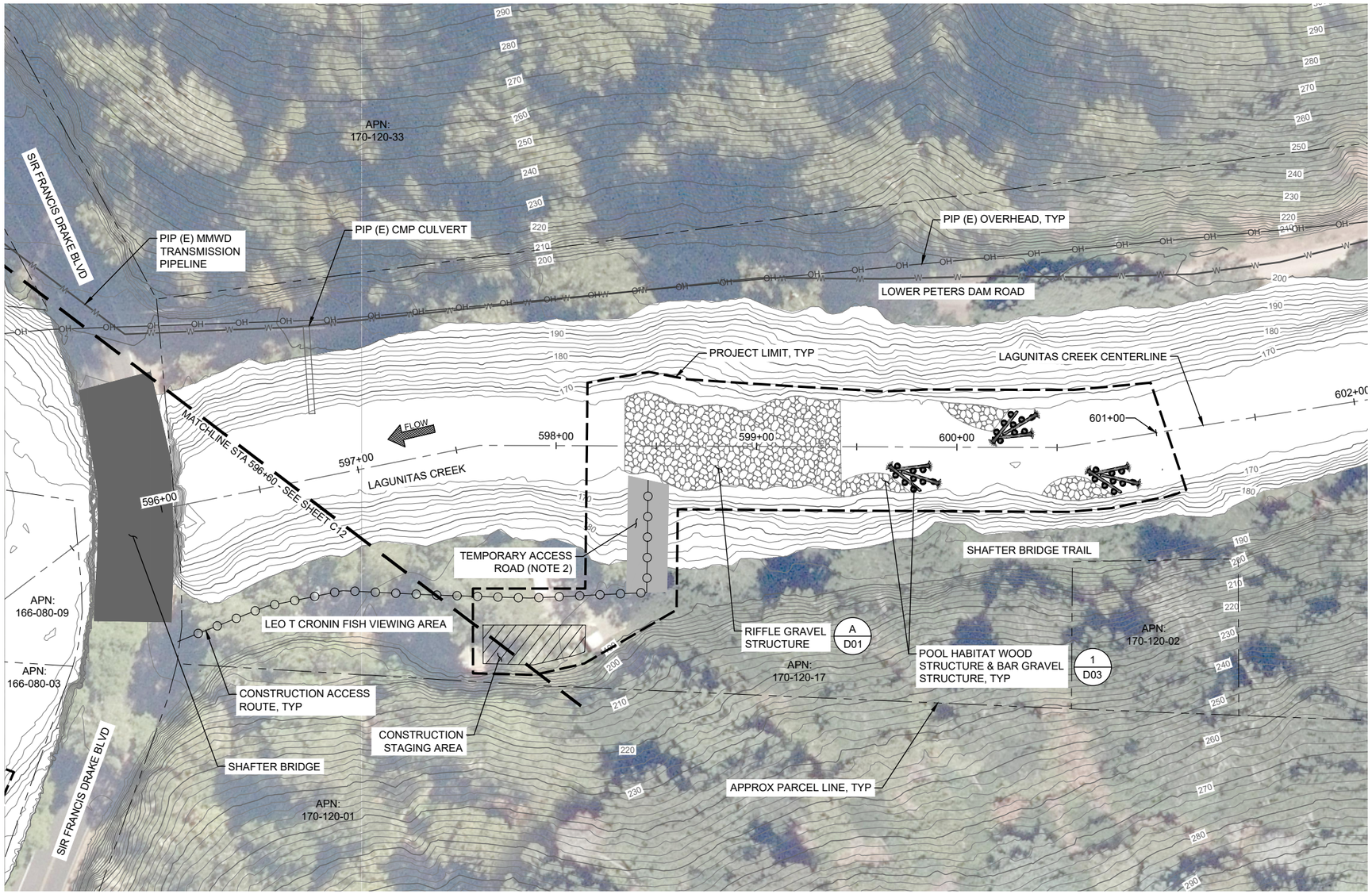
SITE 13 EXISTING CONDITIONS

SHEET NUMBER

G18

SHEET 18 OF 36

FILE: P:\01 CAD\2020\xxxx\D2020006500 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\G04-EXIST-COND-SITE1.dwg PLOT DATE: 10/29/2021 1:29:25 PM PLOTTED BY: STEPHANIE CLARKE



LEGEND

- CONSTRUCTION STAGING AREA
- GRAVEL STRUCTURE
- TEMPORARY ACCESS ROAD
- POOL HABITAT WOOD STRUCTURE

NOTES

1. WOOD STRUCTURES AND GRAVEL PLACEMENT SHOWN FOR REFERENCE ONLY - ACTUAL QUANTITY AS WELL AS PLACEMENT AND ROTATION TO BE CONFIRMED IN FUTURE DETAILED DESIGN.
2. TEMPORARY ACCESS ROAD FROM EXISTING ROAD OR TRAIL TO CHANNEL TO INCLUDE MINOR GRADING AND DISTURBANCE AS WELL AS MINIMAL IMPORT MATERIAL AS NEEDED FOR STABLE CONSTRUCTION VEHICULAR ACCESS. STOCKPILE NATIVE MATERIALS ON-SITE FOR USE IN RESTORING ACCESS ROUTE TO PRE-PROJECT CONDITION. EXISTING TREES MAY BE REMOVED PENDING APPROVAL BY STATE PARKS. MEASURES MAY BE NEEDED TO PROTECT MATURE REDWOOD ROOTS FROM OVERCOMPACTION OF SOIL. SEE DETAILS 1 AND 2 ON SHEET D04.

SITE 1 ENHANCEMENT PLAN

PLAN SCALE: 1" = 30'

N

1"=30' 30 15 0 30 60
SCALE FEET

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MARIN WATER

PROJECT NAME

MW LAGUNITAS CREEK WATERSHED ENHANCEMENT PLAN

MARIN COUNTY
CALIFORNIA

REVISIONS

#	DATE	DESCRIPTION

DESIGNED	LMW/JQW
DRAWN	SVC
CHECKED	AEB
IN CHARGE	M. LANDICHO C86515
PROJECT NUMBER	202000650.00
ISSUE DATE	11/12/2021

SCALE IS AS SHOWN WHEN PLOTTED TO FULL SIZE (22"x34")

PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

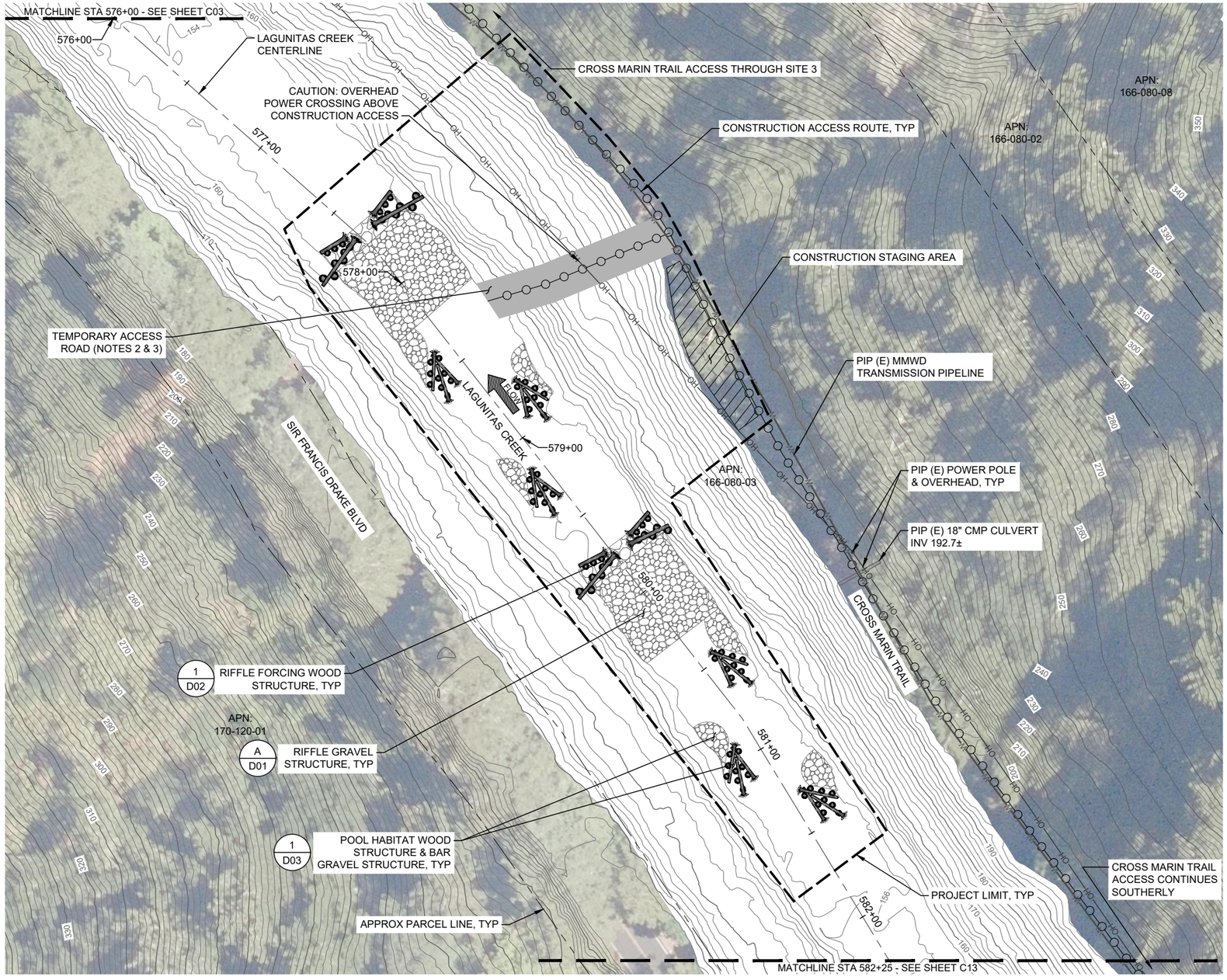
SITE 1 ENHANCEMENT PLAN

SHEET NUMBER

C01

SHEET 19 OF 36

FILE: P:\01 CAD\2020\xxxx\D2020000650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\C-PLAN-SITE1.dwg PLOT DATE: 10/29/2021 1:30:19 PM PLOTTED BY: STEPHANIE CLARKE



SITE 2 ENHANCEMENT PLAN

PLAN SCALE: 1" = 30'

LEGEND

- CONSTRUCTION STAGING AREA
- ROUNDED GRAVEL-COBBLE MIX
- GRAVEL STRUCTURE
- TEMPORARY ACCESS ROAD
- POOL HABITAT WOOD STRUCTURE
- RIFFLE FORCING WOOD STRUCTURE

NOTES

1. WOOD STRUCTURES AND GRAVEL PLACEMENT SHOWN FOR REFERENCE ONLY - ACTUAL QUANTITY AS WELL AS PLACEMENT AND ROTATION TO BE CONFIRMED IN FUTURE DETAILED DESIGN.
2. TEMPORARY ACCESS ROAD FROM EXISTING ROAD OR TRAIL TO CHANNEL TO INCLUDE MINOR GRADING AND DISTURBANCE AS WELL AS MINIMAL IMPORT MATERIAL AS NEEDED FOR STABLE CONSTRUCTION VEHICULAR ACCESS. STOCKPILE NATIVE MATERIALS ON-SITE FOR USE IN RESTORING ACCESS ROUTE TO PRE-PROJECT CONDITION. EXISTING TREES MAY BE REMOVED PENDING APPROVAL BY STATE PARKS. MEASURES MAY BE NEEDED TO PROTECT MATURE REDWOOD ROOTS FROM OVERCOMPACTION OF SOIL. SEE DETAILS 1 AND 2 ON SHEET D04.
3. ACCESS VIA EXISTING ARIZONA CROSSING THAT SHALL BE RESTORED TO PRE-PROJECT CONDITION.

N

1"=30' SCALE 30 15 0 30 60 FEET

ESA
180 GRAND AVENUE,
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OFFICE - 415.896.5900
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CLIENT

MARIN WATER

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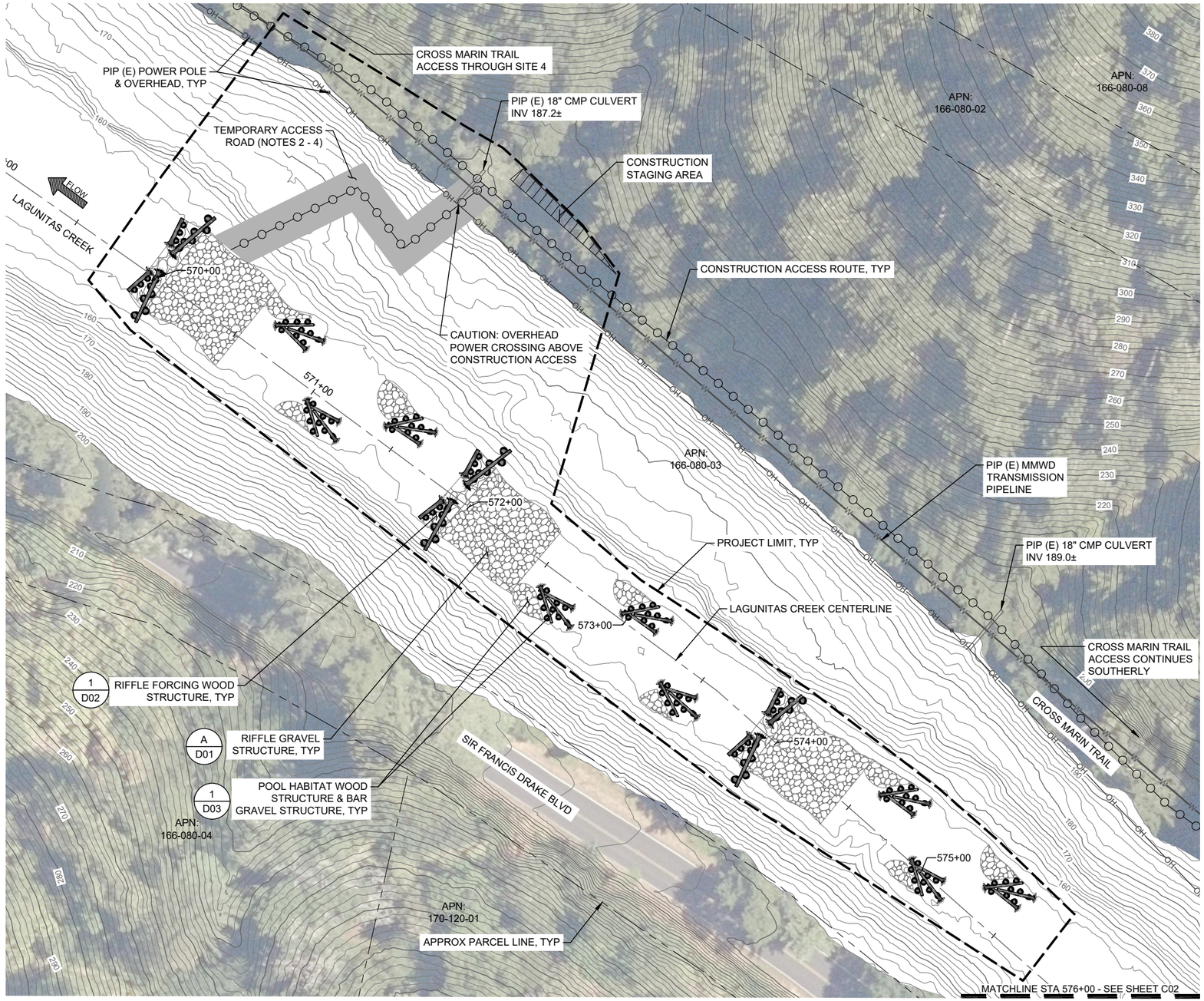
PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE
SITE 2 ENHANCEMENT PLAN

SHEET NUMBER
C02

SHEET 20 OF 36



SITE 3 ENHANCEMENT PLAN

PLAN SCALE: 1" = 30'

LEGEND

- ROUNDED GRAVEL-COBBLE MIX
- GRAVEL STRUCTURE
- TEMPORARY ACCESS ROAD
- CONSTRUCTION STAGING AREA
- POOL HABITAT WOOD STRUCTURE
- RIFFLE FORCING WOOD STRUCTURE

NOTES

1. WOOD STRUCTURES AND GRAVEL PLACEMENT SHOWN FOR REFERENCE ONLY - ACTUAL QUANTITY AS WELL AS PLACEMENT AND ROTATION TO BE CONFIRMED IN FUTURE DETAILED DESIGN.
2. TEMPORARY ACCESS ROAD FROM EXISTING ROAD OR TRAIL TO CHANNEL TO INCLUDE MINOR GRADING AND DISTURBANCE AS WELL AS MINIMAL IMPORT MATERIAL AS NEEDED FOR STABLE CONSTRUCTION VEHICULAR ACCESS. STOCKPILE NATIVE MATERIALS ON-SITE FOR USE IN RESTORING ACCESS ROUTE TO PRE-PROJECT CONDITION. EXISTING TREES MAY BE REMOVED PENDING APPROVAL BY STATE PARKS. MEASURES MAY BE NEEDED TO PROTECT MATURE REDWOOD ROOTS FROM OVERCOMPACTION OF SOIL. SEE DETAILS 1 AND 2 ON SHEET D04.
3. ACCESS VIA EXISTING ARIZONA CROSSING THAT SHALL BE RESTORED TO PRE-PROJECT CONDITION.
4. PROTECTIVE FILL/COVER TO BE PLACED AS NEEDED OVER EXISTING UTILITIES CROSSED BY CONSTRUCTION ACCESS ROUTE TO PREVENT DAMAGE TO UTILITY PIPE AND APPURTENANCES.

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CALIFORNIA

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PHASE
DRAFT 30% DESIGN DRAWINGS

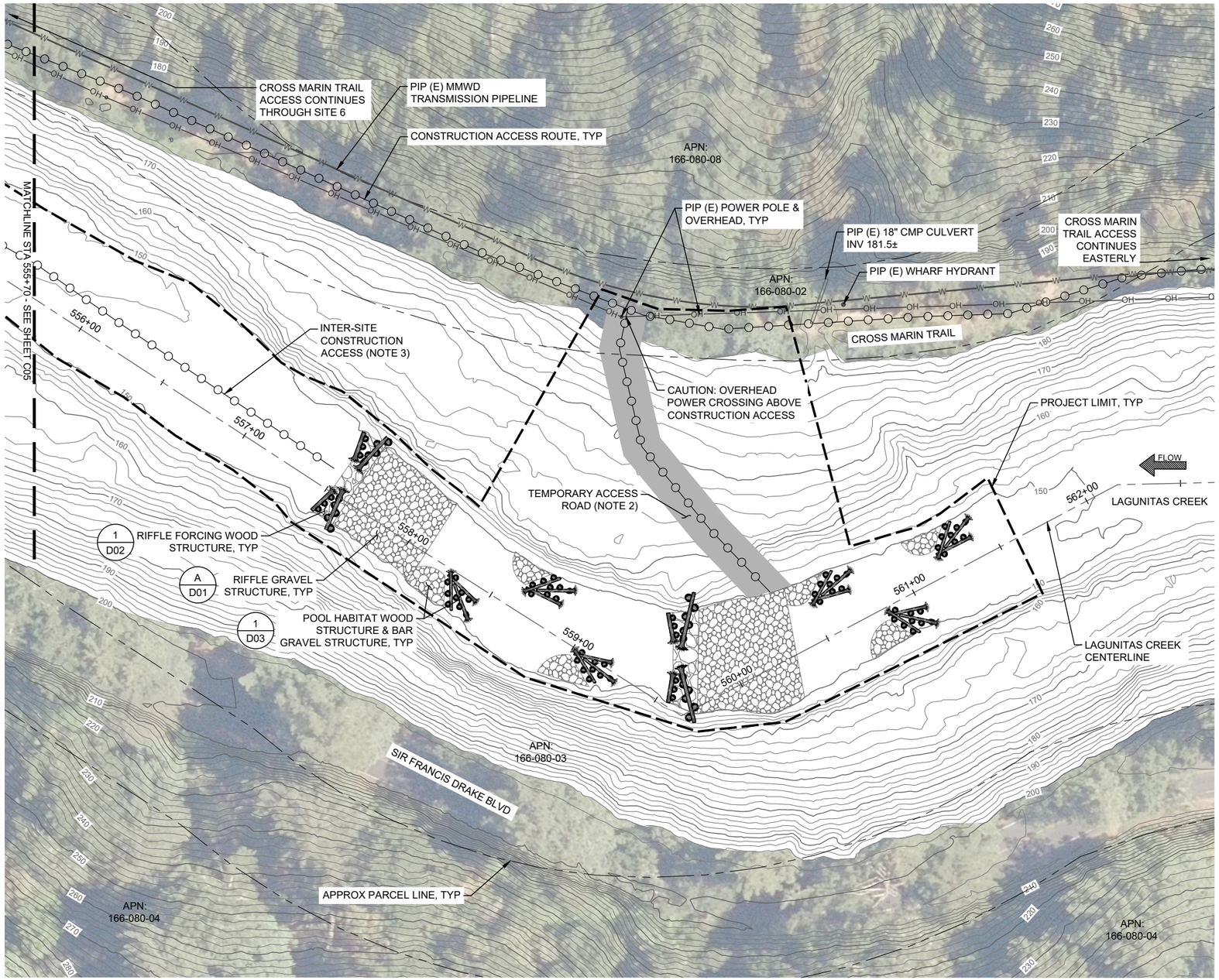
SHEET TITLE

SITE 3 ENHANCEMENT PLAN

SHEET NUMBER
C03

SHEET 21 OF 36

FILE: P:\01 CAD\2020\xxxxx\D2\202000650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\C04-PLAN-SITE3.dwg PLOT DATE: 10/29/2021 1:32:14 PM PLOTTED BY: STEPHANIE CLARKE



SITE 4 ENHANCEMENT PLAN

PLAN SCALE: 1" = 30'

LEGEND

- ROUNDED GRAVEL-COBBLE MIX
- GRAVEL STRUCTURE
- TEMPORARY ACCESS ROAD
- POOL HABITAT WOOD STRUCTURE
- RIFFLE FORCING WOOD STRUCTURE

NOTES

1. WOOD STRUCTURES AND GRAVEL PLACEMENT SHOWN FOR REFERENCE ONLY - ACTUAL QUANTITY AS WELL AS PLACEMENT AND ROTATION TO BE CONFIRMED IN FUTURE DETAILED DESIGN.
2. TEMPORARY ACCESS ROAD FROM EXISTING ROAD OR TRAIL TO CHANNEL TO INCLUDE MINOR GRADING AND DISTURBANCE AS WELL AS MINIMAL IMPORT MATERIAL AS NEEDED FOR STABLE CONSTRUCTION VEHICULAR ACCESS. STOCKPILE NATIVE MATERIALS ON-SITE FOR USE IN RESTORING ACCESS ROUTE TO PRE-PROJECT CONDITION. EXISTING TREES MAY BE REMOVED PENDING APPROVAL BY STATE PARKS. MEASURES MAY BE NEEDED TO PROTECT MATURE REDWOOD ROOTS FROM OVERCOMPACTION OF SOIL. SEE DETAILS 1 AND 2 ON SHEET D04.
3. INTER-SITE ACCESS VIA CHANNEL FROM SITE 4 TO SITE 5 WITH CHANNEL BED PROTECTION MEASURES IN PLACE.
4. CONSTRUCTION STAGING AREA AT IRVING GROUP PICNIC AREA (SHEET G04) OFF CROSS MARIN TRAIL ON NORTH SIDE OF SIR FRANCIS DRAKE NEAR STA 523+50.

N

1"=30' SCALE 30 15 0 30 60 FEET

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OFFICE - 415.896.5900
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MARIN WATER

PROJECT NAME

MW LAGUNITAS CREEK WATERSHED ENHANCEMENT PLAN

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CALIFORNIA

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IN CHARGE	M. LANDICHO C86515
PROJECT NUMBER	202000650.00
ISSUE DATE	11/12/2021

SCALE IS AS SHOWN WHEN PLOTTED TO FULL SIZE (22"x34")

PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

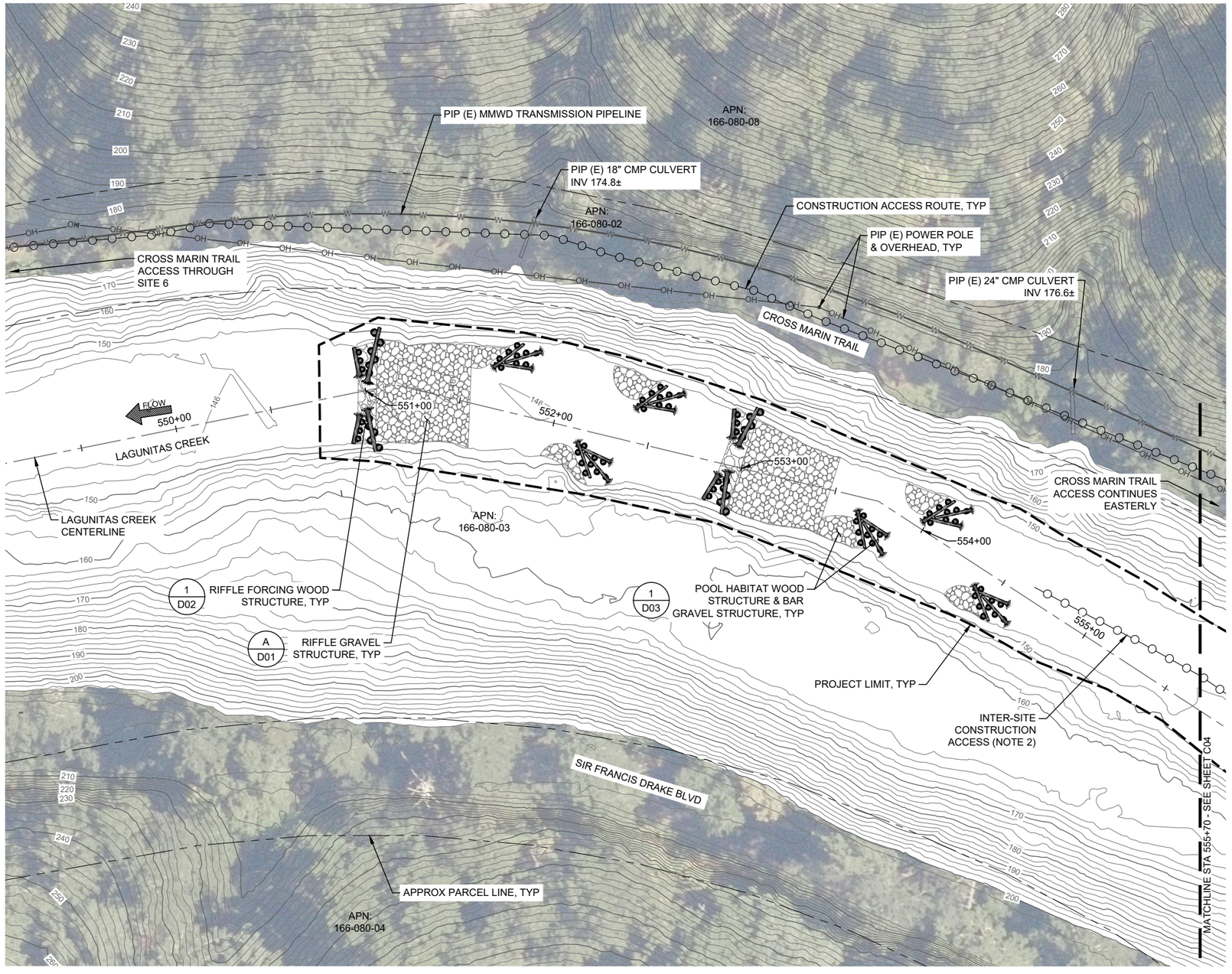
SITE 4 ENHANCEMENT PLAN

SHEET NUMBER

C04

SHEET 22 OF 36

FILE: P:\01 CAD\2020xxxx\D2020000650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\C05-PLAN-SITE4.dwg PLOT DATE: 10/29/2021 1:33:13 PM PLOTTED BY: STEPHANIE CLARKE



LEGEND

- ROUNDED GRAVEL-COBBLE MIX
- GRAVEL STRUCTURE
- POOL HABITAT WOOD STRUCTURE
- RIFFLE FORCING WOOD STRUCTURE

NOTES

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2. INTER-SITE ACCESS VIA CHANNEL FROM SITE 4 TO SITE 5 WITH CHANNEL BED PROTECTION MEASURES IN PLACE.
3. CONSTRUCTION STAGING AREA AT IRVING GROUP PICNIC AREA (SHEET G04) OFF CROSS MARIN TRAIL ON NORTH SIDE OF SIR FRANCIS DRAKE NEAR STA 523+50.

SITE 5 ENHANCEMENT PLAN

PLAN SCALE: 1" = 30'

N

1"=30' 30 15 0 30 60
SCALE FEET

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ISSUE DATE	11/12/2021

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PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

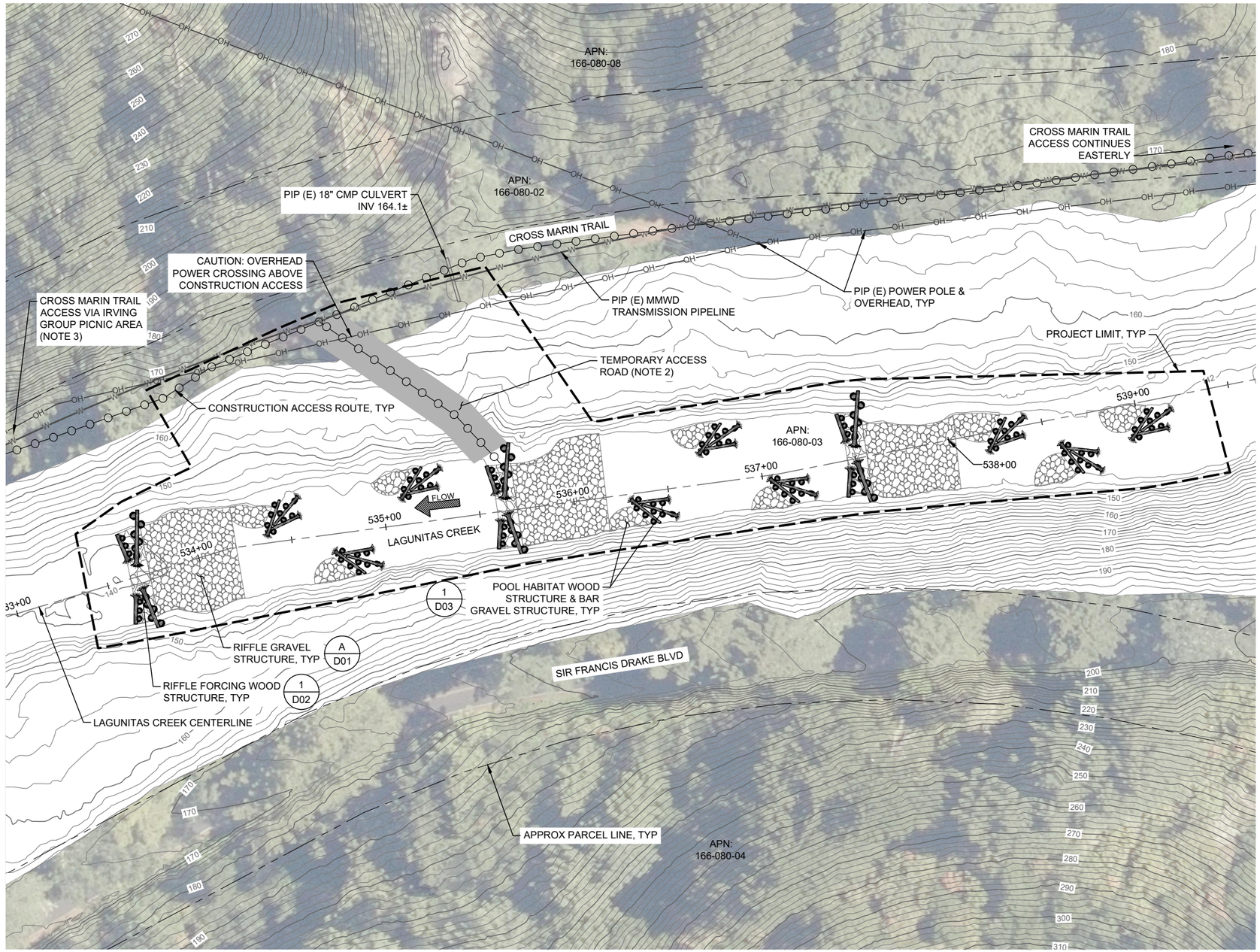
SITE 5 ENHANCEMENT PLAN

SHEET NUMBER

C05

SHEET 23 OF 36

FILE: P:\01 CAD\2020\xxxx\D2020000650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\C06-PLAN-SITE5.dwg PLOT DATE: 10/29/2021 1:34:09 PM PLOTTED BY: STEPHANIE CLARKE



LEGEND

- ROUNDED GRAVEL-COBBLE MIX
- GRAVEL STRUCTURE
- TEMPORARY ACCESS ROAD
- POOL HABITAT WOOD STRUCTURE
- RIFFLE FORCING WOOD STRUCTURE

NOTES

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3. CROSS MARIN TRAIL ACCESS FROM IRVING GROUP PICNIC AREA (SEE SHEET G04) ON NORTH SIDE OF SIR FRANCIS DRAKE BLVD NEAR STA 524+50.
4. CONSTRUCTION STAGING AREA AT IRVING GROUP PICNIC AREA (SHEET G04) OFF CROSS MARIN TRAIL ON NORTH SIDE OF SIR FRANCIS DRAKE NEAR STA 523+50.

SITE 6 ENHANCEMENT PLAN

PLAN SCALE: 1" = 30'

N

30 15 0 30 60
1"=30' SCALE FEET

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MARIN WATER

PROJECT NAME

MW LAGUNITAS
CREEK WATERSHED
ENHANCEMENT PLAN

MARIN COUNTY
CALIFORNIA

REVISIONS

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PHASE
DRAFT 30% DESIGN DRAWINGS

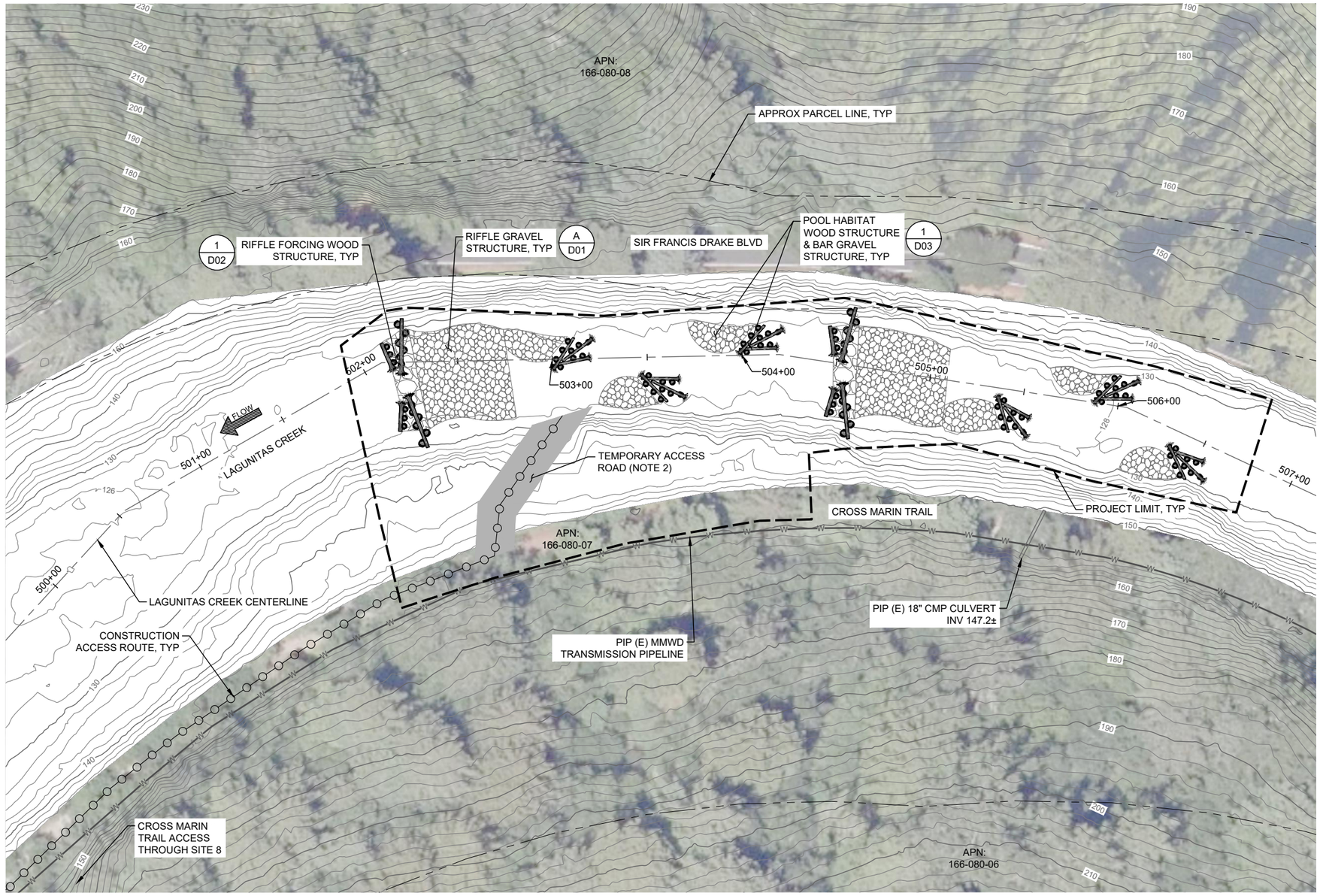
SHEET TITLE

SITE 6
ENHANCEMENT
PLAN

SHEET NUMBER
C06

SHEET 24 OF 36

FILE: P:\01 CAD\2020xxxx\D2020006650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\C07-PLAN-SITE6.dwg PLOT DATE: 10/29/2021 1:35:07 PM PLOTTED BY: STEPHANIE CLARKE



LEGEND

- ROUNDED GRAVEL-COBBLE MIX
- GRAVEL STRUCTURE
- TEMPORARY ACCESS ROAD
- POOL HABITAT WOOD STRUCTURE
- RIFFLE FORCING WOOD STRUCTURE

NOTES

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3. CONSTRUCTION STAGING AREA AT SITE 8 (SHEET C08) IN REDWOOD GROVE GROUP PICNIC AREA ADJACENT TO UPSTREAM SIDE OF CAMP TAYLOR BRIDGE OFF TAYLOR PARK ROAD NEAR STA 487+00.
4. POTENTIAL CULTURAL AND HISTORICAL STRUCTURES AND RESOURCES ARE YET TO BE LOCATED AND IDENTIFIED IN FUTURE PROJECT PHASES.

SITE 7 ENHANCEMENT PLAN

PLAN SCALE: 1" = 30'

N

1"=30' 30 15 0 30 60
SCALE FEET

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MARIN WATER

PROJECT NAME

MW LAGUNITAS CREEK WATERSHED ENHANCEMENT PLAN

MARIN COUNTY
CALIFORNIA

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PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

SITE 7 ENHANCEMENT PLAN

SHEET NUMBER

C07

SHEET 25 OF 36

FILE: P:\01 CAD\2020\xxxx\D2020\00650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\C08-PLAN-SITE7.dwg PLOT DATE: 10/29/2021 1:36:02 PM PLOTTED BY: STEPHANIE CLARKE

LEGEND

- ROUNDED GRAVEL-COBBLE MIX
- GRAVEL STRUCTURE
- TEMPORARY ACCESS ROAD
- CONSTRUCTION STAGING AREA
- SEDIMENT REMOVAL AREA
- SURFACE RESTORATION AREA
- POOL HABITAT WOOD STRUCTURE
- RIFFLE FORCING WOOD STRUCTURE

TAYLOR PARK RD
TAYLOR PARK ROAD ACCESS THROUGH CAMP TAYLOR
CAMP TAYLOR BRIDGE
484+00
APN: 166-080-07
CONFLUENCE WILDCAT CANYON TRIBUTARY STA 0+00 LAGUNITAS CREEK STA 488+06
1 D02 RIFFLE FORCING WOOD STRUCTURE
1 D03 POOL HABITAT WOOD STRUCTURE & BAR GRAVEL STRUCTURE, TYP
PROJECT LIMIT, TYP
RIFFLE GRAVEL STRUCTURE
A D01
485+00
LAGUNITAS CREEK CENTERLINE
486+00
487+00
488+00
489+00
490+00
FLOW
LAGUNITAS CREEK
0+00
CROSS MARIN TRAIL ACCESS CONTINUES EASTERLY
PIP (E) 18" CMP CULVERT INV 140.5±
CONSTRUCTION ACCESS ROUTE, TYP
CROSS MARIN TRAIL
PIP (E) MMWD TRANSMISSION PIPELINE
MODIFY (E) 30" CMP CULVERT INV 127.8± (NOTE 4)
PIP (E) SS LINE, TYP
REDWOOD GROVE GROUP PICNIC AREA
TEMPORARY ACCESS ROAD (NOTE 2)
TAYLOR PARK ROAD ACCESS FROM CAMP TAYLOR BRIDGE (NOTE 3)
CONSTRUCTION STAGING AREA, TYP
1+00
TAYLOR PARK RD
SEDIMENT REMOVAL AREA
2+00
APN: 166-080-06
CONSTRUCTION ACCESS CONTINUES NORTHWESTERLY
WILDCAT CANYON TRIBUTARY CENTERLINE
PIP (E) SS MH, TYP
3+00
APN: 166-080-04
APPROX PARCEL LINE, TYP
4+00
APN: 166-080-04

NOTES

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3. CAMP TAYLOR BRIDGE ACCESS THROUGH CAMP TAYLOR, SOUTH FROM SIR FRANCIS DRAKE BLVD.
4. CULVERT MODIFICATION TO BE DETERMINED IN FUTURE DESIGN PHASES, BUT MAY ENTAIL ARIZONA CROSSING, DAYLIGHTING, OR FREE SPAN BRIDGE.

SITE 8 ENHANCEMENT PLAN

PLAN SCALE: 1" = 30'

N

1"=30' 30 15 0 30 60
SCALE FEET

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OAKLAND, CA 94612
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PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE
SITE 8 ENHANCEMENT PLAN

SHEET NUMBER
C08

SHEET 26 OF 36

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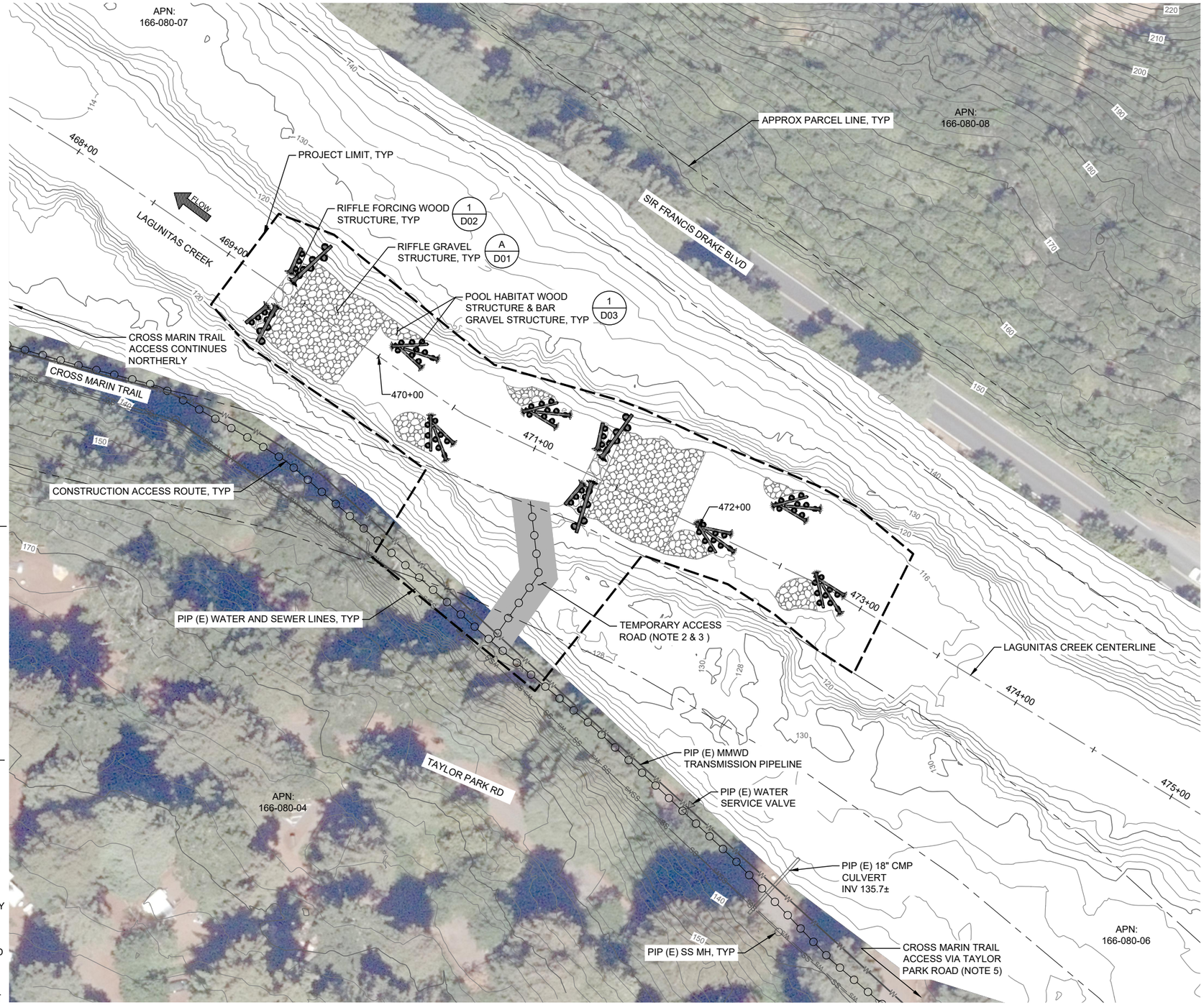

LEGEND

- ROUNDED GRAVEL-COBBLE MIX
- GRAVEL STRUCTURE
- TEMPORARY ACCESS ROAD
- POOL HABITAT WOOD STRUCTURE
- RIFFLE FORCING WOOD STRUCTURE

NOTES

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2. TEMPORARY ACCESS ROAD FROM EXISTING ROAD OR TRAIL TO CHANNEL TO INCLUDE MINOR GRADING AND DISTURBANCE AS WELL AS MINIMAL IMPORT MATERIAL AS NEEDED FOR STABLE CONSTRUCTION VEHICULAR ACCESS. STOCKPILE NATIVE MATERIALS ON-SITE FOR USE IN RESTORING ACCESS ROUTE TO PRE-PROJECT CONDITION. EXISTING TREES MAY BE REMOVED PENDING APPROVAL BY STATE PARKS. MEASURES MAY BE NEEDED TO PROTECT MATURE REDWOOD ROOTS FROM OVERCOMPACTION OF SOIL. SEE DETAILS 1 AND 2 ON SHEET D04.
3. RAMP TO BE GRADED OVER EXISTING SECONDARY TRAIL PATH FOR ACCESS.
4. CONSTRUCTION STAGING AREA (SHEET G05) AT HORSE TRAILER PARKING AREA NEAR THE END OF DEVIL'S GULCH ACCESSED VIA CROSS MARIN TRAIL NEAR STA 441+00
5. TAYLOR PARK ROAD ACCESS FROM CAMP TAYLOR BRIDGE THROUGH CAMP TAYLOR, SOUTH FROM SIR FRANCIS DRAKE BLVD.

SITE 9 ENHANCEMENT PLAN

PLAN SCALE: 1" = 30'

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MARIN COUNTY
CALIFORNIA

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PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

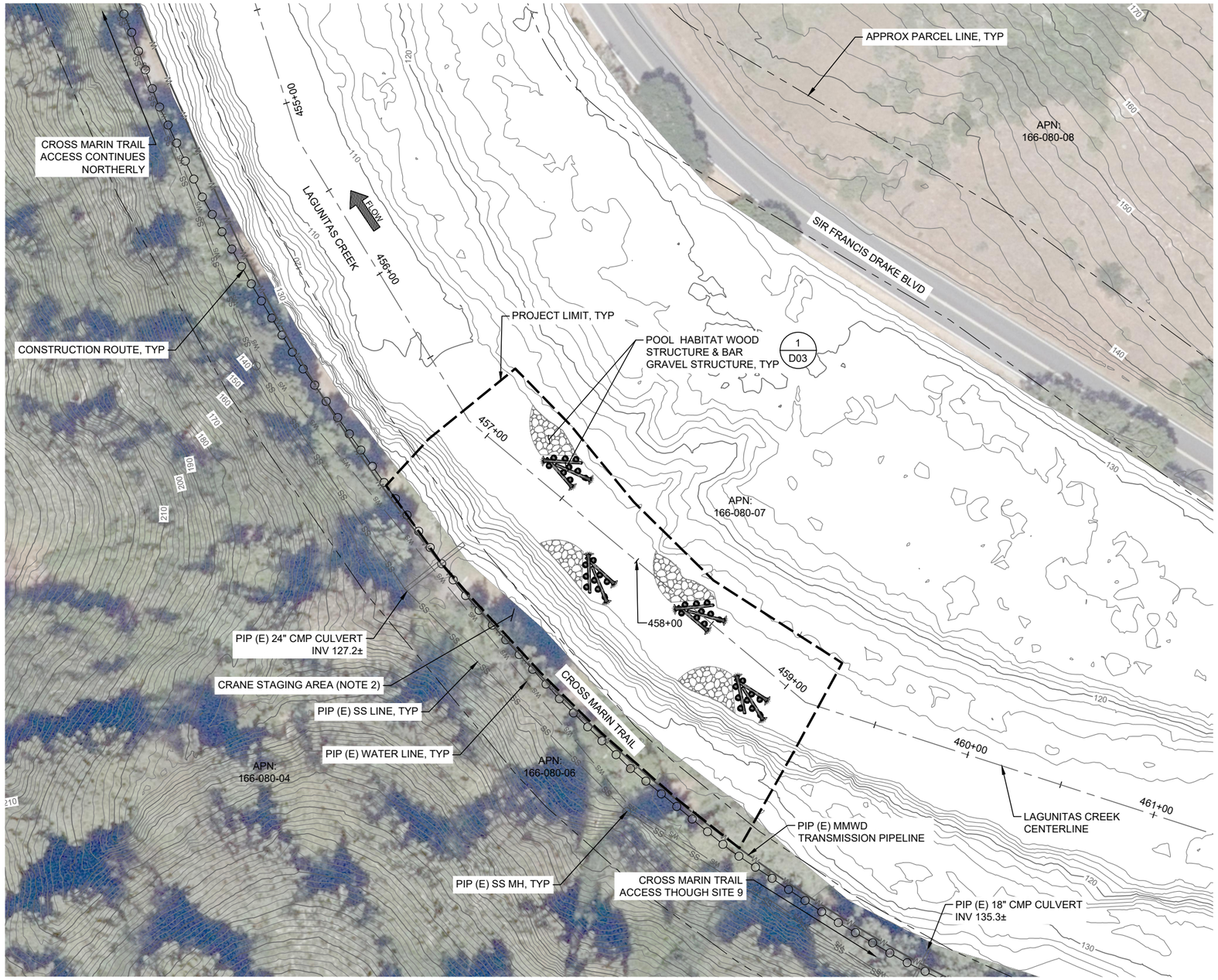
SITE 9 ENHANCEMENT PLAN

SHEET NUMBER

C09

SHEET 27 OF 36

FILE: P:\01 CAD\2020\xxxx\D2020000650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\C10-PLAN-SITE9.dwg PLOT DATE: 10/29/2021 1:37:52 PM PLOTTED BY: STEPHANIE CLARKE



LEGEND

GRAVEL STRUCTURE

POOL HABITAT WOOD STRUCTURE

NOTES

1. WOOD STRUCTURES AND GRAVEL PLACEMENT SHOWN FOR REFERENCE ONLY - ACTUAL QUANTITY AS WELL AS PLACEMENT AND ROTATION TO BE CONFIRMED IN FUTURE DETAILED DESIGN.
2. LIMITED SITE ACCESS. SITE MUST BE ACCESSED BY CRANE AND/OR SLUICING. CRANE STAGING AREA TO BE A MINIMUM OFFSET FRO MMWD TRANSMISSION PIPELINE. OFFSET WILL BE DETERMINED IN FUTURE DESIGN PHASES.
3. CONSTRUCTION STAGING AREA AT HORSE TRAILER PARKING AREA (SHEET G05) NEAR THE END OF DEVIL'S GULCH ACCESSED VIA CROSS MARIN TRAIL NEAR STA 441+00

SITE 10 ENHANCEMENT PLAN

PLAN SCALE: 1" = 30'

N

1"=30' 30 15 0 30 60
SCALE FEET

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CLIENT

MARIN WATER

PROJECT NAME

MW LAGUNITAS
CREEK WATERSHED
ENHANCEMENT PLAN

MARIN COUNTY
CALIFORNIA

REVISIONS

#	DATE	DESCRIPTION

DESIGNED	LMW/JQW
DRAWN	SVC
CHECKED	AEB
IN CHARGE	M. LANDICHO C86515
PROJECT NUMBER	202000650.00
ISSUE DATE	11/12/2021

SCALE IS AS SHOWN WHEN PLOTTED TO FULL SIZE (22"x34")

PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

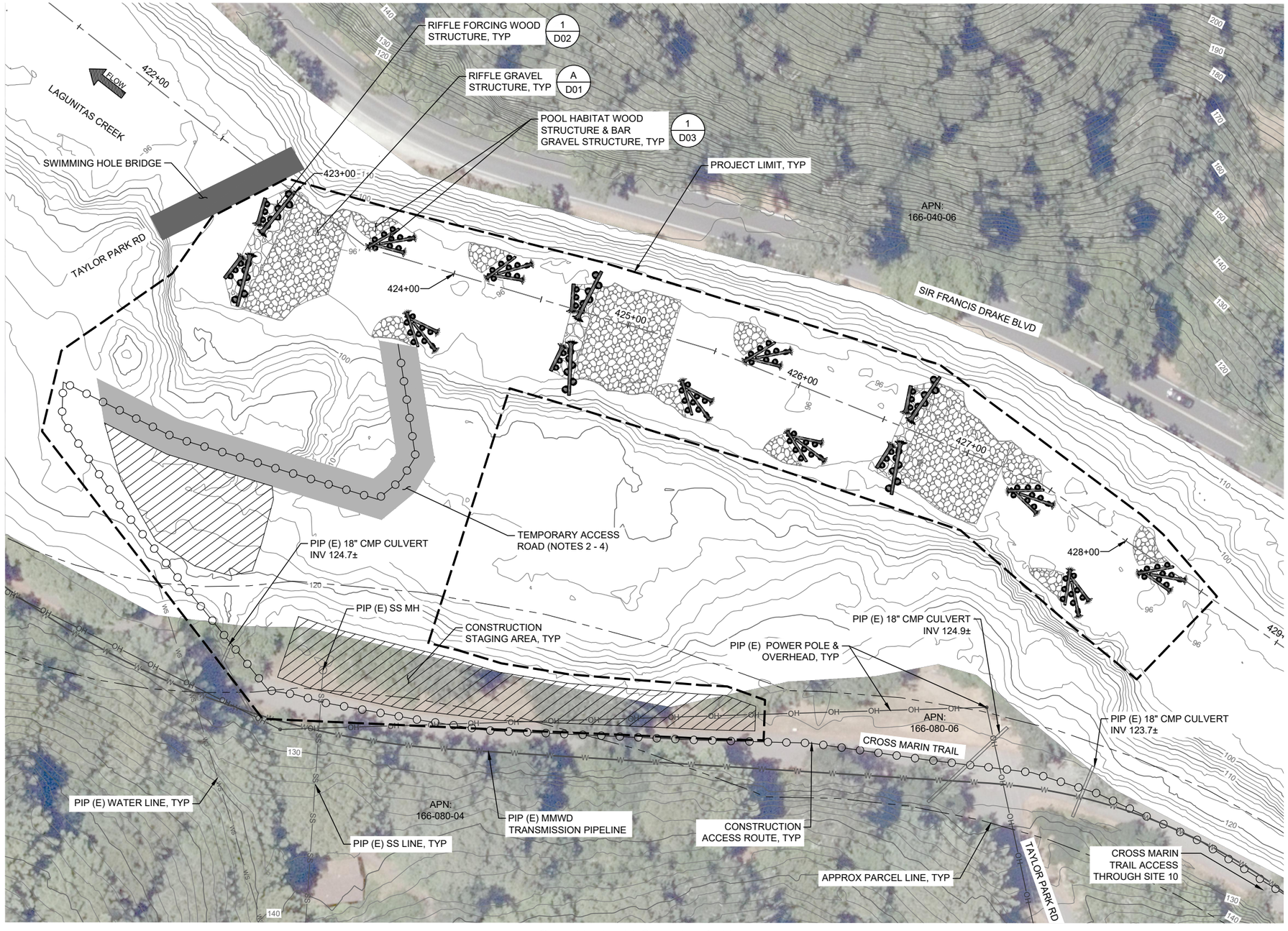
SITE 10
ENHANCEMENT
PLAN

SHEET NUMBER

C10

SHEET 28 OF 36

FILE: P:\01 CAD\2020\xxxxx\D2020010650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\C11-PLAN-SITE10.dwg PLOT DATE: 10/29/2021 1:38:43 PM PLOTTED BY: STEPHANIE CLARKE



SITE 11 ENHANCEMENT PLAN

PLAN SCALE: 1" = 30'

LEGEND

- ROUNDED GRAVEL-COBBLE MIX
- GRAVEL STRUCTURE
- TEMPORARY ACCESS ROAD
- CONSTRUCTION STAGING AREA
- POOL HABITAT WOOD STRUCTURE
- RIFFLE FORCING WOOD STRUCTURE

NOTES

1. WOOD STRUCTURES AND GRAVEL PLACEMENT SHOWN FOR REFERENCE ONLY - ACTUAL QUANTITY AS WELL AS PLACEMENT AND ROTATION TO BE CONFIRMED IN FUTURE DETAILED DESIGN.
2. TEMPORARY ACCESS ROAD FROM EXISTING ROAD OR TRAIL TO CHANNEL TO INCLUDE MINOR GRADING AND DISTURBANCE AS WELL AS MINIMAL IMPORT MATERIAL AS NEEDED FOR STABLE CONSTRUCTION VEHICULAR ACCESS. STOCKPILE NATIVE MATERIALS ON-SITE FOR USE IN RESTORING ACCESS ROUTE TO PRE-PROJECT CONDITION. EXISTING TREES MAY BE REMOVED PENDING APPROVAL BY STATE PARKS. MEASURES MAY BE NEEDED TO PROTECT MATURE REDWOOD ROOTS FROM OVERCOMPACTION OF SOIL. SEE DETAILS 1 AND 2 ON SHEET D04.
3. PROTECTIVE FILL/COVER TO BE PLACED AS NEEDED OVER EXISTING UTILITIES CROSSED BY CONSTRUCTION ACCESS ROUTE TO PREVENT DAMAGE TO UTILITY PIPE AND APPURTENANCES.
4. DOUBLE RAIL CAR TO BE PLACED AS TEMPORARY BRIDGE SPANNING ACROSS EXISTING WOOD FOOT BRIDGE.
5. POTENTIAL CULTURAL AND HISTORICAL STRUCTURES AND RESOURCES ARE YET TO BE LOCATED AND IDENTIFIED IN FUTURE PROJECT PHASES.

N

1"=30' SCALE 30 15 0 30 60 FEET

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PROJECT NAME

MW LAGUNITAS CREEK WATERSHED ENHANCEMENT PLAN

MARIN COUNTY
CALIFORNIA

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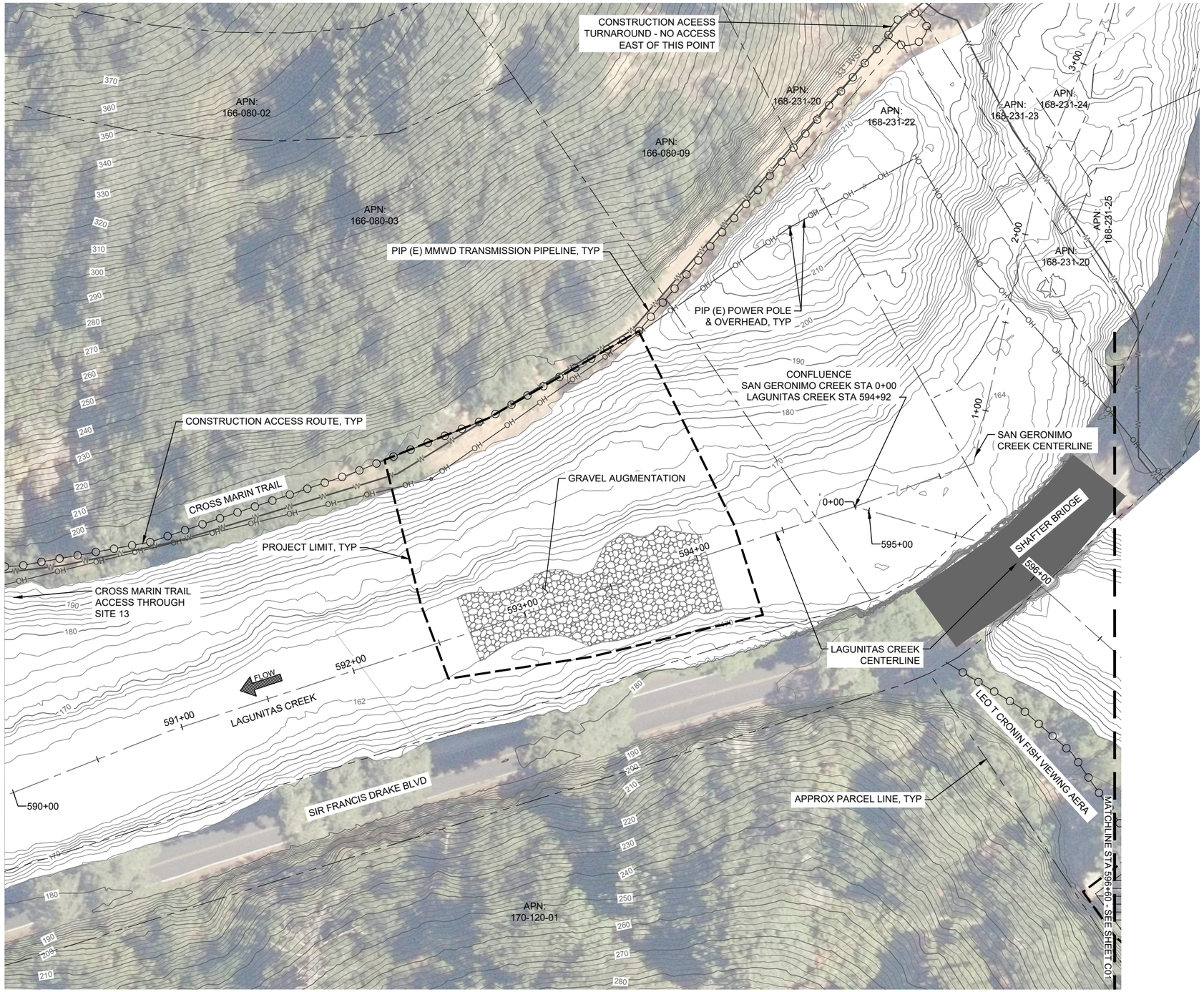
PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE
SITE 11 ENHANCEMENT PLAN

SHEET NUMBER
C11

SHEET 29 OF 36

FILE: P:\01 CAD\2020xxxx\D2020006650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\C12-PLAN-SITE11.dwg PLOT DATE: 10/29/2021 1:39:35 PM PLOTTED BY: STEPHANIE CLARKE



LEGEND

GRAVEL AUGMENTATION

NOTES

1. GRAVEL PLACEMENT SHOWN FOR REFERENCE ONLY - ACTUAL QUANTITY AS WELL AS PLACEMENT AND ROTATION TO BE CONFIRMED IN FUTURE DETAILED DESIGN.
2. LIMITED SITE ACCESS. SITE MUST BE ACCESSED BY CRANE AND/OR SLUICING. CRANE AND/OR GRAVEL SLUICE EQUIPMENT STAGED ON CROSS MARIN TRAIL. EQUIPMENT TO BE A MINIMUM OFFSET FROM MMWD TRANSMISSION PIPELINE. OFFSET WILL BE DETERMINED IN FUTURE DESIGN PHASES.
3. CONSTRUCTION STAGING AREA AT IRVING GROUP PICNIC AREA (SHEET G04) OFF CROSS MARIN TRAIL ON NORTH SIDE OF SIR FRANCIS DRAKE NEAR STA 523+50.

SITE 12 ENHANCEMENT PLAN

PLAN SCALE: 1" = 30'

N

1"=30' 30 15 0 30 60
SCALE FEET

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PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

SITE 12 ENHANCEMENT PLAN

SHEET NUMBER

C12

SHEET 30 OF 36

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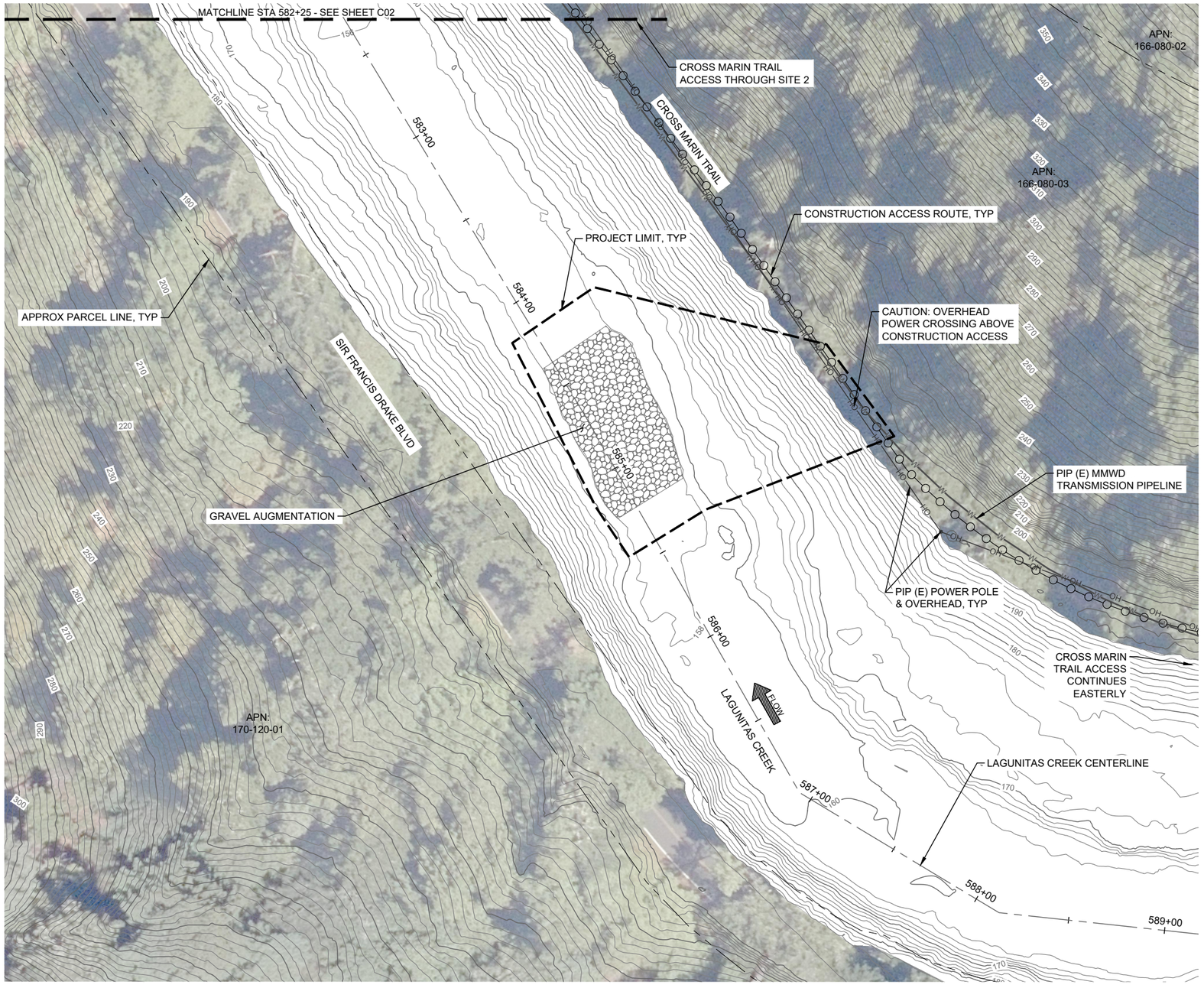

SITE 13 ENHANCEMENT PLAN

PLAN SCALE: 1" = 30'

N

1"=30' 30 15 0 30 60

SCALE FEET

LEGEND

GRAVEL AUGMENTATION

NOTES

1. GRAVEL PLACEMENT SHOWN FOR REFERENCE ONLY - ACTUAL QUANTITY AS WELL AS PLACEMENT AND ROTATION TO BE CONFIRMED IN FUTURE DETAILED DESIGN.
2. LIMITED SITE ACCESS. SITE MUST BE ACCESSED BY CRANE AND/OR SLUICING. CRANE AND/OR GRAVEL SLUICE EQUIPMENT STAGED ON CROSS MARIN TRAIL. EQUIPMENT TO BE A MINIMUM OFFSET FROM MMWD TRANSMISSION PIPELINE. OFFSET WILL BE DETERMINED IN FUTURE DESIGN PHASES.
3. CONSTRUCTION STAGING AREA AT IRVING GROUP PICNIC AREA (SHEET G04) OFF CROSS MARIN TRAIL ON NORTH SIDE OF SIR FRANCIS DRAKE NEAR STA 523+50.

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PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

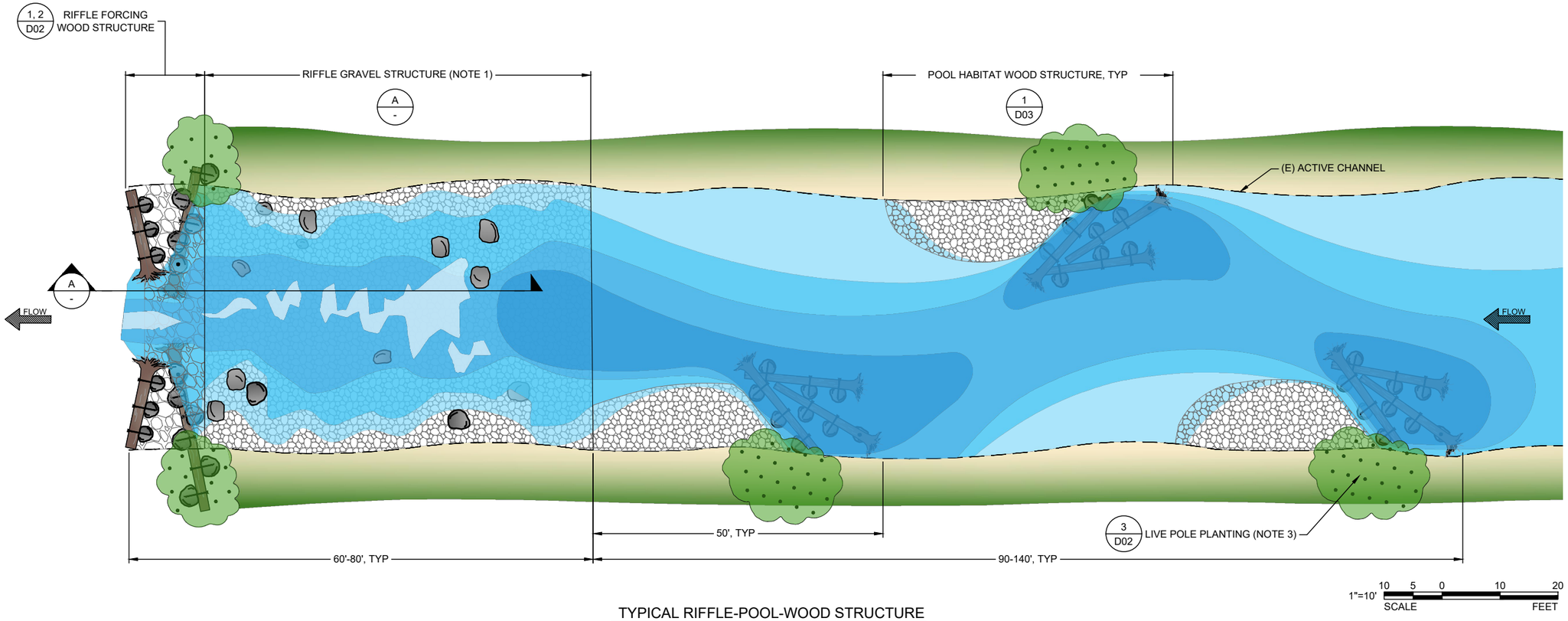
SITE 13 ENHANCEMENT PLAN

SHEET NUMBER

C13

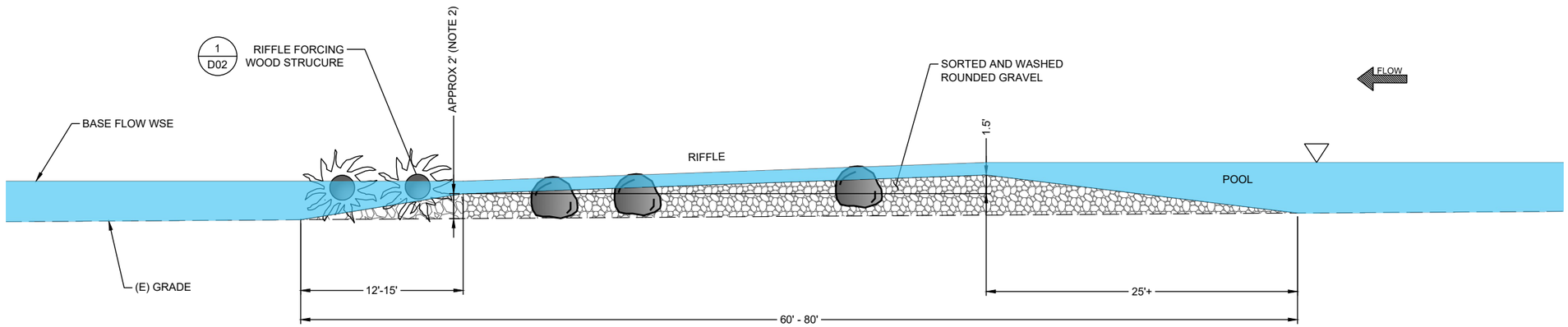
SHEET 31 OF 36

FILE: P:\01 CAD\2020xxxx\D2020006650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\C02-PLAN-SITE1.dwg PLOT DATE: 10/29/2021 1:41:29 PM PLOTTED BY: STEPHANIE CLARKE



TYPICAL RIFFLE-POOL-WOOD STRUCTURE

PLAN VIEW SCALE: 1" = 10'



A RIFFLE GRAVEL STRUCTURE

PROFILE VIEW SCALE: 1" = 5'

NOTES

1. RIFFLE STRUCTURE WILL CONSIST OF WASHED AND SORTED ROUNDED GRAVEL SUITABLE FOR COHO SALMON AND STEELHEAD SPAWNING.
2. HEIGHT OF GRAVEL PLACEMENT WILL DEPEND ON BASE FLOW WSE AT EACH SITE.
3. FOR PROTECTION AGAINST RISK OF FLANKING.

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PHASE

DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

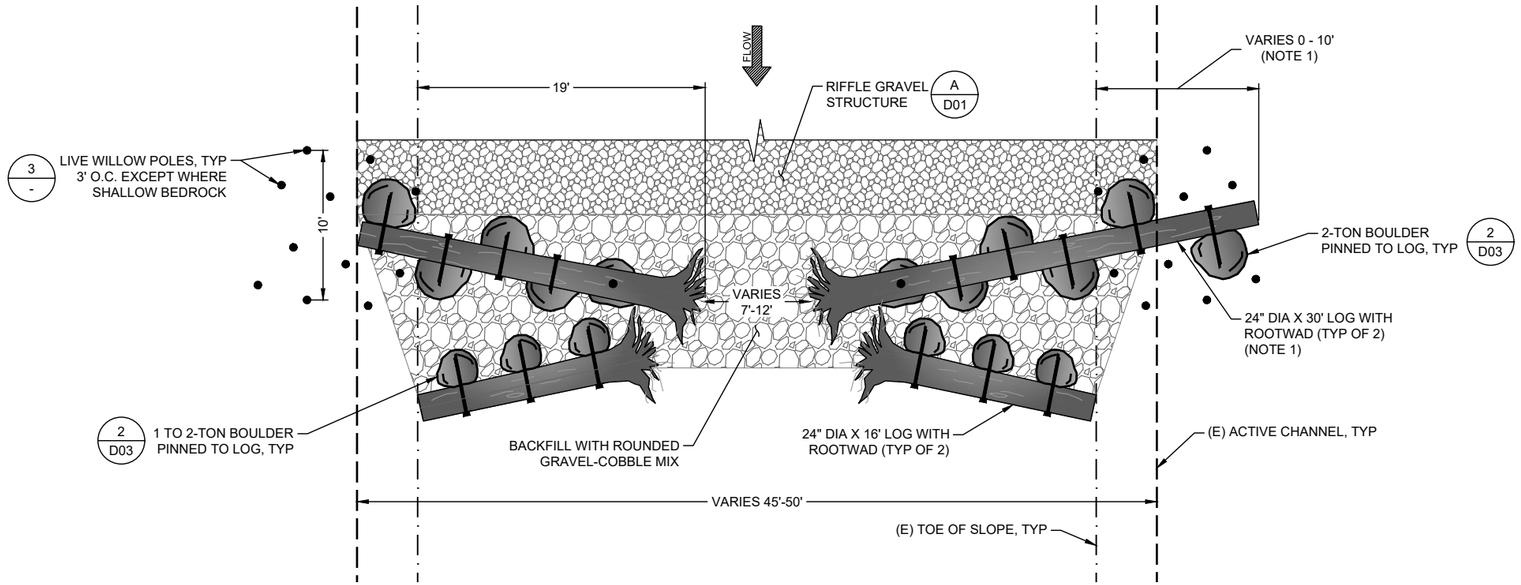
RIFFLE-POOL-WOOD STRUCTURE OVERVIEW - DETAIL

SHEET NUMBER

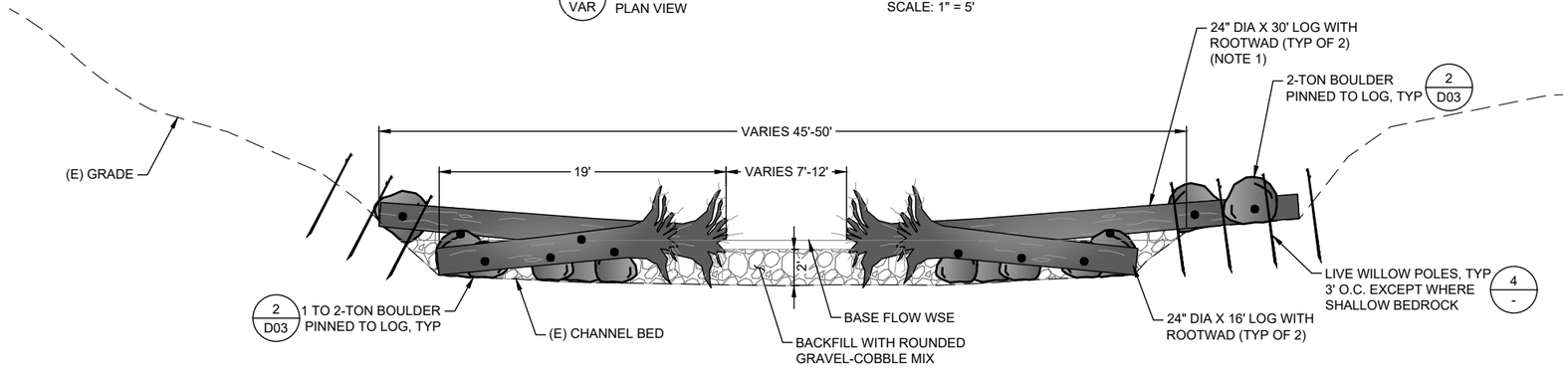
D01

SHEET 32 OF 36

FILE: P:\01 CAD\2020\xxxx\D2\202000650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\D-RIFFL-OVVW.dwg PLOT DATE: 10/29/2021 1:41:44 PM PLOTTED BY: STEPHANIE CLARKE

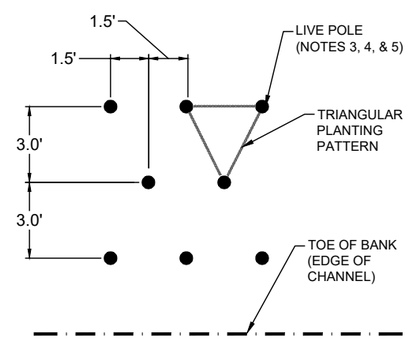


1 VAR **RIFFLE FORCING WOOD STRUCTURE**
PLAN VIEW SCALE: 1" = 5'



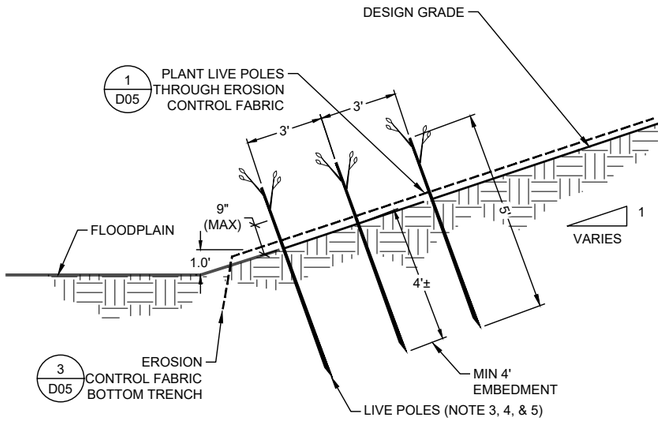
1"=5' 5 2.5 0 5 10
SCALE FEET

2 VAR **RIFFLE FORCING WOOD STRUCTURE**
ELEVATION VIEW SCALE: 1" = 5'



1"=3' 3 1.5 0 3 6
SCALE FEET

3 - **LIVE POLE PLANTING**
PLAN VIEW SCALE: 1" = 3'



1"=3' 3 1.5 0 3 6
SCALE FEET

3A **LIVE POLE PLANTING**
SECTION VIEW SCALE: 1" = 3'

NOTES

1. LENGTH OF UPSTREAM LOG WILL VARY BASED ON SLOPE STEEPNESS ABOVE THE CHANNEL.
2. LOG CONFIGURATION, DIMENSIONS AND BALLASTING IS PRELIMINARY. TO BE REFINED IN NEXT SUBMITTAL BASED ON STABILITY ANALYSIS.
3. BRANCHES SHALL BE A MINIMUM OF 50% LIVE WILLOWS. REMAINING 50% MAY BE OTHER NATIVE SPECIES AND NON-LIVING.
4. NATIVE WOOD PIECES SHALL BE HARVESTED DURING CLEAR AND GRUBBING AND STOCKPILED FOR PLACEMENT AFTER EROSION CONTROL MEASURES HAVE BEEN IMPLEMENTED.
5. CONTRACTOR SHALL STRIP ALL LEAVES FROM LIVE POLES PRIOR TO INSTALLATION.

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MARIN COUNTY
CALIFORNIA

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PHASE
DRAFT 30% DESIGN DRAWINGS

SHEET TITLE
RIFFLE FORCING WOOD STRUCTURE - DETAIL

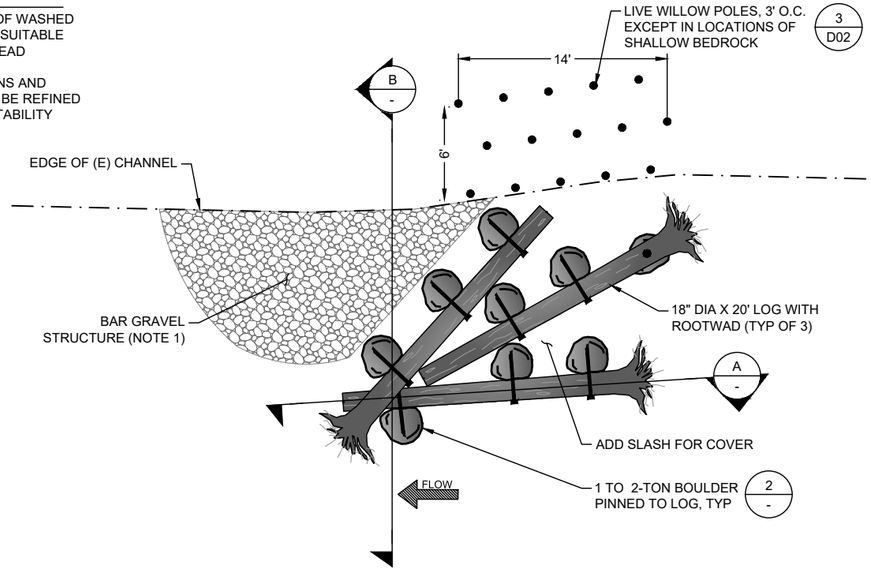
SHEET NUMBER
D02

SHEET 33 OF 36

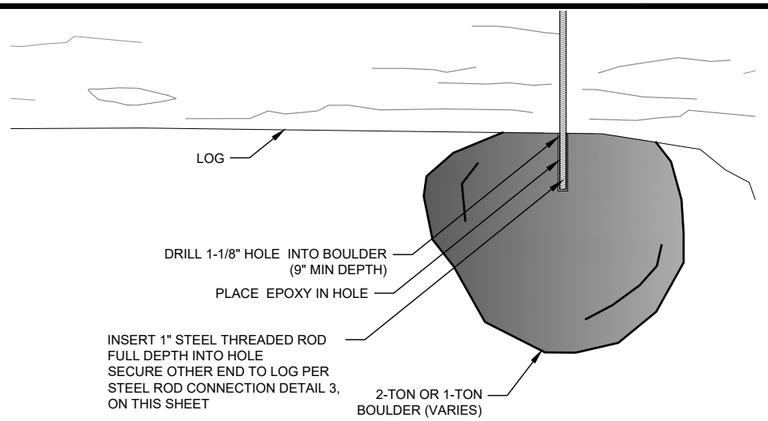
FILE: P:\01 CAD\2020\xxxx\D2\202000650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\D-FWOOD.dwg PLOT DATE: 10/29/2021 1:41:57 PM PLOTTED BY: STEPHANIE CLARKE

NOTES

1. BAR STRUCTURE WILL CONSIST OF WASHED AND SORTED ROUNDED GRAVEL SUITABLE FOR COHO SALMON AND STEELHEAD SPAWNING.
2. LOG CONFIGURATION, DIMENSIONS AND BALLASTING IS PRELIMINARY. TO BE REFINED IN NEXT SUBMITTAL BASED ON STABILITY ANALYSIS.

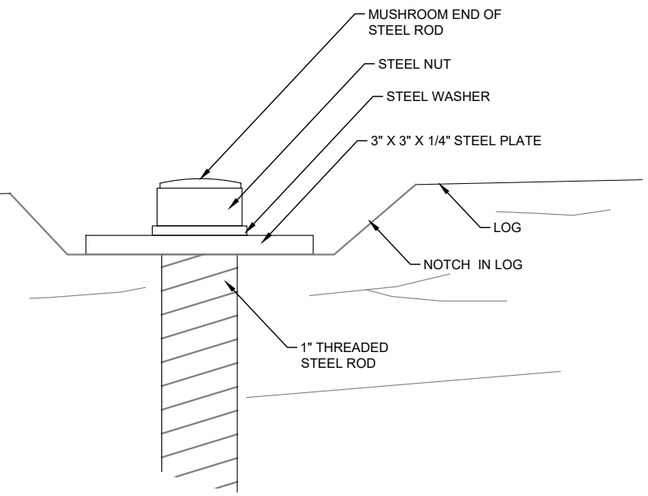


1 VAR POOL HABITAT WOOD STRUCTURE
PLAN VIEW SCALE: 1" = 5'



1"=1' SCALE 1 0.5 0 1 2 FEET

2 VAR LOG TO BOULDER PINNING - REBAR
TYPICAL DETAIL SCALE: 1" = 1'



3 VAR STEEL ROD CONNECTION
TYPICAL DETAIL SCALE: 1" = 1"

1"=5' SCALE 5 2.5 0 5 10 FEET

A - POOL HABITAT WOOD STRUCTURE
PROFILE VIEW SCALE: 1" = 5'

1"=5' SCALE 5 2.5 0 5 10 FEET

B - POOL HABITAT WOOD STRUCTURE
SECTION VIEW SCALE: 1" = 5'

4 - LOG TO BOULDER PINNING "ALTERNATIVE" - CHAIN
TYPICAL DETAIL SCALE: 1" = 1'

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PHASE
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SHEET TITLE

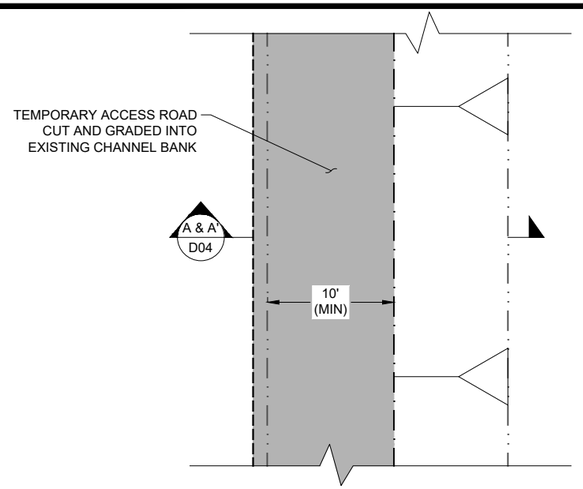
POOL HABITAT WOOD STRUCTURE - DETAIL

SHEET NUMBER

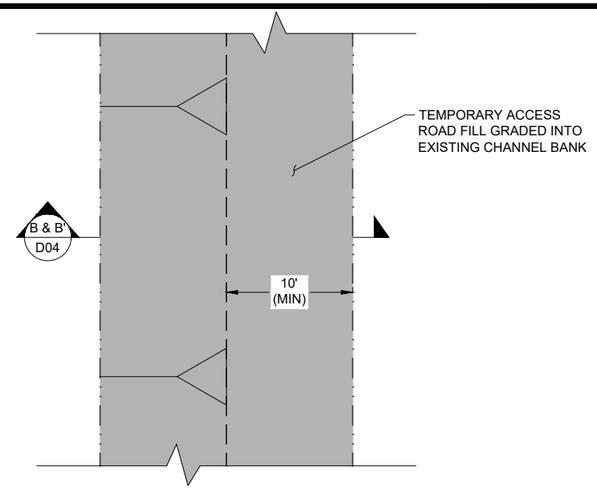
D03

SHEET 34 OF 36

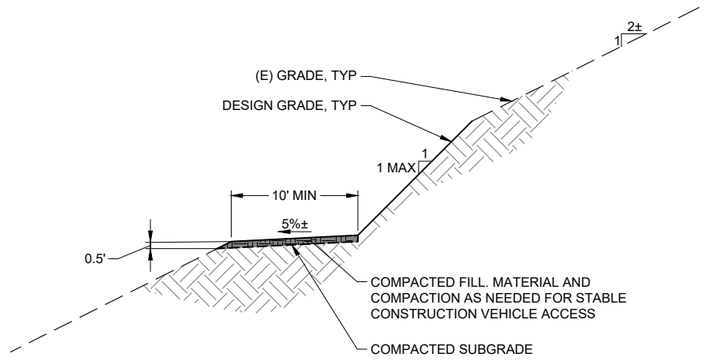
FILE: P:\01 CAD\2020\xxxx\D2\202000650.00 - MMWD Lagunitas Creek Watershed Enhancement Plan\DWG\D-PHABITAT.dwg PLOT DATE: 10/29/2021 1:42:09 PM PLOTTED BY: STEPHANIE CLARKE



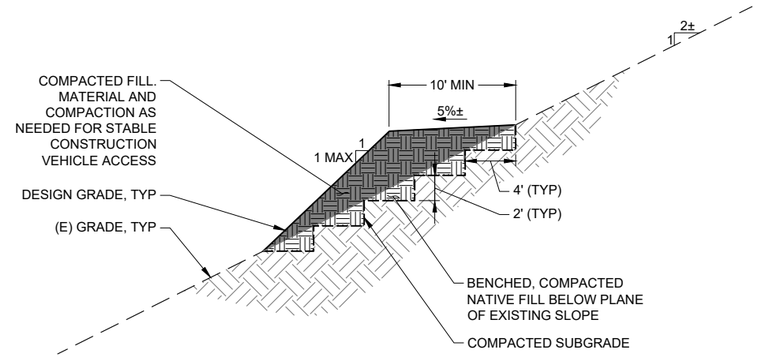
1 / - TEMPORARY ACCESS ROAD TYPE 1 - CUT
PLAN SCALE: 1" = 6'



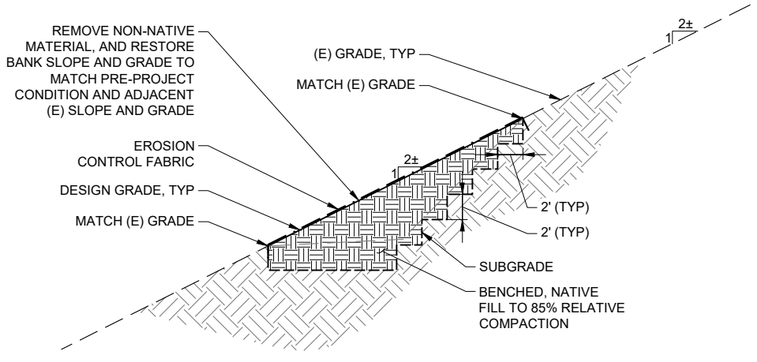
2 / - TEMPORARY ACCESS ROAD TYPE 2 - FILL
PLAN SCALE: 1" = 6'



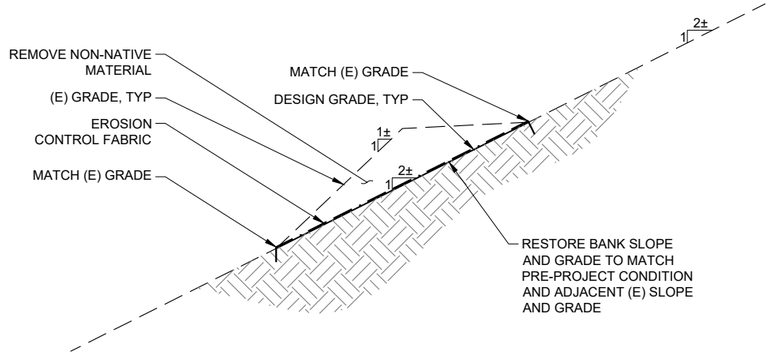
A / - TEMPORARY ACCESS ROAD TYPE 1 - CUT
SECTION SCALE: 1" = 6'



B / - TEMPORARY ACCESS ROAD TYPE 2 - FILL
SECTION SCALE: 1" = 6'



A' / - RESTORED SLOPE TYPE 1 - FILL
SECTION SCALE: 1" = 6'



B' / - RESTORED SLOPE TYPE 2 - CUT
SECTION SCALE: 1" = 6'

NOTES

1. TEMPORARY ACCESS ROUTE FROM EXISTING ROAD OR TRAIL TO CHANNEL TO INCLUDE MINOR GRADING AND DISTURBANCE AS WELL AS PLACEMENT OF IMPORTED MATERIAL AS NEEDED FOR STABLE DRIVING SURFACE.
2. EXISTING GROUND COVERING (INCLUDING DUFF) TO BE SCARIFIED AND STOCKPILED ON-SITE.
3. EXISTING TREES MAY BE REMOVED PENDING APPROVAL BY STATE PARKS. ANY TREES REQUIRING REMOVAL SHALL BE CHIPPED AND STOCKPILED ON-SITE.
4. UPON COMPLETION OF CONSTRUCTION, NON-NATIVE MATERIAL TO BE REMOVED AND OFF-HAULED. ORIGINAL TOPOGRAPHY TO BE GRADED, AND DISTURBED AREA TO BE RESTORED WITH NATIVE MATERIAL COVERING INCLUDING STOCKPILED WOODCHIPS AND DUFF.
5. NO IMPORTED MATERIAL TO BE USED IN RESTORING CONDITION EXCEPT FOR BIODEGRADABLE EROSION CONTROL FABRIC.
6. MEASURES MAY BE NEEDED TO PROTECT MATURE REDWOOD ROOTS FROM OVERCOMPACTION.

1"=6' SCALE 6 3 0 6 12 FEET

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SHEET TITLE
TEMPORARY ACCESS ROAD - DETAIL

SHEET NUMBER
D04

SHEET 35 OF 36

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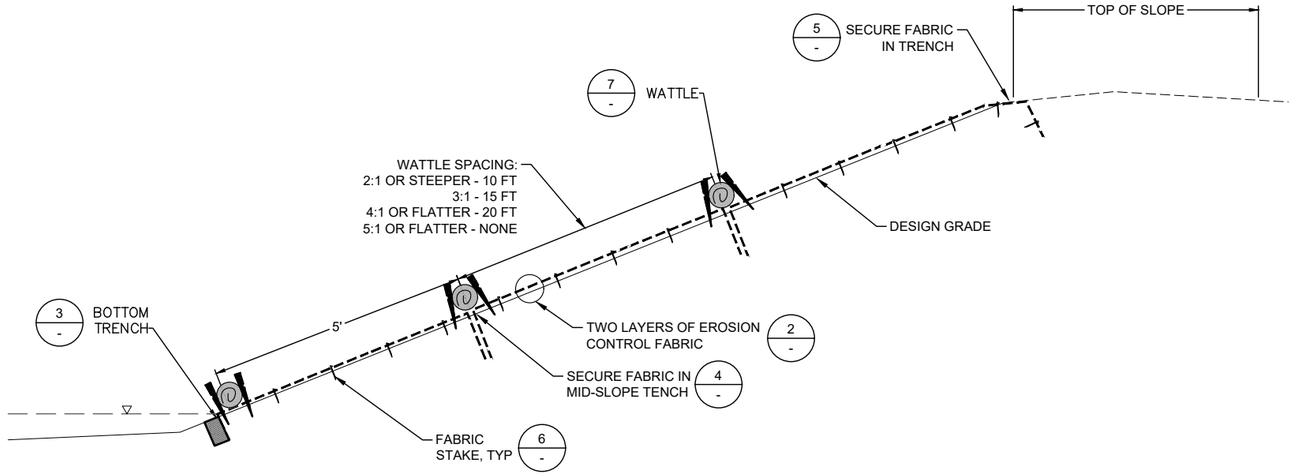


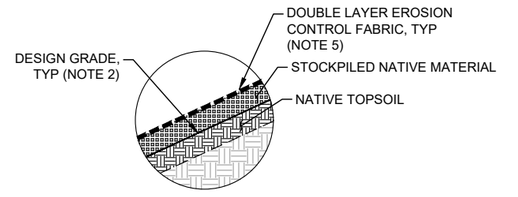
1 - EROSION CONTROL FABRIC

SECTION VIEW

NOT TO SCALE

NOTES

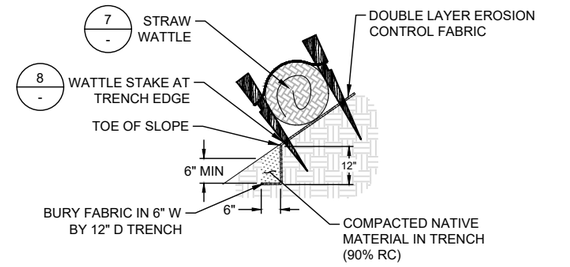
1. THIS SHEET SHOWS MINIMUM REQUIRED EROSION CONTROL MEASURES. INSTALL ADDITIONAL MEASURES AS NEEDED FOR EROSION CONTROL AND SWPPP COMPLIANCE AS DIRECTED BY THE OWNER'S REPRESENTATIVE.
2. FINISH GRADE SURFACE SHALL BE CLEARED OF LOOSE ROCKS, CLODS, STICKS AND GRASS BEFORE FABRIC INSTALLATION.
3. LIMITS OF FLOODPLAIN SLOPE VARY. PRIOR TO INSTALLATION OF EROSION CONTROL FABRIC, CONTRACTOR SHALL STAKE LIMIT FLOODPLAIN BENCHES AND SLOPES AND VERIFY WITH OWNER'S REPRESENTATIVE. EROSION CONTROL FABRIC SHALL BE INSTALLED ON ALL DISTURBED OR CUT-FLOODPLAIN SLOPES.
4. TRACK WALK SLOPE PRIOR TO EROSION CONTROL PER SPECIFICATIONS.
5. PLACE TWO (2) LAYERS OF C125BN (OR APPROVED EQUIVALENT) EROSION CONTROL FABRIC PER SPECIFICATIONS.
6. LAY FABRIC LOOSELY AND STAKE 2' OC (VERTICAL) AND 2' OC (HORIZONTAL) TO MAINTAIN DIRECT CONTACT WITH THE FINISH GRADE SURFACE. DO NOT STRETCH.
7. FABRIC SHALL BE EXTENDED MIN 2' LATERALLY FROM THE TOP OF BANK, SECURED PER DETAILS 1 AND 5, THIS SHEET.
8. INSTALL BOTTOM TRENCH AT TOE OF SLOPE.
9. INSTALL AND MAINTAIN SILT FENCE ALONG THE PROJECT LIMIT LINE AT TOP OF THE ACTIVE CHANNEL DURING BENCH GRADING. SILT FENCE LOCATIONS SHALL BE VERIFIED BY OWNER'S REPRESENTATIVE PRIOR TO INSTALLATION.
10. ALL EROSION CONTROL WORK SHALL BE COMPLETED BY OCTOBER 15TH.



2 - FABRIC

SECTION VIEW

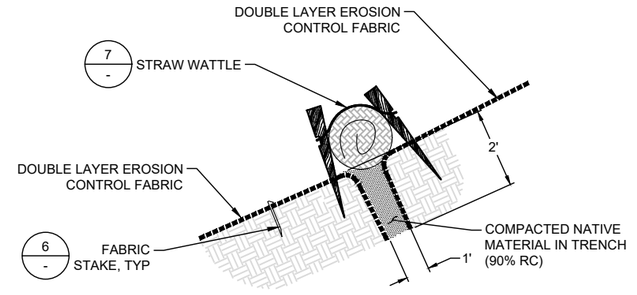
SCALE: 1" = 2'



3 - BOTTOM TRENCH DETAIL

SECTION VIEW

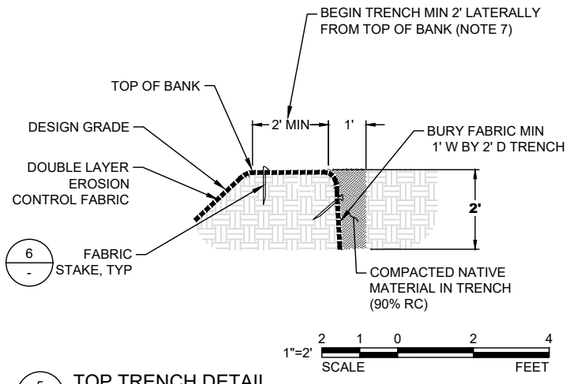
SCALE: 1" = 2'



4 - MID-SLOPE TRENCH DETAIL

SECTION VIEW

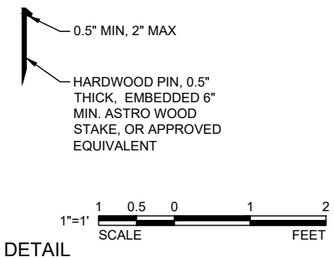
SCALE: 1" = 2'



5 - TOP TRENCH DETAIL

SECTION VIEW

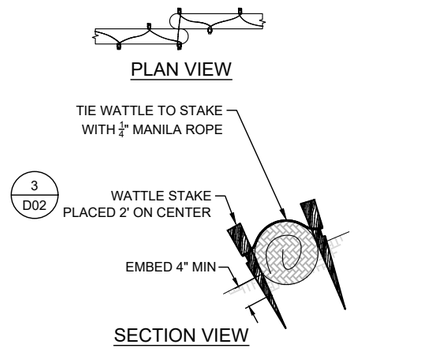
SCALE: 1" = 2'



6 - FABRIC STAKE DETAIL

SECTION VIEW

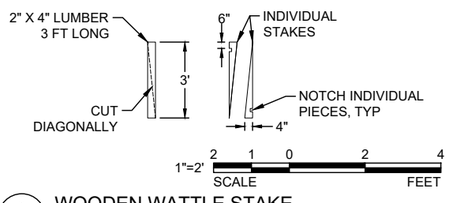
SCALE: 1" = 1'



7A - WATTLE DETAIL

DETAIL

NOT TO SCALE



8 - WOODEN WATTLE STAKE

FABRICATION DETAIL

SCALE: 1" = 2'

ESA
180 GRAND AVENUE,
SUITE 1050
OAKLAND, CA 94612
OFFICE - 415.896.5900
WWW.ESASSOC.COM

STAMP

PRELIMINARY
-
NOT FOR
CONSTRUCTION

CLIENT

MARIN WATER

PROJECT NAME

MW LAGUNITAS
CREEK WATERSHED
ENHANCEMENT PLAN

MARIN COUNTY
CALIFORNIA

REVISIONS

#	DATE	DESCRIPTION

DESIGNED	LMW/JQW
DRAWN	SVC
CHECKED	AEB
IN CHARGE	M. LANDICHO C86515
PROJECT NUMBER	202000650.00
ISSUE DATE	11/12/2021

SCALE IS AS SHOWN WHEN PLOTTED TO FULL SIZE (22"x34")

PHASE

DRAFT 30% DESIGN DRAWINGS

SHEET TITLE

EROSION CONTROL - DETAIL

SHEET NUMBER

D05

SHEET 36 OF 36

Attachment F

30%-Complete Design Estimate of Anticipated Construction Costs

ESA

BY: ENVIRONMENTAL SCIENCE ASSOCIATES
LAGUNITAS CREEK WATERSHED ENHANCEMENT PLAN
DRAFT 30% DESIGN OPINION OF PROBABLY COSTS

11/15/2021

			SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8	SITE 9	SITE 10	SITE 11	SITE 12	SITE 13	Total
NO.	**ITEM**	**UNIT OF**	**QUANTITY**													
1	MOBILIZATION/DEMOBILIZATION	LUMP SUM	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	SWPPP & COMPLIANCE	LUMP SUM	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	CLEARING AND GRUBBING	SQUARE FOOT	1,120	1,980	3,320	3,420	0	2,500	1,700	1,060	1,720	0	5,140	0	0	21,960
4	WATER CONTROL & DIVERSION	LUMP SUM	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	STAGING AREA FENCING & POSTS	LINEAR FOOT	140	210	160	90	90	90	190	190	280	280	850	90	90	2,750
6	STAGING AREA RESTORATION	SQUARE FOOT	930	1,320	420	850	850	850	2,800	2,800	5,300	5,300	10,990	850	850	34,110
7	EXISTING UTILITY, STRUCTURE AND TRAIL FACILITY PROTECTION	LUMP SUM	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	TEMPORARY ACCESS ROAD CONSTRUCTION & RESTORATION	LINEAR FOOT	56	99	166	171	0	125	85	53	86	0	257	0	0	1,098
9	TEMPORARY CRANE STAGING & ACCESS (SITES 10, 12 & 13)	LUMP SUM	-	-	-	-	-	-	-	-	-	1	-	1	1	1
10	TEMPORARY CHANNEL BED PROTECTION FOR SITE 5 INTER-SITE ACCESS	LUMP SUM	-	-	-	-	1	-	-	-	-	-	-	-	-	1
11	TRAIL RESTORATION & REPAIR ALONG ACCESS ROUTE	LINEAR FOOT	239	1,133	862	587	587	185	1,935	524	1,912	1,912	2,792	2,384	1,465	16,517
12	RIFFLE GRAVEL STRUCTURE	CUBIC YARD	387	400	539	435	395	555	389	234	425	0	644	0	0	4,403
13	RIFFLE FORCING WOOD STRUCTURE	EACH	0	2	3	2	2	3	2	1	2	0	3	0	0	20
14	POOL HABITAT WOOD STRUCTURE	EACH	3	6	9	6	6	9	6	2	6	4	9	0	0	66
15	GRAVEL AUGMENTATION (SITES 12 & 13)	CUBIC YARD	-	-	-	-	-	-	-	-	-	-	-	690	483	1,172
16	SITE 8 CULVERT MODIFICATION	LUMP SUM	-	-	-	-	-	-	-	1	-	-	-	-	-	1
17	SITE 8 SEDIMENT REMOVAL & RESTORATION	LUMP SUM	-	-	-	-	-	-	-	1	-	-	-	-	-	1

BY: ENVIRONMENTAL SCIENCE ASSOCIATES
LAGUNITAS CREEK WATERSHED ENHANCEMENT PLAN
DRAFT 30% DESIGN OPINION OF PROBABLY COSTS

11/15/2021

NO.	ITEM	UNIT COST	UNIT	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8	SITE 9	SITE 10	SITE 11	SITE 12	SITE 13	Total
				COST													
1	MOBILIZATION/DEMOBILIZATION	-	-	$22,600	$38,800	$58,500	$43,200	$43,800	$56,800	$38,900	$42,900	$39,800	$18,100	$70,900	$21,100	$15,300	$510,700
2	SWPPP & COMPLIANCE	-	LS	$3,620	$5,050	$4,590	$3,160	$3,160	$3,930	$4,860	$5,630	$4,920	$4,150	$11,750	$2,390	$2,390	$59,600
3	CLEARING AND GRUBBING	$1.70	SF	$1,904	$3,366	$5,644	$5,814	$0	$4,250	$2,890	$1,802	$2,924	$0	$8,738	$0	$0	$37,332
4	WATER CONTROL & DIVERSION	-	LS	$57,000	$57,000	$113,000	$85,000	$141,000	$113,000	$57,000	$57,000	$57,000	$57,000	$113,000	$29,000	$29,000	$965,000
5	STAGING AREA FENCING & POSTS	$8	LF	$1,120	$1,680	$1,280	$720	$720	$720	$1,520	$1,520	$2,240	$2,240	$6,800	$720	$720	$22,000
6	STAGING AREA RESTORATION	$0.20	SF	$186	$264	$84	$170	$170	$170	$560	$560	$1,060	$1,060	$2,198	$170	$170	$6,822
7	EXISTING UTILITY, STRUCTURE AND TRAIL FACILITY PROTECTION	-	LS	$0	$5,600	$5,900	$2,300	$0	$5,100	$5,100	$7,200	$5,500	$7,100	$47,500	$3,800	$1,700	$96,800
8	TEMPORARY ACCESS ROAD CONSTRUCTION & RESTORATION	$250	LF	$14,000	$24,750	$41,500	$42,750	$0	$31,250	$21,250	$13,250	$21,500	$0	$64,250	$0	$0	$274,500
9	TEMPORARY CRANE STAGING & ACCESS (SITES 10, 12 & 13)	-	LS	-	-	-	-	-	-	-	-	-	$9,400	-	$5,600	$2,400	$17,400
10	TEMPORARY CHANNEL BED PROTECTION FOR SITE 5 INTER-SITE ACCESS	-	LS	-	-	-	-	$9,800	-	-	-	-	-	-	-	-	$9,800
11	TRAIL RESTORATION & REPAIR ALONG ACCESS ROUTE	$10	LF	$2,390	$11,330	$8,620	$5,870	$5,870	$1,850	$19,350	$5,240	$19,120	$19,120	$27,920	$23,840	$14,650	$165,170
12	RIFFLE GRAVEL STRUCTURE	$220	CY	$85,140	$88,000	$118,580	$95,700	$86,900	$122,100	$85,580	$51,480	$93,500	$0	$141,680	$0	$0	$968,660
13	RIFFLE FORCING WOOD STRUCTURE	$35,000	EA	$0	$70,000	$105,000	$70,000	$70,000	$105,000	$70,000	$35,000	$70,000	$0	$105,000	$0	$0	$700,000
14	POOL HABITAT WOOD STRUCTURE	$20,000	EA	$60,000	$120,000	$180,000	$120,000	$120,000	$180,000	$120,000	$40,000	$120,000	$80,000	$180,000	$0	$0	$1,320,000
15	GRAVEL AUGMENTATION (SITES 12 & 13)	$210	CY	-	-	-	-	-	-	-	-	-	-	-	$144,828	$101,379	$246,207
16	SITE 8 CULVERT MODIFICATION	-	LS	-	-	-	-	-	-	-	$200,000	-	-	-	-	-	$200,000
17	SITE 8 SEDIMENT REMOVAL & RESTORATION	-	LS	-	-	-	-	-	-	-	$9,400	-	-	-	-	-	$9,400
			SUBTOTAL	**$247,960**	**$425,840**	**$642,698**	**$474,684**	**$481,420**	**$624,170**	**$427,010**	**$470,982**	**$437,564**	**$198,170**	**$779,736**	**$231,448**	**$167,709**	**$5,609,391**
			CONTINGENCY (+35%)	$86,786	$149,044	$224,944	$166,139	$168,497	$218,460	$149,454	$164,844	$153,147	$69,360	$272,908	$81,007	$58,698	$1,963,287
			TOTAL	**$334,746**	**$574,884**	**$867,642**	**$640,823**	**$649,917**	**$842,630**	**$576,464**	**$635,826**	**$590,711**	**$267,530**	**$1,052,644**	**$312,454**	**$226,408**	**$7,572,678**

Notes:

1. For planning purposes, we have provided order of magnitude estimates to allow cost comparison of alternatives. These cost estimates are intended to provide an approximation of total project construction costs appropriate for the conceptual level of design. These cost estimates are considered to be approximately +/-30% accurate and include a 35% contingency to account for project uncertainties (such as final design, permitting restrictions and bidding climate).
2. In providing opinions of probable construction costs, ESA has no control over the actual costs. Additionally, the actual costs of construction may be impacted by the time of construction, availability of construction equipment and crews, and fluctuation of supply prices when the work is bid.
3. These estimates are subject to refinement and revisions as the design is developed in future stages of the project.
4. This table does not include estimated project costs for permitting, design, construction management, monitoring, or ongoing maintenance.
5. Estimated costs are presented in 2024 dollars, assuming a 3% annual escalation from 2021 dollars.
6. This opinion of probable construction cost is based on ESA's previous project experience and bid prices from similar projects.
7. Cost for the SWPPP is based on a shared construction general permit with the State Water Resources Control Board for all sites and temporary BMP application and maintenance at each site.
8. Water control and diversion assumes one (1) construction season and separate stagings per site up to a maximum length of 500 feet per staging.
9. Wood structure unit costs include material cost of logs. Log structures and orientation on ESA 30% designs are schematic and subject to refinement. Riffle Forcing and Pool Habitat Wood structure quantities include 25% contingency.
10. Live pole planting quantities are estimated for potential bank stabilization needs to be determined based on bank slope and hydraulic results of velocity and shear stress from future modelling.