RESOLUTION NO. 55-21

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF RICHMOND, CALIFORNIA, ADOPTING THE FINAL MITIGATED NEGATIVE DECLARATION AND MITIGATION MONITORING AND REPORTING PROGRAM FOR THE VIA VERDI SLOPE STABILIZATION PROJECT AND INITIATING AND AUTHORIZING THE CONSTRUCTION PHASE OF THE PROJECT

WHEREAS, on May 4, 2012, the City Council of the City of Richmond (the "City Council") adopted the Richmond General Plan 2030 (the "General Plan"), which establishes the goals, policies and implementing actions for development of the City of Richmond; and

WHEREAS, Policy SN.1 of the General Plan calls for the City to minimize risk of injury, loss of life and property damage from seismically induced and other known geologic hazards, and Policy SN3.1 Emergency and Disaster Preparedness requires the City to maintain staff and facilities that will continue to support a coordinated and effective response to emergencies and natural disasters; and

WHEREAS, the City of Richmond staff, on August 25, 2017, applied to the Federal Emergency Management Agency (FEMA) to provide emergency funding of the Via Verdi Slope Stabilization Project (Project) administered by the California Governor's Office of Emergency Services under Presidential Major Disaster Declaration FEMA-4308-DR-CA for winter storm events occurring in February/March 2017; and

WHEREAS, the City of Richmond was awarded planning and construction funds in the amount of $63,000 by the FEMA Public Assistance Program for the purposes of implementing the Project; and

WHEREAS, pursuant to the responsibility given to the Planning Director of the City of Richmond by City Council Resolution 125-03 for the general administration of the California Environmental Quality Act (CEQA), and the State CEQA Guidelines, and in accordance with CEQA of 1970 as amended, an Initial Study and Draft Mitigated Negative Declaration (DMND) was prepared by NCE on October 23, 2019, for the Project: for which a Notice of Intent was published on October 23, 2019, announcing a thirty (30) day public comment period; and

WHEREAS, during the comment period five comments were received on the DMND; and

WHEREAS, following the public comment period, a final Mitigated Negative Declaration was prepared. The final MND includes a response to comments memorandum attached (Exhibit A, attached hereto). As required by CEQA, a Mitigation Monitoring and Reporting Program (MMRP) has been prepared to report on and monitor the changes which are required to mitigate or avoid significant environmental effects (Exhibit B, attached hereto); and

WHEREAS, no "substantial revisions" to the Draft MND were required as defined in Section 15073.5(b) of the CEQA Guidelines, the MND is not subject to recirculation prior to adoption; and

WHEREAS, on May 4, 2021, the Richmond City Council held a public meeting to consider adoption of the final MND.

NOW, THEREFORE, BE IT RESOLVED that, after hearing all interested persons and considering all relevant evidence, the Council finds and determines as follows:

1. The Project Final MND, consisting of the Draft MND and Responses to Comments in Exhibit A, and the Mitigation Monitoring and Reporting Program in Exhibit B, have been completed in accordance with the requirements of the California Environmental Quality Act, and the State CEQA Guidelines (14 Cal. Code Regs Section 15000et.seq);
2. The MND for the project was prepared, published, circulated and reviewed in accordance with the requirements of CEQA, and the State CEQA Guidelines, and

constitutes an adequate, accurate, objective, and complete MND in accordance with the requirement of CEQA statues and the State CEQA Guidelines;

3. The MND for the project has been reviewed and found adequate by the City Council prior to authorizing the initiation of the bidding process for the work, and the MND reflects the independent judgment and analysis of the City; and
4. The Initial Study for the Project identifies potentially significant effects on the environment; however, revisions to the Project and incorporation of the mitigation measures in the Project will reduce any and all significant adverse environmental impacts to a less-than-significant level. There is no substantial evidence in the record that the resulting Project in light of the whole record before the Council that will have a significant effect on the environment.

BE IT FURTHER RESOLVED that the City Council does hereby adopt the Mitigated Negative Declaration, which consists of the Draft MND and Responses to Comments, and MMRP dated October 2019.

BE IT FURTHER RESOLVED that the City Council does hereby accept and appropriate the Presidential Major Disaster Declaration: FEMA-4308-DR-CA grant funds to commence with the public bid process for Project construction, and appoints the City Manager, or her designee, as agent to administer, conduct all negotiations, execute and submit all documents including, but not limited to agreements, payment requests and so on, which may be necessary for the completion of the aforementioned project.

BE IT FURTHER RESOLVED that the City Council designates the City Clerk as the custodian of the documents and other materials which constitute the record of proceedings upon which the decision herein is based. These documents may be found at the office of the City Clerk at the Richmond City Hall, 450 Civic Center Plaza, Richmond, California 94804.

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I certify that the foregoing resolution was passed and adopted by the Council of the City of Richmond at a regular meeting thereof held May 18, 2021, by the following vote:

AYES:	Councilmembers Bates, Jimenez, Martinez, McLaughlin, Willis, Vice Mayor Johnson III, and Mayor Butt.
NOES:	None.
ABSTENTIONS:	None.
ABSENT:	None.

PAMELA CHRISTIAN
CLERK OF THE CITY OF RICHMOND
(SEAL)

Approved:

THOMAS K. BUTT
Mayor

Approved as to form:

TERESA STRICKER
City Attorney

State of California }
County of Contra Costa : ss.
City of Richmond }

I certify that the foregoing is a true copy of **Resolution No. 55-21**, finally passed and adopted by the City Council of the City of Richmond at a regular meeting held on May 18, 2021.

Pamela Christian, Clerk of the City of Richmond

Via Verdi Slope Stabilization Project – CEQA IS/MND

Response to Comments

In accordance with CEQA Guidelines Section 15073, the Via Verdi Slope Stabilization Project Initial Study/ Mitigated Negative Declaration (IS/MND) was circulated for review for 30 days beginning on October 28, 2019 and ending on November 26, 2019. Within the 30-day comment period, three agencies provided comment to the City of Richmond. One comment letter was received after the closing of the comment period and although not required by CEQA (State CEQA Guidelines § 15073 and PRC § 21091), responses are provided. No comments from individuals of the public were received. Copies of each of the four agency comments are included (**Attachment 1**). Responses to each comment are provided in the order which they were received, following each summarized comment:

Comment 1. Contra Costa Mosquito & Vector Control District (CCMVCD), received 11/7/2019: *Potential impacts to human health by disease vectors is not properly addressed under CEQA – an oversight that has created problems for mosquito abatement and vector control agencies throughout California. The analysis for a project should consider evidence of potential environmental impacts, even if such impacts are not specifically addressed on the Appendix G checklist. To determine whether Public Health & Safety may be significantly impacted, lead agencies should refer to the California Health and Safety Code section 2000-2093 for definitions and liabilities associated with the creation of habitat conducive to vector production and to guidance provided by local mosquito and vector control districts/agencies in their determination of environmental impacts. Would the project:*

a. *Increase the potential exposure of the public to disease vectors (e.g., mosquitos, ticks, flies, and rats)?*
b. *Increase potential mosquito/vector breeding habitat (i.e., areas of prolonged standing/ponded water like wetlands or stormwater treatment control BMPs and LID features)?*

Response 1a, 1b: Construction of a culvert within San Pablo Creek would not create habitat conducive to disease vectors, as the intent of the culvert is to convey flowing water within the creek as to not cause ponding or capture of debris and trash which would attract vectors. Additionally, implementation of the proposed mitigation plan, the *Rheem Creek Restoration Planting Plan*, would improve water flows within Rheem Creek by removing overgrowth of invasive species, allowing for better conveyance of

water through the area. Trash and/or debris that may attract vectors would also be removed, resulting in a beneficial effect to vector control.

The project does not include permanent stormwater features that would increase potential breeding habitat for vectors, such as construction of a basin or water retention area, or creation of wetlands; therefore, the project is not anticipated to increase the potential exposure of the public to disease vectors.

Comment 2. East Bay Municipal Utility District (EBMUD), received 11/25/2019: *EBMUD owns and operates distribution pipelines in the public ROW of Via Verdi, which provides continuous service to EBMUD customers in the area. The integrity of these pipelines needs to be maintained at all times. Please coordinate the relocation of existing distribution pipelines with Dustin La Vallee, Associate Civil Engineer, Distribution System Engineering and Corrosion Control Section at (510) 287-1152.*

Response 2: The City of Richmond has coordinated with EBMUD for the temporary relocation of their facilities into the Emergency Access Road right-of-way (ROW) alignment. The City has participated in ongoing coordination with EBMUD to restore their facilities back into the Via Verdi Roadway after the stabilization project is completed. The stabilization of the landslide will protect their facilities from potential future damage associated with continued landslide movement.

Comment 3. Contra Costa County Flood Control District (CCCFCD), received 11/26/2019: *We received notice that the City plans to adopt a Mitigated Negative Declaration (MND) for the Via Verdi Slope Stabilization project. As mitigation for the culvert and stabilization project on San Pablo Creek, the city is planning a creek restoration project on Rheem Creek near Mills Avenue and Shane Drive. We have the following comments related to the MND:*

a. *To mitigate any construction impacts related to the water diversion system, the contractor shall obtain a Contra Costa County Drainage 1010 permit for the portion of the water diversion system that may impact San Pablo Creek in unincorporated county.*

Response 3a: Understood. The requirement for the contractor to obtain a County Drainage 1010 permit will be included in the project construction documents.

b. *The Rheem Creek restoration project could affect the unincorporated community of Rollingwood; therefore, Contra Costa County Flood Control District should be included in the review of the restoration plans.*

Response 3b: The proposed conceptual Rheem Creek Restoration Planting Plan (mitigation plan) was provided to the Contra Costa County Flood Control District by the City of Richmond via email on November 27, 2019 after the information was requested by Aleki Mao, Staff Engineer. No additional comments from the County regarding the proposed mitigation plan have been received.

c. *If new trees are proposed for the Rheem Creek restoration project, we recommend that the City consider an operations and maintenance plan, along with maintenance funding, for the proposed trees.*

Response 3c: Ongoing discussions with agencies are occurring to select a mitigation site. Rheem Creek is still under consideration. If chosen, new trees are proposed for the Rheem Creek Restoration Planting Plan. If implemented, supplemental irrigation would be installed to ensure successful establishment. The City has coordinated with the Contra Costa College to assist with operations and maintenance activities of the Rheem Creek mitigation site. Should additional operations and maintenance efforts be required, the City will coordinate to ensure successful implementation of the mitigation plan. The mitigation plan, if approved by the regulatory permitting agencies, would likely have requirements for tree planting success criteria as well as requirements for operations and maintenance.

Comment 4: SF Bay Regional Water Quality Control Board (SFBRWQCB), received 12/2/2019 (Letter received after close of comments period):

a) *We do not agree with the conclusion of the IS/MND, which is stated to be that the installation of a concrete box culvert within San Pablo Creek, backfilled with engineered fill to buttress the landslide, is necessary to reconstruct the roadway damaged in 2017. We also do not agree that the project, as proposed and with the identified mitigation measures, would not have a significant impact on the environment. The project, as proposed, would permanently place fill within a minimum of 350 linear feet of San Pablo Creek. This would result in the loss of 1.35 acres of stream and riparian habitat and extend the existing culvert beneath Via Verdi that will further aggravate fish passage through the reach. As noted in the IS/MND, a Clean Water Act 401-water quality certification is required for the implementation of the project. Demonstration that adverse impacts to San Pablo Creek have been avoided and minimized to the maximum extent practicable is necessary to obtain such certification, and adequate compensatory mitigation for those impacts determined to be unavoidable will be necessary. As discussed in recent correspondence with the City, it has not been demonstrated that other less damaging alternatives are not available to address the earth movement beneath Via Verdi. Further, should the culvert be demonstrated to be*

necessary, the proposed enhancement work along Rheem Creek would not provide adequate compensatory mitigation to offset the permanent impacts to San Pablo Creek.

Response 4a: Please refer to **Attachment 2** for a results summary of the peer reviewed analysis of the alternatives and their feasibility conducted by Cal Engineering & Geology, previously provided to the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) on February 3, 2020.

Whereas CDFW and SFBRWQCB have agreed with the City's determination that there are no other feasible alternatives to the proposed project, the City will work with California Department of Fish and Wildlife (CDFW) and SFBRWQCB to develop a mitigation plan that incorporates mitigation to offset proposed impacts to San Pablo Creek. CDFW and SFBRWQCB are in agreement that an implemented mitigation plan will provide adequate compensatory mitigation to offset the permanent impacts to San Pablo Creek. Mitigation discussions are ongoing and progressing towards restoring fish passage, riparian habitat, and upland habitat within a portion of a larger watershed in the Bay area. The City retains implementation of this agreed upon mitigation and will ensure potentially significant impacts are adequately mitigated. For purposes of CEQA, the City maintains its determination that there is substantial evidence in the record to support the conclusion that the proposed mitigation will ensure that the proposed project will not substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal. CDFW and the SFBRWQCB have agreed to the Alternatives Analysis that no other feasible alternatives exist.

b) *Section 4.4, Biological Resources, Page 48: In the Answers to Checklist Questions, Item a), the IS/MND states that the project is expected to have no effect on Central California Coast Steelhead (Oncorhynchus mykiss). This is largely based on a phone conversation with Gary Stern at National Marine Fisheries Service on May 9, 2011, which indicated limited concern due to existing obstructions to the historical spawning habitat in San Pablo Creek, including the San Pablo dam. This consultation with NMFS appears to have occurred during planning for the replacement of the culvert located immediately downstream of this proposed project and should be updated for this project. To our knowledge it has not been demonstrated that spawning habitat is unavailable below the San Pablo Dam, in the event that steelhead were to be present in the stream, so the no-effect determination does not seem to be well substantiated.*

Response 4b: NCE biologist Mack Casterman has conducted follow up consultation with the NMFS to discuss potential project impacts of the proposed project on steelhead and their spawning habitat. Based on conversations between NCE, NMFS head biologist Dan Logan, and EBMUD fisheries biologist Bert Mulchaey, it is believed Steelhead are absent from San Pablo Creek and no spawning habitat is present. This is due largely to significant fish passage impediments in San Pablo Creek at Giant Road and Highway 80. Additionally, the EBMUD monitoring efforts for the species within San Pablo Creek near the proposed project site have resulted in no detections over the past 12 to 15 years. The *Final Coastal Multispecies Recovery Plan Volume IV: 2016 Central California Coast Steelhead* (NOAA, 2016) also states that the species '*appears to be absent from San Pablo Creek as they have not been observed during recent surveys.*' Correspondence with the NMFS is included as **Attachment 3**.

At the request of the CDFW, NCE developed a Proposed Fish Passage Monitoring Plan that will establish locations to collect pre- and post-project data on water quality and flow parameters affecting fish habitat as required by the City's CDFW Section 1600 permit. This plan includes baseline monitoring in the winter of 2021 prior to project activities and post-construction monitoring. The data will be used to inform the project's impact on fish habitat and passage.

The 350 linear foot culvert within San Pablo Creek will be set within the creek channel aiming at establishing a creek bed within the culvert that allows movement of fish within and through the culvert to areas that provide both spawning habitat and riparian cover. A San Pablo Creek Stream Habitat Assessment Report was conducted in 2010 that determined that three fish species (roaches, suckers, and sticklebacks) were present in the San Pablo Creek (California Department of Fish and Wildlife, 2013). To meet these habitat requirements, fine gravel will be placed upstream of the culvert headwall to encourage the formation of breeding habitat for California Roach and Sacramento Suckers. This mirrors a recommendation from the San Pablo Creek 2010 study that due to the lack of suitable size spawning substrate within San Pablo Creek reaches, projects "should be designed at suitable sites to trap and sort spawning gravel" (California Department of Fish and Wildlife, 2013). The placement of spawning gravel in the shallow reaches upstream of the proposed culvert will meet this recommendation. In addition, upstream of the proposed culvert head and wing walls, willow brush mattresses will be installed to provide additional aquatic riparian cover to reduce predation of threespine stickleback.

Based on California and Arizona's culvert guidance from the Department of Fish and Game, light was considered a required culvert design element.

Consequently, the project design team has proposed 'skylights' in the proposed culvert at no more than a 75-foot distance between each skylight as recommended for successful fish use (NCE 2020). Additional fish passage considerations have been incorporated into culvert design that are currently being proposed to regulatory agencies for approval. This proposed updated design (currently in review with CDFW and SFBRWQCB) is attached as **Attachment 4**; final design of the culvert will reflect agency approval.

In addition to these fish habitat and passage protection measures, the project strives to minimize drainage impacts to the extent practicable, and will maintain downstream flows throughout construction, implement Best Management Practices to protect water quality, and restore areas where vegetation is unavoidably removed.

Based on information obtained during recent consultation efforts, and design changes to incorporate fish passage and mitigation requirements the City retains the significance findings in the initial study *Section 4.4, Biological Resources, Answers to Checklist Questions, Item a).*

c) *Answers to Checklist Questions, Item b), we do not agree that implementation of the proposed Rheem Creek enhancement work would adequately mitigate for the permanent impacts to San Pablo Creek. The Water Board's San Francisco Bay Water Quality Control Plan (Basin Plan) includes the California Wetlands Conservation Policy (Executive Order W-59-93, adopted in 1993). This policy, adopted in 1993, establishes guidelines for wetlands conservation. The primary goal is to ensure no overall net loss, and to achieve a long-term net gain in the quantity, quality and permanence of wetland acreage in California. While beneficial, the Rheem Creek work does not result in no-net-loss of stream/wetland habitat, and enhancement at a roughly 2:1 ratio does not conform to expectations for the type of stream impacts currently proposed for the Via Verdi project. The order of preference for mitigation for permanent enclosure of a stream is to daylight an equivalent length and width of creek at another similar location. Secondary preferences, in ranked order, are significant restoration of degraded creek (creation of meander bends, removal of hardscape, etc.), or enhancement of degraded creek areas. The ratio of mitigation goes up from the 1:1 noted above for daylighting, the degree to which depends on the nature and extent of the restoration/enhancement work. However, it should be noted that identification of satisfactory creek mitigation for a Project of this nature is extremely challenging, so again you are urged to very seriously consider ways to achieve the project goal without installing a culvert in San Pablo Creek.*

Response 4c: Please refer to response to comment 4a, above. The City, in coordination with NCE, CDFW, and SFBRWQCB have reviewed potential mitigation locations across Richmond and San Pablo to identify a site (or sites) with the most potential for implementation of a successful mitigation project. Once a mitigation project is selected (and agreed upon by permitting agencies), NCE will add the proposed mitigation plan into a revised project description and CDFW will incorporate the mitigation project into the Via Verdi Slope Stabilization Project CDFW permit conditions. If a mitigation site is not chosen prior to receipt of a CDFW permit, then a mitigation site commitment from the City of Richmond will be needed and added to the CDFW permit conditions per agreements with the CDFW. The SFBRWQCB has agreed to follow the CDFW mitigation project selection and, therefore, no other mitigation is required.

d) *The IS/MND checks Less Than Significant with Mitigation Incorporated for Section d) which addresses substantial interference with the movement of any native resident or migratory fish or wildlife species or wildlife species or with established native resident or migratory wildlife corridors. This is not appropriate given extending the culvert upstream of the existing structure will further impede fish passage through the area. Although the existing replacement culvert beneath Via Verdi includes baffles intended to facilitate the movement of fish, there is no assurance that the baffles are functioning as intended, or that use of such features in the extended culvert will function to allow effective fish passage. The IS/MND, and the application for 401-certification have not addressed fish passage and minimizes the potential for fish presence in the stream.*

Response 4d: Refer to Response 4a-c above.

Opportunities for fish passage are limited in San Pablo Creek due to existing barriers within the waterway. Per recent discussions with CDFW and the SFBRWQCB, NCE will conduct monitoring within San Pablo Creek prior to and post-construction to determine baseline versus project impact on fish passage and habitat.

The final mitigation plan will be fish passage driven, reflect impacts based on monitoring efforts, and therefore will be determined sufficient for the CDFW Section 1600 and SFBRWQCB Section 401 permits which must satisfy mitigation requirements for fish passage and habitat impacts to ensure significant impacts do not occur (as detailed in CEQA Mitigation Measure BIO-2, which requires the City to obtain all applicable permits).

e) *Section 4.10, Hydrology and Water Quality, Page 94: Less Than Significant Impact is checked for Item a), which addresses violation of water quality*

standards and degradation of surface or ground water quality. This section does not adequately characterize the potential impacts to beneficial uses of San Pablo Creek. In addition to standard parameters such as pH, dissolved oxygen, etc., water quality standards also include beneficial uses of State waters. The beneficial uses of San Pablo Creek identified in the Basin Plan include freshwater replenishment, cold freshwater habitat, fish migration, preservation of rare and endangered species, fish spawning, warm freshwater habitat, wildlife habitat, water contact recreation, and non-contact water recreation. The installation of a 350-foot long culvert will impact beneficial uses, in particular, fish migration, fish spawning, and wildlife habitat. Degradation of water quality may also occur through reduction in allochthonous material discharged to the stream, and a reduction in the quantity and distribution of lower organism such as fungi, bacteria, and macronutrients.

Response 4e: Refer to responses 4c and 4d above. Fish passage within San Pablo Creek is limited due to existing barriers within the waterway; therefore, significant impacts to beneficial uses such as fish migration and spawning are not anticipated to occur. The Biological Opinion of the USFWS has determined that with implementation of required construction controls, installation of the culvert would not significantly impact special status wildlife. However, the City will continue to coordinate with both the SFBRWQCB and CDFW to identify mitigation sufficient to offset potential impacts to beneficial uses of San Pablo Creek including fish passage, spawning habitat, and wildlife habitat. The updated culvert design incorporates fish habitat and passage considerations and would additionally protect the beneficial uses of the creek as aforementioned.

Although installation of the proposed culvert may reduce the total amount of beneficial organic material and nutrients discharging into the stream, impacts are anticipated to be less than significant as the culvert structure is localized and has been reduced to the size necessary to stabilize the landslide. Incorporating 'skylights' and natural bottom substrate is anticipated to provide beneficial impact to habitat within the culvert structure as discussed in Attachment 4 documentation. A minor reduction of allochthonous material into the stream is not anticipated to result in significant impact to protected species and their habitats. As mentioned, NCE will implement a fish monitoring plan to verify presence/absence of protected species within the stream and will continue coordination with SFBRWQCB and CDFW for culvert design and monitoring plan approval.

Implementation of required mitigation identified through the permitting efforts of the U.S. Army Corps of Engineers (USACE), SFBRWQCB, and CDFW is specifically

designed by these agencies to offset ecosystem impacts resulting from the proposed project. As discussed in 4a above, San Pablo Creek in the vicinity of the project area does not contain spawning habitat for Steelhead. This assumption is based on a discussion with the National Marine Fisheries Service (NMFS) about the presence of Central California Coast Steelhead within San Pablo Creek. Mr. Gary Stern of NMFS said that there is no presence of steelhead in San Pablo Creek due to the obstructions within the creek (Attachment 3).

As stated, the City is working with SFBRWQCB, USACE, and CDFW to satisfy mitigation requirements to offset the permanent loss of open stream habitat in San Pablo Creek, as detailed in CEQA Mitigation Measure BIO-2. This will include any required mitigation to offset potential impact to fish migration and beneficial uses of the stream.

f) *The Answers to Checklist Questions for this segment states that overall, the project proposes features that would have a beneficial effect on water quality. Noted is a 'failing creek bank.' Referring to the creek bank as 'failing' seems to mis-characterize the situation. The creek bank itself is not failing, or contributing to the degradation of water quality, rather, it appears that the constructed fill placed in the 1970s is unstable. According to the inclinometers placed at the site for measurement of the landslide, there is movement within the underlying Orinda formation. However, such movement may, or may not have occurred naturally without the overburden of fill and would not typically be characterized as a failing creek bank, but rather would be considered as a natural occurrence along streams in the area. It is understood that should the landslide move into the creek at a rapid rate, blockage of stream flows would occur, resulting in the discharge of soil to State waters. But to characterize the project as an improvement to water quality seems opportunistic. While the proposed project would, in fact, eliminate this concern, it has yet to be demonstrated that other methods that would allow the stream to remain as an open channel with riparian vegetation are not feasible.*

Response 4f: Refer to Response 4a above. CEQA requires analysis of a project's effect on existing conditions; although it may technically be constructed fill, it has been in place for 50 years and serves as a creek bank. Either way it is defined, it is failing, and providing permanent stabilization against continuing slope movement will have a beneficial effect on water quality over existing conditions.

As requested by the SFBRWQCB and CDFW, the City has undergone the effort to obtain a third-party peer review of the Alternatives Analysis and Geotechnical Report to demonstrate there are no other methods to stabilize the landslide which would allow the stream to remain as an open channel with riparian vegetation. The CDFW

and SFBRWQCB have agreed to the Alternatives Analysis and peer review and no further analysis of alternatives is needed. Determined through this effort is that the proposed 'toe buttress with culvert' within San Pablo Creek provides the most technically viable and reliable long-term landslide stabilization alternative.

Therefore, the City believes there is sufficient and substantial evidence in the record to demonstrate there is no feasible method to retain San Pablo Creek as an open channel.

References

California Department of Fish and Wildlife, Marin County. 2013. "Stream Inventory Report, San Pablo Creek, Surveyed 2010."

"Culvert Criteria for Fish Passage." 2002. State of California, Resources Agency, Department of Fish and Game.

"Guidelines for Culvert Construction to Accommodate Fish & Wildlife Movement and Passage." 2006. Arizona Game and Fish Department, Habitat Branch. http://www.conservewildlifenj.org/downloads/cwnj_281.pdf.

NCE. 2020. "Via Verdi Culvert Fish Mitigation Memorandum."

Wallace, Edward. 2015. "Appendix A Fish Passage Assessment and Preliminary Design at Evans Lake Drain Levee." April 21, 2015. http://www.uppersarhcp.com/documents/UpperSAR_Restoration_Draft_EIR_Apr2019-6b.pdf.

Attachment 1

PUBLIC RESPONSES RECEIVED

Comment 1. Contra Costa Mosquito & Vector Control District (CCMVCD), received 11/7/2019

CONTRA COSTA MOSQUITO & VECTOR CONTROL DISTRICT

155 Mason Circle
Concord, CA 94520
phone (925) 685-9301
fax (925) 685-0266
www.contracostamosquito.com

November 7, 2019

Lina Velasco
City of Richmond, Planning Division
450 Civic Center Plaza
P.O. Box 4046
Richmond, CA 94804

Re: Via Verdi Slope Stabilization Project Mitigated Negative Declaration

Dear Ms. Velasco,

Thank you for the opportunity to express the position of the Contra Costa Mosquito & Vector Control District (the District) regarding the notice to adopt a Mitigated Negative Declaration for the Via Verdi Slope Stabilization Project located along Via Verdi between El Portal Drive and the Sobrante Glen neighborhood in Richmond, CA.

As a bit of background, the District is tasked with reducing the risk of diseases spread through vectors in Contra Costa County by controlling them in a responsible, environmentally-conscious manner. A "vector" means any animal capable of transmitting the causative agent of human disease or capable of producing human discomfort or injury, including, but not limited to, mosquitoes, flies, mites, ticks, other arthropods, and rodents and other vertebrates. Under the California Health and Safety Code, property owners retain the responsibility to ensure that the structure(s), device(s), other project elements, and all additional facets of their property do not produce or harbor vectors, or otherwise create a nuisance. Owners are required to take measures to abate any nuisance caused by activities undertaken and/or by the structure(s), device(s), or other feature(s) of their property. Failure to adequately address a nuisance may lead to abatement by the Contra Costa Mosquito & Vector Control District and civil penalties up to $1,000 per day pursuant to California Health & Safety Code §2060-2067.

Potential impacts to human health by disease vectors is not properly addressed under CEQA—an oversight that has created problems for mosquito abatement and vector control agencies throughout California. The analysis for a project should consider evidence of potential environmental impacts, even if such impacts are not specifically listed on the Appendix G checklist. [State CEQA Guidelines, § 15063(f)]. To determine whether Public Health & Safety may be significantly impacted, lead agencies should refer to the California Health and Safety Code § 2000-2093 for definitions and liabilities associated with the creation of habitat conducive to vector production and to guidance provided by local mosquito and vector control districts/agencies in their determination of environmental impacts. Would the project:

1 a) Increase the potential exposure of the public to disease vectors (e.g., mosquitoes, flies, ticks, and rats)?

1 b) Increase potential mosquito/vector breeding habitat (i.e., areas of prolonged standing/ponded water like wetlands or stormwater treatment control BMPs and LID features)?

Addressing these concerns in the environmental review and project planning phases can not only better protect public health and reduce the need for pesticide applications for vector control efforts, but avoid costly retrofits and fines for property owners in the future. Please don't hesitate to contact the District should you have any questions or need anything further.

Sincerely,

Jeremy Shannon
Vector Control Planner
925-771-6119
jshannon@contracostamosquito.com

Comment 2. East Bay Municipal Utility District (EBMUD), received 11/25/2019

EAST BAY
MUNICIPAL UTILITY DISTRICT

November 21, 2019

Lina Velasco, Director of Planning and Building Services
City of Richmond Planning Division
450 Civic Center Plaza
Richmond, CA 94804

Re: Notice of Intent to Adopt a Mitigated Negative Declaration – Via Verdi Slope Stabilization Project, Richmond

Dear Ms. Velasco:

East Bay Municipal Utility District (EBMUD) appreciates the opportunity to comment on the Mitigated Negative Declaration for the Via Verdi Slope Stabilization Project located at Via Verdi Road and El Portal Drive in the City of Richmond. EBMUD has the following comments.

2. EBMUD owns and operates distribution pipelines in the public right-of-way of Via Verdi, which provide continuous service to EBMUD customers in the area. The integrity of these pipelines needs to be maintained at all times. Please coordinate the relocation of the existing distribution pipelines with Dustin La Vallee, Associate Civil Engineer, Distribution System Engineering and Corrosion Control Section at (510) 287-1152.

Sincerely,

David J. Rehnstrom
Manager of Water Distribution Planning

DJR:WTJ:sjp
sb19_227.doc

cc: City of Richmond Engineering/CIP Division
450 Civic Center Plaza
Richmond, CA 94804

Comment 3. Contra Costa County Flood Control District, received 11/26/2019:

From: Lina Velasco <Lina_Velasco@ci.richmond.ca.us>
Date: Tuesday, November 26, 2019 at 7:53 PM
To: Gail Ervin <GErvin@ncenet.com>
Subject: Fwd: Comments on the Via Verdi Slope Stabilization Project Mitigated Negative Declaration
From: Teri Rie <teri.rie@pw.cccounty.us>
Date: November 26, 2019 at 7:37:57 PM PST
To: "lina_velasco@ci.richmond.ca.us" <lina_velasco@ci.richmond.ca.us>
Cc: Michelle Cordis <michelle.cordis@pw.cccounty.us>, Tim Jensen <tim.jensen@pw.cccounty.us>
Subject: Comments on the Via Verdi Slope Stabilization Project Mitigated Negative Declaration

Dear Ms. Velasco,
We received notice that the city plans to adopt a Mitigated Negative Declaration (MND) for the Via Verdi Slope Stabilization project. As mitigation for the culvert and stabilization project on San Pablo Creek, the city is planning a creek restoration project on Rheem Creek near Mills Avenue and Shane Drive. We have the following comments related to the MND:

3a. 1. To mitigate any construction impacts related to the water diversion system, the contractor shall obtain a Contra Costa County Drainage 1010 permit for the portion of the water diversion system that may impact San Pablo Creek in unincorporated county.

3b. 2. The Rheem Creek restoration project could affect the unincorporated community of Rollingwood; therefore, Contra Costa County Flood Control District should be included in the review of the restoration plans.

3c. 3. If new trees are proposed for the Rheem Creek restoration project, we recommend that the city consider an operations and maintenance plan, along with maintenance funding, for the proposed trees.

Please let me know if you have any questions.
Sincerely,

Teri Rie
Contra Costa County Flood Control District
255 Glacier Drive
Martinez, CA 94553
925-313-2363

Comment 4: SF Bay Regional Water Quality Control Board, received 12/2/2019 (note the 30 day comment period closed on 11/26/19):

San Francisco Bay Regional Water Quality Control Board

Sent via electronic mail: No hard copy to follow

December 2, 2019
CIWQS Place ID: 858409
Regulatory Measure ID: 430699

City of Richmond
450 Civic Center Plaza
Richmond, CA 94804

Attention: Yader Bermudez (yader_bermudez@ci.richmond.ca.us)

Subject: Via Verdi Slope Stabilization Project – Draft Initial Study/Mitigated Negative Declaration

Dear Mr. Bermudez:

This letter provides comments on the draft Initial Study/Mitigated Negative Declaration (IS/MND) for the Via Verdi Slope Stabilization Project in the City of Richmond (City).

4a. We do not agree with the conclusion of the IS/MND, which is stated to be that the installation of a concrete box culvert within San Pablo Creek, back-filled with engineered fill to buttress the landslide, is necessary to reconstruct the roadway damaged in 2017. We also do not agree that the project, as proposed and with the identified mitigation measures, would not have a significant impact on the environment. The project, as proposed, would permanently place fill within a minimum of 350 linear feet of San Pablo Creek. This would result in the loss of 1.35 acres of stream and riparian habitat, and extend the existing culvert beneath Via Verdi that will further aggravate fish passage through the reach.

As noted in the IS/MND, a Clean Water Act 401-water quality certification is required for the implementation of the project. Demonstration that adverse impacts to San Pablo Creek have been avoided and minimized to the maximum extent practicable is necessary to obtain such certification, and adequate compensatory mitigation for those impacts determined to be unavoidable will be necessary. As discussed in recent correspondence with the City, it has not been demonstrated that other less damaging alternatives are not available to address the earth movement beneath Via Verdi. Further, should the culvert be demonstrated to be necessary, the proposed enhancement work along Rheem Creek would not provide adequate compensatory mitigation to offset the permanent impacts to San Pablo Creek.

Further comments are noted below:

4b. ***Section 4.4, Biological Resources, Page 48***: In the *Answers to Checklist Questions*, Item a), the IS/MND states that the project is expected to have no effect on Central California Coast Steelhead (*Oncorhynchus mykiss*). This is largely based on a phone conversation with Gary Stern at National Marine Fisheries Service on May 9, 2011, which indicated limited concern due to existing obstructions to the historical spawning habitat in San Pablo Creek, including the San Pablo dam. This consultation with NMFS appears to have occurred during planning for the replacement of the culvert located immediately downstream of this proposed project, and should be updated for this project. To our knowledge it has not been demonstrated that spawning habitat is unavailable below the San Pablo Dam, in the event that steelhead were to be present in the stream, so the no-effect determination does not seem to be well substantiated.

4c. For Item b), we do not agree that implementation of the proposed Rheem Creek enhancement work would adequately mitigate for the permanent impacts to San Pablo Creek. The Water Board's San Francisco Bay Water Quality Control Plan (Basin Plan) includes the California Wetlands Conservation Policy (Executive Order W-59-93, adopted in 1993. This policy, adopted in 1993, establishes guidelines for wetlands conservation. The primary goal is to ensure no overall net loss, and to achieve a long-term net gain in the quantity, quality and permanence of wetland acreage in California. While beneficial, the Rheem Creek work does not result in no-net-loss of stream/wetland habitat, and enhancement at a roughly 2:1 ratio does not conform to expectations for the type of stream impacts currently proposed for the Via Verdi project. The order of preference for mitigation for permanent enclosure of a stream is to daylight an equivalent length and width of creek at another similar location. Secondary preferences, in ranked order, are significant restoration of degraded creek (creation of meander bends, removal of hardscape, etc.), or enhancement of degraded creek areas. The ratio of mitigation goes up from the 1:1 noted above for daylighting, the degree to which depends on the nature and extent of the restoration/enhancement work. However, it should be noted that identification of satisfactory creek mitigation for a Project of this nature is extremely challenging, so again you are urged to very seriously consider ways to achieve the project goal without installing a culvert in San Pablo Creek.

4d. The IS/MND checks *Less Than Significant with Mitigation Incorporated* for Section d), which addresses substantial interference with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors. This is not appropriate given extending the culvert upstream of the existing structure will further impede fish passage through the area. Although the existing replacement culvert beneath Via Verdi includes baffles intended to facilitate the movement of fish, there is no assurance that the baffles are functioning as intended, or that use of such features in the extended culvert will function to allow effective fish passage. The IS/MND, and the application for 401-certification have not addressed fish passage, and minimizes the potential for fish presence in the stream.

4e. Section 4.10, Hydrology and Water Quality, Page 94: *Less Than Significant Impact* is checked for Item a), which addresses violation of water quality standards and degradation of surface or ground water quality. This section does not adequately characterize the potential impacts to beneficial uses of San Pablo Creek. In addition to standard parameters such as pH, dissolved

oxygen, etc., water quality standards also include beneficial uses of State waters. The beneficial uses of San Pablo Creek identified in the Basin Plan include freshwater replenishment, cold freshwater habitat, fish migration, preservation of rare and endangered species, fish spawning, warm freshwater habitat, wildlife habitat, water contact recreation, and non-contact water recreation. The installation of a 350-foot long culvert will impact beneficial uses, in particular, fish migration, fish spawning, and wildlife habitat. Degradation of water quality may also occur through reduction in allochthonous material discharged to the stream, and a reduction in the quantity and distribution of lower organism such as fungi, bacteria, and macronutrients.

4f. The *Answers to Checklist Questions* for this segment states that overall, the project proposes features that would have a beneficial effect on water quality. Noted is a 'failing creek bank.' Referring to the creek bank as 'failing' seems to mis-characterize the situation. The creek bank itself is not failing, or contributing to the degradation of water quality, rather, it appears that the constructed fill placed in the 1970s is unstable. According to the inclinometers placed at the site for measurement of the landslide, there is movement within the underlying Orinda formation. However, such movement may, or may not have occurred naturally without the overburden of fill, and would not typically be characterized as a failing creek bank, but rather would be considered as a natural occurrence along streams in the area. It is understood that should the landslide move into the creek at a rapid rate, blockage of stream flows would occur, resulting in the discharge of soil to State waters. But to characterize the project as an improvement to water quality seems opportunistic. While the proposed project would, in fact, eliminate this concern, it has yet to be demonstrated that other methods that would allow the stream to remain as an open channel with riparian vegetation are not feasible.

In conclusion, we expect to continue working with you to identify the least damaging practicable alternative, and appreciate your consideration of these comments. If you have any questions concerning the information contained herein, please contact Kathryn Hart at (510) 622-2356 or kathryn.hart@waterboards.ca.gov. All future correspondence regarding this Project should reference the CIWQS Place ID No. indicated at the top of this letter.

Sincerely,

Kathryn R. Hart
Water Resource Control Engineer
Watershed Division

Attachment 2

PEER REVIEW OF ALTERNATIVES ANALYSIS

Ms. Kathryn R. Hart, PE
Water Resource Control Engineer
Watershed Management Division
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

February 3, 2020
Project No: 568.41.55

RE: **Response to Water Board Letter Dated October 29, 2019 Subject: Review of Alternatives Analysis and Geotechnical Report (CIWQS Place ID: 858409, Regulatory Measure ID: 430699)**
Via Verdi Slope Stabilization Project

Dear Ms. Hart,

NCE is pleased to provide this letter of response to the San Francisco Bay Regional Water Quality Control Board (Water Board) letter titled *Review of Alternatives Analysis and Geotechnical Report, Proposed Via Verdi Slope Stabilization* dated October 29, 2019, referred to hereafter as Water Board Letter. Subsequent to the issuance of this letter, the NCE Team and the City of Richmond (City) met with the Water Board on November 7, 2019 (hereafter referred to as the Water Board Meeting) to discuss the Water Board letter comments, clarify and answer questions, and summarize the conclusions and key finding from our Alternatives Analysis and Geotechnical Investigation. The key action items from this meeting were as follows:

1) City to engage a geotechnical firm to provide a peer review of the Alternatives Analysis and Geotechnical Investigation.
2) NCE Team to provide preliminary structural and geotechnical evaluation of an additional alternative conceptualized by the Water Board during the meeting on November 7, 2019, consisting of a U-shaped reinforced concrete buttress to be placed below the creek channel (Water Board Alternative).
3) NCE Team to provide written response to Water Board Letter dated October 29, 2019.

Each of the key action items are addressed within this letter as follows:

PEER REVIEW

The City retained Cal Engineering and Geology (CE&G) to conduct a peer review of the Alternatives Analysis and Geotechnical Investigation completed for the Via Verdi Slope Stabilization Project. CE&G's peer review letter dated January 20 ,2020 attached herein generally can be summarized as follow:

1) Alternative 1, Toe Buttress with Culvert provides the most technically viable and reliable long-term stabilization alternative.
2) The alternatives considered are generally appropriate and reflect a reasonable suite of potential stabilization measures. Further CE&G did not judge that any other significantly different alternatives could provide an adequately reliable and cost-effective means of stabilizing the road.
3) There are minor clarifications and revisions that could be made to the analysis and presentation of geotechnical data, but further assessments are very unlikely to change the results of the alternatives analyses of alternatives considered.
4) To help reduce the potential for risk during construction of the stabilization measures CE&G recommended the following:
    a. Completion of a more detailed surface field mapping of the creek bank with respect to the slope failure and potential expression at the creek bank.

b. If feasible, take additional readings of existing inclinometers above the level that previously sheared off to evaluate possible shallower failures that may have formed.
c. Install and monitor at least one additional inclinometer below the roadway and one above the upslope head scarp to monitor before and during construction.

STRUCTURAL AND GEOTECHNICAL EVALUATIONS OF WATER BOARD ALTERNATIVE

During the Water Board Meeting, the Water Board proposed another stabilization alternative which generally consists of a U-shaped reinforced concrete channel buttress covered with soil/creek alluvium. The intent of the proposed alternative would be to offer another solution to buttress/stabilize the landslide but maintain an open creek channel to reduce environmental, water quality, and habitat impacts. The NCE Team evaluated this alternative and our geotechnical engineer, Hultgren-Tillis Engineers, and structural engineer, Degenkolb, have both concluded this repair alternative is not a viable landslide mitigation alternative. The results of the structural and geotechnical evaluations are summarized in the attached letters from both, Hultgren-Tillis Engineers and Degenkolb, dated December 5, 2019.

RESPONSE TO WATER BOARD LETTER

NCE has reviewed the Water Board Letter and provides the following written responses to each comment included in the Water Board Letter.

Comment 1: *For clarification, the Project is not water dependent, so unless the analysis clearly demonstrates otherwise, we presume there are practicable alternatives with no, or limited discharge of fill with less adverse impact on the aquatic ecosystem.*

Response: The project applicant acknowledges the Water Board's role in determining whether or not a specific project is water dependent or not, relative to the application for water quality certification. Since there is no published State guidance on determination of Basic Project Purpose statement and water dependency, the federal regulations are presumed to apply: The federal regulations (see 40 CFR 230.10(a)(3)) dictate that projects found not water dependent, "…that practicable alternatives that do not involve special aquatic sites are presumed to be available, unless clearly demonstrated otherwise." This presumption, commonly referred to as the "rebuttable presumption" is analyzed in the document titled "Alternatives Analysis, additional material provided in accordance with Section 404(b)(1) for Individual Permit Applications. Slope Stabilization Project, City of Richmond, Contra Costa County, California," dated September 2018, and submitted to your office for review. Section 3.1 of this document defines the Basic Project purpose as "…to repair an existing linear transportation system.", and concludes that the project is not water dependent (therefore it is subject to Section 404(b)(1) analysis requirements).

Comment 2: *Alternative 1, Toe Buttress With Culvert. If this option is determined to be the least damaging practicable alternative, you will need to provide additional geotechnical details on how the work would be achieved, e.g., proper keying and compaction of new fills, subgrade preparation, compaction requirements, moisture content/conditioning, etc.*

Response: Subgrade preparation, site grading, and compaction requirements/details are provided in the project construction documents based on geotechnical recommendations in accordance with the standards of practice generally followed for earthwork and grading work of this nature. The final project construction documents have not yet been prepared due to the need for an alternative to be approved prior to these documents being finalized. Once these documents are finalized, they will be provided to the Water Board.

Comment 3*: Alternatives 4 and 5 – These options would remove the landslide debris, composed largely of constructed fill, install keys and benches below the bottom of the slide, place the slide debris back as compacted, engineered fill, include the installation of subdrains to capture groundwater and lower the groundwater table, etc. Alternative 4*

includes geogrid reinforcement and achieves the highest factor of safety of 1.85. Alternative 5 does not include geogrid enforcement, so the factor of safety is lowered to 1.75.

Based on the information provided, it is not clear to us why Alternatives 4 and 5 are not feasible and practicable. Noted in the Analysis are logistical constraints, including a significant volume of earthwork excavation, hauling, temporary stockpiling, and compaction of engineered fill. Of particular note is the potential for destabilization of landslide debris upgradient of the work area and damage to both the emergency access road and the slope areas above, which belong to the Cemetery Trust. While this may be a legitimate concern, there is no discussion of possible means to minimize risk during construction through stabilization of the temporary access road area prior to implementing either one of Alternatives 4 or 5. Although these alternatives appear to be more costly than the preferred alternative, no substantiation for the costs have been provided, and we note that to be practicable, the alternative does not need to be the least costly to implement. Please provide an assessment of means to provide greater stability for the upgradient mass while performing construction of either Alternative 4 or 5, or some variation of each including designs that could reduce the overall mass of constructed fill in the area (e.g., remove some of the fill material that was imported during construction of the subdivision).

With further consideration of Alternatives 4 and 5, or some variation of these alternatives, more geotechnical details on how these options would be accomplished will need to be provided. For example, how would proper keying and benching of new fills be conducted (minimum depths into competent bedrock, minimum widths and allowable angles of keys and benches, etc.), subgrade preparation, compaction requirement (thickness of lifts, recommended minimum relative degree of compaction, moisture content/conditioning, etc.) subdrain design (size of pipes, type of drain rock/filter material, filter fabric specifications, etc.), whether the slope should be dewatered first due to the high groundwater table, whether the fill above the top of the landslide should be removed first before keying and benching is conducted above the creek channel (to reduce driving forces and renewed slope movement), etc.

Response: As discussed at the Water Board Meeting, both of these alternatives are similar to the stabilization methodology utilized to stabilize the historical landslide for the construction of the Sobrante Glen Subdivision and associated Via Verdi roadway in the late 1970's that stabilized the previous landslide for a period of time, but has now failed. The previously mapped landslide was removed and keyed below the landslide debris and buttressed with a roadway fill embankment according to the details on Plate 3, Section B-B within the Harding-Lawson Associates report titled *Geotechnical Investigation Sobrante Glen Subdivision Richmond, California* dated October 11, 1977 (HLA 1977). This report was provided to the Water Board. The roadway fill embankment buttress worked for a period of time, but now a deeper landslide failure plane extends below the previous stabilized embankment buttress. Alternatives 4 and 5 similarly would also be prone to this mechanism of failure, if a deeper landslide plane were to occur below the new constructed embankment. The inherent issue is that the new fill embankment is keyed into the Orinda Formation, which is not competent and a very problematic local geologic formation, very prone to landslides.

We have discussed the constructability issue of these alternatives with respect to destabilizing the emergency access road with the large excavation of the slide mass and consequently removal of the materials that currently are acting to stabilize/buttress landslide areas further upslope of the emergency access road. As discussed, and diagramed at the Water Board Meeting, shoring the emergency access roadway is not feasible as it would be prone to failure and be problematic with respect to uphill slopes and landslides. The construction of shoring with tie-back systems could activate the upslope landslide and destabilize and damage the only access road for the Sobrante Glen Neighborhood.

These alternatives would also require significant earthwork operations within the creek channel, removal of approximately 75,000 cubic yards of soil, removal of all vegetation within the affected creek section, and requiring over 10,000 truck trips for transport, stockpile/disposal, and fill. Subgrade preparation, site grading, compaction, benching and keying were developed for the purposes of developing alternatives and completing geotechnical slope stability analysis and are detailed in the Plate 5 Cross Section View and described on Page 35 of the Alternatives Analysis. Dewatering for these alternatives would be significant as well to allow for earthwork operations and draw water levels down to 5 feet below the anticipated excavation depths or approximately over 25 feet below the bottom

of the existing creek bottom. Experience indicates that dewatering would be handled with an extensive and large system of exterior dewatering wells and/or combination within the excavation of a system of trenches, piping, sumps, pumps, and large sedimentation control devices.

Comment 4: *The HTE Report references several documents, including a "Grading Plan, Subdivision 5493, 'Sobrante'" from KCA Engineers, originally dated December 6, 1977, with an as-built revision date of February 26, 1983. Please provide a copy of this plan for our review for better understanding the current conditions at the site.*

Response: These documents have been provided to the Water Board.

Comment 5: *Please also provide a copy of the October 11, 1977, "Geotechnical Investigation, Sobrante Glen Subdivision, Richmond, California" from Harding-Lawson Associates (HLA). Please also provide any other specific reports prepared by HLA that discuss the construction observations, testing, etc. during the actual subdivision development.*

Response: These documents have been provided to the Water Board.

Comment 6: *A geologic map that shows the distribution of native soils versus constructed/placed-fills, the overall older landslide mass limits, etc. should be provided.*

Response: A geologic map with the requested information is shown in the HLA 1977 report (previously provided to the Water Board).

Comment 7: *The discussion for Alternative 3, Retaining Wall, needs to be augmented. The wall under consideration would be 50 feet high, or higher, and according to the Analysis is not recommended because it would require tie backs to resist the large landslide forces, and excavation in front of the wall could compromise the stability of the wall and further activate the landslide by removing toe support materials. Have you explored mechanisms that could be used to provide stability during installation of the tie backs, or an alternative stepped-back retaining wall design? How would the viability of this alternative change if some of the constructed fill material were to be removed from the site to reduce the over-burden?*

Response: As discussed at the Water Board Meeting a retaining wall alternative is not recommended and is not a viable long-term solution given the inherent deep nature of this large rotational landslide with driving forces that could both structurally fail and undermine the wall system. In addition, the height of the retaining wall would require tie-backs, which would be anchored into problematic Orinda formation rock materials that are weak and prone to movement/failure. The interim stability of the landslide during construction of a retaining wall for both vertical and stepped systems carries significant risks with excavation of support materials in front of the wall to install tie-backs that currently act as a buttress to the existing upslope landslide. Removal of these support materials could destabilize upslope landslide areas and damage the emergency access road and retaining wall as well. While materials could be removed or sloped back above the retaining wall there is limited stability gained without compromising the stability of the emergency access road. In the Alternatives Analysis document Alternatives 2, 6, and 7 shown on Plates 3, 6, and 7 show various layback slopes and removal of soil materials with slope stability factors of safety of 0.97 to 1.18, indicating limited to no improvement in stability.

Comment 8: *As noted above, for either of the Alternatives 4/5 and/or 3, to what extent would removal of some or all of the constructed fill material create additional options with a new profile to support the road in the original alignment, or a modified alignment that may or may not include encroaching into the cemetery property? To what extent is the constructed fill contributing to further movement of the slide and increasing risk? What could something along the lines of Alternative 7, Realign Via Verdi, look like with a modified profile and landslide stabilization?*

Response: As mentioned in the response to Comment 7 above, removal of soil mass or sloping back of fill materials within the landslide to help reduce driving forces indicates limited stability gain without compromising stability of the emergency access road. The fill materials within the landslide can only be practically removed to a limited depth and layback without undermining the emergency access road and destabilizing the upslope landslide areas. In the Alternatives Analysis document Alternatives 2, 6, and 7 shown on Plates 3, 6, and 7 show various layback slopes and removal of soil mass materials with slope stability factors of safety of 0.97 to 1.18, indicating limited to no improvement in stability. The existing fill material was necessary to construct the roadway embankment supporting Via Verdi and serves as a buttress to stabilize the upslope landslide. Without this roadway embankment fill buttress, the upslope landslide would have continued to move towards the creek, and the Via Verdi roadway could not have been constructed.

Comment 9: *To the extent the City of Richmond is concerned about landslide movement in the near future, why haven't wells been installed to lower the groundwater elevations to reduce risk? We understand the drainage gallery option alone does not offer the necessary factor of safety, but it is not clear why this option has not been explored as an interim protective measure, or, alternatively as a measure that could be used in conjunction with one of the other alternatives as proposed, or modified.*

Response: Interim measures to address surface water and infiltration have been developed and implemented, including regrading of the site and the removal of soil between the northern edge of Via Verdi and the emergency bypass road, and the construction of stormwater inlets and pipes to direct surface water and runoff from the hillside and the site itself into stormwater collection facilities. These measures were implemented to help prevent infiltration into the landslide. In addition, an anchored tarp has been installed over the upper portion of the landslide (i.e. north of Via Verdi) to direct water away from the head scarp area and again help prevent infiltration of surface water into the landslide. Based on NCE's landslide movement monitoring, these interim measures have shown that limited stability is gained, given the high groundwater regime and proximity to the creek. Due to this, the goal is to construct the repair as soon as possible starting in Spring 2020, recognizing the risk of potential further landslide movement.

Comment 10: *Is any stormwater runoff or other subsurface drainage from the cemetery directed to the ravine above the landslide area?*

Response: This cemetery property drains into the ravine behind the emergency access road and does contribute to surface water, recognizing the entire area behind Via Verdi is the cemetery property. There are several existing stormwater inlets and pipes within this area that collect and direct surface water from this ravine to San Pablo Creek.

Comment 11: *What is the current function of the desilting basin and soil stockpile upslope of the original road alignment? Does the silt basin collect water that is then flowing subsurface, possibly contributing to movement of the engineered fill for the road? The HTE report notes on page 6 that the scarp observed in February 2017 was located within the 'retention basin area' and this raises questions as to its function within the system, and whether these features require modification.*

Response: HTE was provided the historical KCA Engineers, Inc. grading plan titled *Grading Plan Subdivision 4593 "Sobrante Glen" "As built"* dated 1983; this was also provided to the Water Board. This grading plan referred to desilting basins and temporary topsoil/stockpile areas behind Via Verdi and within the previous mapped landslide area. HTE used this as a reference to describe the approximate location of the landslide scarp. As indicated on the as-built plan there is a note within these areas stating, "Temporary topsoil/stockpile to be removed together with desilting basin". This was presumably completed since the note is shown on an as-built plan. NCE did not observe a desilting basin or a soil stockpile upslope of the original road alignment.

Comment 12: *Section 5.8, Alternative Cost Comparison, of the Analysis does not provide information on how costs were assessed for each alternative. Please provide supporting data and documentation for the costs included.*

Response: *Attached herein are detailed approximate cost estimates for each alternative that were used as the basis for costs provided in the Alternatives Analysis document.*

Thank you for providing these detailed comments and I trust that this correspondence provides the necessary information at this time to continue moving forward with the preferred alternative, Toe Buttress with Culvert. Please contact me at (510) 215-3620 with any additional questions and/or needs.

Sincerely,
NCE

J. Ryan Shafer, PE, GE
Principal

Attachments: Geotechnical and Structural Evaluation Letters of Water Board Alternative
Peer Review Letter
Detailed Alternative Cost Estimates

GEOTECHNICAL AND STRUCTURAL EVALUATION LETTERS OF WATER BOARD ALTERNATIVE

A California Corporation
Specializing in Geotechnical Engineering

Hultgren-Tillis Engineers

December 5, 2019
Project No. 867.01

NCE
501 Canal Blvd., Suite I
Richmond, California 94804

Attention: Mr. Ryan Shafer

Geotechnical Evaluation Additional Alternative
Concrete Channel Buttress Repair Alternative
Via Verdi Slope Stabilization Project
Richmond, California

Dear Mr. Shafer:

This letter presents our evaluation of an additional alternative for the Via Verdi Slope Stabilization project, which we understand was proposed by the San Francisco Regional Water Quality Control Board (SFRWQCB) at a meeting in their offices on November 7, 2019. The additional alternative consists of a reinforced concrete channel buttress with a nominal cover with soil/creek alluvium with the intent to buttress/stabilize the landslide but maintain an open creek channel to reduce environmental, water quality, and habitat impacts to the creek.

We evaluated this alternative to check the feasibility of implementation from a geotechnical perspective and to analyze slope stability to evaluate the effectiveness of this alternative in stabilizing the landslide.

We performed slope stability analysis to check the effectiveness of this alternative to increase the factor of safety. Generally, an acceptable long-term factor of safety for the purposes of this analysis is 1.5. The factor of safety for the alternative is 0.99 as shown on Plate 1 and is, therefore, not effective in stabilizing the landslide.

While the open channel concrete buttress can be structurally designed to meet the geometric constraints, for the buttress to be effective, fill, to the height as shown in the culvert and toe buttress alternative, is needed to effectively stabilize the landslide. The fill provides substantial vertical confinement and allows translation of landslide forces to the opposite creek bank. Although the open channel concrete buttress could be heavily reinforced or tied down (e.g. micro pile foundations) to increase vertical load resistance, the landslide failure plane could extend in front or above the concrete channel buttress. Based on our review of the additional alternative and the slope stability analysis, we judge this alternative does not provide an acceptable slope stability factor of safety and, therefore, is not a viable alternative.

If you have any questions, please call.

Sincerely,

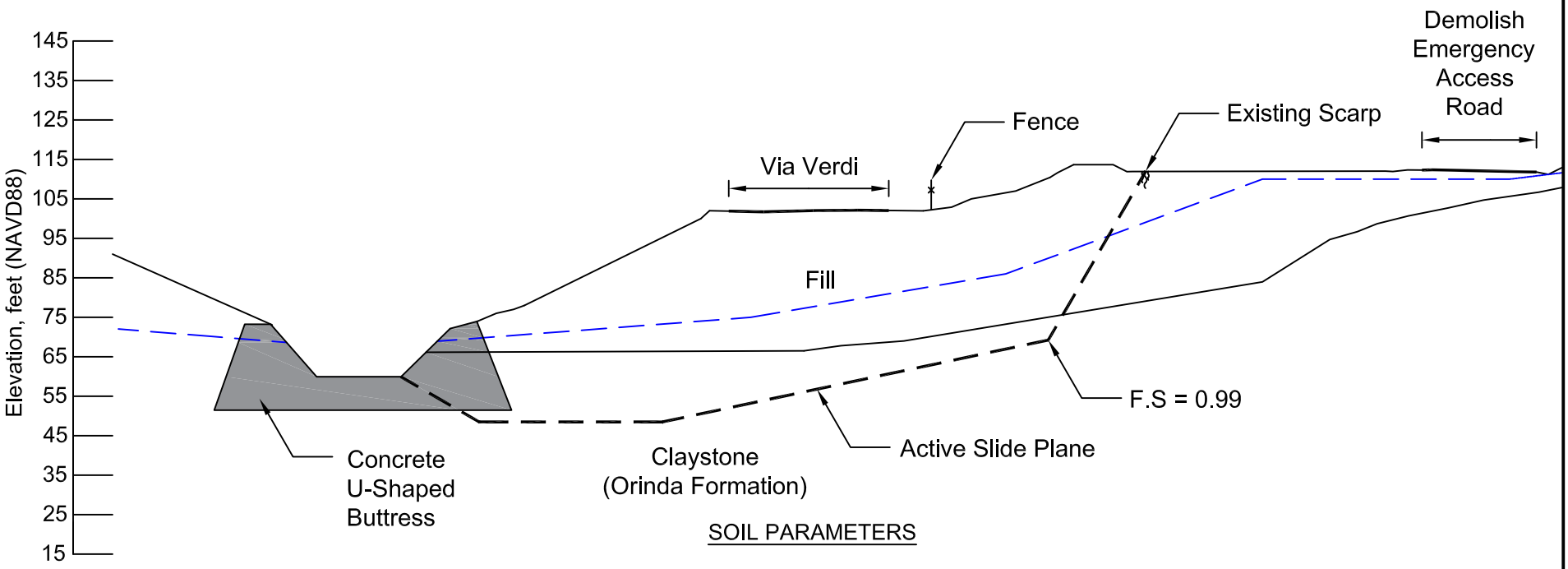
Hultgren – Tillis Engineers

R. Kevin Tillis
Geotechnical Engineer

RKT:lm:la

Attachment: Plate 1

File Name: 86701L02_concrete channel - final



SOIL PARAMETERS

Soil Type	Unit Weight (pcf)	Undrained Strength		Effective Strength	
		Cohesion (psf)	Friction Angle (°)	Cohesion (psf)	Friction Angle (°)
Fill	125	0	20	-	-
Claystone	125	0	13	-	-

SCALE
0 40 feet
1 inch = 40 feet

Via Verdi Landslide
Richmond, California

Slope Stability
Concrete Channel

Hultgren - Tillis Engineers

Project No. 867.01

Plate No. 1

1300 Clay Street
9th Floor
Oakland, CA 94612
p: 510.272.9040
www.degenkolb.com

December 5, 2019

NCE
501 Canal Blvd. Suite I
Richmond, CA 94804

Attention: Mr. Ryan Shafer

Concrete Channel Buttress Repair Alternative
Structural Engineering Considerations
Via Verdi Slope Stabilization Project
Richmond, California
Degenkolb Job No. B8425021.00

Dear Mr. Shafer:

In conjunction with Hultgren-Tillis Engineers, we have evaluated the structural feasibility of the additional alternative consisting of a reinforced concrete channel buttress with a nominal cover of soil/creek alluvium. We understand the intent of this alternate is to buttress/stabilize the landslide, but maintain an open creek channel to reduce environmental, water quality, and habitat impacts to the creek.

We evaluated this alternative to check the feasibility of implementation from a Structural Engineering perspective.

We considered the structural systems that could be implemented within the geometric constraints of being placed under the creek channel. We considered mass concrete, caissons, and tie-downs.

Based on our understanding of the Hultgren-Tillis analysis, any structural system (regardless of structural capacity or configuration) placed below the creek channel will be ineffective in mitigating the landslide hazard. As such, while we can design a structure to meet the geometric constraints, we concur with Hultgren-Tillis Engineers that this alternative does not present a viable landslide mitigation alternative.

Sincerely,

DEGENKOLB ENGINEERS

Abe Lynn, PhD, PE
Associate

Andrew Scott, SE 4809
Principal

p:\project.b08\425\b8425021.00\corr\out\191205ltr_via_verdi_additional_alternative_structural.docx

PEER REVIEW LETTER

CE&G
CAL ENGINEERING & GEOLOGY
Pragmatic Expertise™

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GEOTECHNICAL PEER REVIEW MEMORANDUM

To: Tawfic N. Halaby, P.E.
Senior Civil Engineer
City of Richmond
Engineering & Capital Improvement Projects Department
Engineering Services Division
450 Civic Center Plaza
Richmond, California 94804-1630

From: Phillip Gregory, P.E., G.E.
Cal Engineering & Geology, Inc.
785 Ygnacio Valley Road
Walnut Creek, California 94595

Date: 20 January 2020

RE: Peer Review of Geotechnical Report and Alternatives Analysis
Via Verdi Slope Stabilization Project
Richmond, California
CE&G Document 191210.001

INTRODUCTION

Pursuant to your request and authorization, Cal Engineering & Geology (CE&G) has reviewed the geotechnical aspects of alternatives analysis documents related to the proposed Via Verdi slope stabilization project in Richmond, California. Our services have been provided primarily in response to comments made by the San Francisco Bay Regional Water Quality Control Board (Board) in a letter dated October 29, 2019 to the City of Richmond.

The slope failure at the Via Verdi site occurred in mid to late February 2017 as a result of heavy rains. On February 20, 2017 the City of Richmond became aware of roadway distress within the Via Verdi roadway area just north of El Portal Drive. Via Verdi is a residential street that serves as the sole access to 85 single family homes and 100 apartment units in the Sobrante Glen neighborhood. The slope failure includes over 200 feet of the Via Verdi road embankment that has moved down towards San Pablo Creek. The slope failure

impacted the Via Verdi roadway and utilities and an Emergency Access Road and temporary utilities were constructed through a vacant land parcel to maintain safe access for Sobrante Glen residents. To stabilize the site, the City has secured FEMA funding administered by Cal OES for Presidential Major Disaster Declaration: FEMA- 4308-DR-CA for the winter storm events that occurred in February/March 2017.

Plans for stabilization of the slope were developed by NCE and their geotechnical subconsultant, Hultgren Tillis Engineers. To qualify for the federal funding, the City was required to complete an alternatives evaluation in compliance with federal guidelines. An alternatives analysis was completed for the City by NCE and Johnson Marigot Consulting, Inc. (NCE/Johnson) and was presented in a report dated September 2018. The alternatives analysis was based on geotechnical stabilization alternatives developed by NCE based on geotechnical exploration and analyses completed by Hultgren Tillis Engineers (HTE). HTE's work included advancing serval borings and installation of instrumentation consisting of inclinometer casings and vibrating wire piezeometers. It was determined that beneath the edge of the road embankment, movement impacting the roadway was occurring along a defined slide plane at a depth of up to more than 50 feet below the existing ground surface.

Eight alternatives were analyzed by NCE/Johnson and evaluated in accordance with referenced federal guidelines to identify the *Least Environmentally Damaging Practicable Alternative* (LEDPA). Based on their analyses and evaluations, NCE/Johnson presented a proposed Alternative 1 which consists of a toe buttress with a culvert that requires that a 300-foot long portion of San Pablo Creek be enclosed in a new culvert located at the toe of the slope failure. The backfill and culvert would buttress and stabilize the slope failure.

The Board reviewed the September 2018 NCE/Johnson report and some other supporting documents and prepared their October 29, 2019 review letter. In their letter the Board concluded that *"….* Analysis is inadequate because it does not provide detailed supporting documentation for all of the alternatives, or adequate discussion of other possible options."

The Board summarizes their review as follows:

"Alternatives Analysis: The document concludes that installation of a box culvert and backfill within San Pablo Creek is the most viable alternative for addressing slope instability in the area to the north of the creek. Reasoning presented is generally that other alternatives are either not feasible for technical reasons, too costly, and/or would require extended time frames to implement. The Analysis does not provide adequate detail and supporting documentation for all of the alternative designs or the associated costs of each option. Given the significant impacts associated with the fill of 350 linear feet (LF) of San Pablo Creek, and the challenge in locating meaningful and adequate mitigation for these impacts, you are

requested to reconsider some of the alternatives that would avoid placement of fill in San Pablo Creek."

The purpose of our geotechnical peer review has been to provide a third-party assessment of the geotechnical conclusions drawn by NCE/HTE regarding the proposed Alternative 1 and the efficacy of the other alternatives.

DOCUMENTS REVIEWED AND SITE RECONNAISSANCE

The following documents were provided to CE&G as part of our review:

- *Alternatives Analysis for the Via Verdi Slope Stabilization Project,* prepared by NCE & Johnson Marigot Consulting, LLC (NCE/Johnson), dated September 2018;
- *Geotechnical Investigation, Via Verdi Landslide*, prepared by Hultgren – Tillis Engineers (HTE), dated May 1, 2018
- *Geotechnical Evaluation Repair Alternatives Via Verdi Slope Stabilization Project Richmond, California,* letter prepared by HTE for NCE, dated January 11, 2018 (revised August 17, 2018).
- *Concrete Channel Buttress Repair Alternative Structural Engineering Considerations Via Verdi Slope Stabilization Project Richmond, California,* letter to NCE prepared by Degenkolb, dated December 5, 2019.
- *Geotechnical Investigation Sobrante Glen Subdivision Richmond, California,* report to Design Real Estate prepared by Harding-Lawson Associates (HLA), dated October 11, 1977.
- Grading Plans sheets 1 - 8 for Subdivision 4593 prepared by KCA Engineers dated 12-6-1977.
- *Response to Water Board Letter Dated October 29, 2019 Subject: Review of ALterntives Analysis and Geotechnical Report (CIQQS Place ID:858409, Regulatory Measure ID: 430699) Via Verdi Slope Stabilization Project,* letter to Ms. Kathryn R. Hart San Francisco Regional Water Quality Control Board prepared by NCE, draft dated December 27, 2019.

We completed a reconnaissance of the site on January 3, 2020 and discussed the project briefly via telephone with Ryan Shafer of NCE.

FINDINGS AND COMMENTS

SUMMARY REGARDING ALTERNATIVE 1

Comment 1. Our review of the noted documents has revealed that the proposed Alternative 1 will provide the lowest risk geotechnical stabilization of the slope failure. We concur with NCE and HTE that the proposed Alternative 1 will most effectively stabilize the slope by buttressing the mobilized mass and essentially giving it nowhere to move any further. We find that the proposed Alternative 1 is both technically feasible and constructible and that it is the most technically viable and reliable long-term stabilization alternative.

We agree with the Board that the original documents provided do not provide sufficient detail to evaluate the estimated costs of construction presented by NCE/Johnson. Our review of the draft response letter from NCE indicates that more sufficient cost estimates have been prepared and are being provided to the Board.

HTE GEOTECHNICAL REPORT AND LETTER

Comment 2. The geotechnical investigation work completed by HTE provided a basis on which HTE and NCE developed stabilization alternatives. The extent of the investigative work downslope of the road appears to have been limited to the road shoulder where inclinometers and piezometers were installed. It was not clear in the report if geologic mapping of the creek bank was completed to identify the toe of the slope movement. Discussions with Ryan Shafer of NCE confirmed that reconnaissance level observations of the creek bank were completed. However, the investigation and explorations were limited due to considerations regarding clearing of the creek bank vegetation to facilitate drilling or other exploration.

Based on our site observations and review of the boring logs and instrumentation data, we believe that the postulated failure slip surface depicted in the Idealized Subsurface Cross Section in Plate No. 5 of the HTE report is reasonable and adequate for evaluation of the stability of the slope and the evaluation of stabilization alternatives. However, the locations of the phreatic surface and the borings and instrumentation should be added to the figure on Plate No. 5 and be reviewed and confirmed during construction, as appropriate (see subsequent comments presented herein).

Comment 3. The inclinometer data and borings presented in the HTE report indicate that the slope movement which impacted the road and utilities occurred along a discrete failure plane that is primarily within the Orinda Formation claystone materials that underlie the fill placed to construct Via Verdi in the late 1970s. It is our understanding that the inclinometer

casings each sheared off at the discrete plane within a few months after the instruments were installed and readings of the casings were stopped. As a result of the brief readings prior to shearing of the casing, it appears that HTE/NCE interpreted that data to indicate that the road embankment above the discrete failure plane was moving as a coherent mass. Because the fill is comprised of Orinda formation materials, this may or may not be a completely correct interpretation/assumption. We recommend that consideration be given to taking additional readings in the inclinometer casings down to the depth of shearing of the casing and continuing the readings during construction to the extent possible. Based on our understanding of conditions at the site, if warranted by the additional readings, adjustment to the design and implementation of stabilization measures to address any identified shallower movements on the slope will be possible and straightforward and will not impact the viability of the alternatives.

Comment 4. The Idealized Cross Section used in the various alternative analyses seems reasonable and the assigned, back-calculated shear strength of 13 degrees for the failure plane seems reasonable based on our experience. The inclinometer readings suggest that the failure plane within Orinda formation developed along a discrete surface within the claystone. The shear strength along the discrete surface is likely at or near the inherent residual shear strength of the claystone while the shear strength in other parts of the claystone is likely greater. In our opinion, assigning the phi = 13 degrees strength to all the underlying Orinda formation materials is both conservative and reasonable for the known site conditions. If desired, the impact of this assumption could be assessed by modifying the Idealized Cross Section to reflect a limited discrete failure zone with phi = 13 degrees and modeling the remainder of the Orinda Formation materials with a slightly higher (fully-softened instead of residual) shear strength. In our opinion, any such assessment is very unlikely to change the results of the analyses of alternatives considered.

COMMENTS REGARDING POTENTIAL FEASIBILITY OF OTHER ALTERNATIVES

Comment 5. Overall, we conclude that the alternatives considered in the reports are generally appropriate and reflect a reasonable suite of potential stabilization measures. We do not believe that any other significantly different alternatives could provide an adequately reliable and cost-effective means of stabilizing the road.

Comment 6. The results of the analyses and the conclusions drawn by HTE and NCE/Johnson regarding the geotechnical feasibility of Alternative 2, potentially modified versions of Alternative 2, and other alternatives are based on reasonable assumptions made by HTE regarding failure plane geometry and strength of the Orinda Formation materials.

RECOMMENDATIONS

Comment 7. As indicated in a previous comment, we recommend that the assumptions made during the analyses and development of stabilization measures be reviewed and confirmed during construction and that modifications to the design and implementation of the construction be made accordingly.

Based on our review of the exploration and instrumentation data, to reduce the potential for risk associated with construction of the project, we recommend that the following be completed as part of construction of the stabilization measures to confirm the assumed subsurface conditions:

- Complete more detailed field mapping of the creek bank and creek in the vicinity of the slope failure to identify the location of the toe of the failure.

- Take additional readings of existing inclinometer casings above the levels at which they have sheared off.

- Install and monitor at least one additional inclinometer casing on the slope below the road shoulder to confirm the location of the base of the failure plane and overall failure plane geometry.

- Install at least one inclinometer in the area upslope of the failure head scarp to confirm no movements are occurring in this area and to provide monitoring capabilities during construction.

DETAILED ALTERNATIVE COST ESTIMATES

Via Verdi Slope Stabilization Project			
Restore Via Verdi			
Alternative 1: Toe Buttress with Culvert			
Major Project Item	Description	Budgetary Construction Cost	Notes
1	Mob/demob, Construction Schedule, Utility Protection	$ 340,000	5%of items 2 through 18
2	Traffic Control	$ 180,000	
3	Clearing & Grubbing	$ 160,000	
4	Storm Water Pollution Prevention Plan, Temporary BMPs, silt Fencing	$ 70,000	
5	Dewatering	$ 120,000	
6	Demolition (concrete headwall, abandon piezometer, fences, conc. improvements)	$ 120,000	
7	Tree Removal	$ 10,000	
8	Earthwork (excavation and fill, grading)	$ 1,510,000	9,650 cubic yards backfill placed around and over the culvert to raise the ground surface to buttress the landslide.
9	Riprap and Bioengineered Slope Protection	$ 150,000	
10	Cast-in-place Concrete Culvert (culvert box, headwall, culvert bend, cutoff wall, culvert connection,subdrain)	$ 2,460,000	340 feet concrete culvert (H=17'; W=20') to channel creek
11	Revegetation	$ 70,000	
12	Culvert Baffles and Creek Sediment	$ 50,000	
13	Fencing	$ 30,000	
14	Via Verdi roadway construction	$ 710,000	Reconstruct 31,760 square feet of road; includes embankment and storm drain system
15	Concrete Improvements (sidewalk, driveways)	$ 140,000	Sidewalk, curb & gutter, curb ramps, driveways
16	Traffic Striping	$ 5,000	
17	Restore underground utilities in Via Verdi	$ 480,000	Restore water, sewer, gas, comm lines, utility covers
18	Restore cemetery parcel	$ 200,000	Demo existing emergency access road, revegetate, and restore property to near pre-project conditions
	Subtotal	$ 6,805,000	
	30% Contingency	$ 2,040,000	
	Construction Total	**$ 8,845,000**	
	12% Design	$ 1,060,000	
	8% Construction Management, Inspection, and Testing	$ 710,000	
	3% Construction Administration	$ 270,000	
	Permitting	$ 150,000	
	Environmental Document (CEQA/NEPA)	$ 250,000	MND/EA Extensive biological resources analysis, tree removal, hydrology impacts due to creek work.
	Permanent Drainage Easement/TCE	$ 70,000	
	Alternative 1 Total	**$ 11,360,000**	

Via Verdi Slope Stabilization Project			
Abandon Via Verdi			
Alternative 2 (Option 1): Abandon Via Verdi and Construct New Access Road (Fariss Lane)			
Major Project Item	Description	Budgetary Construction Cost	Notes
1	Mob/demob, demolition, clearing & grubbing, traffic control, SWPPP	$ 580,000	15% of Items 2 - 6
2	Stabilization of slope & revegetation	$ 980,000	Remove and dispose portions of landslide soil mass (12,300 CY) or grade creek slope back to 3:1 or 4:1 depending on factor of safety achieved. Removing portions of the landslide would only mitigate disturbance/damage to riparian areas.
3	Structure Demolition (2 homes)	$ 100,000	Demolish 2 homes
4	2-lane roadway construction	$ 1,100,000	Construct 975 feet long approx. 45 feet wide roadway to connect Mozart Drive with Fariss Lane
5	Underground utilities (connect to utility in Fariss Lane)	$ 1,490,000	Abandon water, sewer, gas, communication lines in Via Verdi - connect all utilities to Fariss Lane (assume utilities - 2,300 lf of water line in Fariss and Garden Lane - need upgrades); sewer lift station
6	Restore cemetery parcel	$ 200,000	Demo existing emergency access road, revegetate, and restore property to near pre-project conditions
	Subtotal	$ 4,450,000	
	30% Contingency	$ 1,340,000	
	Construction Total	**$ 5,790,000**	
	12% Design	$ 690,000	
	8% Construction Management, Inspection, and Testing	$ 460,000	
	3% Construction Administration	$ 170,000	
	Permitting	$ 150,000	
	Environmental Document (CEQA/NEPA)	$ 300,000	EIR/EIS:Significant traffic analysis, biological resources assessment, community outreach, air quality analysis, commuinity impacts assesment, noise, aesthetics.
	Purchase Private Properties	$ 3,450,000	5 properties
	Permanent Drainage Easement/TCE	$ 30,000	
	Alternative 2a Total	**$ 11,040,000**	

Via Verdi Slope Stabilization Project

Abandon Via Verdi

Alternative 2 (Option 2): Abandon Via Verdi and Construct New Access Road (Foster Lane)

Major Project Item	Description	Budgetary Construction Cost	Notes
1	Mob/demob, demolition, clearing & grubbing, traffic control, SWPPP	$ 1,120,000	20% of Items 2 - 7 for bridge construction
2	Stabilization of slope & revegetation	$ 980,000	Remove and dispose portions of landslide soil mass (12,300 CY) or grade creek slope back to 3:1 or 4:1 depending on factor of safety achieved. Removing the head mass would only mitigate disturbance/damage to riparian areas.
3	Structure demolition (2 homes)	$ 100,000	Demolish 2 homes
4	Concrete bridge	$ 2,170,000	230 feet bridge crossing (45' wide) at end of Foster Lane
5	2-lane roadway construction	$ 840,000	Construct 745 feet long approx. 45 feet wide roadway to connect Mozart Drive with Foster Lane
6	Underground utilities (connect to utility in Foster Lane)	$ 1,290,000	Abandon water, sewer, gas, communication lines in Via Verdi - connect all utilities to Foster Lane (assume utilities 2,200 lf of water line in Foster and Garden Lane - need upgrades); sewer lift station
7	Restore cemetery parcel	$ 200,000	Demo existing emergency access road, revegetate, and restore property to pre-project conditions
	Subtotal	$ 6,700,000	
	30% Contingency	$ 2,010,000	
	Construction Total	**$ 8,710,000**	
	12% Design	$ 1,050,000	
	8% Construction Management, Inspection, and Testing	$ 700,000	
	3% Construction Administration	$ 260,000	
	Permitting	$ 150,000	
	Environmental Document (CEQA/NEPA)	$ 300,000	EIR/EIS:Significant traffic analysis, biological resources assessment, community outreach, air quality analysis, commuinity impacts assesment, noise, aesthetics.
	Purchase Private Properties	$ 3,450,000	5 properties
	Permanent Drainage Easement/TCE	$ 30,000	
	Alternative 2b Total	**$ 14,650,000**	

Via Verdi Slope Stabilization Project			
Abandon Via Verdi			
Alternative 2 (Option 3): Abandon Via Verdi and Construct New Access Road (Garden Road)			
Major Project Item	Description	Budgetary Construction Cost	Notes
1	Mob/demob, demolition, clearing & grubbing, traffic control, SWPPP	$ 850,000	20% of Items 2 - 7 for bridge construction
2	Stabilization of slope & revegetation	$ 980,000	Remove and dispose portions of landslide soil mass (12,300 CY) or grade creek slope back to 3:1 or 4:1 depending on factor of safety achieved. Removing portions of the landslide would only mitigate disturbance/damage to riparian areas.
3	Demolition, Clearing & Grubbing	$ 300,000	Demolish 6 homes
4	Concrete bridge	$ 1,580,000	160 feet bridge crossing (45' wide) at end of Garden Road
5	2-lane roadway construction	$ 370,000	Construct 325 feet long approx. 45 feet wide to connect Mozart Drive with Garden Road
6	Underground utilities (connect to utility in Garden Road)	$ 820,000	Abandon water, sewer, gas, communication lines in Via Verdi - connect all utilities to Garden road (assume utilities - 1,550 lf of water line in Garden Lane - need upgrades); sewer lift station
7	Restore cemetery parcel	$ 200,000	Demo existing emergency access road, revegetate, and restore property to near pre-project conditions
	Subtotal	$ 5,100,000	
	30% Contingency	1,530,000	
	Construction Total	**6,630,000**	
	12% Design	800,000	
	8% Construction Management, Inspection, and Testing	530,000	
	3% Construction Administration	200,000	
	Permitting	150,000	
	Environmental Document (CEQA/NEPA)	300,000	EIR/EIS: Significant traffic analysis, biological resources assessment, community outreach, air quality analysis, commuinity impacts assesment, noise, aesthetics.
	Purchase Private Properties	5,050,000	6 properties
	Permanent Drainage Easement/TCE	$ 30,000	
	Alternative 2c Total	**$ 13,690,000**	

Via Verdi Slope Stabilization Project			
Restore Via Verdi			
Alternative 3: Retaining Wall			
Major Project Item	Description	Budgetary Construction Cost	Notes
1	Mob/demob, demolition, clearing & grubbing, traffic control, SWPPP	$ 1,240,000	20% of Items 2 - 5 for wall construction
2	Secant Pier Wall	$ 4,880,000	Wall with tie-backs + excavation
3	Via Verdi roadway construction	$ 710,000	Reconstruct 31,760 square feet of road; includes storm drain system, curb & gutter, sidewalk, striping, embankment
4	Restore underground utilities in Via Verdi	$ 430,000	Restore water, sewer, gas, comm lines
5	Restore cemetery parcel	$ 200,000	Demo existing emergency access road, revegetate, and restore property to near pre-project conditions
	Subtotal	$ 7,460,000	
	30% Contingency	2,240,000	
	Construction Total	**9,700,000**	
	12% Design	1,160,000	
	8% Construction Management, Inspection, and Testing	780,000	
	3% Construction Administration	290,000	
	Permitting	150,000	
	Environmental Document (CEQA/NEPA)	200,000	MND/EA
	Purchase Private Properties	-	
	Permanent Drainage Easement/TCE	$ 10,000	
	Alternative 3 Total	**$ 12,290,000**	

Via Verdi Slope Stabilization Project			
Restore Via Verdi			
Alternative 4: Excavate Slide Mass and Reconstruct Slope with Geogrid			
Major Project Item	Description	Budgetary Construction Cost	Notes
1	Mob/demob, demolition, clearing & grubbing, traffic control, SWPPP	$ 1,530,000	20% of Items 2 - 5
2	Excavation, fill, and revegetation	$ 6,320,000	Excavate and fill below slide plane (total 75,000 CY in 3 segments, one at a time, to protect uphill slope from sliding during construction; stockpile on cemetery property), temporary shoring (4 installations, 32,000 SF @ $50/SF), and construct intermediate buttress bench with subdrains; reinforce with geogrid (40,000 SY @ $5/SY)
3	Via Verdi roadway construction	$ 710,000	Reconstruct 31,760 square feet of road; includes storm drain system, curb & gutter, sidewalk, striping, embankment
4	Restore underground utilities	$ 430,000	Relocate water, sewer, gas, communication lines
5	Restore cemetery parcel	$ 200,000	Demo existing emergency access road, revegetate, and restore property to near pre-project conditions
	Subtotal	$ 9,190,000	
	30% Contingency	2,760,000	
	Construction Total	**11,950,000**	
	12% Design	1,430,000	
	8% Construction Management, Inspection, and Testing	960,000	
	3% Construction Administration	360,000	
	Permitting	150,000	
	Environmental Document (CEQA/NEPA)	300,000	EIR/EA: Extensive mitigation required for impacts to riparian resources and tree removal. Extensive cultral resources investigation for stockpile area near cemetary.
	Purchase Private Properties	-	
	Permanent Drainage Easement/TCE	$ 30,000	
	Alternative 4 Total	**$ 15,180,000**	

Via Verdi Slope Stabilization Project			
Restore Via Verdi			
Alternative 5: Excavate Slide Mass and Reconstruct Slope			
Major Project Item	Description	Budgetary Construction Cost	Notes
1	Mob/demob, demolition, clearing & grubbing, traffic control, SWPPP	$ 1,490,000	20% of Items 2 - 5
2	Excavation, fill, and revegetation	$ 6,120,000	Excavate and fill below slide plane (total 75,000 CY in 3 segments, one at a time, to protect uphill slope from sliding during construction; stockpile on cemetery property), temporary shoring (4 installations, 32,000 SF @ $50/SF), and construct intermediate buttress bench with subdrains
3	Via Verdi roadway construction	$ 710,000	Reconstruct 31,760 square feet of road; includes storm drain system, curb & gutter, sidewalk, striping, embankment
4	Restore underground utilities	$ 430,000	Relocate water, sewer, gas, communication lines
5	Restore cemetery parcel	$ 200,000	Demo existing emergency access road, revegetate, and restore property to near pre-project conditions
	Subtotal	$ 8,950,000	
	30% Contingency	2,690,000	
	Construction Total	**11,640,000**	
	12% Design	1,400,000	
	8% Construction Management, Inspection, and Testing	930,000	
	3% Construction Administration	350,000	
	Permitting	150,000	
	Environmental Document (CEQA/NEPA)	280,000	EIR/EA: Extensive mitigation required for impacts to riparian resources and tree removal. Extensive cultral resources investigation for stockpile area near cemetary.
	Purchase Private Properties	-	
	Permanent Drainage Easement/TCE	$ 30,000	
	Alternative 5 Total	**$ 14,780,000**	

Via Verdi Slope Stabilization Project			
Restore Via Verdi			
Alternative 6: Concrete Bridge			
Major Project Item	Description	Budgetary Construction Cost	Notes
1	Mob/demob, demolition, clearing & grubbing, traffic control, SWPPP	$ 1,190,000	20% of Items 2 - 7 for bridge construction
2	Stabilization of slope & revegetation	$ 2,000,000	Excavate portions of landslide soil mass (25,000 CY) and grade creek slope back to 3:1 or 4:1. Revegetate riparian areas.
3	Via Verdi Bridge	$ 3,230,000	350 feet concrete causeway bridge, 45' wide, 4 bridge piers, 50 feet tall
4	Via Verdi roadway construction	$ 150,000	Via Verdi Roadway Restoration (approx. 10565 SF)
5	Restore underground utilities	$ 220,000	Relocate water, sewer, gas, communication lines
6	Underground utility relocations	$ 140,000	Hang water and sewer lines from bridge
7	Restore cemetery parcel	$ 200,000	Demo existing emergency access road, revegetate, and restore property to near pre-project conditions
	Subtotal	$ 7,130,000	
	30% Contingency	2,140,000	
	Construction Total	**9,270,000**	
	12% Design	1,110,000	
	8% Construction Management, Inspection, and Testing	740,000	
	3% Construction Administration	280,000	
	Permitting	150,000	
	Environmental Document (CEQA/NEPA)	250,000	MND/EA. Extensive tree removal mitigation required.
	Purchase Private Properties	-	
	Permanent Drainage Easement/TCE	$ 20,000	
	Alternative 6 Total	**$ 11,820,000**	

Via Verdi Slope Stabilization Project			
Abandon Via Verdi			
Alternative 7: Re-align Via Verdi			
Major Project Item	Description	Budgetary Construction Cost	Notes
1	Mob/demob, demolition, clearing & grubbing, traffic control, SWPPP	$ 290,000	15% of Items 2 - 5
2	Stabilization of slope & revegetation	$ 610,000	Remove portions of landslide soil mass and lay back creek slope to 3:1 or 4:1 depending on factor of safety desired. Revegetate stabilized slope
3	Realign Via Verdi (2-lane roadway)	$ 780,000	Realign and construct 29,270 SF road
4	Underground utility relocations	$ 430,000	Relocate water & sewer lines to match new road alignment
5	Demolish existing section of Via Verdi	$ 100,000	Demo current section of Via Verdi
	Subtotal	$ 2,210,000	
	30% Contingency	660,000	
	Construction Total	**2,870,000**	
	12% Design	340,000	
	8% Construction Management, Inspection, and Testing	230,000	
	3% Construction Administration	90,000	
	Permitting	150,000	
	Environmental Document (CEQA/NEPA)	300,000	EIR/EA, Extensive biological impacts and tree removal requiring mitigation. Requires aesthetics, noise, air quality analysis for new roadway segment.
	Purchase Cemetery Parcel	210,000	
	Permanent Drainage Easement/TCE	$ 20,000	
	Alternative 7 Total	**$ 4,210,000**	

Via Verdi Slope Stabilization Project			
Restore Via Verdi			
Alternative 8: Drainage Gallery			
Major Project Item	Description	Budgetary Construction Cost	Notes
1	Mob/demob, demolition, clearing & grubbing, traffic control, SWPPP	$ 420,000	15% of Items 2 - 5
2	Slope Drain Gallery	1,450,000	Nine large diameter wells filled with permeable material connected with underground pipes to lower groundwater level
3	Via Verdi roadway construction	$ 710,000	Reconstruct 31,760 square feet of road; includes storm drain system, curb & gutter, sidewalk, striping, embankment
4	Restore underground utilities	$ 430,000	Relocate water, sewer, gas, communication lines
5	Restore cemetery parcel	$ 200,000	Demo existing emergency access road, revegetate, and restore property to near pre-project conditions
	Subtotal	$ 3,210,000	
	30% Contingency	960,000	
	Construction Total	**4,170,000**	
	12% Design	500,000	
	8% Construction Management, Inspection, and Testing	330,000	
	3% Construction Administration	130,000	
	Permitting	150,000	
	Environmental Document (CEQA/NEPA)	280,000	EIR/EA Extensive tree removal mitigation required.
	Purchase Private Properties	-	
	Permanent Drainage Easement/TCE	$ 10,000	
	Alternative 8 Total	**$ 5,570,000**	

Attachment 3

CORRESPONDENCE WITH NATIONAL MARINE FISHERIES SERVICE

It was nice chatting with you this morning, Mack. Attached please find a few documents that may be of interest to you.
(1) Leidy *et al*. (2005) Historical Distribution and Current Status of Steelhead/Rainbow Trout (*Oncorhynchus mykiss*) in streams of the San Francisco Estuary, California -- Contra Costa County;
(2) Cleugh and McKnight (2002) Steelhead Migration Barrier Survey of San Francisco Bay Area Creeks;
(3) CDFW (2013) San Pablo Creek Stream Inventory Report; and
(4) NMFS (2019) Guidelines for Salmonid Passage at Stream Crossings

Bert Mulchaey is the supervising fisheries biologist for the East Bay Municipal Utility District (EBMUD). Bert and his crew likely have more experience than anyone else looking at San Pablo Creek. Bert is happy to share his information and experiences. Please feel free to contact him at (510) 287-2038 or bert.mulchaey@ebmud.com. Bert has mentioned that there are some significant fish passage impediments in San Pablo Creek downstream of the Via Verdi crossing – one at the Giant Road crossing and another at the Hwy 80 crossing. There are likely photos of these barriers in the Cleugh and McKnight (2002) document. The EBMUD has three electrofishing areas upstream of the Hwy 80 crossing, including one at your proposed work area, that they sample each year. They have not detected any steelhead in the past 12-15 years. Bert has heard from old-timers that steelhead ran in the creek probably into the 1980's or early 1990's at least up to I-80.

Although steelhead may be extirpated from San Pablo Creek, that stream is included in our recovery plan: https://www.fisheries.noaa.gov/resource/document/final-coastal-multispecies-recovery-plan-california-coastal-chinook-salmon. Look at that site for volume 4 (CCC steelhead DPS) for information on San Pablo Creek, including recovery actions proposed for that stream. Three recovery actions come to mind to me, improve passage conditions, prevent impairment to floodplain connectivity, and reconnect the stream to its floodplain. The City's proposal, as I understand it, is contrary to those recovery actions.
Please let me know if you have any questions.

Dan

On Wed, Jan 22, 2020 at 10:38 AM Mack Casterman <MCasterman@ncenet.com> wrote:

Hi Dan,

I'm following up to find out if you were able to find any info regarding the presence of steelhead in the section of San Pablo creek adjacent to Via Verdi road. Thanks for any help you can provide.

Cheers,

Mack

From: Dan Logan - NOAA Federal <dan.logan@noaa.gov>
Sent: Tuesday, January 14, 2020 10:40 AM
To: Mack Casterman <MCasterman@ncenet.com>
Subject: Fwd: Potential for Steelhead presence in San Pablo Creek below San Pablo Dam

Hi, Mack. I will be in touch shortly.

Dan

---------- Forwarded message ---------
From: **Gary Stern** <gary.stern@noaa.gov>
Date: Mon, Jan 13, 2020 at 10:00 AM
Subject: Fwd: Potential for Steelhead presence in San Pablo Creek below San Pablo Dam
To: Dan Logan <Dan.Logan@noaa.gov>

Dan - Here's the email from Mack Casterman. Please see if you can help him assess his project's potential effects on steelhead.

thanks
Gary

-------- Forwarded Message --------

Subject: Potential for Steelhead presence in San Pablo Creek below San Pablo Dam
Date: Sat, 11 Jan 2020 01:18:18 +0000
From: Mack Casterman <MCasterman@ncenet.com>
To:gary.stern@noaa.gov <gary.stern@noaa.gov>

Mr. Stern,

My name is Mack Casterman and I work for an engineering and environmental consulting company called NCE. I am working on developing a CEQA document for the Via Verdi Slope Stabilization project in Richmond California. The City of Richmond is proposing to build a 340 linear foot culvert in San Pablo Creek and to cover it with engineered fill in order to stabilize an eroding hill slope that destroyed Via Verdi road in February 2017. This culvert would extend east from the existing culvert (built in 2012) that conveys creek flows under Via Verdi and El Portal Drive.

I am writing to find out what the potential for steelhead presence is in this stretch of San Pablo Creek. Are steelhead known to use this section of the creek for spawning or migration? I am also hoping to get an opinion on the potential for fish movement to be impeded by culverts. The section of culvert in this area that was built in 2012 was built with baffles to facilitate fish passage, but no work has been done to determine if these baffles are functioning as intended. Sedimentation has been observed within the baffles in the existing culvert. If baffles were to be designed into this new section of culvert, it is likely that the same sedimentation would occur. Is there a better way to design culverts to facilitate fish movement than using baffles?

Thanks for any information you can provide.

Mack Casterman
Project Scientist

p (775) 588-2505 **c** (650) 678-8379
f (775) 588-2607 **e** mcasterman@ncenet.com

NCE

P.O. Box 1760, Zephyr Cove, NV 89448

www.ncenet.com

Attachment 4

FISH PASSAGE - CULVERT DESIGN MEMORANDUMS

NCE Collaboration. Commitment. Confidence.℠

MEMORANDUM

Date:	**November 16, 2020**
To:	**Melissa Farinha, Andrew Chambers, Will Arcand, and Bryan Demucha, CDFW**
From:	**Sarah (Bryan) Davenport, Franz Haidinger, J. Ryan Shafer of NCE**
Subject:	**Proposed Culvert Design for San Pablo Creek**

The City of Richmond (City), Via Verdi Slope Stabilization Project (project) is a result of a winter 2017 emergency response project. On February 20, 2017, the City became aware of Via Verdi roadway distress. Over 200 feet of the Via Verdi road embankment had moved down towards San Pablo Creek as part of a larger landslide with settling of the roadway and buckling of concrete flatwork. Due to ongoing damage to Via Verdi roadway from the landslide, an emergency access road was constructed, and a portion of Via Verdi road was closed. **The landslide is still active**. This project is immediately upstream of the culvert replacement constructed in 2012 due to a partial culvert collapse that occurred in April 2010. This project included a full alternatives analysis that resulted in the selection of a concrete box culvert (height: 16', width: 22') to replace the partially collapsed corrugated metal culvert in San Pablo Creek.

For the current project, the preferred alternative to halt the landslide from discharging into San Pablo Creek is the installation of a 350 linear foot culvert (in addition to other required upland engineering solutions). The 350-foot culvert will be installed upstream and attached to the concrete box culvert from the 2010 culvert collapse repair project, resulting in a total of about 800 feet of San Pablo Creek being culverted. The concrete box culvert was constructed with a baffle system that will remain in place along with the current sediment to maintain natural habitat.

The purpose of this memo is to document what fish species may be present in San Pablo Creek and discuss key design considerations for the culvert, specifically natural light coverage and preferred bottom substrate.

San Pablo Creek

San Pablo Creek is a tributary to San Pablo Bay and drains a watershed of approximately 42.28 square miles (California Department of Fish and Wildlife, Marin County 2013). Within the 2010, California Department of Fish and Wildlife, Stream Habitat Assessment Report for San Pablo Creek, a biological inventory was conducted from the stream banks and found the following fish species: large 5-inch roaches and suckers, and sticklebacks. Within the report four reaches were examined and the proposed culvert site is upstream of the third reach.

California Roaches (*Lavinia symmetricus*)

Roaches from the 2010 Stream Habitat Assessment are likely the California roach (*Lavinia symmetricus*) as this species is native to the upper San Joaquin, Fresno, and Chowchilla river systems in central California (Nico and Fuller 2020). The California roach is typically found in large numbers in the shallow pools with high water clarity, warm water temperatures, and sand-gravel dominated substrates (Leidy 2007). These fish breed in gravel beds or riffles where groups of females lay eggs on and into the substrate (University of California Agriculture and Natural Resources n.d.). Due to the human disturbances and introduced predatory fish, the majority of the California roach population is likely threatened to some degree (Moyle et al. 1995).

Sacramento Suckers (*Catostomus occidentalis*)

Suckers from the 2010 Stream Habitat Assessment are likely Sacramento suckers (*Catostomus occidentalis*) which have been found in the San Pablo Bay Watershed and are native to California. These fish are capable of thriving in diverse conditions within streams, lakes, and mild estuarine environments, although most are found in clear, cool streams and lakes at moderate elevations (University of California Agriculture and Natural Resources n.d.). Sacramento suckers are often located in deep pools within the lower reaches of large watersheds (<50 m elevation) and large congregations are observed migrating from the reservoirs into tributary streams to spawn (Leidy 2007). Spawning happens in groups and fertilized eggs are carried out with the current to settle in gravel and slackwater areas (University of California Agriculture and Natural Resources n.d.). Sacramento sucker populations in estuary streams appear to be stable (Leidy 2007).

Threespine Sticklebacks (*Gasterosteus aculeatus*)

Sticklebacks from the 2010 Stream Habitat Assessment are likely the threespine stickleback (*Gasterosteus aculeatus*) that are native to California and found within the San Pablo Watershed (University of California Agriculture and Natural Resources n.d.). These fish are located in both freshwater/brackish waters as well as marine

environments (University of California Agriculture and Natural Resources n.d.). Within a stream, the threespine stickleback prefers shallow pools over a mixture of fine sand and gravel substrates (Leidy 2007). For protection from predation, these fish need adequate cover, often in the form of overhanging brush or aquatic plants and then clear water for nest building and food foraging (University of California Agriculture and Natural Resources n.d.). Threespine stickleback's are considered diurnal, but migrations are mostly nocturnal (McClory and Gotthardt 2006). Although unarmored threespine sticklebacks (*Gasterosteus aculeatus williamsoni)* are considered endangered*,* threespine stickleback (*Gasterosteus aculeatus*) are not considered special status species (U.S. Fish and Wildlife Service n.d.). California special status species are plant and animal species native to the state that have low population numbers, limited distributions, or are otherwise vulnerable to extinction or extirpation within the state. As a result, California special status species are protected by state and federal laws.

Criteria to Consider for Culvert Design

With longer culverts, there is a reduction in the light levels within, which has raised concerns about the impact of darkness on fish movement. According to the 2002 Culvert Criteria for Fish Passage published by the California Department of Fish and Game, all new and replacement culverts over 150 feet in length require natural or artificial supplemental lighting ("Culvert Criteria for Fish Passage" 2002). Based on these criteria, the spacing between light sources shall not exceed 75 feet ("Culvert Criteria for Fish Passage" 2002). Arizona Game and Fish Department made similar guidelines as light was considered a required culvert design element for successful fish and wildlife use ("Guidelines for Culvert Construction to Accommodate Fish & Wildlife Movement and Passage" 2006). Specifically the Arizona Game and Fish Department suggests installing grates or skylights to provide additional lighting ("Guidelines for Culvert Construction to Accommodate Fish & Wildlife Movement and Passage" 2006). Therefore, reduced light levels in culverts have the potential to be a barrier for fish and wildlife, hence multiple state departments of fish and game require supplemental lighting.

The relative elevation of the bottom of a culvert to the thalweg of a creek is another criterion that needs to be considered. According to a 2002 study on fish passage, elevated outlets (i.e. the downstream invert becoming perched above the existing stream-bed) are frequently causes of impediment for migratory fish (Larinier 2002). National Oceanic and Atmospheric Administration (NOAA) also described culvert bottom elevation in relation to the thalweg as a potential barrier to fish migration if the culvert is perched too high (Fisheries 2019). Due to the threespine stickleback's small body size and weak swimming ability, this species is especially sensitive to

impacts from vertical drops (Greene et al. 2017). In summary, elevated culvert bottoms or outlets are considered a potential barrier for fish.

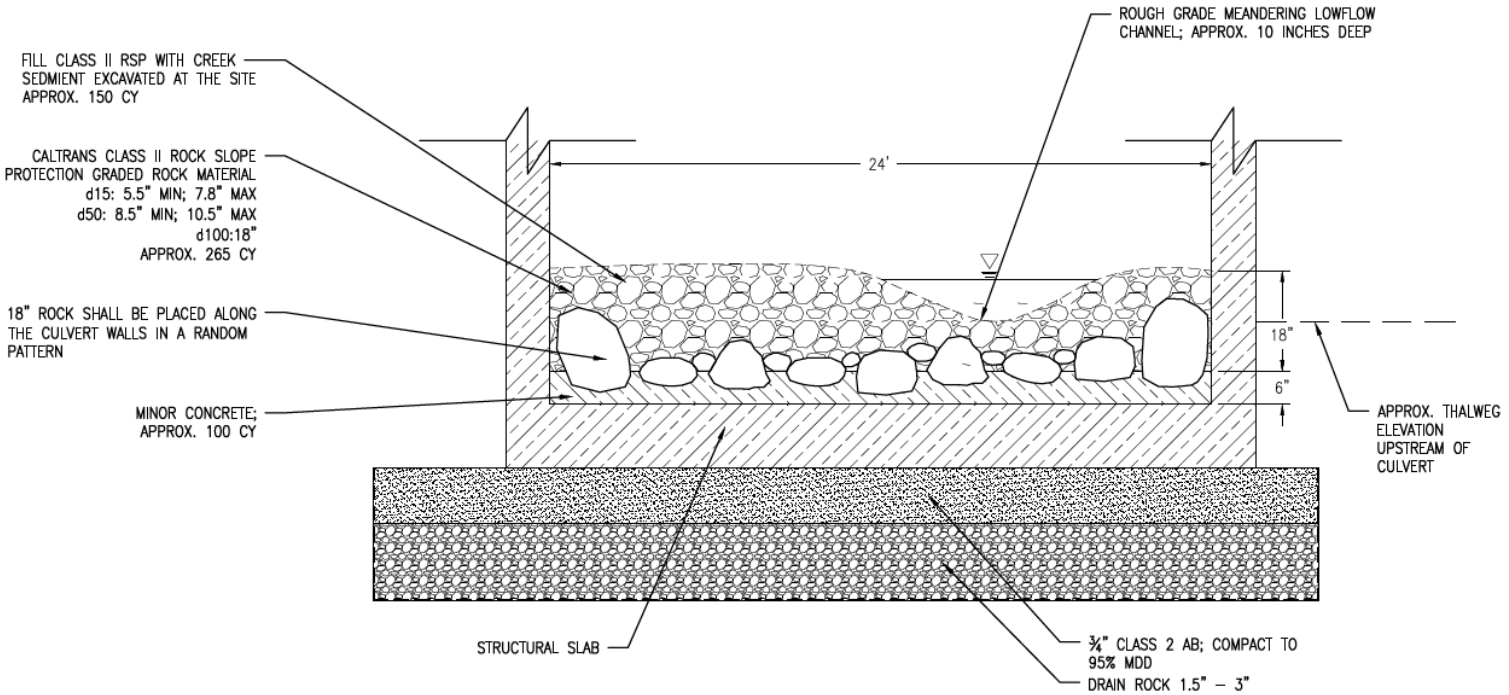
Design of the Creek Culvert Recommendations

The 350 linear foot culvert within San Pablo Creek will be set within the creek channel aiming at establishing a creek bed within the culvert that allow movement of fish within and through the culvert to areas that provide both spawning habitat and riparian cover. To meet these habitat requirements fine gravel will be placed upstream of the culvert headwall to encourage the formation of breeding habitat for California Roach and Sacramento Suckers. The fine gravel will be placed for a total length of 50 feet within San Pablo Creek. This mirrors a recommendation from the San Pablo Creek 2010 study that due to the lack of suitable size spawning substrate within San Pablo Creek reaches, projects "should be designed at suitable sites to trap and sort spawning gravel" (California Department of Fish and Wildlife, Marin County 2013). The placement of spawning gravel in the shallow reaches upstream of the proposed culvert will meet this recommendation. In addition, upstream of the proposed culvert head and wing walls, willow brush mattresses will be installed to provide additional aquatic riparian cover to reduce predation of threespine stickleback.

Based on California and Arizona's culvert guidance from the Department of Fish and Game, light was considered a required culvert design element ("Culvert Criteria for Fish Passage" 2002; "Guidelines for Culvert Construction to Accommodate Fish & Wildlife Movement and Passage" 2006). Consequently, the design will include 'skylights' in the proposed culvert at no more than a 75-foot distance between each skylight as recommended for successful fish use. Skylights are in essence a manhole about 5 feet in diameter at the apex of the culvert. The first natural light source (skylight) will be approximately 37 feet upstream of the connection point to the existing culvert. There will be a total of 4 skylights with the following spacing starting from the connection point to the existing culvert, moving upstream: the first skylight is 37 feet upstream of the existing culvert, then at 75 feet, then at 75 feet, then at 75 feet, and the last skylight will be 70 feet from the upstream end of the culvert. Each skylight will have a metal grate at the top to allow natural light and fenced to provide secure access. The layout of the proposed skylights for CDFW's review is attached as drawing C8 and is shown in plan and profile view.

As a result of our October 29, 2020 site meeting and NOAA's guidance, the proposed culvert will be embedded or countersunk by approximately 2 feet into the San Pablo Creek bed to mitigate potential future issues with elevated culvert outlets impeding fish migration. The California Salmonid Stream Habitat Restoration Manual provided guidance to design the embedment depth of the culvert. A typical cross section of

the embedded culvert for CDFW's review is shown below in Detail 3/D1. This design includes placement of Caltrans Class II Rock Material, with larger 18" diameter rock placed at edges and smaller diameter rock materials in the center and excavated creek sediment to promote differential deposition, natural stream habitat and substrate, and a meandering low flow channel.



3/D1 CULVERT COBBLE/RIPRAP EMBEDMENT
N.T.S.

In addition to these fish habitat and passage protection measures, the project strives to minimize drainage impacts to the maximum extent practicable, and will maintain downstream flows throughout construction, implement Best Management Practices to protect water quality, and restore areas where vegetation is unavoidably removed.

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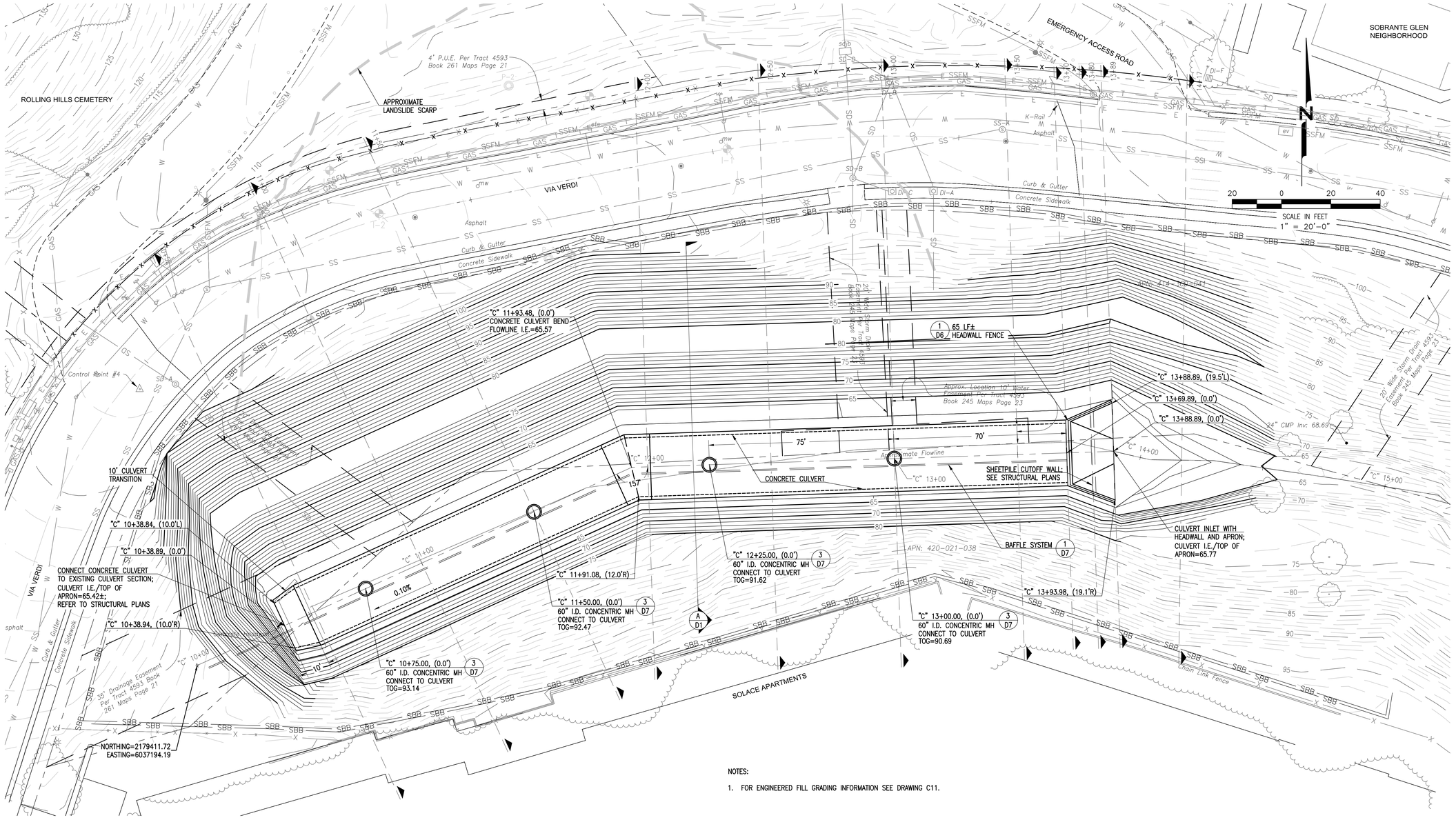
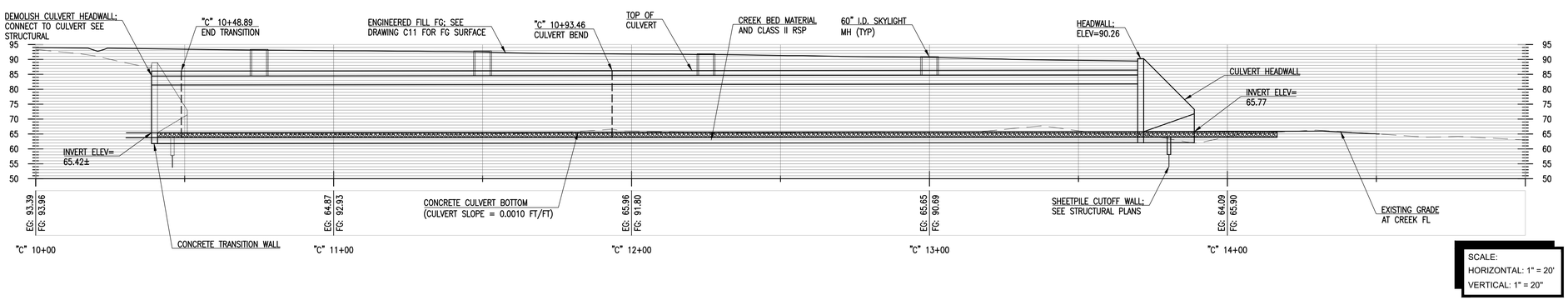


NOTES:

1. FOR ENGINEERED FILL GRADING INFORMATION SEE DRAWING C11.



SCALE:
HORIZONTAL: 1" = 20'
VERTICAL: 1" = 20"

811 Know what's below. Call before you dig.

100% SUBMITTAL
PRELIMINARY
FOR REVIEW
NOT FOR CONSTRUCTION
DATE: 10-30-2020

NCE
501 Canal Blvd., Suite I
Richmond, Ca. 94804
(510) 215-3620 * Fax (510) 215-2898

REGISTERED PROFESSIONAL ENGINEER
FRANK G. HAUTZINGER
NO. C 64725
EXP. 06/30/19
CIVIL
STATE OF CALIFORNIA

VIA VERDI SLOPE STABILIZATION

OWNER

CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

NO.	DATE	DESCRIPTION

PROJECT NO:	568.41.55
DESIGNED BY:	FGH, VL
DRAWN BY:	MG, VL
CHECKED BY: JWN	DATE 08/12/2019
DATE:	10/30/2020

SHEET TITLE

REINFORCED CONCRETE CULVERT PLAN AND PROFILE

DRAWING

C8

SHEET 10 OF 33

MEMORANDUM

Date:	**February 8, 2021**
To:	**Melissa Farinha, Andrew Chambers, Will Arcand, and Bryan Demucha, CDFW** **Kathryn Hart, California Water Board**
From:	**Franz Haidinger, J. Ryan Shafer, Debra Lemke, Sarah Davenport, NCE**
Subject:	**Proposed Fish Passage Design for the Via Verdi Slope Stabilization Project**

The City of Richmond (City), Via Verdi Slope Stabilization Project (project) is a result of a winter 2017 emergency response project. On February 20, 2017, the City became aware of Via Verdi roadway distress. Over 200 feet of the Via Verdi road embankment had moved down towards San Pablo Creek as part of a larger landslide with settling of the roadway and buckling of concrete flatwork. Due to ongoing damage to the Via Verdi roadway from the landslide, an emergency access road was constructed, and a portion of Via Verdi road was closed. **The landslide is still active**. This project is immediately upstream of the culvert replacement constructed in 2012 due to a partial culvert collapse that occurred in April 2010. This project included a full alternatives analysis that resulted in the selection of a concrete box culvert (height: 16', width: 22') to replace the entire corrugated metal culvert in San Pablo Creek.

We previously submitted a memorandum titled Proposed Culvert Design for San Pablo Creek dated November 16, 2020 that documented what fish species may be present in San Pablo Creek and discussed key design considerations for the culvert with respect to fish passage, specifically natural light coverage and sediment covering the culvert floor. Based on our discussion of the previous memorandum in video conference dated December 18, 2020, both CDFW and the Water Board were accepting of the proposed skylights design, initial fish species documented to be present, and the desire to have creek sediment covering the culvert floor. However, both agencies further requested three items 1) a fish monitoring plan 2) fish passage design within the existing and proposed new culvert including minimum depth of flow considerations, and 3) hydraulic design output of the proposed new culvert. Item 1 was submitted to the agencies as NCE's memorandum titled Proposed Fish Passage

Monitoring Plan for the Via Verdi Slope Stabilization Project dated January 15, 2021 and subsequently revised based on comments received and resubmitted February 8, 2021. The remaining Items 2 and 3 are addressed herein.

San Pablo Creek

San Pablo Creek is a tributary to San Pablo Bay and drains a watershed of approximately 42.28 square miles (California Department of Fish and Wildlife, Marin County 2013). Within the 2010, California Department of Fish and Wildlife, Stream Habitat Assessment Report for San Pablo Creek, a biological inventory was conducted from the stream banks and found the following fish species: large 5-inch roaches and suckers, and sticklebacks, as summarized in our November 16, 2020 Memorandum.

Water Depth for Fish Passage and Flow Criteria

According to the California Department of Fish and Game Criteria for Fish Passage ("Culvert Criteria for Fish Passage" 2002), a minimum flow depth for native and non-native non-salmonid species needs to be considered for hydraulic design of fish passage features (U.S. Fish and Wildlife Service Northeast Region 2019). What follows summarizes the result of our research regarding the flow depth for fish passage for the roaches/suckers and sticklebacks that may occur within San Pablo Creek.

Santa Ana suckers, similar to the Sacramento suckers believed to be in the San Pablo Creek, are known to occupy habitat with depths of 15-30 cm (approx. 6 to 12 inches) and require a minimum depth of 6 inches for fish passage (Wallace 2015). This low depth of flow for swimming is due to the small size of Santa Ana suckers, as adults are often less than 16 cm (approx. 6 inches) in size (Wallace 2015).

Based on research conducted on threespine sticklebacks, male threespine stickleback build shallow nests in streams or shallow areas (Hale 1981). These nests have an average depth of 24 cm (approx. 9 inches) with some nests built in water as shallow as 4 cm (approx. 1.5 inches) (Hagen 1967). Given this information, threespine stickleback water depth needs is not expected to be a limiting factor for fish passage design of the San Pablo Creek Via Verdi Slope Stabilization Project.

As a result of this guidance, the proposed culvert hydraulic design intent is to account for 6 inches of flow depth. This depth will provide the largest fishes present (roaches and suckers) adequate depth to swim within the proposed culvert after construction.

Existing and Proposed Culvert Fish Passage Design

The Washington baffle system in the existing culvert will be removed as this type of design is no longer recommended. In both, the existing and proposed culverts, the

design includes an angled baffle system, made from redwood and bolted to the concrete floor of the culverts, to enhance fish passage. Over time the baffles will retain sediment under the dynamics of aggregation and erosion of sediment transported by San Pablo Creek. The design is in accordance with California Salmonid Stream Habitat Restoration Manual, Fourth Edition (Restoration Manual) dated July 2009.

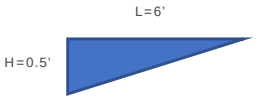
Given the flat floor of the existing and proposed culvert, angled baffles (6”x6” redwood) with a tapered height over about a quarter of the baffle length are recommended per the Restoration Manual. The baffles are skewed at 60 degrees relative to the direction of flow and walls of the culvert. The skew of the baffles and partially tapered top or crest are designed to concentrate flow in the lower portion of the taper providing flow for fish passage. The proposed angled baffle system is shown in plan and cross-sectional views on the attached plan sheet. The intent of the baffle design is to provide an initial water depth of 12 inches during low flow conditions by means of a triangular notch in the top of the baffle adjacent to the culvert wall. The triangular notch is 6 feet long and 6 inches deep at its deepest point, forming a tapered weir crest along the northern wall of the culvert. The design intent is that the tapered weir flows full (maximum water depth is 6 inches) at the low flow conditions and functions as a gentle weir with a hydraulic grade line drop of approximately 0.1 foot. The low flow conditions are assumed at approximately 2.8 cfs as estimated by field measurements. At that flowrate the velocity at the notch is estimated to be 1.9 feet per second.

The angled baffles will be spaced at 30 feet on center and will be installed in the existing and the new culvert (slope=0.1%). The existing baffle system will be removed. The new culvert floor elevation matches the existing culvert floor to promote uniformity in flow.

Hydraulic Output

As requested, attached is the hydraulic output used for the sizing of the culvert based on design storm events (1-year, 5-year, 10-year, 25-year, 50-year and 100-year estimated flows). Per the hydraulic output, there is no intended adverse effect, or change upstream, or downstream, in the surface water elevations from the proposed culvert.

The calculation below estimates the flow over the tapered (notch) weir, which is triangular shaped, 6 feet long, and 0.5 feet deep. At the estimated low flow of 2.8 cfs the notch weir flows provide approximately 6 inches of water depth.

Flow over notch weir: 

Length =	6	ft	
C2 =	0.61		
Theta =	170.4	degrees	2.97 radians
g =	32.09	ft/sec2	
H =	0.5	ft	

Flow over a triangular weir [Q]; for the flow over the notch (half of the calculated triangle) divide the result by 2 [Qn].

Q = C2 * (8/15) * tan (Theta/2) * SQRT 2g * H^5/2

Q= 5.4 cfs ⟶ Qn= 2.7 cfs

Summary

Please provide a concurrence on the proposed fish passage design for the existing and proposed culverts no later February 18, 2021 to facilitate the City of Richmond releasing the construction bid documents on February 26, 2021.

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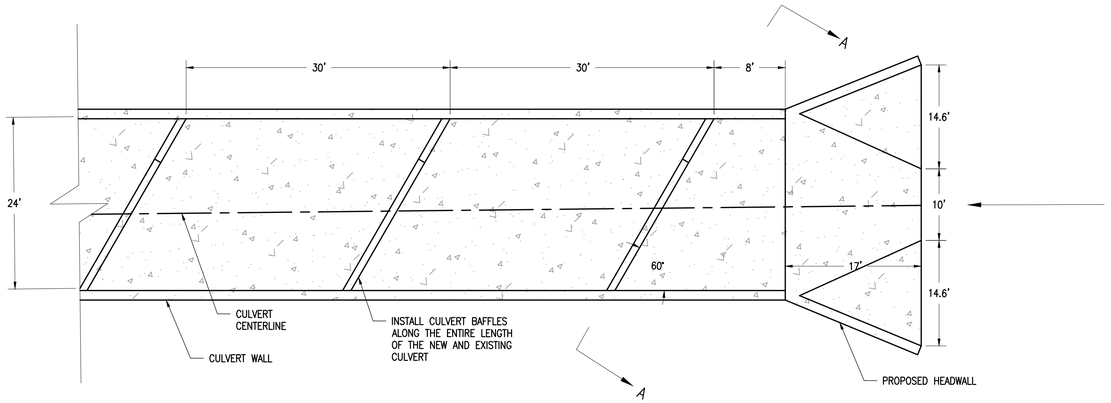
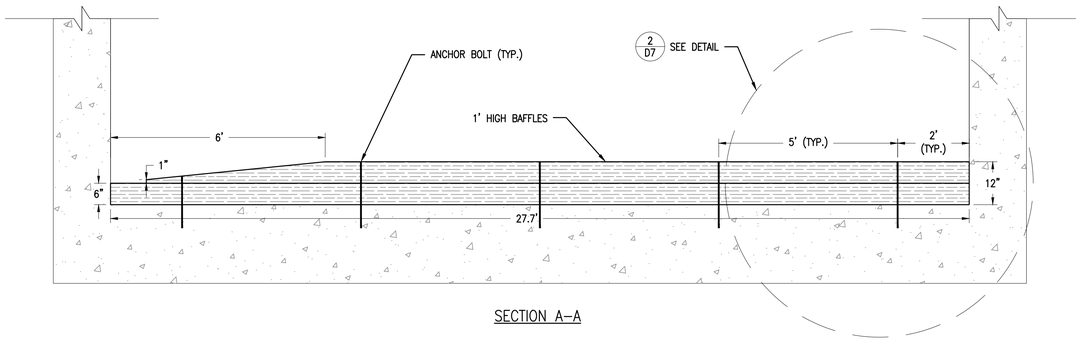
California Department of Fish and Game Wildlife and Fisheries Division, “California Salmonid Stream Habitat Restoration Manual;” Fourth Edition.

ATTACHMENTS

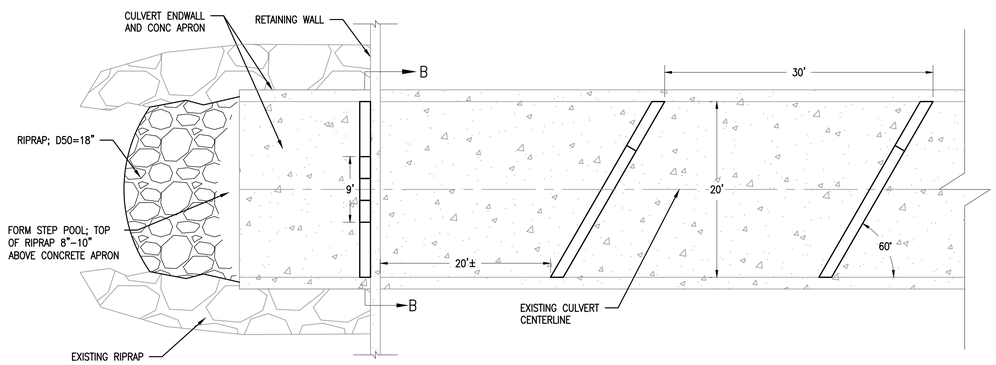
BAFFLE DESIGN

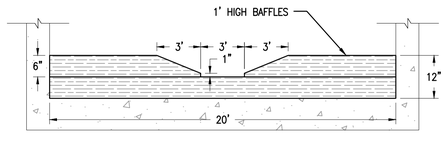
Richmond, CA
501 Canal Blvd., Suite I
Richmond, CA 94804
(510) 215-3620





SECTION A–A

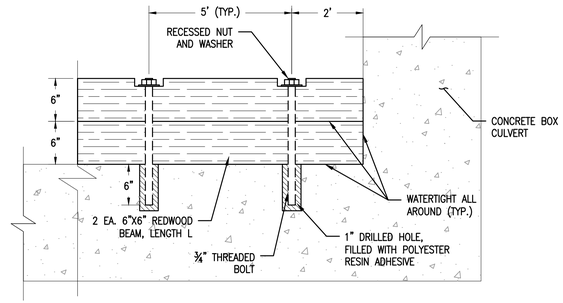




SECTION B–B

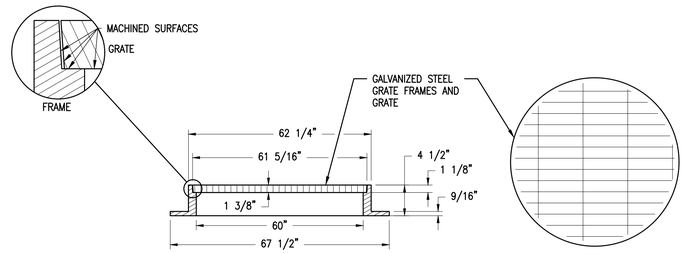
1/D7 ANGLED BAFFLE LAYOUT AND PLAN SECTION
N.T.S.

NOTE:
1. WOODEN BEAMS SHALL BE WATER TIGHT WITH CONCRETE BOTTOM, WALLS, AND BETWEEN BEAMS.
2. ALL BAFFLES SHALL BE CONSTRUCTED OF 6"X6" ROUGH–SAWN REDWOOD TIMBERS.

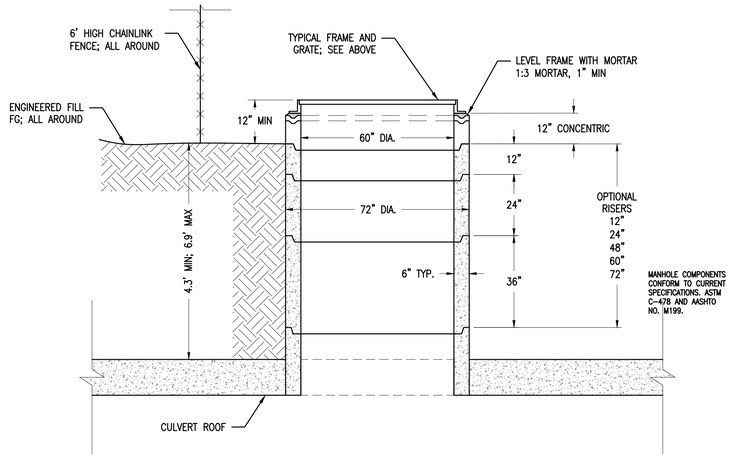


2/D7 BAFFLE INSTALLATION
N.T.S.

NOTE:
1. LUMBER DIMENSIONS ARE NOMINAL.
2. BOLTS, NUTS AND WASHERS SHALL BE HOT–DIP GALVANIZED.



TYPICAL FRAME AND GRATE DETAIL



3/D7 CULVERT SKYLIGHT
N.T.S.

100% SUBMITTAL
PRELIMINARY
FOR REVIEW
NOT FOR CONSTRUCTION
DATE: 10-30-2020

Know what's below. Call before you dig.

NCE
501 Canal Blvd., Suite I
Richmond, Ca. 94804
(510) 215-3620 * Fax (510) 215-2898

REGISTERED PROFESSIONAL ENGINEER FRANZ G. HALDIMER NO. C 64725 EXP. 06/30/21 CIVIL STATE OF CALIFORNIA

VIA VERDI SLOPE STABILIZATION

OWNER

CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

NO.	DATE	DESCRIPTION

PROJECT NO:	568.41.55
DESIGNED BY:	FGH, VL
DRAWN BY:	MG, VL
CHECKED BY:	DATE 00/00/0000
DATE:	10/30/2020

SHEET TITLE

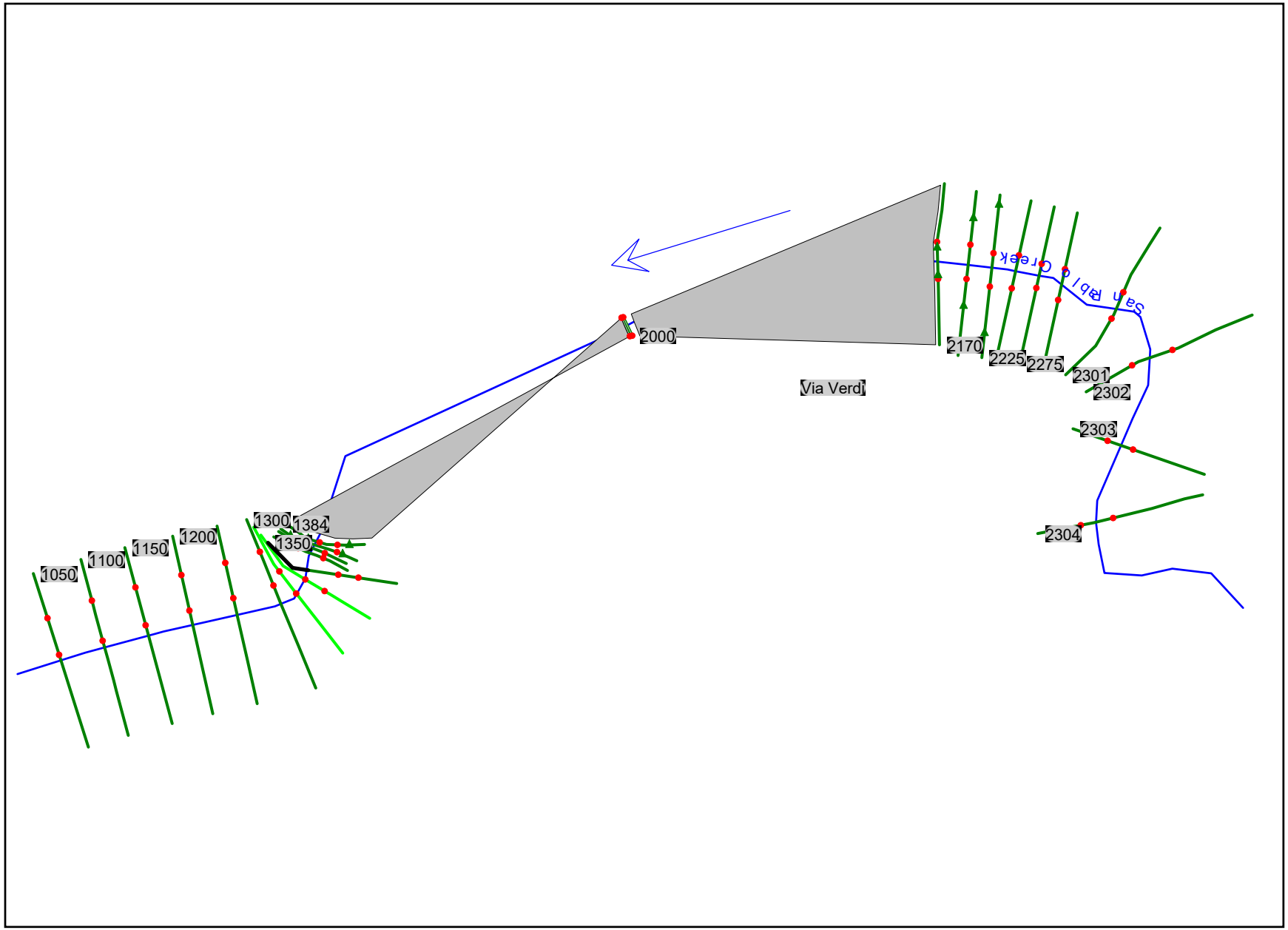
SECTIONS AND DETAILS - CULVERT BAFFLE

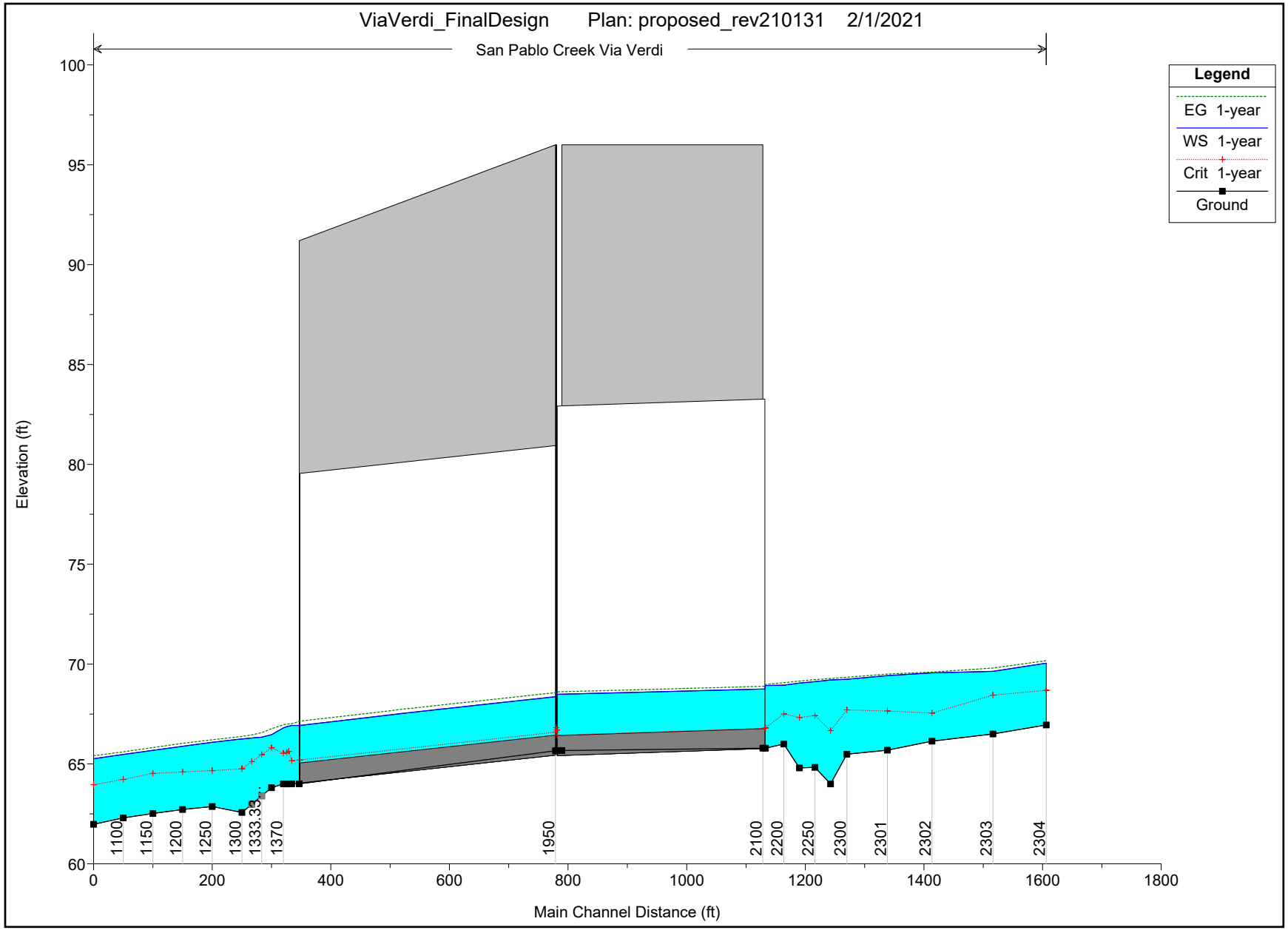
DRAWING

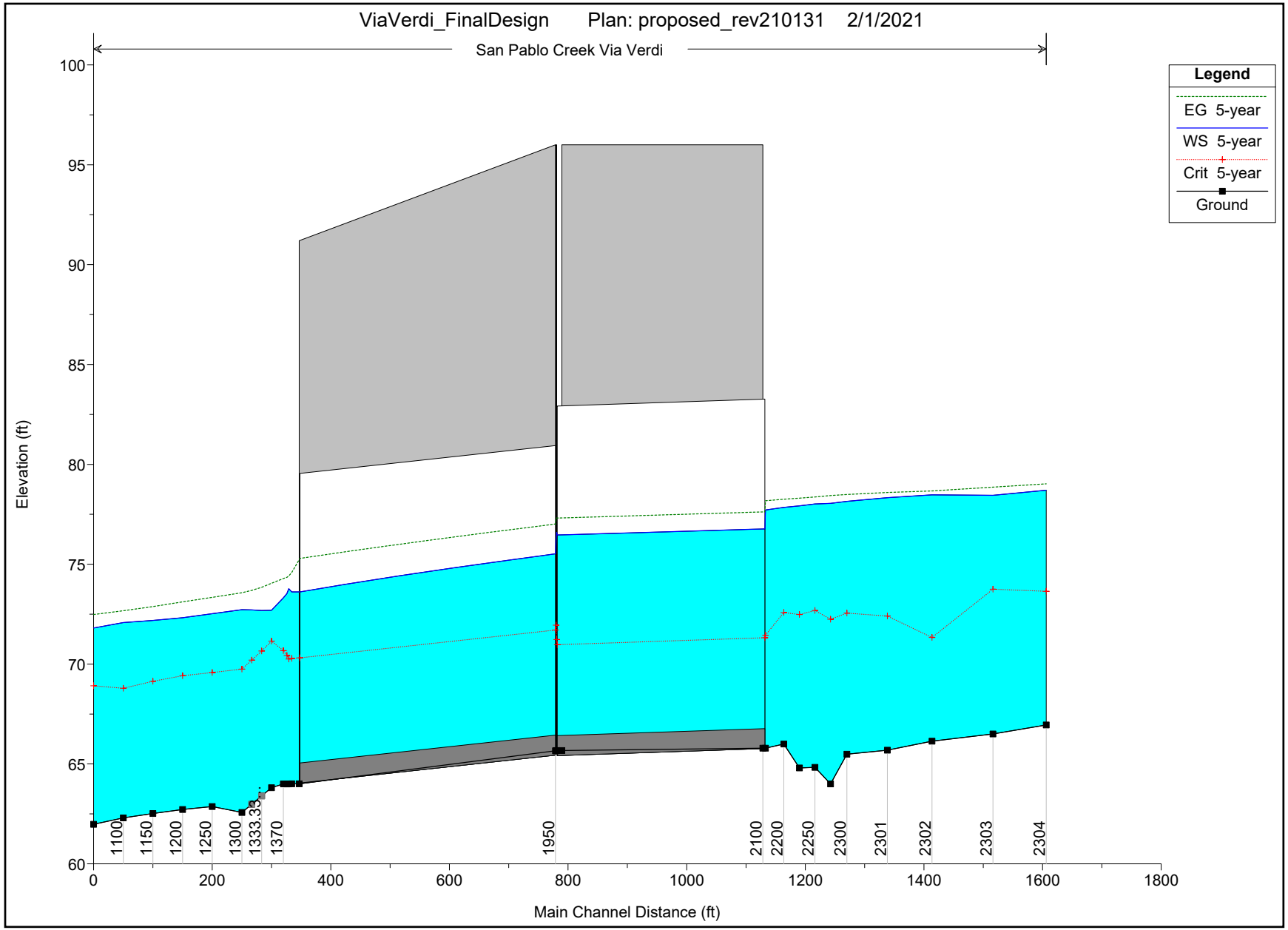
D7

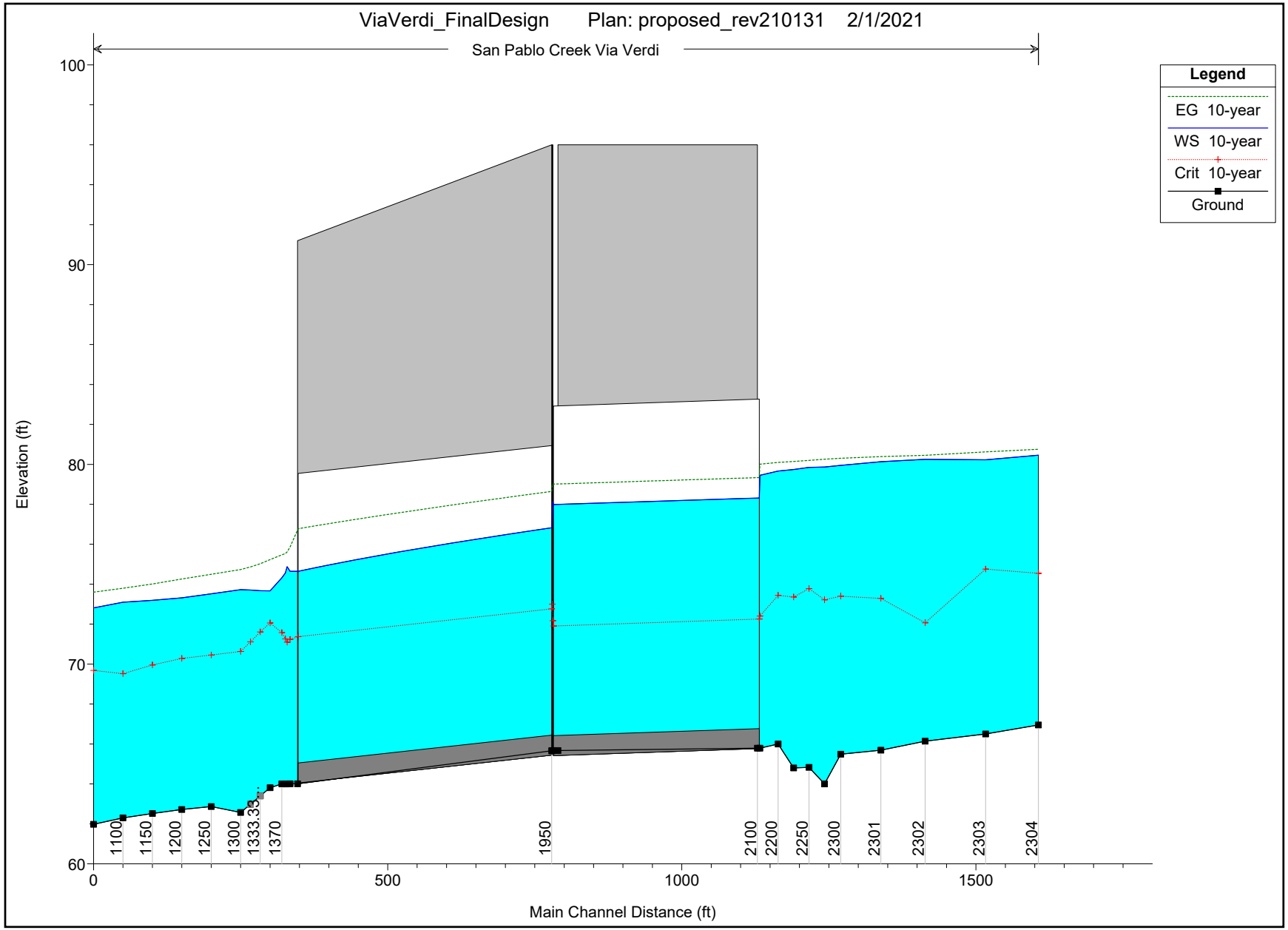
SHEET 29 OF 33

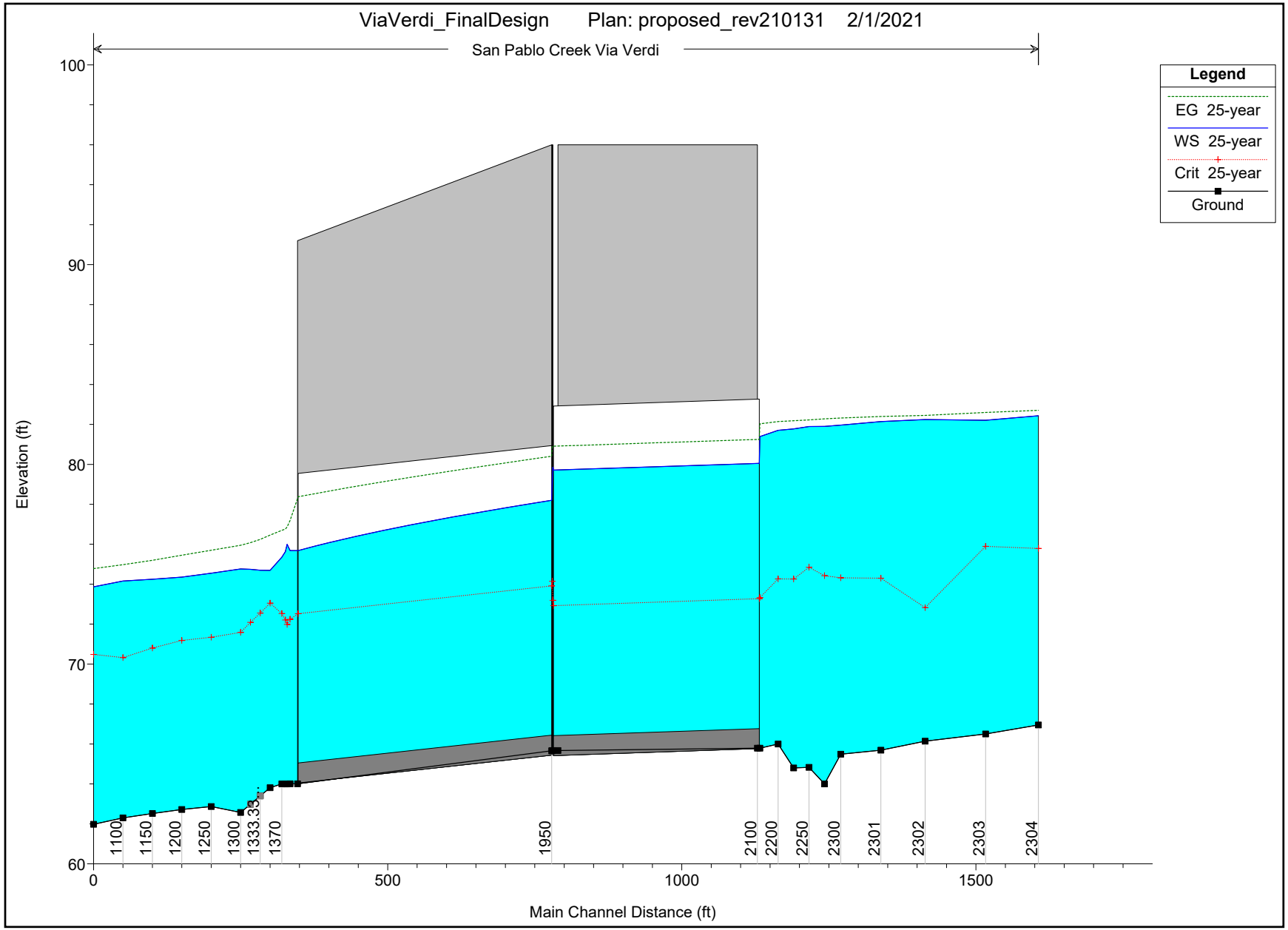
HYDRAULIC CALCULATION OUTPUT

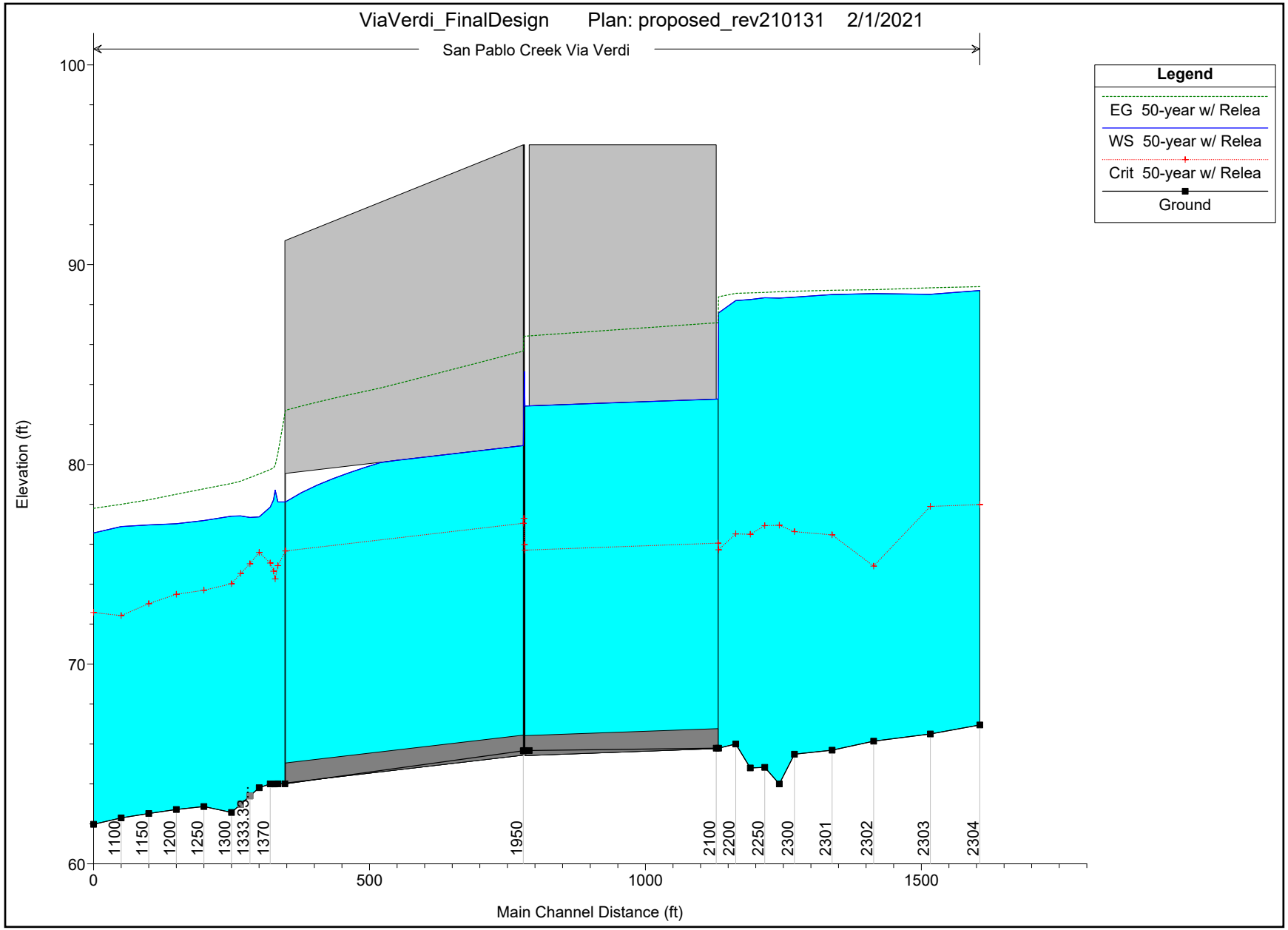

1050
1100
1150
1200
1300
1384
1350
2000
2170
2225
2275
2301
2302
2303
2304
Via Verdi
San Pablo Creek

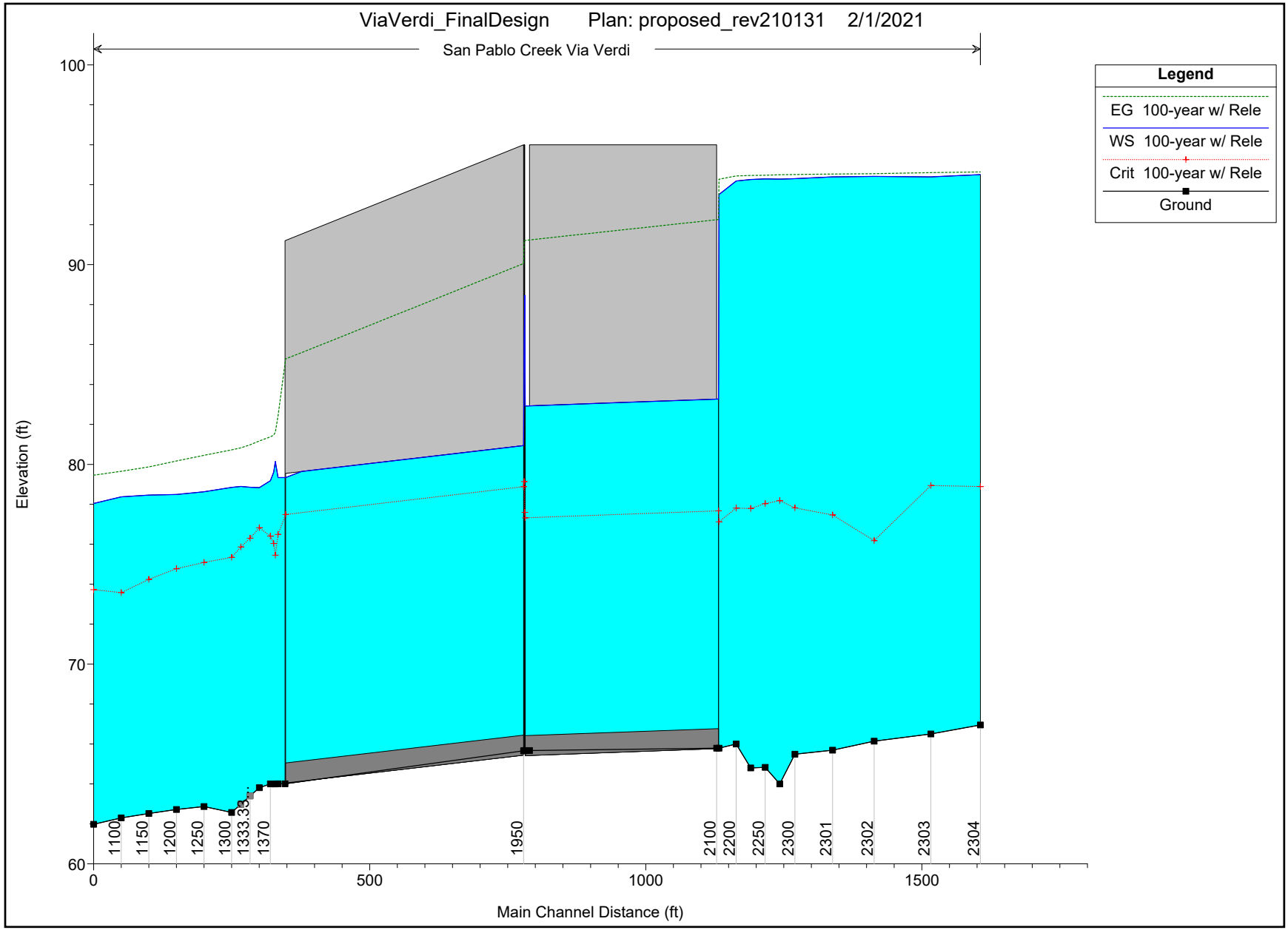

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
San Pablo Creek Via Verdi
Legend
EG 1-year
WS 1-year
Crit 1-year
Ground
Elevation (ft)
Main Channel Distance (ft)
100
95
90
85
80
75
70
65
60
0
200
400
600
800
1000
1200
1400
1600
1800
1100
1150
1200
1250
1300
1333.33
1370
1950
2100
2200
2250
2300
2301
2302
2303
2304

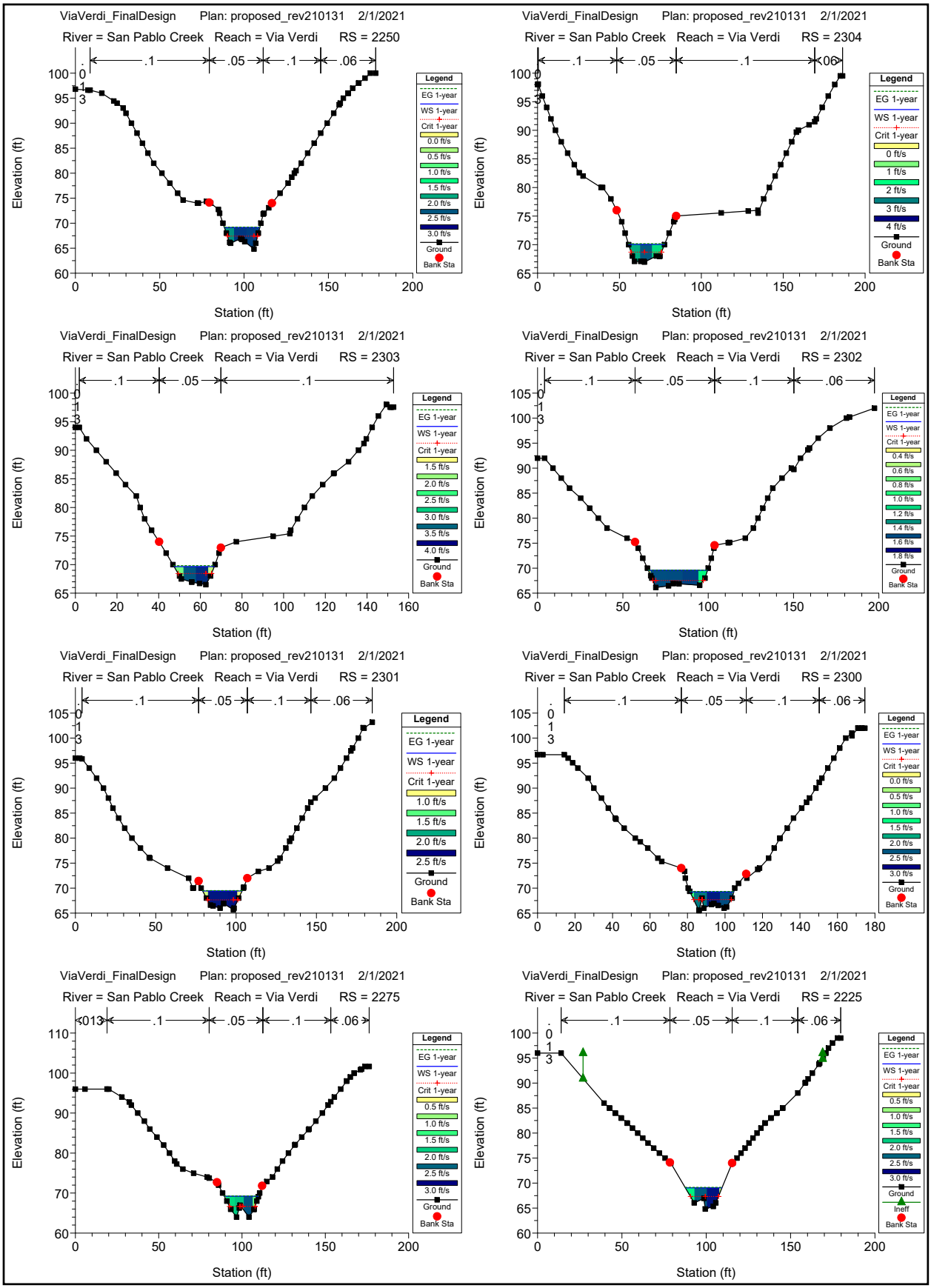

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
San Pablo Creek Via Verdi
Legend
EG 5-year
WS 5-year
Crit 5-year
Ground
Elevation (ft)
Main Channel Distance (ft)
100
95
90
85
80
75
70
65
60
0
200
400
600
800
1000
1200
1400
1600
1800
1100
1150
1200
1250
1300
1333.33
1370
1950
2100
2200
2250
2300
2301
2302
2303
2304

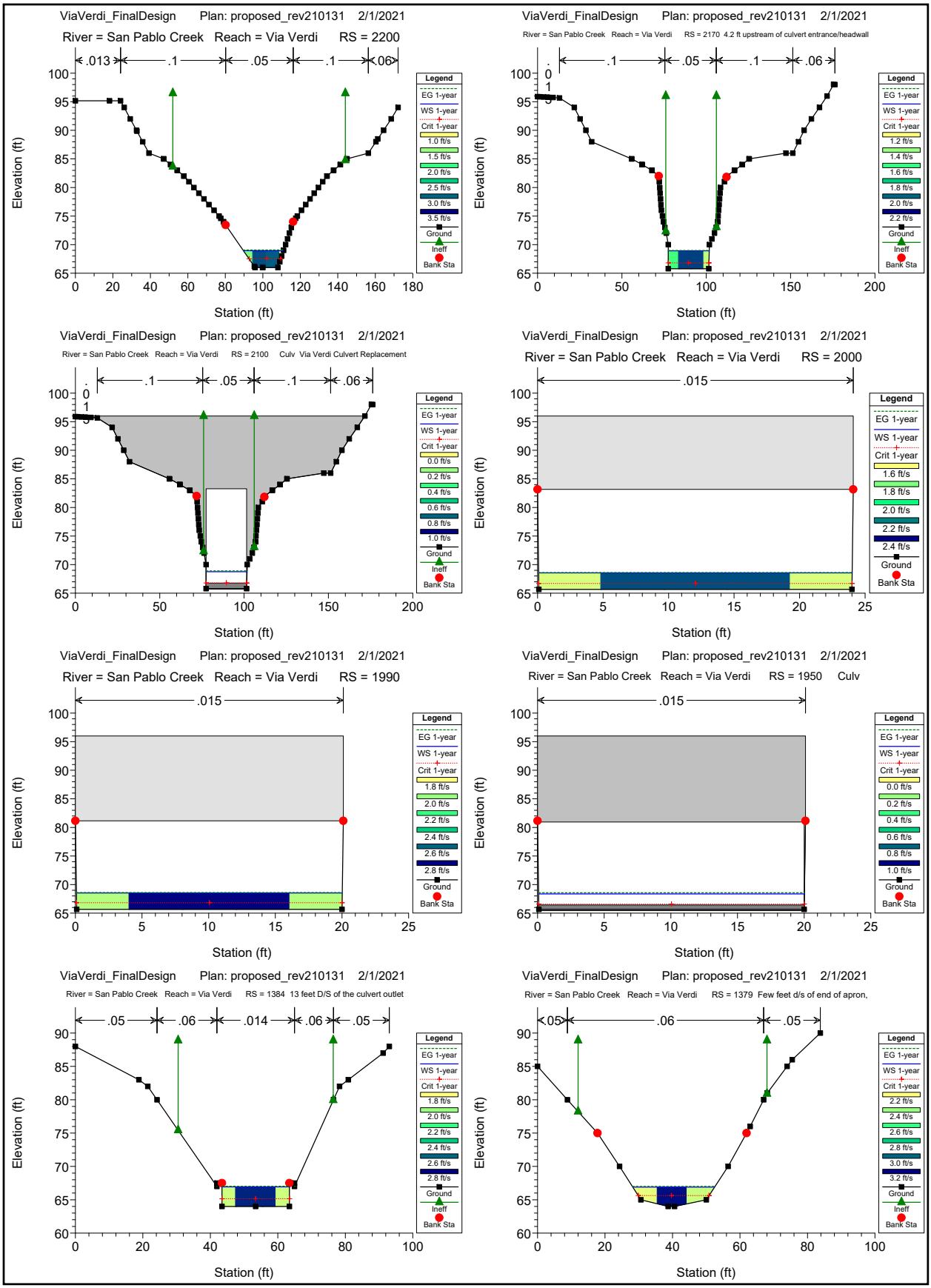

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
San Pablo Creek Via Verdi
Legend
EG 10-year
WS 10-year
Crit 10-year
Ground
Elevation (ft)
Main Channel Distance (ft)
100
90
80
70
60
0
500
1000
1500
1100
1150
1200
1250
1300
1333.33
1370
1950
2100
2200
2250
2300
2301
2302
2303
2304

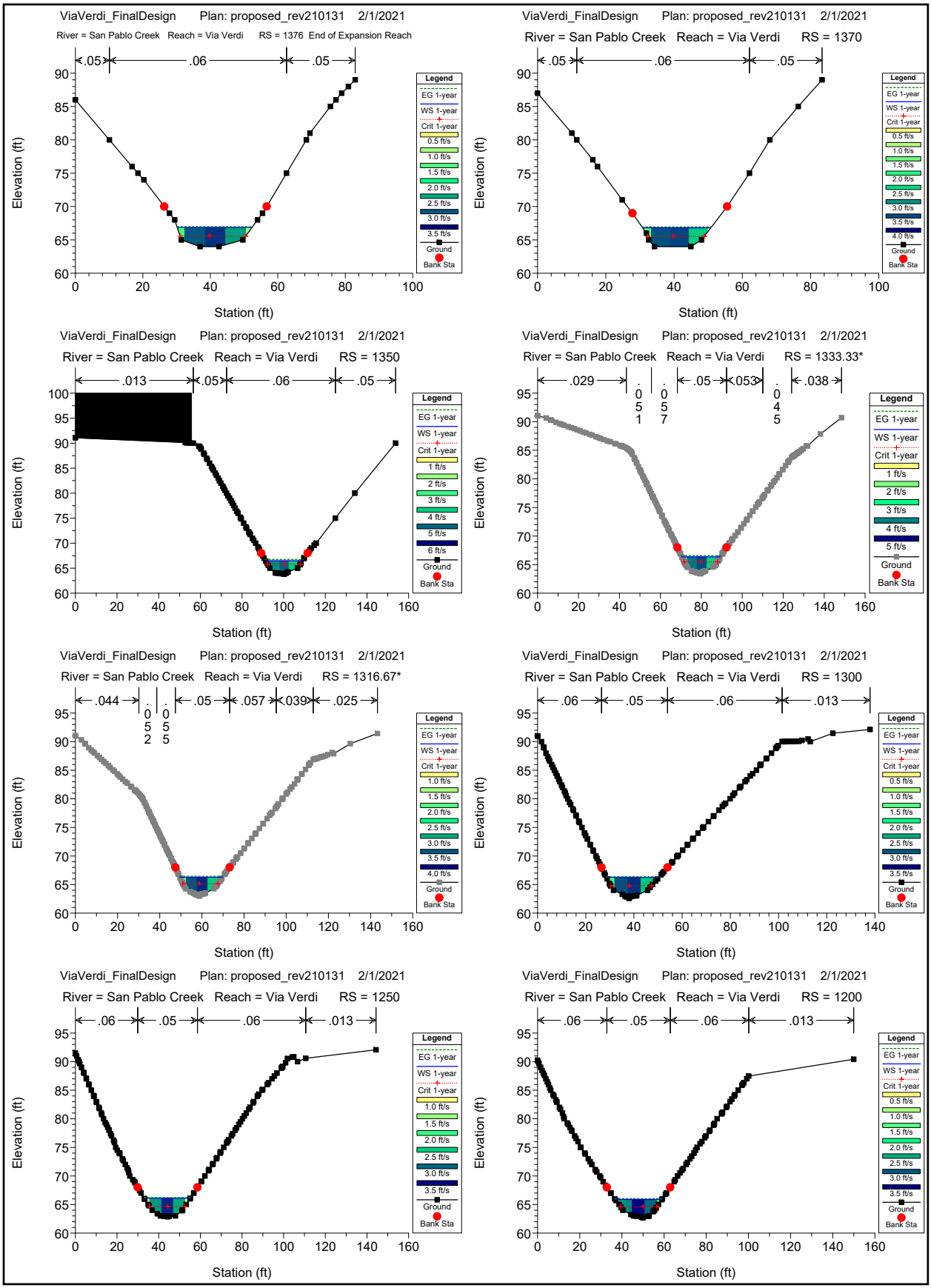

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
San Pablo Creek Via Verdi
Legend
EG 25-year
WS 25-year
Crit 25-year
Ground
Elevation (ft)
Main Channel Distance (ft)
100
90
80
70
60
0
500
1000
1500
1100
1150
1200
1250
1300
1333.33
1370
1950
2100
2200
2250
2300
2301
2302
2303
2304

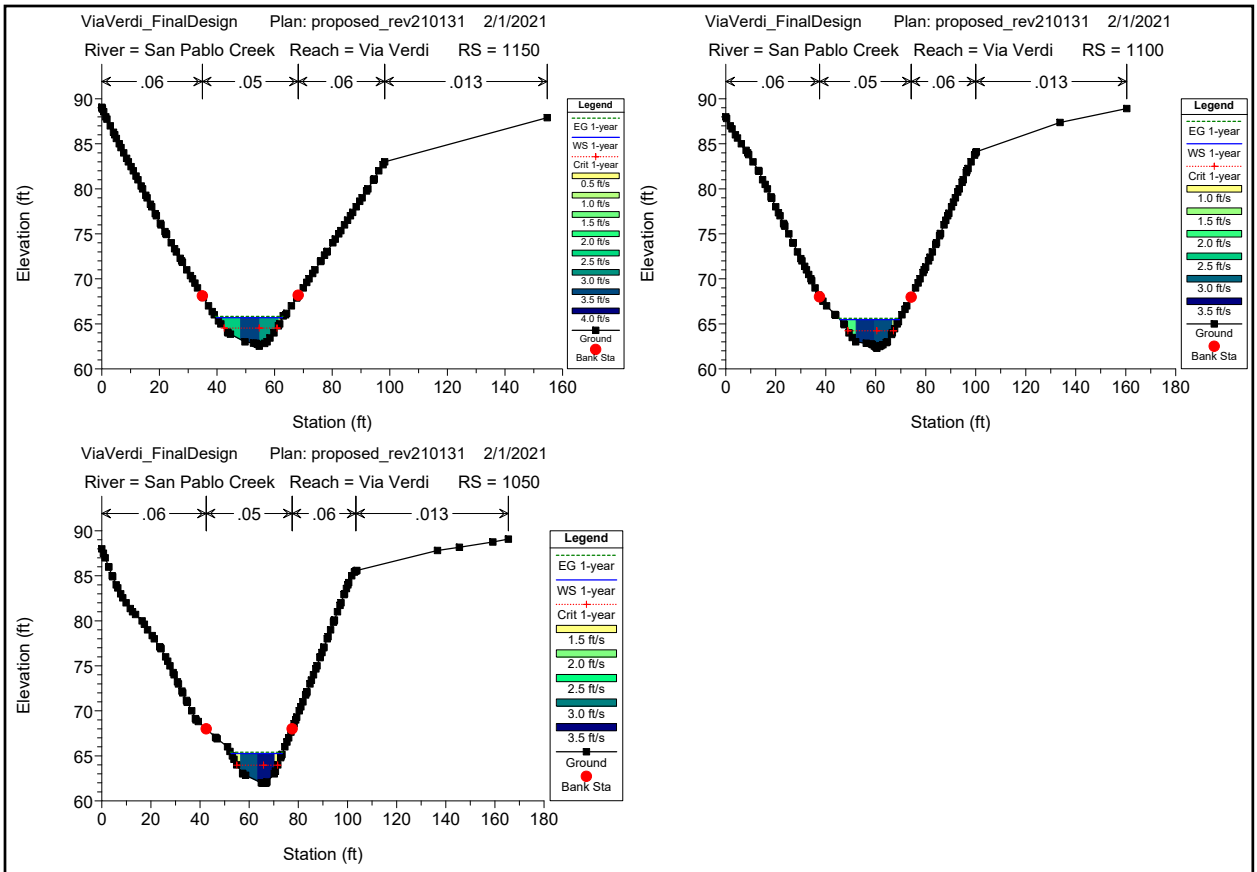

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
San Pablo Creek Via Verdi
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
Ground
Elevation (ft)
100
90
80
70
60
0
500
1000
1500
Main Channel Distance (ft)
1100
1150
1200
1250
1300
1333.33
1370
1950
2100
2200
2250
2300
2301
2302
2303
2304


ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
San Pablo Creek Via Verdi
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
Ground
Elevation (ft)
100
90
80
70
60
0
500
1000
1500
Main Channel Distance (ft)
1100
1150
1200
1250
1300
1333.33
1370
1950
2100
2200
2250
2300
2301
2302
2303
2304


ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2250
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2304
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2303
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2302
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2301
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2300
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2275
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2225
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Ineff
Bank Sta


ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2200
.013 .1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2170 4.2 ft upstream of culvert entrance/headwall
.1 .05 .1 .06
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2100 Culv Via Verdi Culvert Replacement
.1 .05 .1 .06
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2000
.015
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1990
.015
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1950 Culv
.015
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1384 13 feet D/S of the culvert outlet
.05 .06 .014 .06 .05
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1379 Few feet d/s of end of apron,
.05 .06 .05
3.0 ft/s
3.2 ft/s


ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1376 End of Expansion Reach
.05 .06 .05
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1370
.05 .06 .05
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1350
.013 .05 .06 .05
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1333.33*
.029 .051 .057 .05 .053 .045 .038
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1316.67*
.044 .052 .055 .05 .057 .039 .025
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1300
.06 .05 .06 .013
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1250
.06 .05 .06 .013
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1200
.06 .05 .06 .013
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta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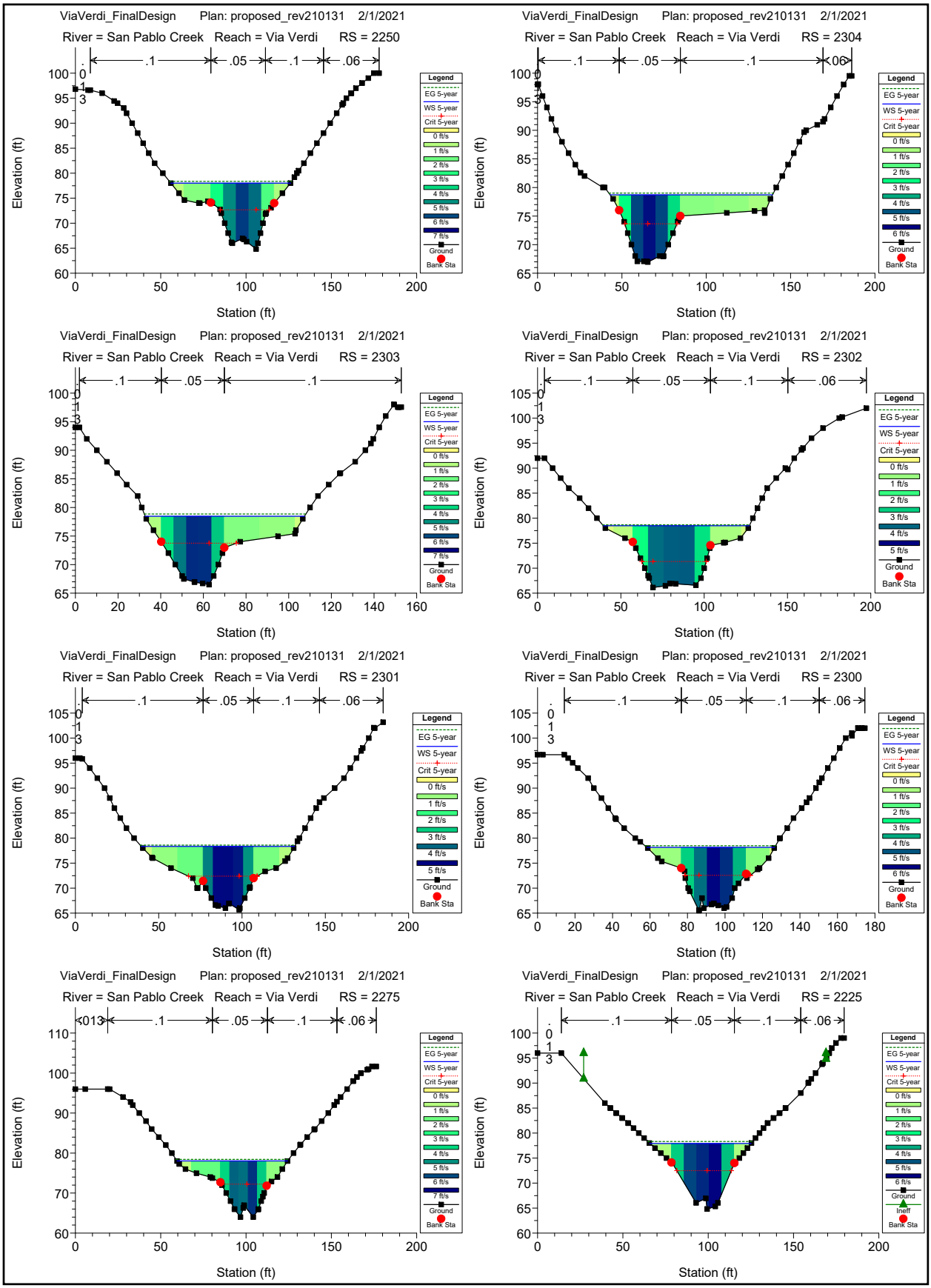
River = San Pablo Creek Reach = Via Verdi RS = 1150
.06
.05
.06
.013
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1100
.06
.05
.06
.013
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1050
.06
.05
.06
.013
Elevation (ft)
Station (ft)
Legend
EG 1-year
WS 1-year
Crit 1-year
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta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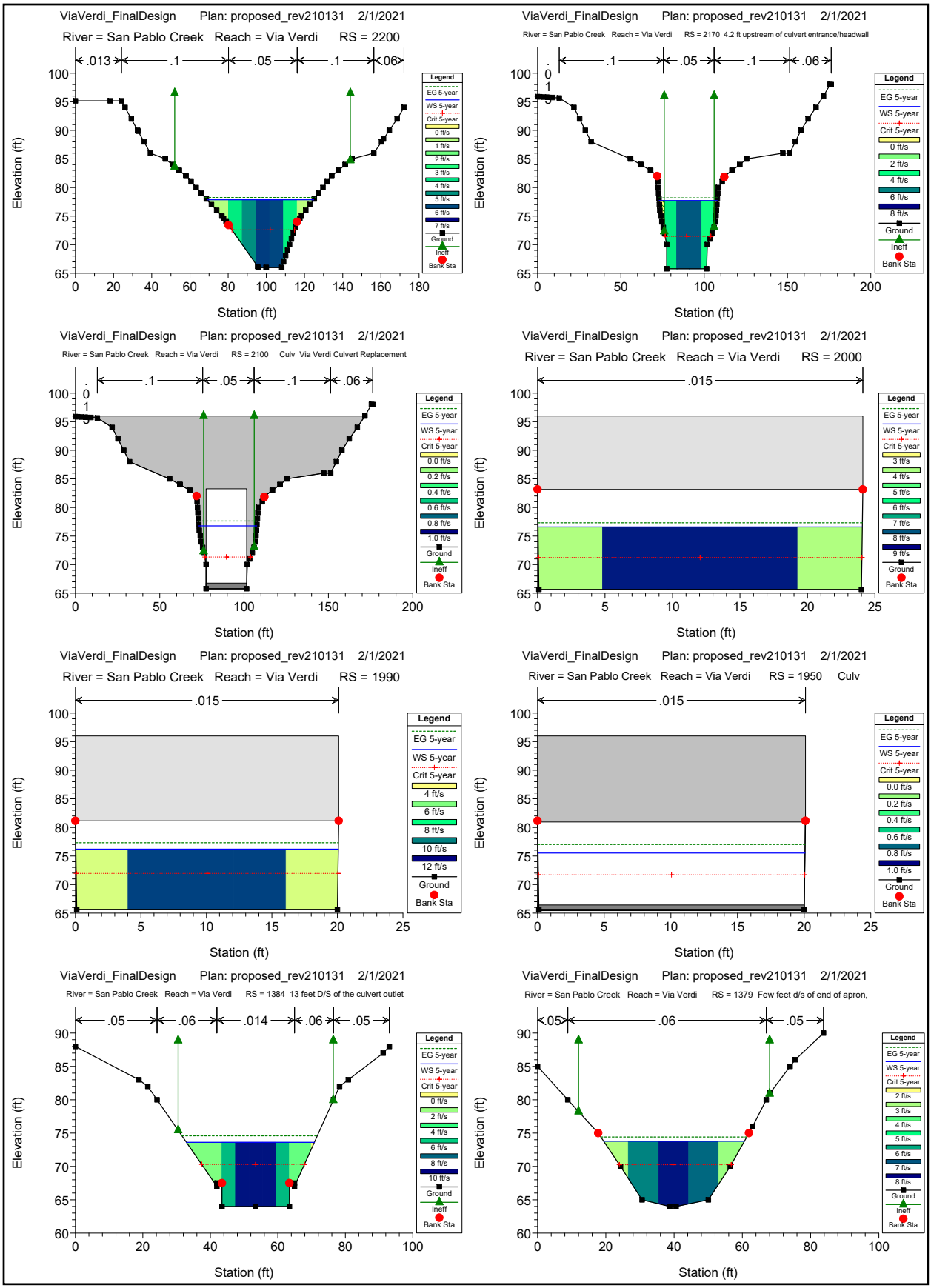
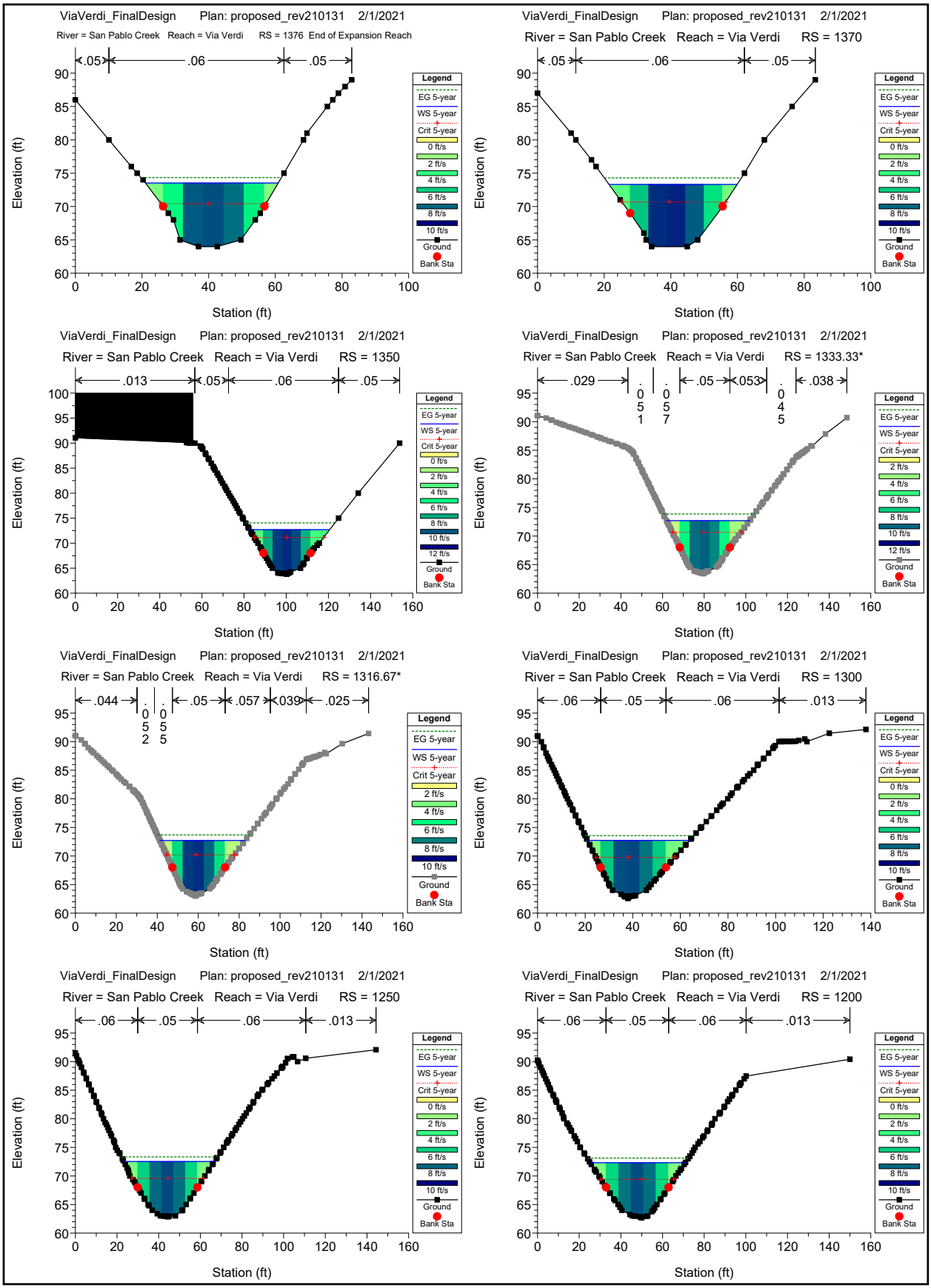
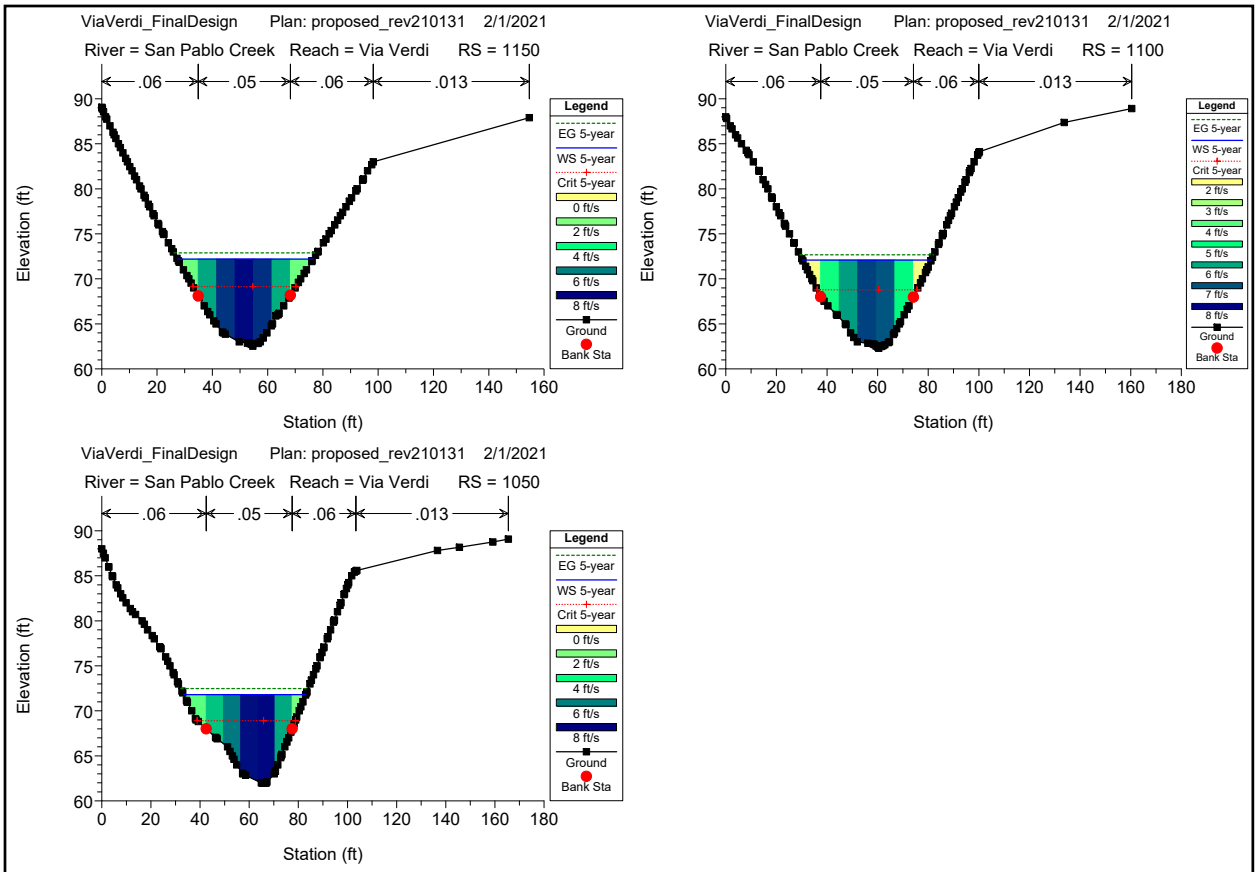
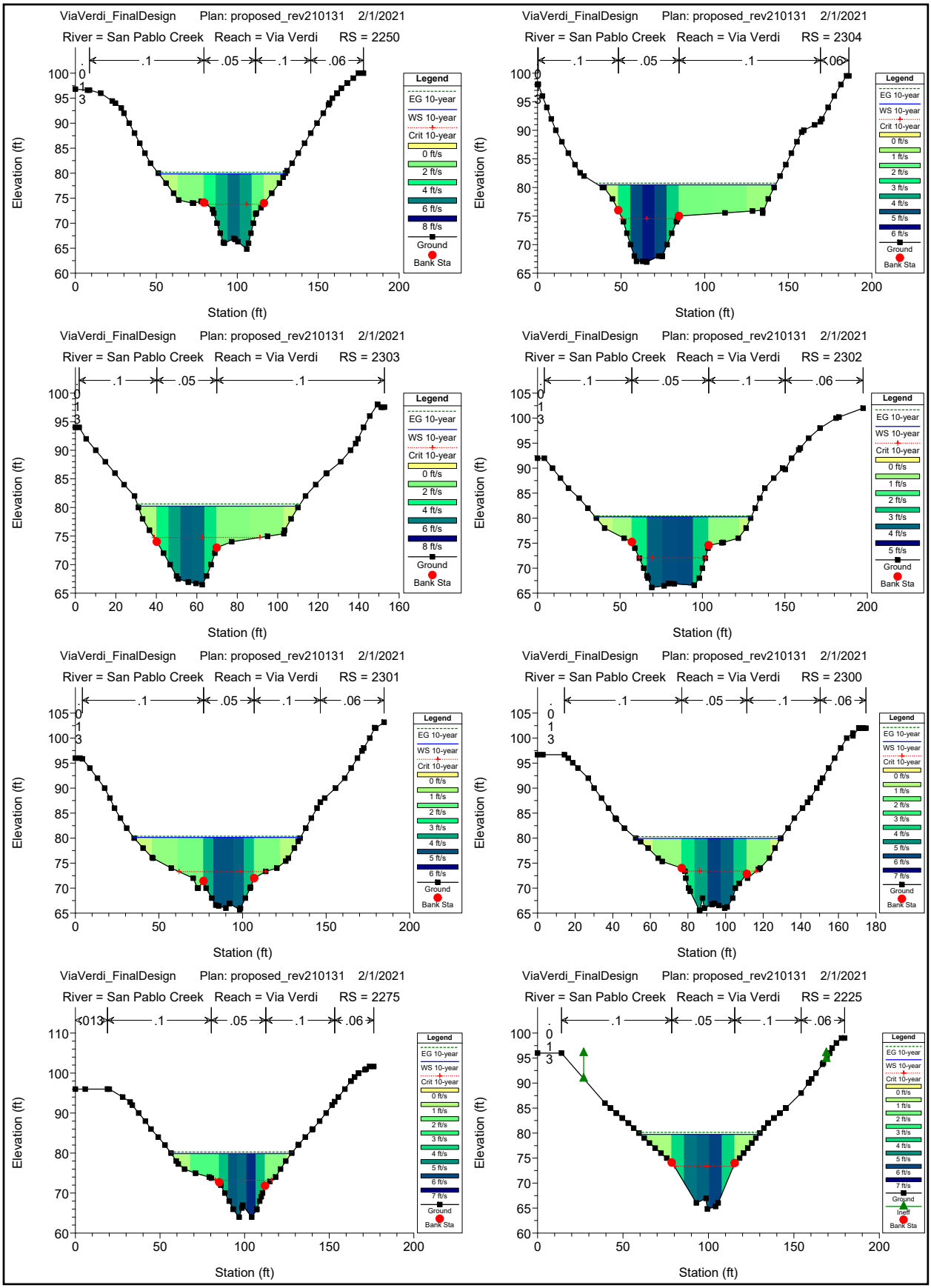
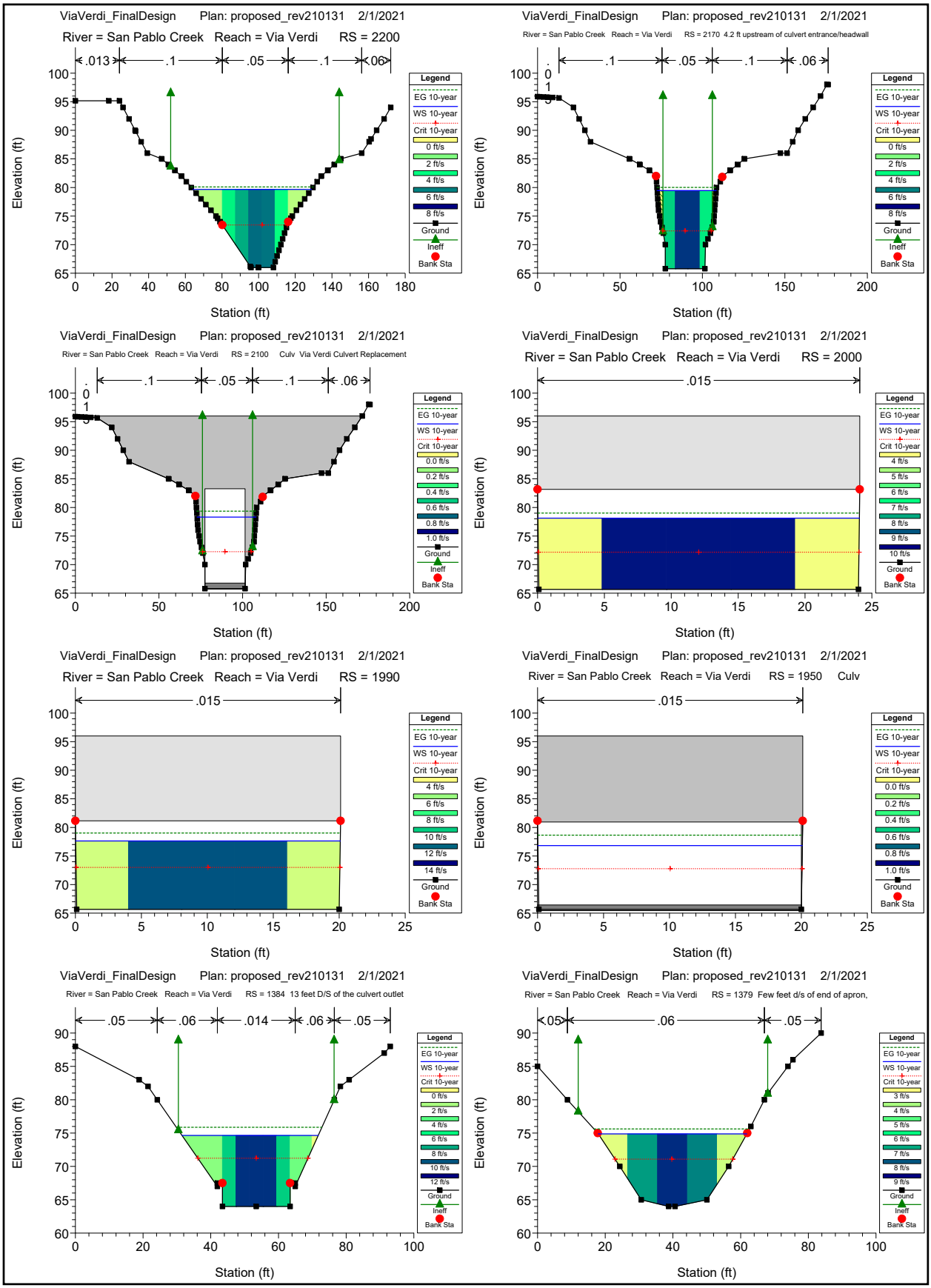
River = San Pablo Creek Reach = Via Verdi RS = 2250
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2304
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2303
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2302
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2301
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2300
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2275
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2225
Elevation (ft)
Station (ft)
Legend
EG 5-year
WS 5-year
Crit 5-year
Ground
Ineff
Bank Sta

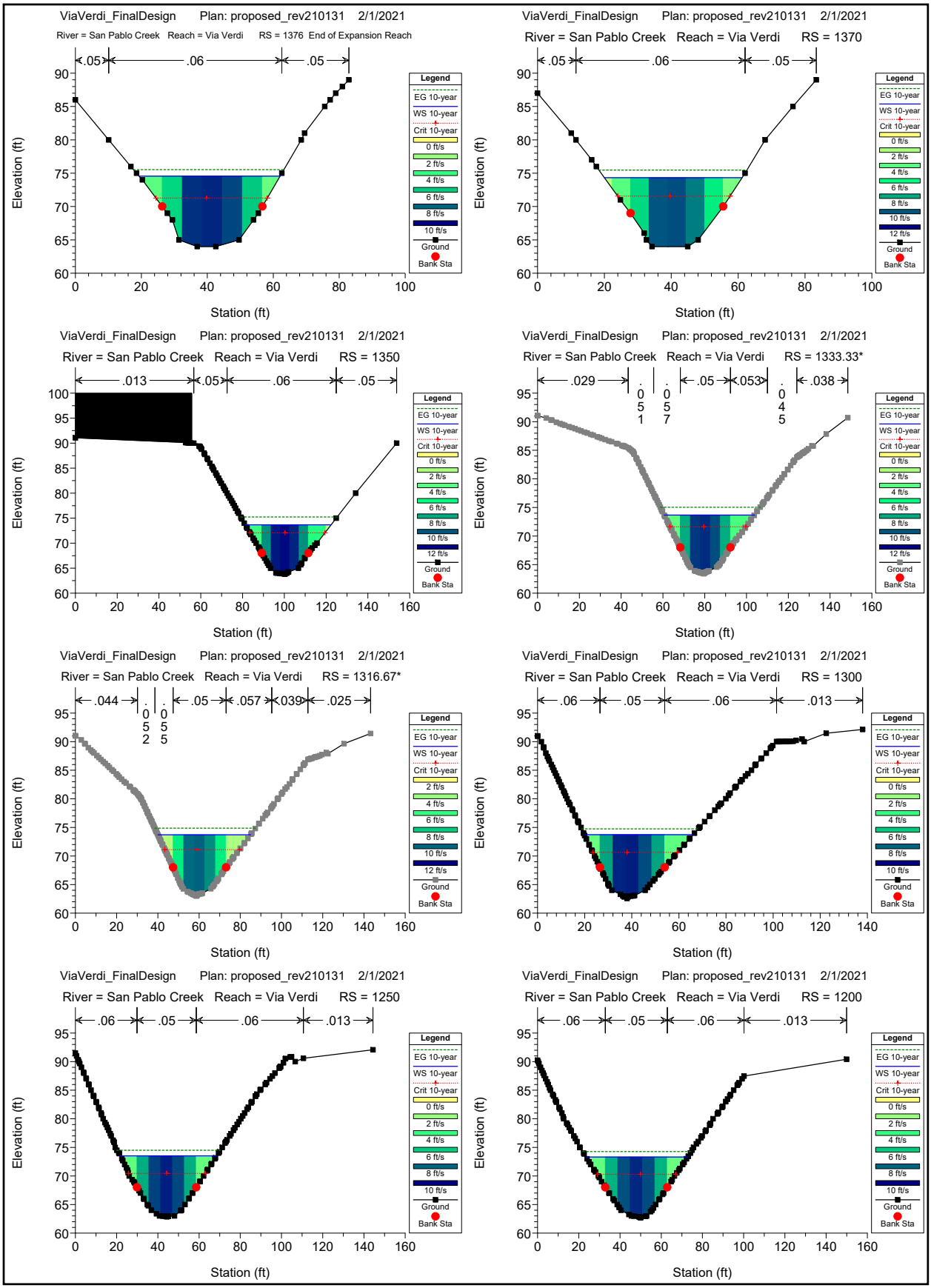

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2200
.013 .1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 5-year
WS 5-year
Crit 5-year
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2170 4.2 ft upstream of culvert entrance/headwall
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 5-year
WS 5-year
Crit 5-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2100 Culv Via Verdi Culvert Replacement
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 5-year
WS 5-year
Crit 5-year
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2000
.015
Elevation (ft)
Station (ft)
Legend
EG 5-year
WS 5-year
Crit 5-year
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
8 ft/s
9 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1990
.015
Elevation (ft)
Station (ft)
Legend
EG 5-year
WS 5-year
Crit 5-year
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1950 Culv
.015
Elevation (ft)
Station (ft)
Legend
EG 5-year
WS 5-year
Crit 5-year
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1384 13 feet D/S of the culvert outlet
.05 .06 .014 .06 .05
Elevation (ft)
Station (ft)
Legend
EG 5-year
WS 5-year
Crit 5-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1379 Few feet d/s of end of apron,
.05 .06 .05
Elevation (ft)
Station (ft)
Legend
EG 5-year
WS 5-year
Crit 5-year
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
8 ft/s
Ground
Ineff
Bank Sta

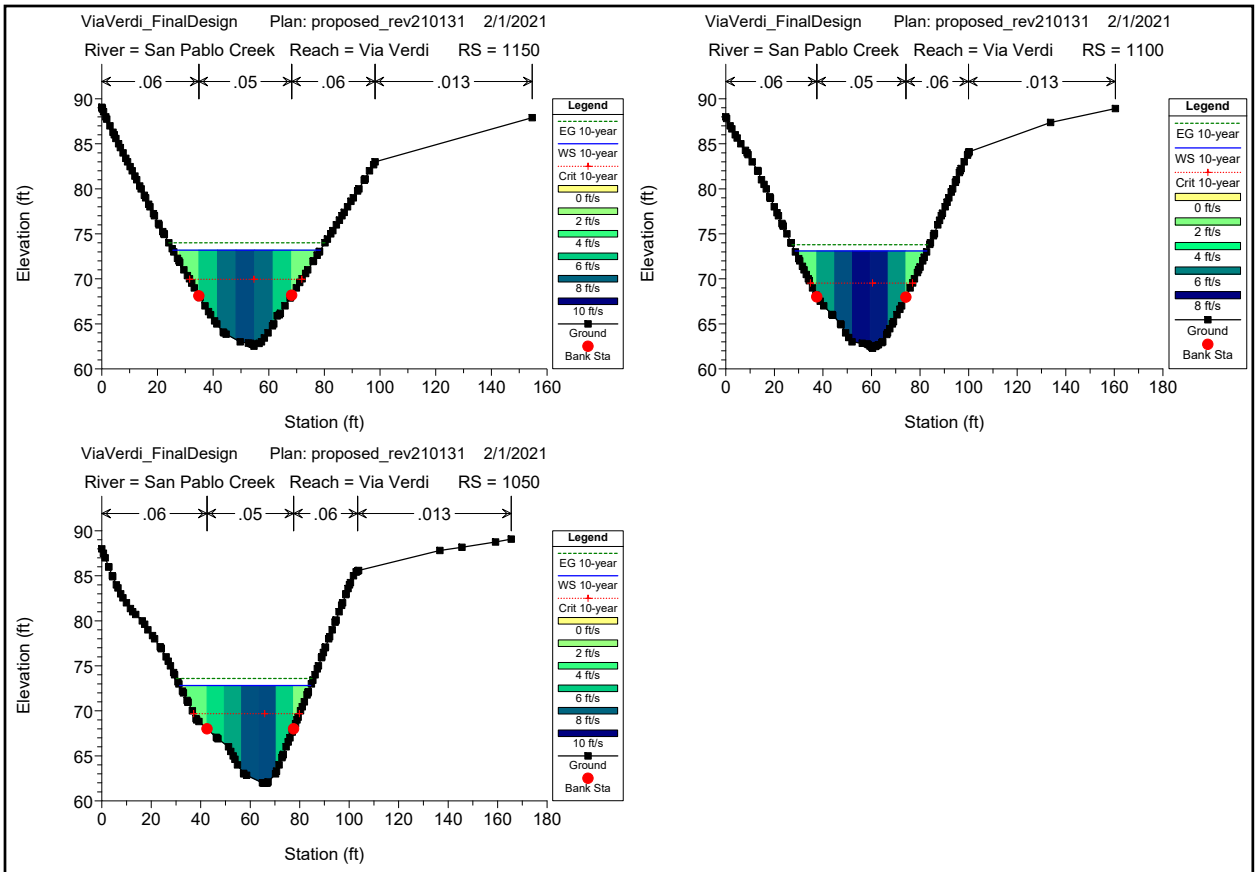

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1376 End of Expansion Reach
.05 .06 .05
Legend
EG 5-year
WS 5-year
Crit 5-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1370
.05 .06 .05
Legend
EG 5-year
WS 5-year
Crit 5-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1350
.013 .05 .06 .05
Legend
EG 5-year
WS 5-year
Crit 5-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1333.33*
.029 .051 .057 .05 .053 .045 .038
Legend
EG 5-year
WS 5-year
Crit 5-year
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1316.67*
.044 .052 .055 .05 .057 .039 .025
Legend
EG 5-year
WS 5-year
Crit 5-year
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1300
.06 .05 .06 .013
Legend
EG 5-year
WS 5-year
Crit 5-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1250
.06 .05 .06 .013
Legend
EG 5-year
WS 5-year
Crit 5-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1200
.06 .05 .06 .013
Legend
EG 5-year
WS 5-year
Crit 5-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

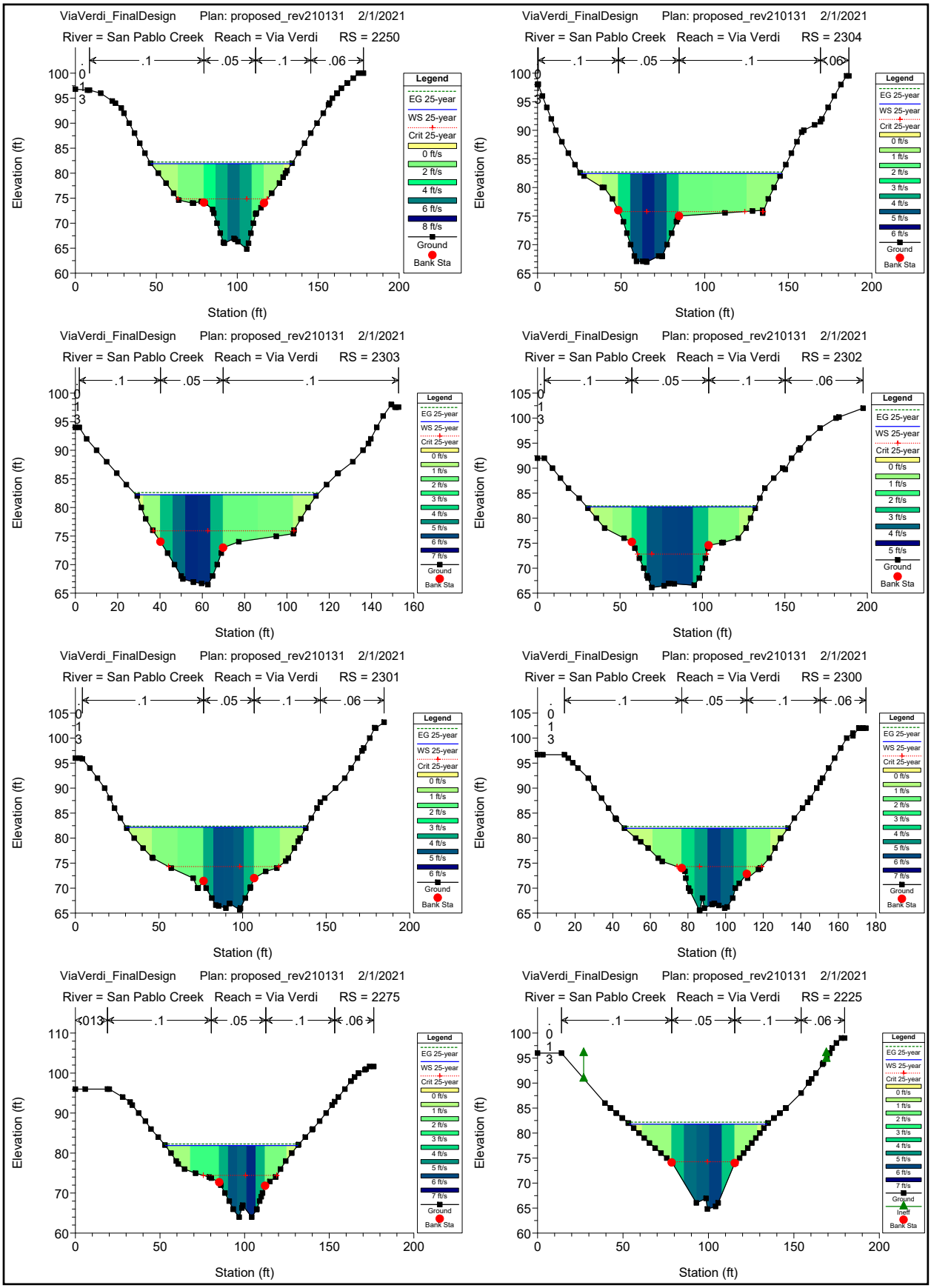

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1150
.06
.05
.06
.013
Elevation (ft)
Station (ft)
Legend
EG 5-year
WS 5-year
Crit 5-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1100
.06
.05
.06
.013
Elevation (ft)
Station (ft)
Legend
EG 5-year
WS 5-year
Crit 5-year
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
8 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1050
.06
.05
.06
.013
Elevation (ft)
Station (ft)
Legend
EG 5-year
WS 5-year
Crit 5-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta

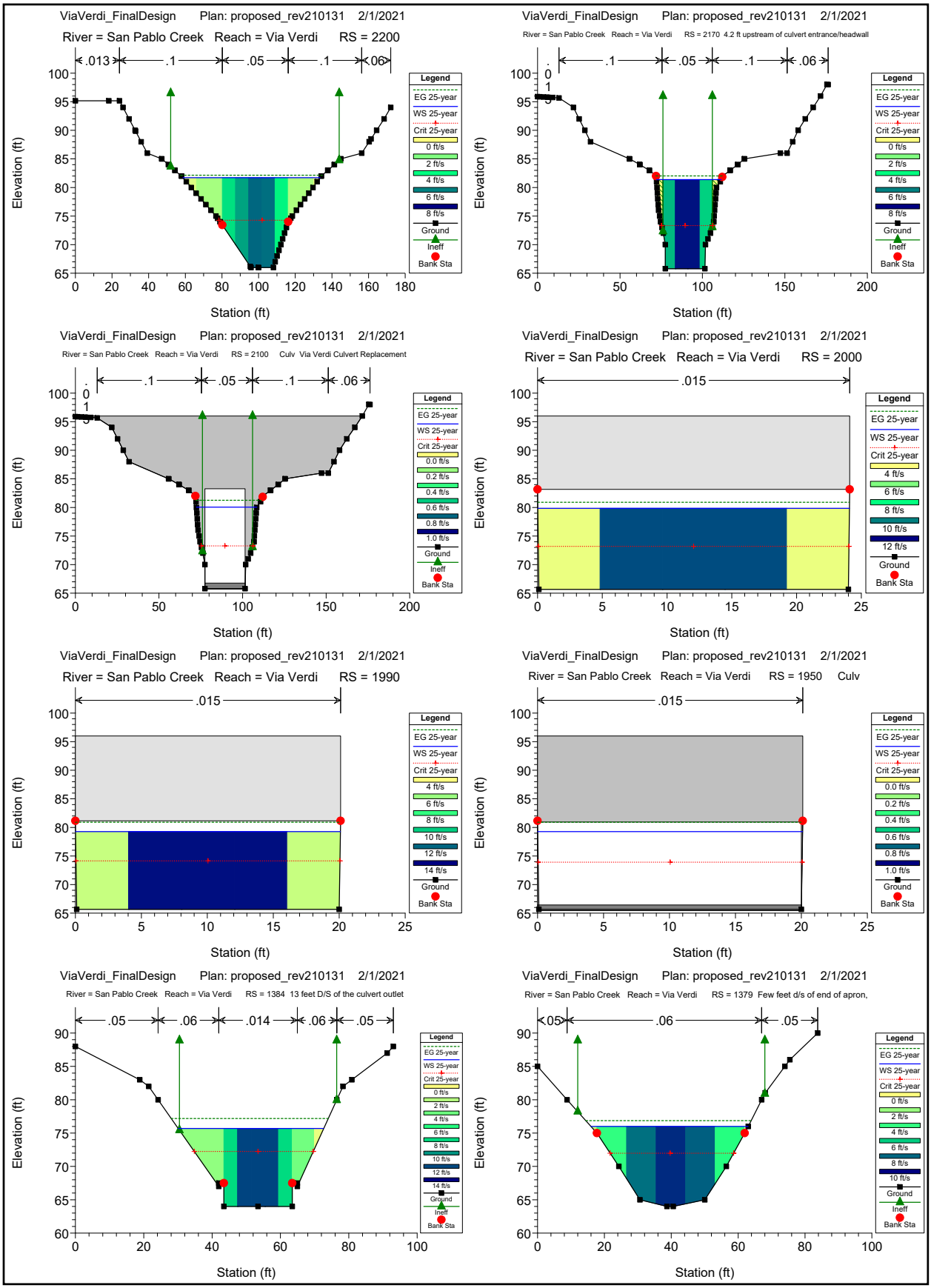

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2250
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2304
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2303
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2302
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2301
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2300
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2275
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2225
Elevation (ft)
Station (ft)
Legend
EG 10-year
WS 10-year
Crit 10-year
Ground
Ineff
Bank Sta

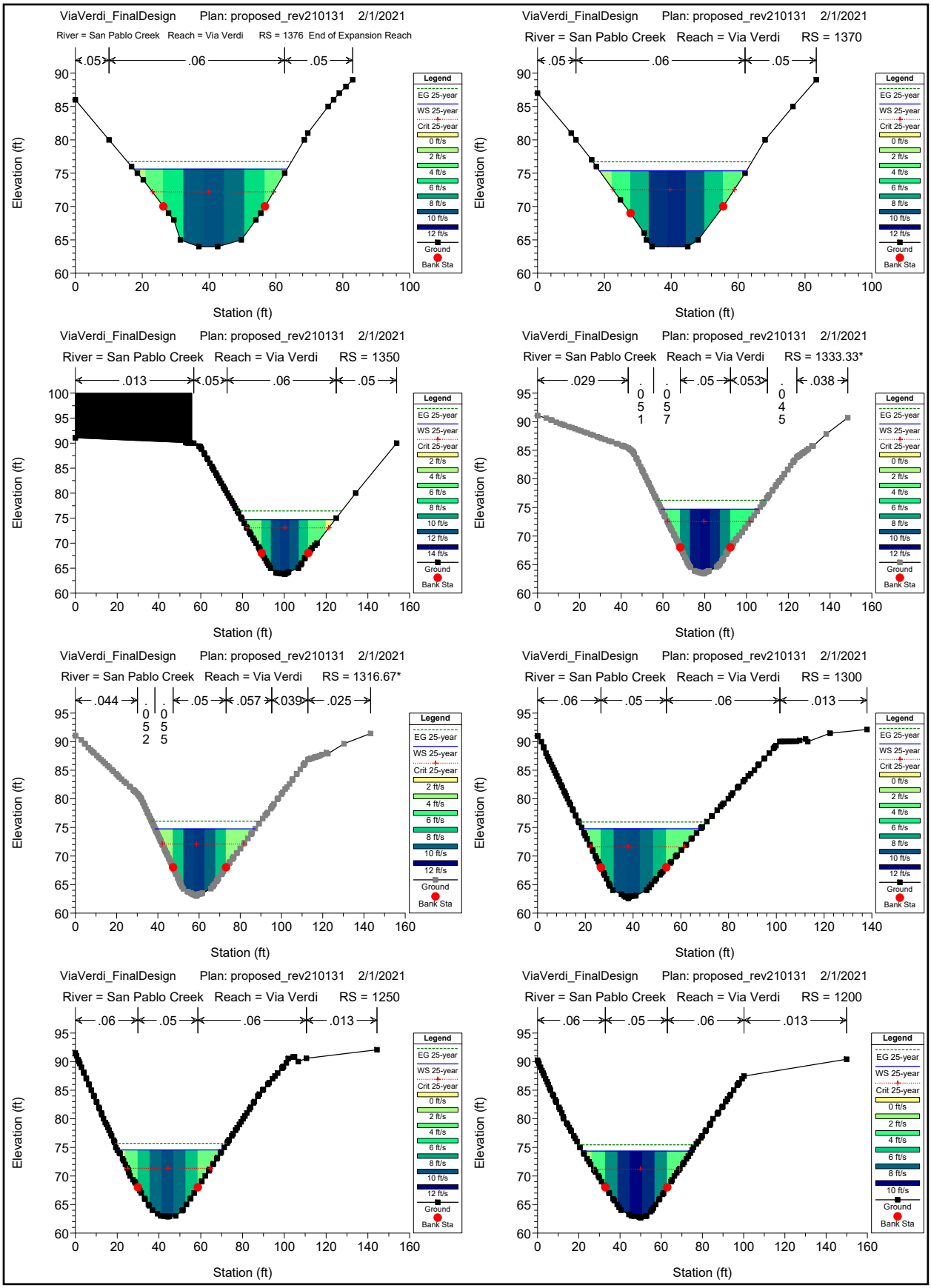

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2200
.013 .1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 10-year
WS 10-year
Crit 10-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2170 4.2 ft upstream of culvert entrance/headwall
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 10-year
WS 10-year
Crit 10-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2100 Culv Via Verdi Culvert Replacement
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 10-year
WS 10-year
Crit 10-year
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2000
.015
Elevation (ft)
Station (ft)
Legend
EG 10-year
WS 10-year
Crit 10-year
4 ft/s
5 ft/s
6 ft/s
7 ft/s
8 ft/s
9 ft/s
10 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1990
.015
Elevation (ft)
Station (ft)
Legend
EG 10-year
WS 10-year
Crit 10-year
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
14 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1950 Culv
.015
Elevation (ft)
Station (ft)
Legend
EG 10-year
WS 10-year
Crit 10-year
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1384 13 feet D/S of the culvert outlet
.05 .06 .014 .06 .05
Elevation (ft)
Station (ft)
Legend
EG 10-year
WS 10-year
Crit 10-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1379 Few feet d/s of end of apron,
.05 .06 .05
Elevation (ft)
Station (ft)
Legend
EG 10-year
WS 10-year
Crit 10-year
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
8 ft/s
9 ft/s
Ground
Ineff
Bank Sta

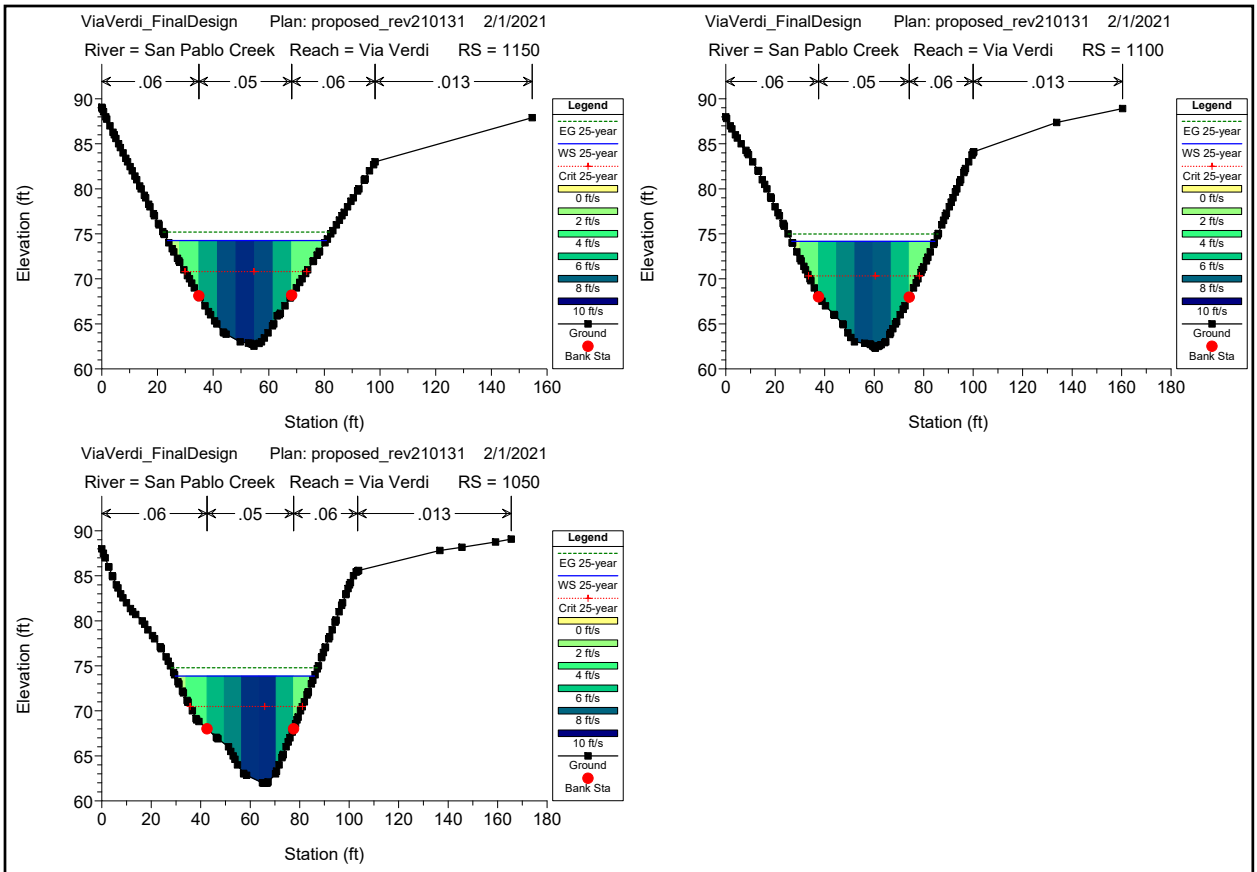

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1376 End of Expansion Reach
.05 .06 .05
Legend
EG 10-year
WS 10-year
Crit 10-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1370
.05 .06 .05
Legend
EG 10-year
WS 10-year
Crit 10-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1350
.013 .05 .06 .05
Legend
EG 10-year
WS 10-year
Crit 10-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1333.33*
.029 .051 .057 .05 .053 .045 .038
Legend
EG 10-year
WS 10-year
Crit 10-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1316.67*
.044 .052 .055 .05 .057 .039 .025
Legend
EG 10-year
WS 10-year
Crit 10-year
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1300
.06 .05 .06 .013
Legend
EG 10-year
WS 10-year
Crit 10-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1250
.06 .05 .06 .013
Legend
EG 10-year
WS 10-year
Crit 10-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1200
.06 .05 .06 .013
Legend
EG 10-year
WS 10-year
Crit 10-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

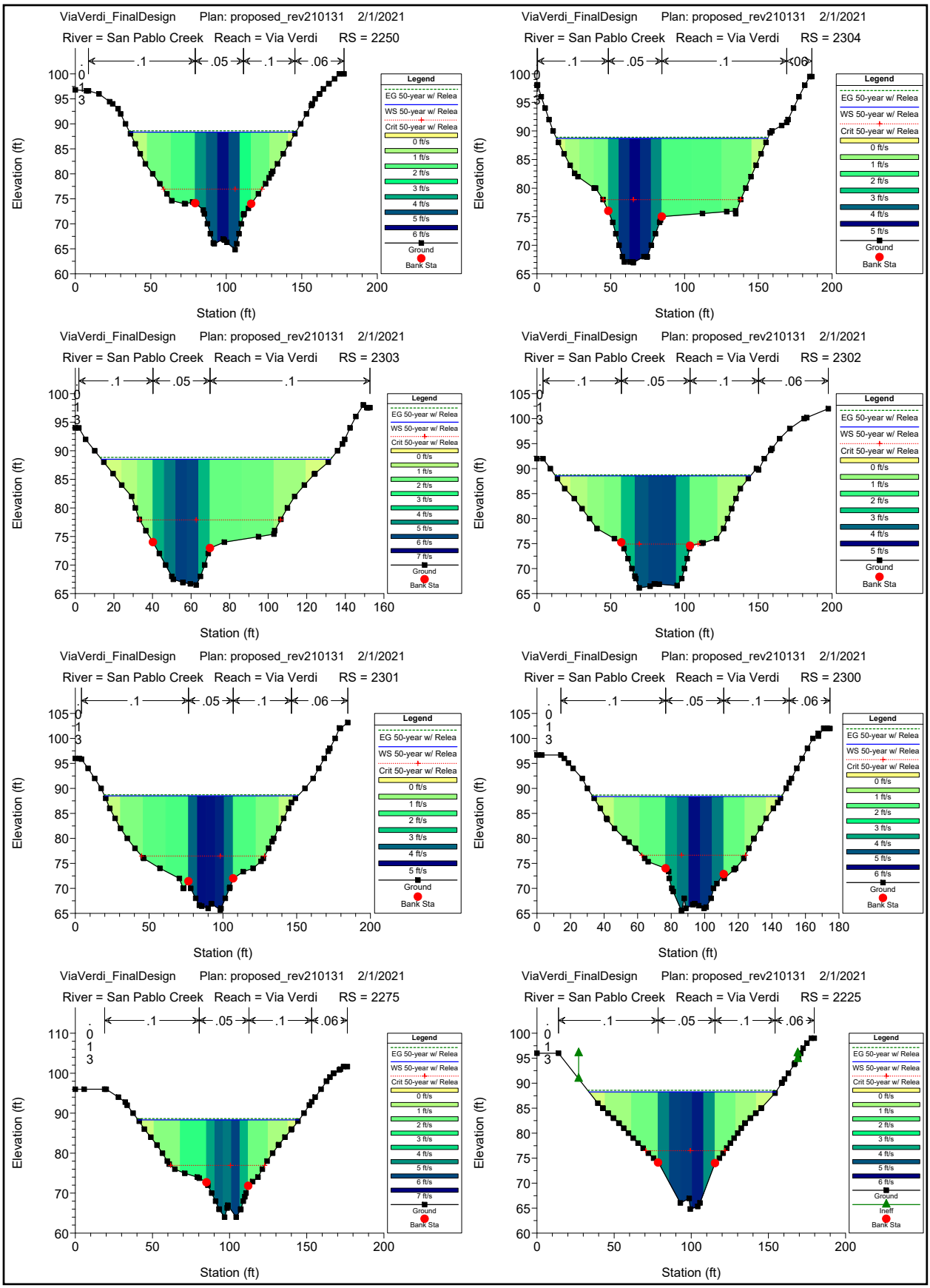

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1150
.06
.05
.06
.013
Elevation (ft)
Station (ft)
Legend
EG 10-year
WS 10-year
Crit 10-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1100
.06
.05
.06
.013
Elevation (ft)
Station (ft)
Legend
EG 10-year
WS 10-year
Crit 10-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1050
.06
.05
.06
.013
Elevation (ft)
Station (ft)
Legend
EG 10-year
WS 10-year
Crit 10-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta

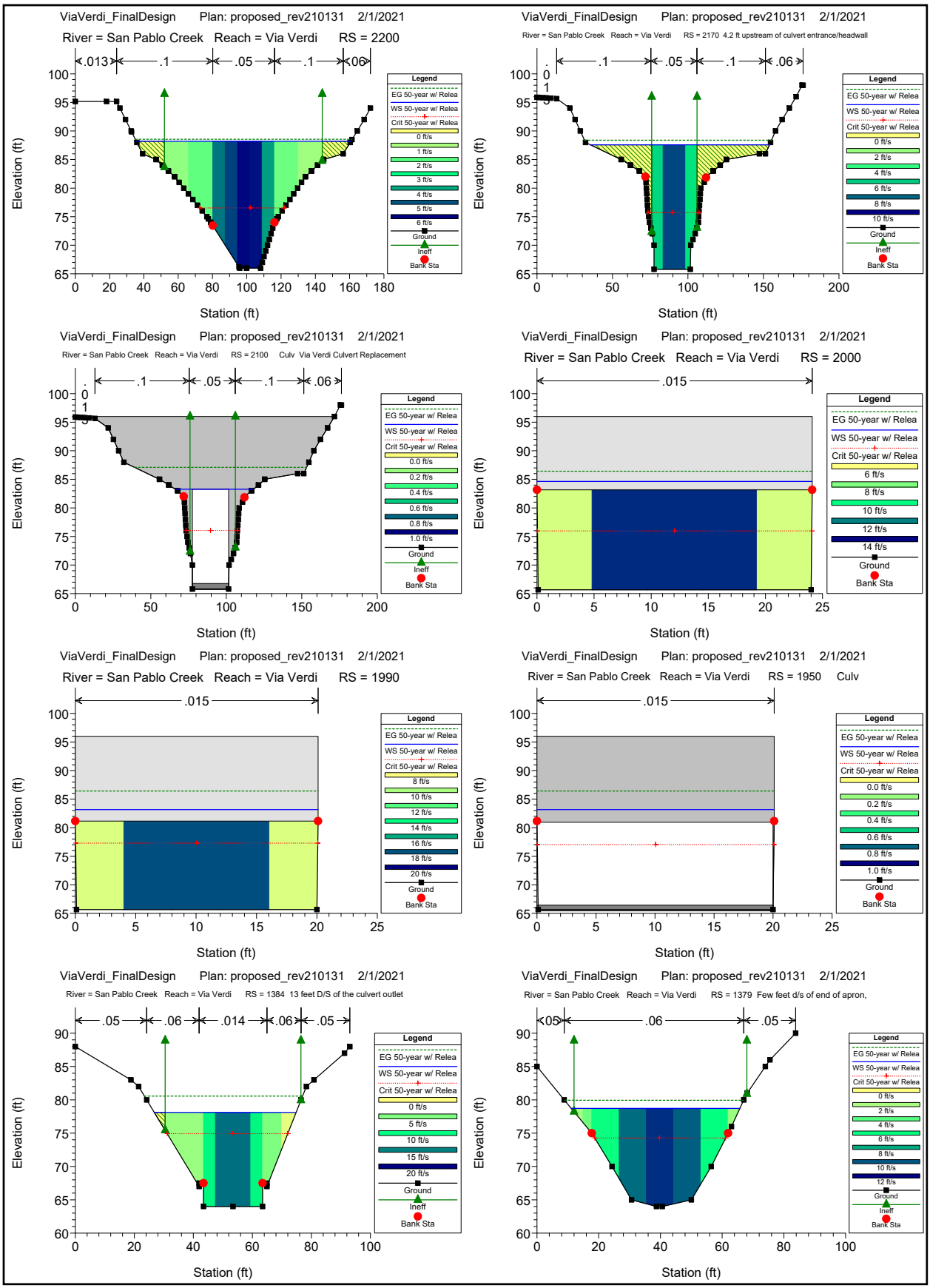

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2250
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2304
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2303
.1 .05 .1
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2302
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2301
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2300
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2275
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2225
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Ineff
Bank Sta

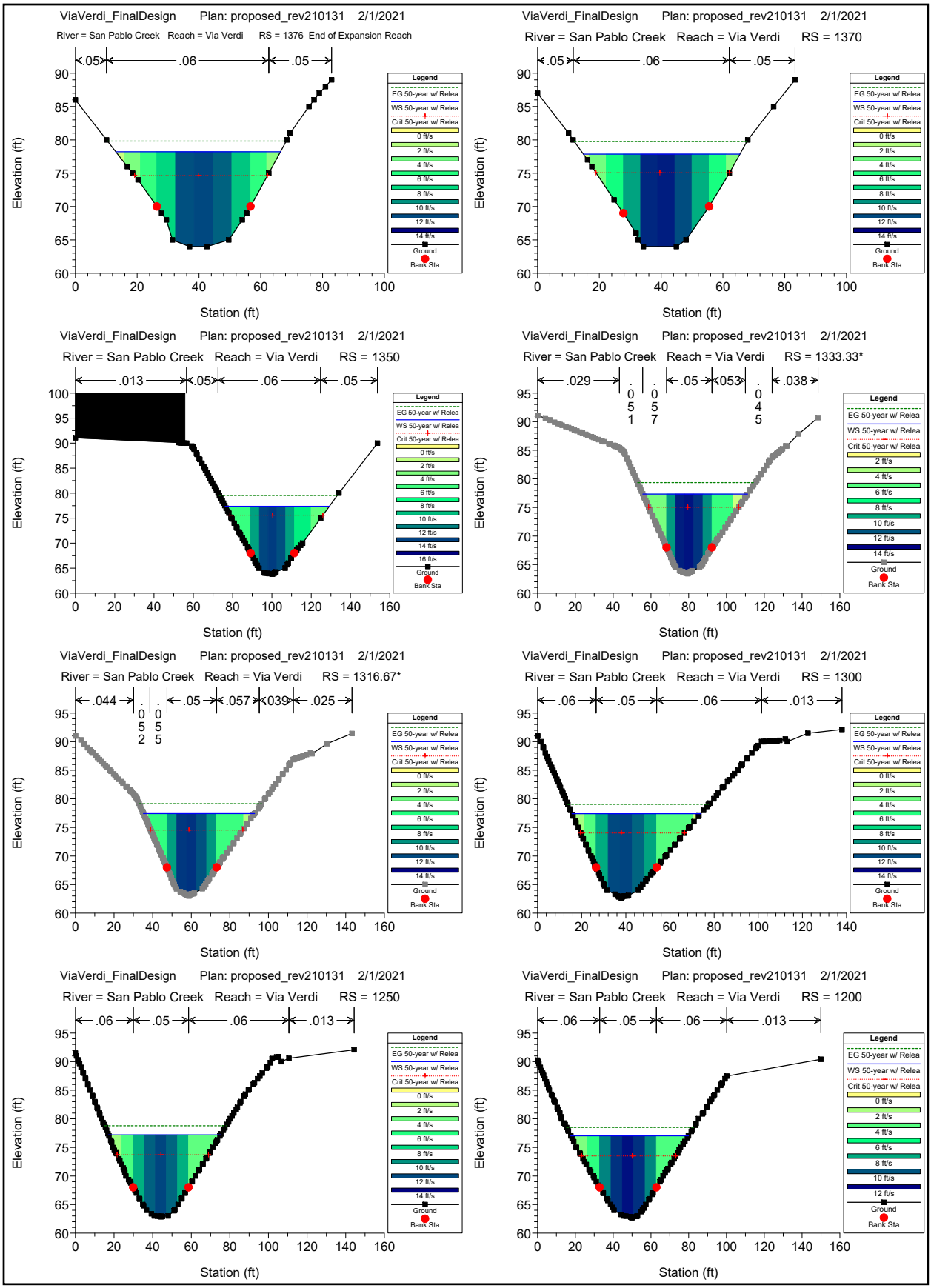

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2200
.013 .1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2170 4.2 ft upstream of culvert entrance/headwall
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2100 Culv Via Verdi Culvert Replacement
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2000
.015
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1990
.015
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
14 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1950 Culv
.015
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1384 13 feet D/S of the culvert outlet
.05 .06 .014 .06 .05
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
14 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1379 Few feet d/s of end of apron,
.05 .06 .05
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Ineff
Bank Sta

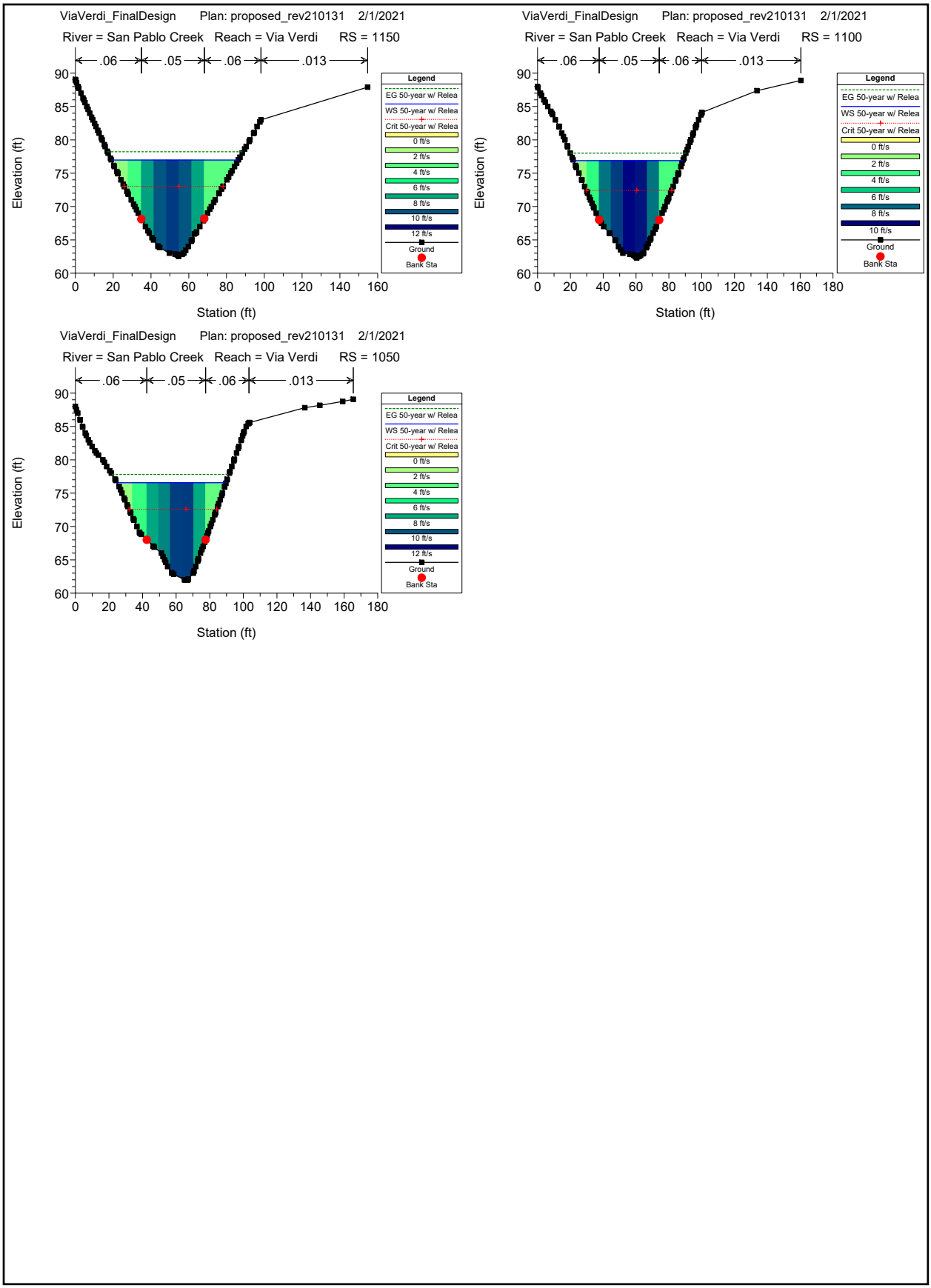

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1376 End of Expansion Reach
.05 .06 .05
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1370
.05 .06 .05
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1350
.013 .05 .06 .05
Legend
EG 25-year
WS 25-year
Crit 25-year
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
14 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1333.33*
.029 .051 .057 .05 .053 .045 .038
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1316.67*
.044 .052 .055 .05 .057 .039 .025
Legend
EG 25-year
WS 25-year
Crit 25-year
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1300
.06 .05 .06 .013
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1250
.06 .05 .06 .013
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1200
.06 .05 .06 .013
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

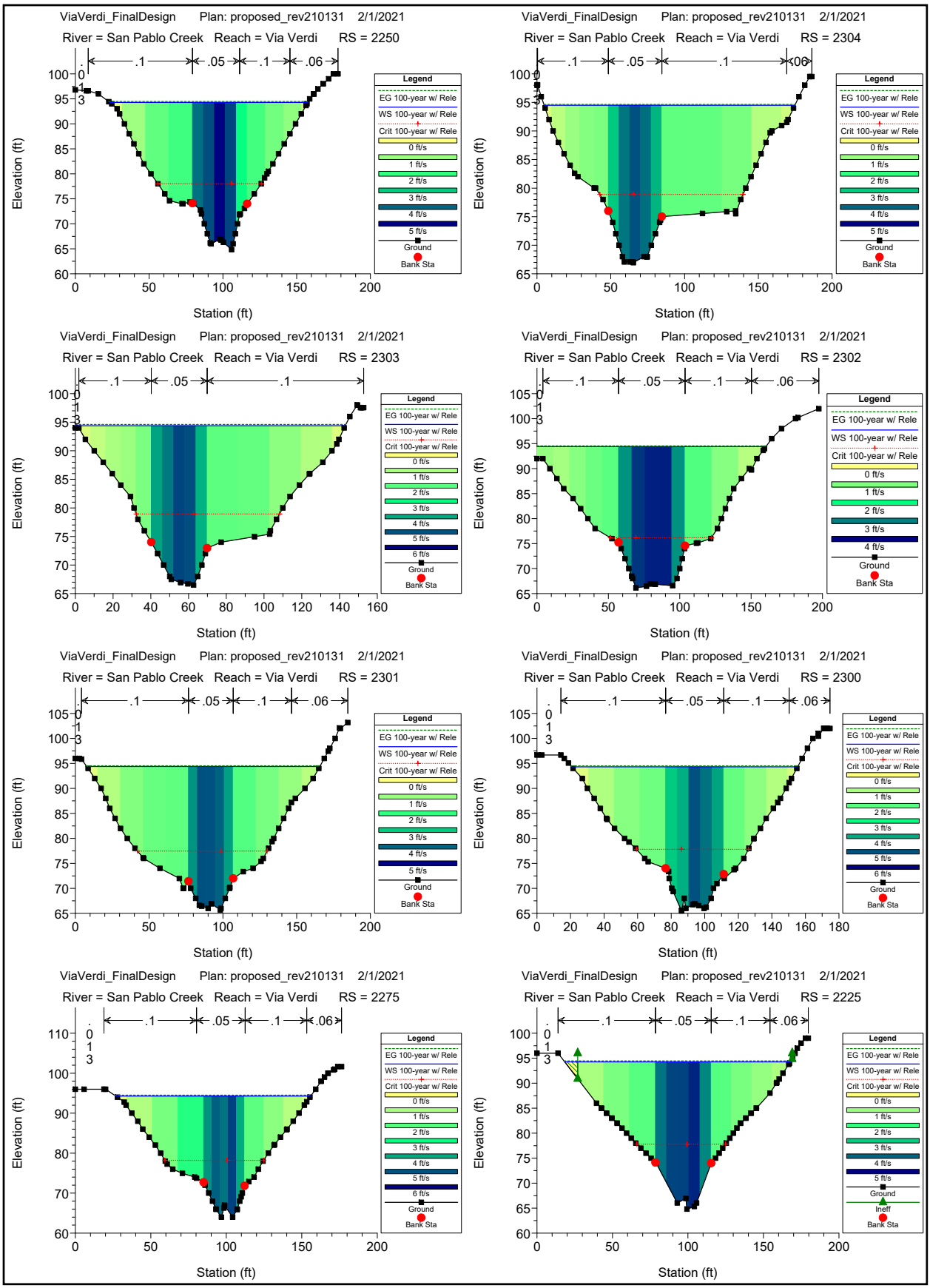

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1150
.06
.05
.06
.013
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1100
.06
.05
.06
.013
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1050
.06
.05
.06
.013
Elevation (ft)
Station (ft)
Legend
EG 25-year
WS 25-year
Crit 25-year
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta

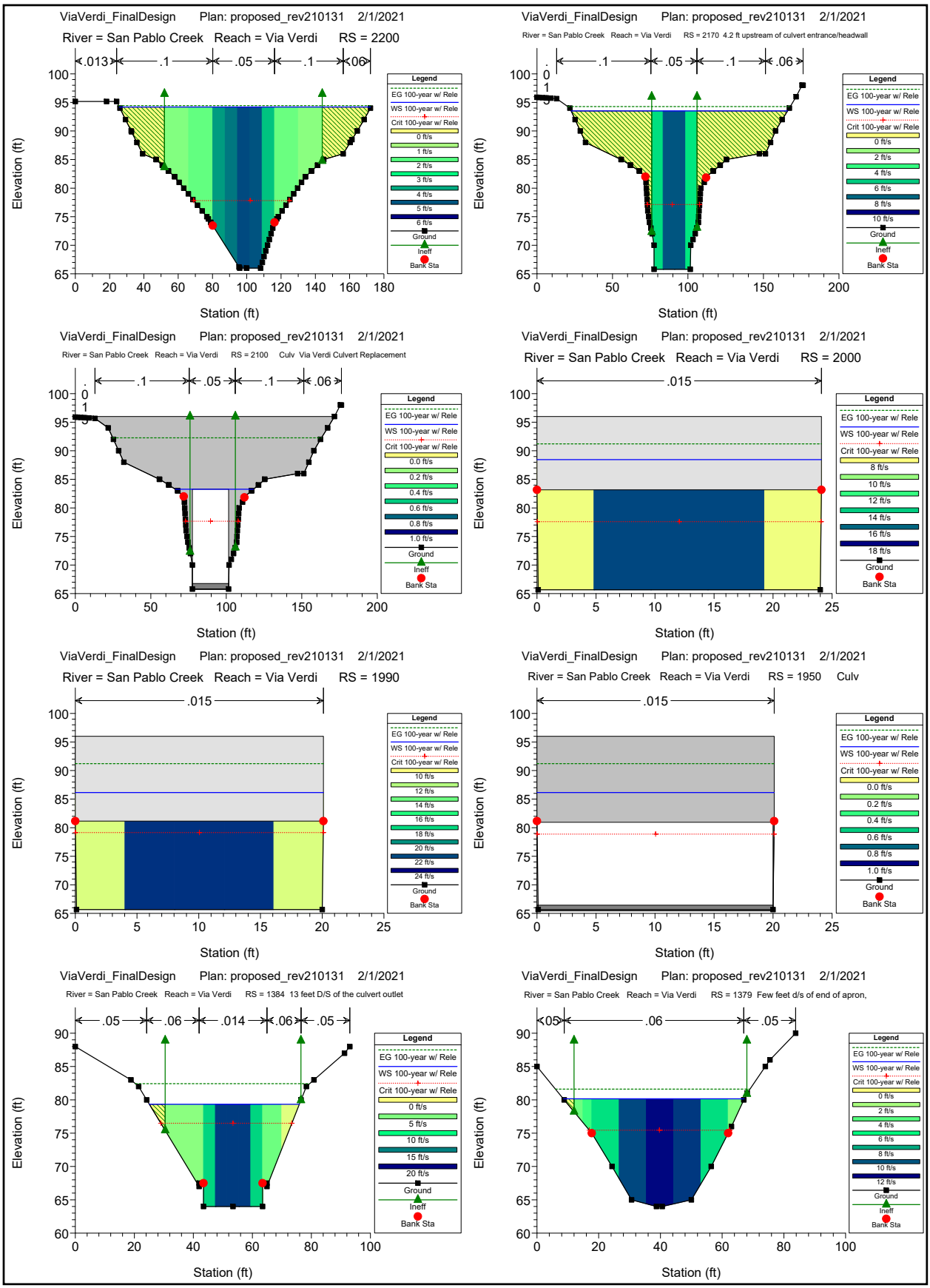

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2250
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2304
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2303
.1 .05 .1
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2302
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2301
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2300
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2275
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2225
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Ineff
Bank Sta

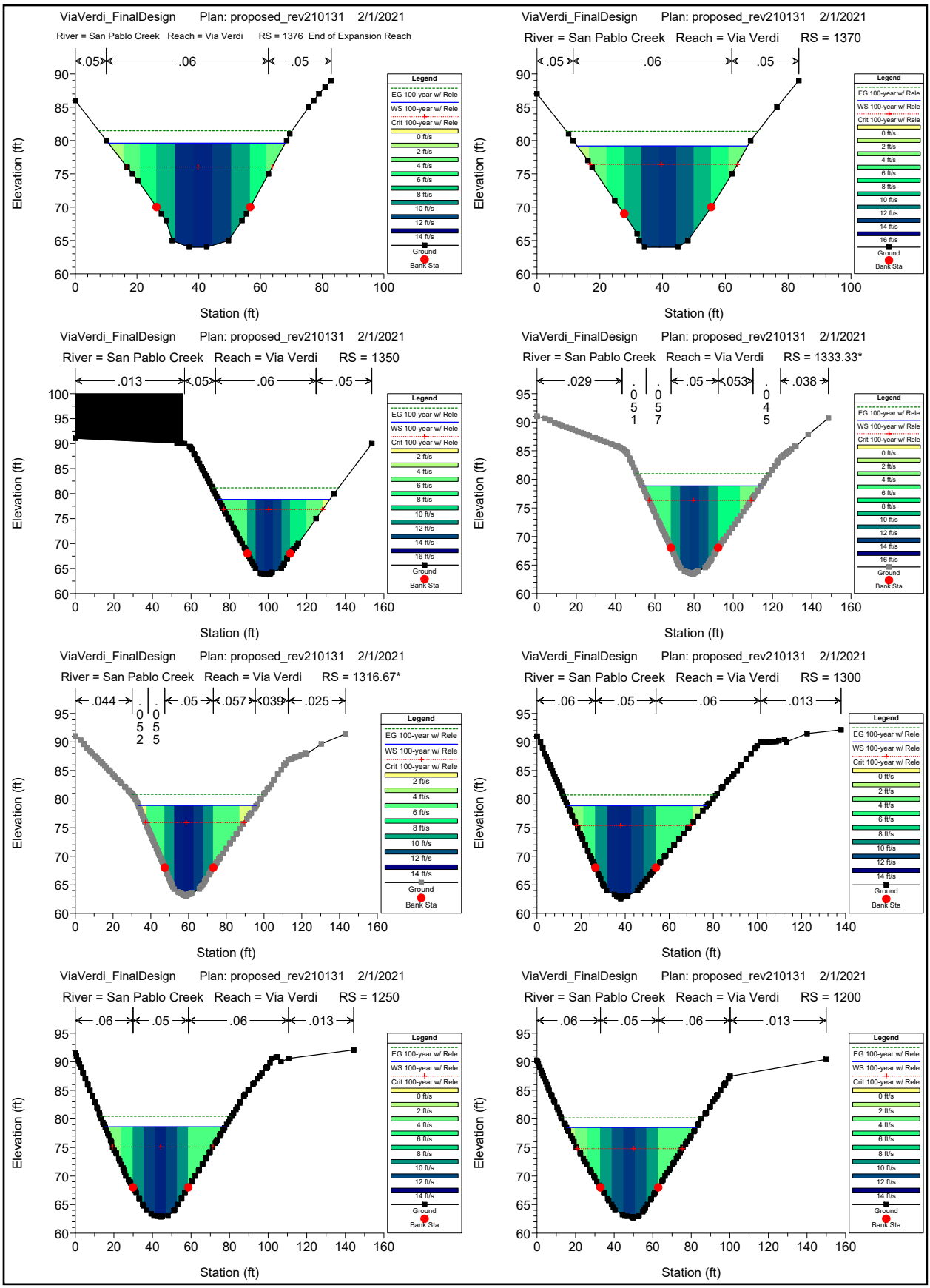

ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2200
.013 .1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2170 4.2 ft upstream of culvert entrance/headwall
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2100 Culv Via Verdi Culvert Replacement
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2000
.015
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
6 ft/s
8 ft/s
10 ft/s
12 ft/s
14 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1990
.015
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
8 ft/s
10 ft/s
12 ft/s
14 ft/s
16 ft/s
18 ft/s
20 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1950 Culv
.015
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1384 13 feet D/S of the culvert outlet
.05 .06 .014 .06 .05
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0 ft/s
5 ft/s
10 ft/s
15 ft/s
20 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1379 Few feet d/s of end of apron,
.05 .06 .05
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Ineff
Bank Sta


ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1376 End of Expansion Reach
.05 .06 .05
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
14 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1370
.05 .06 .05
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1350
.013 .05 .06 .05
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1333.33*
.029 .051 .057 .05 .053 .045 .038
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1316.67*
.044 .052 .055 .05 .057 .039 .025
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1300
.06 .05 .06 .013
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1250
.06 .05 .06 .013
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1200
.06 .05 .06 .013
Elevation (ft)
Station (ft)


ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1150
.06
.05
.06
.013
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1100
.06
.05
.06
.013
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1050
.06
.05
.06
.013
Elevation (ft)
Station (ft)
Legend
EG 50-year w/ Relea
WS 50-year w/ Relea
Crit 50-year w/ Relea
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta


ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2250
.1 .05 .1 .06
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2304
.1 .05 .1 .06
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2303
.1 .05 .1
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2302
.1 .05 .1 .06
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2301
.1 .05 .1 .06
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2300
.1 .05 .1 .06
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2275
.1 .05 .1 .06
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2225
.1 .05 .1 .06
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2200
.013 .1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2170 4.2 ft upstream of culvert entrance/headwall
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2100 Culv Via Verdi Culvert Replacement
.1 .05 .1 .06
Elevation (ft)
Station (ft)
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 2000
.015
Elevation (ft)
Station (ft)
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
8 ft/s
10 ft/s
12 ft/s
14 ft/s
16 ft/s
18 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1990
.015
Elevation (ft)
Station (ft)
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
10 ft/s
12 ft/s
14 ft/s
16 ft/s
18 ft/s
20 ft/s
22 ft/s
24 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1950 Culv
.015
Elevation (ft)
Station (ft)
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1384 13 feet D/S of the culvert outlet
.05 .06 .014 .06 .05
Elevation (ft)
Station (ft)
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
0 ft/s
5 ft/s
10 ft/s
15 ft/s
20 ft/s
Ground
Ineff
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1379 Few feet d/s of end of apron,
.05 .06 .05
Elevation (ft)
Station (ft)
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Ineff
Bank Sta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Elevation (ft)
Station (ft)
Legend
EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
Ground
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ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
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ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
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.013 .05 .06 .05
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
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ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
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.06 .05 .06 .013
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
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ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
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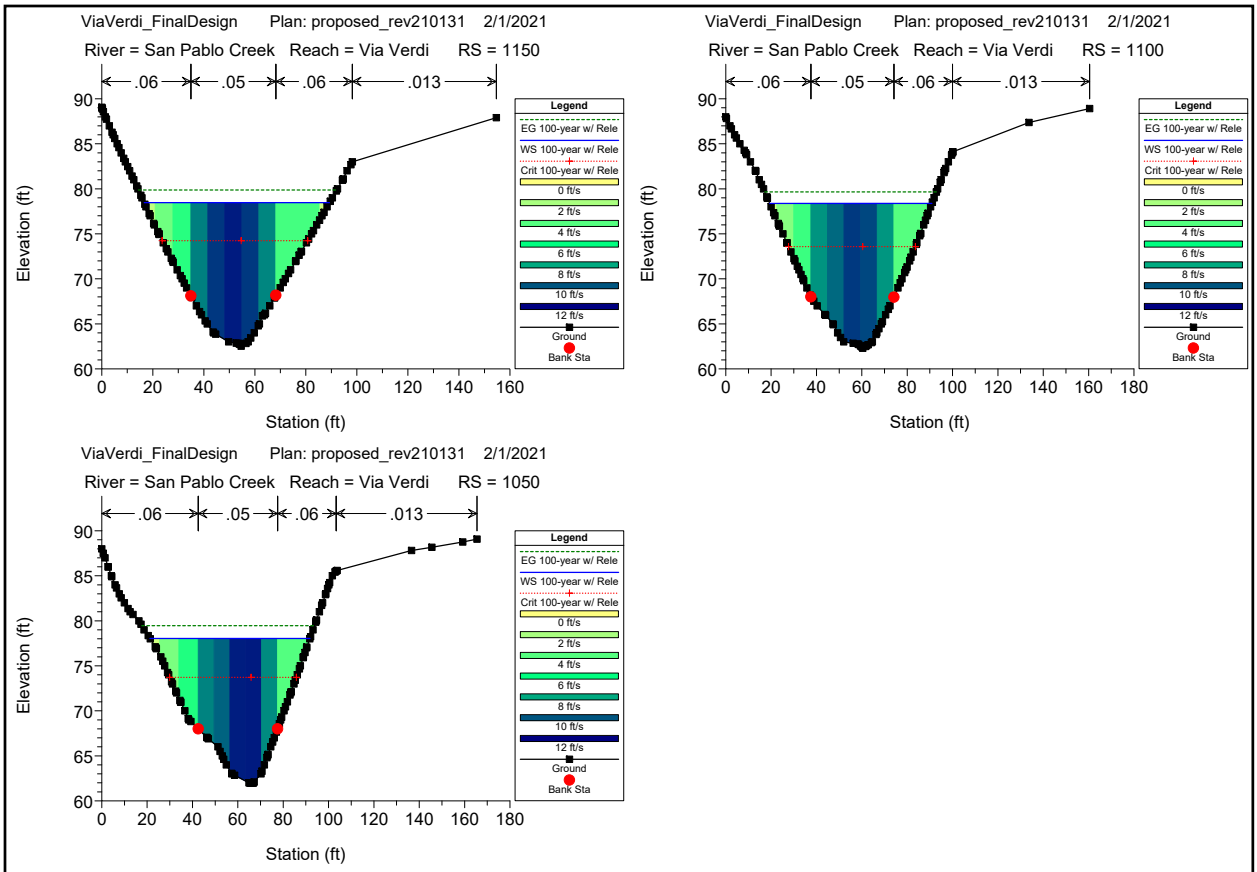
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Elevation (ft)
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EG 100-year w/ Rele
WS 100-year w/ Rele
Crit 100-year w/ Rele
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2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
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Elevation (ft)
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WS 100-year w/ Rele
Crit 100-year w/ Rele
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4 ft/s
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8 ft/s
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Ground
Bank Sta
ViaVerdi_FinalDesign Plan: proposed_rev210131 2/1/2021
River = San Pablo Creek Reach = Via Verdi RS = 1050
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Elevation (ft)
Station (ft)
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WS 100-year w/ Rele
Crit 100-year w/ Rele
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Ground
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Table 6. Mitigation Monitoring and Reporting Plan

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
Mitigation Measures					
Air Quality Mitigation Measure AQ-1					
The following measures shall be implemented to minimize impacts to air quality during construction: *a.* All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered at least two times per day. *b.* All haul trucks transporting soil, sand, or other loose material off-site shall be covered. *c.* Visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. *d.* All vehicle speeds on unpaved roads shall be limited to 15 mph. *e.* All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. *f.* Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of the California Code of Regulations [CCR]). Clear	Project Contractors, BAAQMD, and City of Richmond Capital Projects Division	BAAQMD and City of Richmond Capital Projects Division	Capital Projects Division to verify inclusion of BAAQMD BMPs in applicable construction plans and specifications submitted before construction. City of Richmond Capital Projects to inspect site during construction to ensure compliance with project construction plans.	Prior to any earthwork. Field inspections during construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
Air Quality Mitigation Measure AQ-1 (cont.)					
signage shall be provided for construction workers at all access points. *g.* All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation. *h.* A publicly visible sign shall be posted with the telephone number and person to contact at the lead agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.					
Biology Mitigation Measure BIO-1					
If any construction activities (e.g., grubbing or grading) are scheduled during the bird nesting season (typically defined by CDFW as February 1 to September 1), the City or approved construction contractor shall retain a qualified biologist to conduct a pre-construction survey of the project area and a 100-foot buffer, as access is available, to locate active bird nests, identify measures to protect the nests, and locate any other special status species. The pre-construction survey shall be conducted no more than 14 days prior to the implementation of	Project Contractors shall hire a qualified biologist to conduct pre-construction surveys as described. Project Contractors shall prepare construction	Project Contractors City of Richmond Capital Projects Division and Biologist	Review and approve a qualified biologist. Review pre-construction survey reports. If active nests are found, inspect construction site to confirm buffer zones.	No more than 14 days before start or restart of construction during the months of February through August.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
construction activities (including staging and equipment storage). Any active nest should not be disturbed until young have fledged or under the direction provided by a qualified biologist. Any special status species shall not be disturbed without the direction of a qualified biologist. If an active nest is found during construction, disturbance shall not occur without direction from a qualified biologist.	plans that incorporate pre-construction surveys and buffer zones. If required, avoidance procedures shall be implemented.				
Biology Mitigation Measure BIO-2					
Prior to construction, the City shall obtain a Section 404 CWA permit from the USACE and a Section 401 Water Quality Certification from the San Francisco Bay RWQCB, and an LSN or LSA from the CDFW. The City shall comply with all mitigation measures identified in the permit approvals.	City of Richmond Capital Projects Division	U.S. Army Corps of Engineers San Francisco Bay RWQCB California Department of Fish and Wildlife	Agencies to review and approve the City of Richmond prepared permit applications.	Review and approval of applicable permits prior to construction.	*Verified by:* *Date:*
Geology Mitigation Measure GEO-1					
The City shall retain a professional qualified paleontologist to review the Paleontological Resource Potential Maps and determine if the project area contains the potential for paleontological resources. The City shall coordinate for a "request for opinion" from a qualified professional paleontologist, state	Project Contractor and qualified Paleontologist	City of Richmond Capital Projects Division	Review and approval of Paleontologist. If resources are encountered, Contractor to verify work is suspended as required, review and approve paleontologist and paleontologist's recommendations.	Prior to and during construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
paleontological clearinghouse, or an accredited institution with an established paleontological repository housing paleontological resources from the region of interest. If the paleontological resource potential of a rock unit cannot be determined from the literature search and specimen records, a field survey by a qualified professional paleontologist will be necessary to determine the fossiliferous potential and the distribution or concentrations of fossils within the extent of the rock units present in a specific project area.		Project Contractor			
Tribal Cultural Resources Mitigation Measure TCR-1					
Conduct a Worker Environmental Awareness Program. The City shall require the contractor to provide a cultural resources and tribal cultural resources sensitivity and awareness training program (Worker Environmental Awareness Program [WEAP]) for all personnel involved in project construction, including field consultants and construction workers, before any project-related construction activities begin. The WEAP shall be developed in coordination with culturally affiliated Native American tribes and a qualified archaeologist, as defined by the Secretary of the Interior's Professional Qualifications Standards for Archeology. The City may invite Native American representatives from interested culturally affiliated Native American tribes to participate. The WEAP shall include relevant information regarding sensitive cultural resources and tribal cultural resources, including applicable regulations, protocols	Project Contractor	City of Richmond Capital Projects Division	Verify attendance and training by all project personnel prior to beginning work onsite.	Prior to construction commencement.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
for avoidance, and consequences of violating State laws and regulations. The WEAP shall also describe appropriate avoidance and impact minimization measures for resources that could be located at the project area or mitigation site and provide procedures and contact information should workers encounter any potential cultural resources or tribal cultural resources. The WEAP will emphasize the requirement for confidentiality and culturally appropriate treatment of any discovery of significance to Native Americans and will discuss appropriate behaviors and responsive actions, consistent with Native American tribal values.					
Tribal Cultural Resources Mitigation Measure TCR-2					
In the event that cultural resources or tribal cultural resources are discovered during construction, the following avoidance and minimization measures to avoid significant impacts and procedures to evaluate resources will be implemented: If cultural resources or tribal cultural resources (such as structural features, unusual amounts of bone or shell, artifacts, or human remains) are encountered at the project area or mitigation site during construction, work shall be suspended within 100 feet of the find (based on the apparent distribution of cultural materials), and the construction contractor shall immediately notify the project's City representative. Avoidance and preservation in place is the preferred manner of mitigating impacts to cultural resources and tribal cultural resources. This will be accomplished, if feasible, by several alternative means, including:	Project Contractor and Archaeologist	Contractor, City of Richmond Capital Projects Division, and Archaeologist	Review and approval of archaeologist. Review and approval of the construction plan that includes archaeological mitigation. Inspect site during construction.	Prior to construction. Field inspections during construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
Recommendations for avoidance of unanticipated cultural resources and tribal cultural resources will be reviewed by the City representative, interested culturally affiliated Native American tribes and other appropriate agencies, in light of factors such as costs, logistics, feasibility, design, technology and social, cultural, and environmental considerations, and the extent to which avoidance is consistent with project objectives. Avoidance and design alternatives may include realignment within the project area to avoid cultural resources or tribal cultural resources, modification of the design to eliminate or reduce impacts to cultural resources or tribal cultural resources, or modification or realignment to avoid highly significant features within a cultural resource or tribal cultural resource. Native American representatives from interested culturally affiliated Native American tribes will be invited to review and comment on these analyses and shall have the opportunity to meet with the City representative and its representatives who have technical expertise to identify and recommend feasible avoidance and design alternatives, so that appropriate and feasible avoidance and design alternatives can be identified. If the discovered cultural resource or tribal cultural resource can be avoided, the construction contractor(s) shall install protective fencing outside the site boundary, including a 100-foot buffer area, before construction restarts and for the duration of construction, demarking the area as an “Environmentally Sensitive Area." The boundary of a cultural resource or a tribal cultural resource will be determined in consultation with interested culturally					

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
affiliated Native American tribes and tribes will be invited to monitor the installation of fencing. Use of temporary and permanent forms of protective fencing will be determined in consultation with Native American representatives from interested culturally affiliated Native American tribes. If a cultural resource or a tribal cultural resource cannot be avoided, each resource shall be evaluated for CRHR eligibility through application of established eligibility criteria (CCR 15064.636), in consultation with consulting Native American tribes, as applicable. If a cultural resource or a tribal cultural resource is determined to be eligible for listing in the CRHR, the City shall avoid damaging effects to the resource in accordance with California PRC Section 21084.3, if feasible. The City shall coordinate the investigation of the find with a qualified archaeologist (as described in Mitigation Measure TCR-1) and with interested culturally affiliated Native American tribes that respond to the City's invitation. As part of the site investigation and resource assessment, the City and the archaeologist shall consult with interested culturally affiliated Native American tribes to assess the significance of the find, make recommendations for further evaluation and treatment as necessary, and provide proper management recommendations should potential impacts to the resources be determined by the City to be significant. A written report detailing the site assessment, coordination activities, and management recommendations shall be provided to the City representative by the qualified archaeologist. These recommendations shall be documented in the project record. For any recommendations made by interested culturally affiliated Native American tribes					

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
that are not implemented, a justification for why the recommendation was not followed shall be provided in the project record. If the City determines that the project may cause a significant impact to a tribal cultural resource, measures to avoid or minimize significant adverse impacts shall be identified in the consultation process to either avoid and preserve resources in place, and treat the resource with culturally appropriate dignity, taking into account the Tribal cultural values and meaning of the resource.					
Tribal Cultural Resources Mitigation Measure TCR-3					
If an inadvertent discovery of human remains is made at any time during project-related construction activities or project planning, the City shall meet the following performance standards prior to implementing or continuing actions such as construction that may result in damage to or destruction of human remains: In accordance with the California Health and Safety Code (HSC), if human remains are encountered during ground-disturbing activities, the City shall immediately halt potentially damaging excavation in the area of the remains and notify the County Coroner and a professional archaeologist to determine the nature of the remains. The Coroner is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or State lands (HSC Section 7050.5[b]). If the human remains are of historic age and are determined to be not of Native American origin, the City will follow the provisions of the HSC Section 7000 (et seq.) regarding	Project Contractor and Archaeologist	Contractor, City of Richmond Capital Projects Division, and Archaeologist	City to verify mitigation measure on construction plans. Inspect site during construction to ensure compliance with project construction plans.	Prior to construction. Field inspections during construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
the disinterment and removal of non-Native American human remains. If the Coroner determines that the remains are those of a Native American, he or she must contact the NAHC by phone within 24 hours of making that determination (HSC Section 7050[c]). After the Coroner's findings have been made, the archaeologist and the NAHC-designated Most Likely Descendant, in consultation with the landowner, shall determine the ultimate treatment and disposition of the remains. The responsibilities of the City for acting upon notification of a discovery of Native American human remains are identified in California PRC Section 5097.9 et seq.					
Conservation Measures Incorporated into Project					
Within 15 calendar days, prior to the onset of activities, the applicant will submit the name(s) and credentials of biologists who will conduct activities specified in the following measures. No earthmoving or other project activities will begin until written approval from the USFWS has been received that the biologist(s) is qualified to conduct the work. The USFWS-approved biologist(s) will be experienced in their respective field of specialization, have permits as required to perform the required work, and have the authority to stop construction activities if situations arise that could be detrimental to listed species.	City of Richmond Capital Projects Division	USFWS	Submit the name(s) and credentials of biologists who will conduct activities specified in the Conservation Measures.	Within 15 calendar days, prior to the onset of construction activities.	*Verified by:* *Date:*
Before any construction activities begin, a USFWS-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of the AWS and the CRLF and their habitats, the importance of the AWS and the	Project Contractor, USFWS-approved Biologist	City of Richmond Capital Projects	Conduct training session for all construction personnel.	Before construction activities begin.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
CRLF and their respective habitats, the general measures that are being implemented to conserve the AWS and the CRLF as they relate to the proposed project, the penalties for non-compliance, and the boundaries within which the proposed project may be accomplished. Brochures, books and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions. Construction workers will sign a form stating that they attended the program and understand all protection measures for the AWS and the CRLF.		Division and USFWS	Construction workers sign form confirming attendance and understanding of protection measures for AWS and CRLF.		
Prior to the initiation of excavation, construction, or vehicle operation, the project area will be surveyed by a USFWS-approved biologist to ensure that no AWS or CRLF are present. This survey is not intended to be a protocol-level survey, but rather one designed to verify that no AWS or CRLF are present within the construction area before construction activities begin. Two pre-construction surveys for CRLF and AWS will be conducted by a qualified biologist in and adjacent to the project area. The surveys will be conducted within 48 and 24 hours prior to construction. During the pre-construction surveys, the construction area will be inspected, and the biologist will also inspect areas of San Pablo Creek both upstream and downstream of the area. If any CRLF are found, the USFWS will be contacted, and the USFWS-approved biologist will be allowed sufficient time to move any CRLF from the work site before work activities begin. If any AWS are found, all activities will cease, the USFWS will be immediately contacted, and no other actions will be taken without authorization from the USFWS. Only USFWS-approved biologists will participate in activities associated with the capture, handling, and monitoring	Project Contractor, USFWS-approved Biologist	City of Richmond Capital Projects Division and USFWS	Conduct preconstruction surveys per measure. If any CRLF or AWS are found, all activities will cease, and the USFWS will be immediately contacted. Only approved biologist(s) will participate in activities associated with contact of AWS or CRLF per instructions in measure.	Prior to the initiation of excavation, construction, or vehicle operation; one within 48 hours prior to construction and one within 24 hours prior to construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
of CRLF. Any biologist involved with the surveying/ handling will employ sterilization techniques appropriate to avoid the transmission of diseases to and from the site.					
Immediately after the second survey, construction fencing and silt fencing will be installed around the work area to prevent the disturbance of sensitive habitats and the movement of any reptiles or amphibians into the project area. The bottom of the silt fencing will be buried. The USFWS-approved biologist will supervise the installation of the fencing around the work area. Access routes, tum-around and parking areas, and staging areas will be limited to the minimum necessary to achieve the project goal.	Project Contractor, USFWS-approved Biologist	City of Richmond Capital Projects Division and USFWS	City to verify inclusion of condition on construction plans. USFWS biologist to supervise installation of fencing. Inspect site during construction to ensure compliance with measure.	Immediately after second pre-construction survey.	*Verified by:* *Date:*
A USFWS-approved biologist will monitor all ground-disturbing construction activities. After ground-disturbing project activities are complete, the USFWS-approved biologist will train an individual to act as the on-site biological monitor. The USFWS-approved biological monitor will have attended the training described above. Both the USFWS-approved biologist and the biological monitor will have the authority to stop and/or redirect project activities to ensure protection of resources and compliance with all environmental permits and conditions of the project. The USFWS-approved biologist or biological monitor will complete a daily log summarizing activities and environmental compliance. The daily log and weekly, monthly, and quarterly summaries will be placed on a file-sharing website that is accessible to regulatory staff at any time.	Project Contractor, USFWS-approved Biologist	City of Richmond Capital Projects Division and USFWS	Biologist and/or Biologist-trained Monitor to monitor construction activities and complete log as prescribed in measure.	During and after ground-disturbing project activities.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
A USFWS-approved biologist or construction monitor will conduct daily construction monitoring, making a thorough inspection of the construction site and fences for the presence of AWS or CRLF. These site inspections will take place each morning before the start of construction activities.	Project Contractor, USFWS-approved Biologist	City of Richmond Capital Projects Division and USFWS	Conduct daily monitoring per measure. City to verify inclusion of condition on construction plans.	Daily before the start of construction activities.	*Verified by:* *Date:*
If any AWS or CRLF are found, all activities will cease, the USFWS will be immediately contacted and no other actions will be taken without authorization from the USFWS. Construction will be halted until all AWS or CRLF depart on their own or are removed from the work area by the USFWS-approved biologist. Actions taken to relocate AWS or CRLF will be conducted under the guidance of the USFWS and CDFW. The USFWS-approved biologist may relocate any AWS or CRLF that are in danger of immediate harm from project-related activities to a nearby safe location outside the work area that will remain undisturbed throughout the duration of the project. The USFWS-approved biologist will monitor any CRLF or AWS that has been relocated until it is determined that it is not imperiled by predators or other dangers.	Project Contractor, USFWS-approved Biologist	City of Richmond Capital Projects Division and USFWS	If any AWS or CRLF are found, all activities will cease, the USFWS will be immediately contacted and no other actions will be taken without authorization from the USFWS. USFWS biologist will relocate and monitor per measure.	Ongoing if any AWS or CRLF are found	*Verified by:* *Date:*
Construction will take place during daylight hours only.	Project Contractor	City of Richmond Capital Projects Division and USFWS	Inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	Daily during construction.	*Verified by:* *Date:*
Prior to being brought on-site, all vehicles and machinery will be inspected for fluid leaks. No vehicles or machinery exhibiting signs of leaking fluid will be brought on-site.	Project Contractor	City of Richmond Capital Projects	Inspect vehicles for fluid leaks prior to being brought on-site.	During construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
		Division and USFWS	City to verify inclusion of condition on construction plans.		
A fine mesh screen will be used on the intake to the pump used for the upstream cofferdam to ensure that no AWS, CRLF, or other amphibians or reptiles are taken at the pump.	Project Contractor	City of Richmond Capital Projects Division and USFWS	Inspect intake to the pump used for the upstream cofferdam during construction to ensure compliance with measure.	During construction.	*Verified by:* *Date:*
Any vegetation to be removed will be hand-cleared. No machinery or vehicles that disturb the ground surface will be allowed in areas in which the ground is not clearly visible.	Project Contractor	City of Richmond Capital Projects Division and USFWS	Inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	During construction.	*Verified by:* *Date:*
Construction activities in San Pablo Creek and the associated riparian habitat will be timed to occur during the latter part of the dry season (non-breeding season for CRLF: April 15 to October 15)	Project Contractor	City of Richmond Capital Projects Division and USFWS	Inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	Ongoing	*Verified by:* *Date:*
All areas disturbed as a result of project-related activities will be re-vegetated with native plant species only.	Project Contractor	City of Richmond Capital Projects Division and USFWS	Inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	During construction.	*Verified by:* *Date:*
Erosion control and sediment detention devices (e.g., well-anchored sandbag cofferdams, straw bales, or silt fences) will be incorporated into the proposed project design and implemented at the time of construction. These devices will be in place during construction	Project Contractor	City of Richmond Capital Projects	Inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	During construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
activities, and after if necessary, for the purposes of minimizing fine sediment and sediment/water slurry input to flowing water and of detaining sediment laden water on-site. These devices will be placed at all locations where the likelihood of sediment input exists.		Division and USFWS			
The biological monitor will inspect the performance of the pumps and the sediment control devices at least once each day during construction to ensure that the devices are functioning properly. The pump intake will be inspected to ensure that it does not become clogged, and if necessary, debris will be removed regularly. If an erosion control measure is not functioning effectively, the control measure will be immediately repaired or replaced. Additional controls will be installed as necessary.	USFWS-approved Biologist, Project Contractor	City of Richmond Capital Projects Division and USFWS	USFWS to inspect site once daily to ensure erosion and sediment control devices functioning properly. USFWS to report to Project Contractor if control measures need to be repaired or replaced.	At least once each day during construction.	*Verified by:* *Date:*
All debris, sediment, rubbish, vegetation, or other material removed from the channel banks, channel bottom, or sediment basins will be disposed of at an approved disposal site. All petroleum products, chemicals, silt, fine soils, and any substance or material deleterious to listed species will not be allowed to pass into, or be placed where it can pass into, the stream channel. There will be no side casting of material into any waterway.	Project Contractor	City of Richmond Capital Projects Division and USFWS	Inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	During construction.	*Verified by:* *Date:*
During project activities, all trash that may attract predators will be properly contained, removed from the work site, and disposed of regularly. Following construction, all trash and construction debris will be removed from work areas. Construction materials will be managed to minimize the provision of cover for AWS and CRLF by removing all surface construction debris daily except that required for construction.	Project Contractor	City of Richmond Capital Projects Division and USFWS	Inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	Daily during construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
To mitigate for erosion impacts, best management practices (BMPs) for construction will be implemented during and after construction. These include measures such as installing silt fences, placing rice-straw bales on and directly downstream of exposed soils, and minimizing exposed surfaces.	Project Contractor	City of Richmond Capital Projects Division and USFWS	Inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	During and post-construction.	*Verified by:* *Date:*
All fueling and maintenance of vehicles and other equipment and staging areas will occur at least 60 feet from any riparian habitat or water body. The USACE and applicant will ensure contamination of habitat does not occur during such operations. Prior to the onset of work, the USACE will ensure that the applicant will prepare a plan to allow a prompt and effective response to any accidental spills. All workers will be informed of the importance of preventing spills and of the appropriate measures to take should a spill occur.	Project Contractor and USACE	City of Richmond Capital Projects Division, USFWS, and USACE	USACE to ensure a spill response plan is developed and implemented. Contractor to educate workers about spill prevention and response per measure.	Prior to and during construction.	*Verified by:* *Date:*
The biological monitor will ensure that the spread or introduction of invasive exotic plant species will be avoided to the maximum extent possible. When practicable, invasive exotic plants in the project area will be removed.	USFWS-approved Biological Monitor	City of Richmond Capital Projects Division and USFWS	USFWS to inspect site during construction to ensure compliance with measure.	During construction.	*Verified by:* *Date:*
To minimize temporary disturbances, all project-related vehicle traffic shall be restricted to established roads, construction areas, and specifically designated access areas. These areas also should be included in pre-construction surveys and, to the maximum extent possible, should be established in locations disturbed by previous activities to prevent further adverse effects.	Project Contractor	City of Richmond Capital Projects Division and USFWS	USFWS to inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	Ongoing	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
Tightly woven fiber netting or similar material shall be used for erosion control or other purposes at the project site to ensure that AWS do not become entangled in the mesh. Coconut coir matting is an acceptable erosion control material. No plastic mono-filament matting shall be used for erosion control.	Project Contractor	City of Richmond Capital Projects Division and USFWS	USFWS to inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	Ongoing	*Verified by:* *Date:*
To avoid entrapment and prevent injury or mortality of listed species resulting from trenching activities, the perimeter of the construction site will be contained with silt fencing or similar material that excludes amphibians and reptiles. Approaches to the edge of the trench will be blocked along El Portal with concrete barriers known as K-rails.	Project Contractor	City of Richmond Capital Projects Division and USFWS	USFWS to inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	Ongoing	*Verified by:* *Date:*
Pipes that are stored on the site will be inspected for trapped animals before the pipe is used in any way. Pipes in or adjacent to trenches left overnight will be capped.	USFWS-approved Biologist	City of Richmond Capital Projects Division and Biologist	USFWS to inspect pipes to ensure compliance with measure. City to verify inclusion of condition on construction plans.	Ongoing	*Verified by:* *Date:*
All vehicle parking will be restricted to existing roads. Necessary vehicles belonging to the biological monitors and construction supervisors will be parked at the nearest point on existing access roads. A 15 mile-per-hour speed limit on the dirt access road will be imposed for all vehicles during construction activities.	Project Contractor	City of Richmond Capital Projects Division and USFWS	USFWS to inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	Ongoing	*Verified by:* *Date:*
A post-construction survey will be conducted the night before the cofferdams are removed to make sure no AWS or CRLF have occupied the temporary pool created upstream of the site. If any AWS or CRLF are present, they will be captured by hand and removed upstream of the pond to prevent them being	Project Contractor, USFWS-approved Biologist	City of Richmond Capital Projects Division and USFWS	USFWS-approved biologist to conduct post-construction survey at cofferdam site to ensure compliance with measure.	The night before the cofferdams are removed.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
potentially stranded when the dams are removed during the daylight hours and the water levels drop.					
Construction Controls Incorporated into Project					
Hydrology and Water Quality					
Prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) and monitor the effectiveness of the plan.	Project Contractor	San Francisco Bay Regional Water Quality Control Board City of Richmond Capital Projects Division and Engineering Services Department/ Water Resource Recovery Department	The San Francisco Bay RWQCB to review and approve the SWPPP. City of Richmond Water Resource Recovery Department to monitor implementation of project BMPs.	Review and approval of the SWPPP prior to construction. Field inspections during construction.	*Verified by:* *Date:*
Temporary erosion and sediment control BMPs will be used to prevent the transport of earthen materials and other construction waste materials from disturbed land areas, stockpiles, and staging areas during periods of precipitation or runoff (such as silt fence, erosion control fabric, fiber rolls).	Project Contractor	City of Richmond Capital Projects Division and Water Resource	City of Richmond Water Resource Recovery Department to monitor implementation of project BMPs.	Field inspections during construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
		Recovery Department			
Tracking controls (such as designated ingress and egress areas) and designated staging areas outside of drainage areas will be implemented.	Project Contractor	City of Richmond Capital Projects Division and Water Resource Recovery Department	City of Richmond Water Resource Recovery Department to monitor implementation of project BMPs.	Field inspections during construction.	*Verified by:* *Date:*
All disturbed areas will be revegetated, including staging with native species only.	Project Contractor	City of Richmond Capital Projects Division and Water Resource Recovery Department	City of Richmond Water Resource Recovery Department to monitor implementation of project BMPs.	Field inspections during construction.	*Verified by:* *Date:*
Temporary BMPs will be used to prevent wind erosion and sediment transport of disturbed areas, such as use of water for dust control and covering of stockpiles.	Project Contractor	City of Richmond Capital Projects Division and Water Resource Recovery Department	City of Richmond Water Resource Recovery Department to monitor implementation of project BMPs.	Field inspections during construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
Implement construction BMPs to reduce erosion potential. Such BMPs include, but are not limited to, construction scheduled for dry season; high flow bypass until the system is stabilized; temporary and permanent erosion and sediment controls; prevention of runoff during construction.	Project Contractor	City of Richmond Capital Projects Division	City of Richmond Water Resource Recovery Department to monitor implementation of project BMPs.	Field inspections during construction.	*Verified by:* *Date:*
Construction boundary fencing will be installed to limit land disturbance to areas not planned for construction.	Project Contractor	City of Richmond Capital Projects Division	City of Richmond Water Resource Recovery Department to monitor implementation of project BMPs.	Field inspections during construction.	*Verified by:* *Date:*
Hazards and Hazardous Materials					
Prepare a Spill Prevention Plan with details of site-specific BMPs to prevent accidental spills from impacting water and land resources. Outline response protocols and information for contacting the San Francisco Bay Regional Water Quality Control Board and other responsible agencies.	Project Contractor	City of Richmond Capital Projects Division	Contractor to prepare Spill Prevention Plan per measure. City of Richmond Capital Projects Division to approve Spill Prevention Plan.	Prior to permit issuance.	*Verified by:* *Date:*
Provide spill containment and absorbent materials on-site at all times.	Project Contractor	City of Richmond Capital Projects Division	Field inspections during construction to verify compliance with measure.	During construction.	*Verified by:* *Date:*
Remove petroleum products and hazardous waste must be removed from the project area and disposed of at an appropriate location.	Project Contractor	City of Richmond Capital Projects Division	Field inspections during construction to verify compliance with measure.	During construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
Traffic During Construction					
Prepare and submit for review a California Manual on Uniform Traffic Control Devices Traffic/Pedestrian Control Plan for activities within a City right-of-way.	Project Contractor	City of Richmond Engineering Department and City of Richmond Capital Projects Division.	Contractor to prepare Plan. City Richmond Capital Projects Division of to approve Plan.	Prior to issuance of Encroachment Permit	*Verified by:* *Date:*