CHAPTER 5
Growth-Inducing and Cumulative Effects

5.1 Growth Inducement Potential and Secondary Effects of Growth

Section 15126.2(d) of the State California Environmental Quality Act (CEQA) *Guidelines* requires that an environmental impact report (EIR) discuss "the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth (a major expansion of a wastewater treatment plant might, for example, allow for more construction in service areas). It must not be assumed that growth in any area is necessaril0079 beneficial, detrimental, or of little significance to the environment."

As discussed in Section 4.12, Population and Housing, the San Anselmo Flood Risk Reduction Project (Project) would not involve any housing construction and therefore would not induce growth directly by constructing housing that would attract people to the area. Project construction would not extend roads or other infrastructure that could indirectly induce growth. Given the size and availability of the regional workforce, Project construction would not be expected to induce demand for housing by attracting a substantial number of workers from outside the region. Nor would the Project provide new permanent employment opportunities that could attract workers to the area; long-term operation of the Project would not increase the number of workers employed by the Marin County Flood Control and Water Conservation District (Flood Control District).

In some cases, a flood risk reduction project can remove an obstacle to growth. However, in this case, the Project would reduce flood risk in existing developed areas and for growth already anticipated in the Marin Countywide Plan. The Project would not allow additional growth to occur than what has already been planned, nor would it change the locations where this growth is planned to occur. Consequently, implementation of the proposed project would not affect current and/or projected population growth patterns within Marin County as already evaluated and planned for in the Countywide Plan and, therefore, would not have a growth-inducing impact.

For these reasons, the Project would not have a substantial growth-inducing impact.

5.2 Significant Irreversible Changes

Sections 15126(b) and 15126.2(c) of the CEQA Guidelines require a discussion of the significant irreversible environmental changes of a project.

Irreversible commitments of resources are those which cause either direct or indirect use of natural resources such that the resources cannot be restored or returned to their original condition. Construction activities associated with the Proposed Project would result in an irretrievable and irreversible commitment of natural resources though direct consumption of fossil fuels and use of materials. Construction would include the short-term use of electricity and refined petroleum products during the operation of construction equipment (primarily gas, diesel, and motor oil). However, the energy consumption for construction would not result in long-term depletion of non-renewable energy resources and would not permanently increase reliance on energy resources that are not renewable. Construction activities would not reduce or interrupt existing electrical or natural gas services such that existing supplies would be constrained.

Project operations that would affect irretrievable resources would be limited to annual maintenance activities. Maintenance activities would result in irreversible and irretrievable use of energy and material resources in the following forms:

1. Energy expended in the form of electricity, gasoline, diesel fuel, and oil for construction equipment;
2. Labor;
3. Conversion of land use from commercial uses to flood management uses.

The use of the nonrenewable resources is expected to account for a minimal portion of the region's resources and would not affect the availability of these resources for other needs within the region. Similarly, the conversion of one parcel of land from its former commercial land use to a flood management facility would not affect the availability of commercially zoned parcels in Marin County, Ross Valley as a whole, or in the adjacent Town of Fairfax. Additional information on irreversible changes or resource use is available in Section 4.4, Energy, Minerals Forestry, and Agricultural Resources; Section 4.5, Biological Resources; and Section 4.10, Land Use.

5.3 Cumulative Impacts

Cumulative impacts, as defined in Section 15355 of the CEQA Guidelines, refer to two or more individual effects that, when taken together, are "considerable" or that compound or increase other environmental impacts. A cumulative impact from several projects is the change in the environment that would result from the incremental impact of each project when added to those of other closely related past, present, or probable future projects. Section 15130 of the CEQA Guidelines provides the following pertinent guidance for cumulative impact analysis:

1. An EIR shall discuss cumulative impacts of a project when the project's incremental effect is "cumulatively considerable" (i.e., the incremental effects of an individual project are considerable when viewed in connection with the effects of past, current, and probable future projects, including those outside the control of the agency, if necessary).
2. An EIR should not discuss impacts that do not result in part from the project evaluated in the EIR.
3. A project's contribution is less than cumulatively considerable, and thus not significant, if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact.
4. The discussion of impact severity and likelihood of occurrence need not be as detailed as for effects attributable to the project alone.
5. The focus of analysis should be on the cumulative impact to which the identified other projects contribute, rather than on attributes of the other projects that do not contribute to the cumulative impact.

CEQA Guidelines Section 15130(b)(1) provides two approaches to a cumulative impact analysis. The analysis can be based (a) on a list of past, present, and probable future projects producing related or cumulative impacts; or (b) a summary of projections contained in a general plan or related planning document.

This cumulative impact analysis considers the effects of the Project together with those of other past, present, or probable future projects proposed by the Flood Control District or others. The cumulative considerations and impacts for each section are summarized below. Each analysis of cumulative impacts is based on the same setting, regulatory framework, and significance criteria as the Project-specific analysis. Additional mitigation measures are identified if the cumulative analysis determines that a significant cumulative impact could occur and the Project's contribution to a significant cumulative impact would be considerable, even with Project-level mitigation.

As provided for in CEQA Guidelines Section 15130(b)(1), the analysis in this EIR employs the list-based approach for defining projects to be considered in the cumulative impact analysis — that is, the analysis is based on a list of past, present, and probable future projects that could result in related or cumulative impacts. A probable future project is defined as one that is "reasonably foreseeable," which is generally a project for which an application has been filed with the approving agency, for which environmental review is underway, or that has approved funding. The probable future projects are subject to independent environmental review and consideration by approving agencies. Consequently, it is possible that some of the projects will not be approved or will be modified prior to approval (e.g., as a result of the CEQA process).

Projects that are relevant to the cumulative analysis include those that could have incremental effects on the same environmental resources and would have similar environmental impacts as those identified for the Project in this EIR. The following factors were used to determine an appropriate list of relevant projects to be considered in the cumulative analyses:

1. **Similar Environmental Impacts.** Whether a project contributes to effects on the same environmental resources that are also affected by the Project and would have similar or related environmental impacts as those discussed in this EIR (Sections 4.1 through 4.15).
2. **Geographic Scope of the Area Affected and Location.** Whether a project is located within the defined geographic scope for the cumulative effect. The geographic scope of cumulative projects depends on the resource affected and is identified within each section of the EIR. The geographic scope generally coincides with the physical environment described in the setting and could include the areas adjacent to the proposed construction. For some potential impacts, however, the geographic scope would extend farther, such as for the discussion of traffic in which the regional roadway network is relevant, or the evaluation of air quality effects in which the regional air basin is the appropriate geographic scope for the analysis.
3. **Timing and Duration of Implementation.** Whether the schedule of activities for a relevant project would need to coincide in timing with the effects of the Project to result in cumulative impacts. For temporary impacts such as noise and traffic, the cumulative analyses consider the short-term cumulative effects of those projects with overlapping construction schedules as well as the long-term cumulative effects of those projects that would be in operation concurrently with the Project and would affect the same environmental resources.

Table 5-1 describes the past, present, and probable future projects that are considered in the cumulative analyses (based on the factors described above), and their locations are shown on **Figure 5-1**. The list includes projects that have overlapping construction schedules with the Project (or would be completed prior to or following Project construction) and that would be constructed in the general vicinity of the Project elements. The list also includes projects that would be in operation concurrently with the Project.

The cumulative analyses presented below first consider whether there is an impact of the Project that could result in adverse physical effects on the environment. If so, the cumulative analysis considers whether any of the projects listed in Table 5-1 would result in related impacts or affect the same environmental resources as the Project, resulting in a cumulative impact. If the cumulative impact is considered significant based on the identified significance criteria, the analysis next considers whether the Project’s contribution would be cumulatively considerable. If the Project’s contribution would be cumulatively considerable, mitigation measures are identified to reduce the Project’s contribution to a less-than-cumulatively-considerable level. If there is no feasible mitigation to reduce the Project’s contribution to a less-than-significant level, the Project’s contribution to the cumulative impact is considered significant and unavoidable.

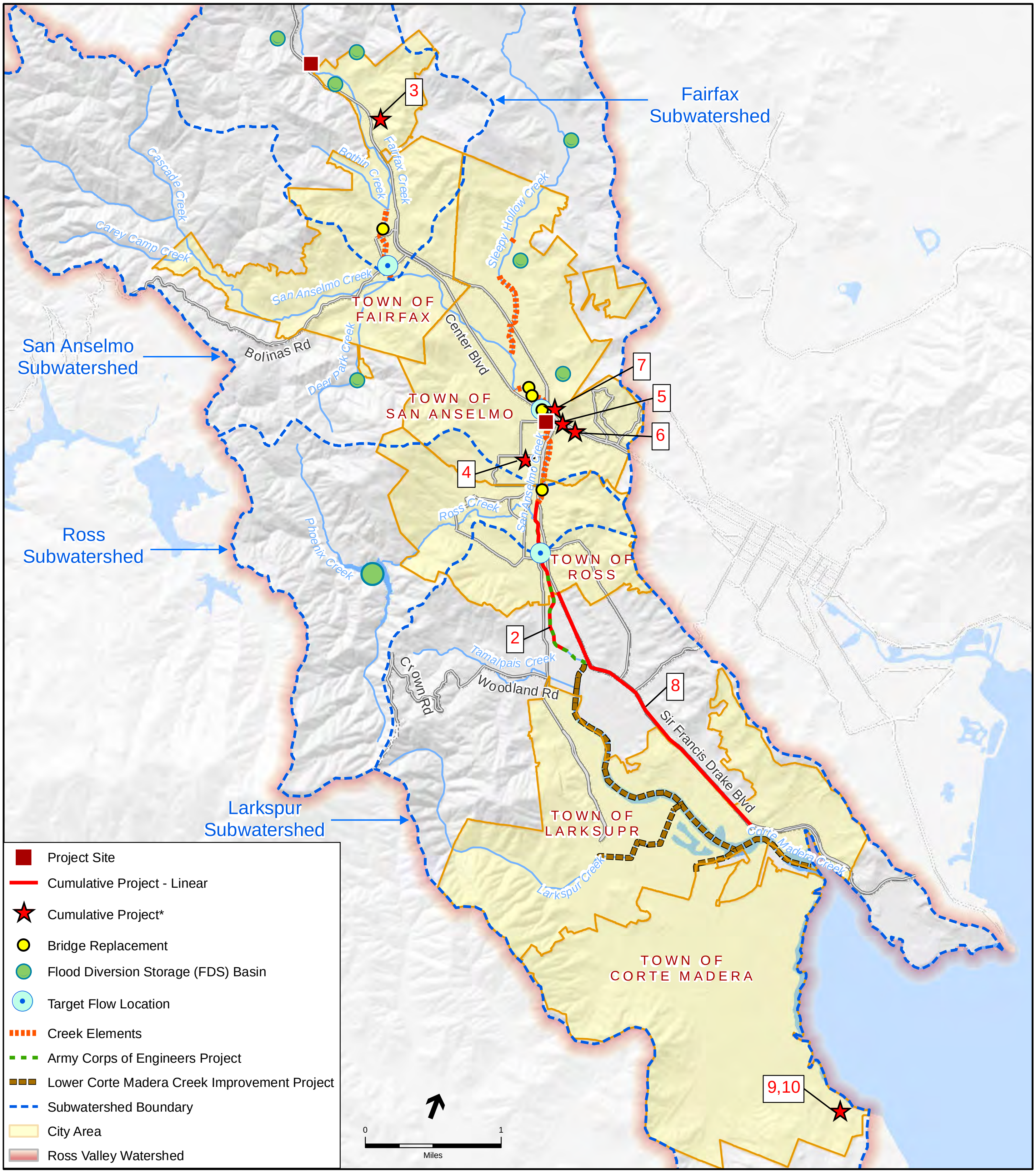
TABLE 5-1
PROJECTS CONSIDERED IN CUMULATIVE IMPACT ANALYSIS

Project No. on Map	Project Name (Project Sponsor or Jurisdiction)	Project Description	Status	Construction Dates
n/a (throughout the watershed)	Ross Valley Flood Protection and Watershed Program (Marin County)	The Ross Valley Watershed Flood Risk Reduction Program is a regional effort led by the Flood Control District in partnership with the City of Larkspur, Town of Ross, Town of San Anselmo, Town of Fairfax, and Town of Corte Madera. The program would meet the overall objective of substantially reducing the frequency and severity of flooding throughout the Ross Valley Watershed in an economically viable manner while providing multiple benefits and minimizing environmental impacts. Phase One would include use of flood diversion and storage (FDS) basins, bridge replacements and selected elements in the creeks to increase capacity. Phase Two elements of the Program would implement additional creek improvements, bridge replacements, additional FDS basins, low impact development, flood preparation and education, and creek maintenance, after implementation of Phase One.	Undergoing Environmental Review	Phase One (2017 to 2027) Phase Two (2028-2050
n/a (see yellow circles on map figure)	Ross Valley Flood Protection and Watershed Program's Bridge Replacement Projects: Azalea Avenue, Nokomis Avenue, Madrone Avenue, Center Blvd-Sycamore Avenue, and Winship Avenue Bridges (San Anselmo, Fairfax, Ross)	Several bridges in the same region of the Ross Valley as the proposed Project (i.e., on San Anselmo Creek or other tributaries in the Corte Madera Creek watershed) are planned for removal and replacement in such a way as to move their foundations out of the creek channels. These would be funded in part by the California Department of Transportation (Caltrans) under it local assistance project. The local towns (Fairfax, San Anselmo, and Ross) would share the costs and coordination to plan and implement the projects, and would be the CEQA lead agencies. The bridge replacements would include Azalea Avenue, Nokomis Avenue, Madrone Avenue, Center Blvd-Sycamore Avenue, and Winship Avenue bridges.	Undergoing Environmental Review	Within the next 5 years; some could occur contemporaneously with the Project
2	Corte Madera Creek Flood Risk Management Project (U.S. Army Corps of Engineers; USACE) (*Also known as the Corte Madera Creek Flood Control Project, Units 2, 3, and 4*)	The goal of this project would be to enhance and improve Corte Madera Creek to reduce the risk of flooding in the communities of Ross and Kentfield. The project would examine several alternatives, but would include: removal of a wooden fish ladder, widening overly narrow sections, installing flood walls adjacent to the banks, and stabilizing creek banks in Unit 4 and also downstream of the fish ladder in Units 2 and 3. Project benefits include flood reduction during large storms and ecosystem restoration.	Undergoing Environmental Review	Within the next 5 years
3	Victory Village- Affordable Housing (Fairfax)	This project, located at 2626 Sir Francis Drake Boulevard, will require the subdivision of the existing 20-acre site into three parcels, one 2-acres in size and two others that will each be 9-acres. The 2-acre parcel is proposed to be developed as a senior housing project affordable to extremely low and very low income households. Given these affordability parameters, the project applicant, Resources for Community Development, seeks a density bonus in order to construct 54 units at a density of 27 dwelling units per acre, where 20 dwelling units per acre would otherwise be permitted, and has requested density bonus waivers and/or concessions with respect to the project's proposed height (38' 7"), uncovered parking, and undergrounding of the existing above ground utility lines on Sir Francis Drake Boulevard.	Planned	January 2018-January 2019
4	45 Ross Avenue (San Anselmo)	This project involves the demolition of existing housing and construction of a 10-unit apartment/condominium development. The 10 units will have between one and four bedrooms, and 17 parking spaces total.	Planned	Uncertain; unlikely before 2019

TABLE 5-1 (CONTINUED)
PROJECTS CONSIDERED IN CUMULATIVE IMPACT ANALYSIS

Project No. on Map	Project Name (Project Sponsor or Jurisdiction)	Project Description	Status	Construction Dates
5	600 Red Hill Avenue (San Anselmo)	This project proposes for a subdivision to create a new 43,829 square feet (approximately 1 acre) lot behind an existing apartment building, with access from Spaulding Street. Four new residential townhomes are proposed. Each unit is approximately 3,000 square feet with four bedrooms and a two car garage.	Planned	Uncertain; unlikely before 2019
6	1 Lincoln Park (San Anselmo)	Rezoning of a narrow strip of land from R-1 (Single Family Residential) to C-3 (Commercial District). A 16-unit apartment building is proposed, to total approximately 15,300 square feet of floor area over an 8,000 square foot parking garage. The garage would provide 17 parking spaces, include 5 disables parking spaces. The applicant intends the project to be for senior housing, and the project includes two units that would be deed restricted for low income housing.	Planned	2018-2019
7	754 Sir Francis Drake Boulevard (San Anselmo)	The project proposes the demolition of existing 5,700 sf of commercial and office buildings, and construction of 16 apartments over 22 parking spaces on approximately a one-half acre site.	Planned	2018-2019
8	Sir Francis Drake Boulevard Rehabilitation (Ross)	The project proposes several traffic flow, pavement, safety improvements, and water main replacement along Sir Francis Drake Boulevard between Highway 101 and the Ross Town limits.	Planned	Uncertain
9	Marin County Day School Improvements, Lake or Streambed Alteration Agreement No. 1600-2015-0385-R3 (Corte Madera)	This project involves modification to an existing ephemeral stream that flows through campus. Phase 1 work was implemented along the downstream portion of the stream according to Streambed Alteration Agreement 1600-2008-0167- R3. This project (Phase 2) continues the creek modification from the upstream terminus of the previous project. Approximately 400 linear feet of stream channel will be modified. The intent of the channel design is to create a geomorphically stable channel design that represents a naturalized and enhanced creek channel.	Planned	Uncertain
10	Marin County Day School Improvements (Corte Madera)	Marin Country Day School, proposes building renovations, demolitions, and new construction of the existing campus and completion of a creek restoration program. In addition, portable classrooms would be added north of Paradise Drive temporarily during the construction period and new permanent bathrooms would be added in this same area. These portable classrooms would be removed at the end of construction. A net addition of 11,334 gsf would be added to the campus to provide classrooms, a performing arts center, and associated facilities. A total of 8,349 gsf would be demolished. The improvements would provide updated and more modern accommodations for students and more classrooms in order to reduce class sizes for more personalized instruction. No enrollment increases are proposed as part of this project.	Planned	Uncertain

SOURCES:
[a] Price, Sarah, Town of San Anselmo, personal communication with Karen Lancelle, ESA, February 15, 2018; Marin Watershed Program, USACE Corte Madera Creek Flood Risk Management Project, February 22, 2018; Town of Fairfax, Planning Commission Meeting Agenda, April 20, 2017; Town of Fairfax Planning Department, Victory Village - Affordable Housing 2626 Sir Francis Drake Blvd; Fairfax, CA 94930 Initial Study Mitigated Negative Declaration - Recirculated. March 29, 2017; Gardner, Michele, Town of Fairfax, personal communication with Alena Maudru, ESA, May 24, 2017; Scoble, Heidi, Town of Ross, personal communication with Alena Maudru, ESA, May 25, 2017; California Office of Planning and Research, CEQAnet query results for Sir Francis Drake Boulevard Rehabilitation. Available online at http://www.ceqanet.ca.gov/, accessed June 20, 2017.



*Projects without a map number in Table 5-1 have not been mapped either because they occur in several locations or because no specific location has been identified.

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Figure 5-1
Cumulative Projects

5.4 Cumulative Impact Analysis

The following subsections provide detailed discussion of cumulative impacts by resource topic and, where appropriate, a description of the mitigation measures that would avoid or lessen the impacts. Pursuant to CEQA Guidelines Section 15130(a)(1), an EIR should not discuss impacts that do not result in part from the Project evaluated in the EIR. Therefore, the following analysis includes only those impacts that would result from Project implementation of the Project.

5.4.1 Aesthetics and Visual Resources

The geographic scope for the analysis of potential cumulative aesthetic impacts includes the Project sites and surrounding areas within the publicly accessible viewsheds of the Project, as described in *Section 4.2, Aesthetics and Visual Resources*.

Concurrent construction of the Project with other projects proposed in the area (Table 5-1) located within the same viewsheds could result in short-term visual impacts during construction. The nearest projects to the Nursery Basin site (other than rehabilitation of Sir Francis Drake Boulevard) is the Victory Village Affordable Housing, and the nearest projects to the downtown San Anselmo site are 600 Red Hill Avenue, 1 Lincoln Park and 754 Sir Francis Drake Boulevard. These projects are not located in the immediate visual vicinity of either Project site and would not contribute to short-term or long-term impacts to aesthetics. Additionally, these projects would be subject to the design review requirements of the municipalities located in the Ross Valley, which ensure consistency with the goals and policies of the area General Plans regarding community and visual character.

The change in visual context of the Nursery Basin site would not have a substantial negative effect on the visual quality or character of the site, because the site would remain largely screened from publicly-accessible vantage points by existing intervening mature vegetation and topography as well as the revegetation portions of the Project. Similarly, removal of the San Anselmo structure to improve creek capacity would include restoration of the site in a manner that would not detract from the visual character of downtown San Anselmo. Therefore, the Project would not contribute to any cumulative impact on visual resources.

5.4.2 Air Quality and Greenhouse Gas Emissions

Regional air pollution is by its very nature a cumulative impact. Emissions from past, present and future projects contribute to the region's (i.e., the Bay Area Air Basin) exceedances of air quality standards on a cumulative basis. No single project by itself would be sufficient in size to result in regional non-attainment of ambient air quality standards. Instead, a project's individual emissions contribute to existing cumulative adverse air quality impacts.[1] The project-level thresholds for criteria air pollutants set by the Bay Area Air Quality District (BAAQMD) are based on levels by which new sources are not anticipated to contribute to an air quality violation or result in a cumulatively considerable net increase in criteria air pollutants. Therefore, if a project would exceed the identified construction or operational significance thresholds, its emissions would be

[1] BAAQMD, *CEQA Air Quality Guidelines*, May 2017.

cumulatively considerable, and if a project would not exceed the construction or operational significance thresholds, its emissions would not be cumulatively considerable.

The geographic scope for toxic air contaminant and odor impacts is the vicinity of the Project sites. The analysis of greenhouse gas emissions presented in *Section 4.3, Air Quality and Greenhouse Gas Emissions*, is in a cumulative context because the impact is inherently cumulative (i.e., changes that affect the global climate).

As described in *Section 4.3, Air Quality and Greenhouse Gas Emissions*, the Project's construction-related criteria pollutant emissions would not exceed the project-level thresholds for the criteria pollutants nitrogen oxides (NOx), reactive organic gases (ROG), and particulate matter (PM_{10}, and $PM_{2.5}$). Emissions of fugitive dust would be generated by construction activities associated with grading and earth disturbance, and travel on unpaved roads. However, implementation of the Bay Area Air Quality Management District's (BAAQMD) fugitive dust Basic Control Measures, which are contained in Mitigation Measure 4.3-1 (BAAQMD Basic Construction Measures), would reduce impacts associated with fugitive dust emissions to a less-than-significant level. Compliance with this mitigation measure would further minimize the potential for air quality impacts from construction activities associated with the Project. Project-related criteria pollutant construction emissions would not be cumulatively considerable and would result in a less-than-significant cumulative impact.

With regard to health risk impacts, construction of some of the projects in Table 5-1 (Victory Village Affordable Housing Project, 600 Red Hill Avenue and 754 Sir Francis Drake Boulevard) could coincide with the construction of the Project. In order to determine whether the Project's contributions to the excess cancer risk would be cumulatively considerable if combined with the emissions of these projects, the Project's contribution can be compared to the project-level significance thresholds for health risks. Pursuant to implementation of Mitigation Measure 4.3-4 (Tier 4 Engines for Construction Equipment), maximum incremental cancer risk associated with the Project would be mitigated to approximately 6.6 chances per million for the Nursery Basin and 5.6 chances per million for Downtown San Anselmo, which would be less than the BAAQMD's project-level significance threshold of 10.0 per million. The maximum annual average $PM_{2.5}$ exhaust concentrations would be mitigated to approximately 0.1 micrograms per cubic meter ($\mu g/m^3$) for the Nursery Basin and 0.28 $\mu g/m^3$ for Downtown San Anselmo, which would be less than the BAAQMD's project-level significance threshold of 0.3 $\mu g/m^3$. Implementation of Mitigation Measure 4.3-4 would reduce the Project's contribution of TAC emissions to the extent that the Project would not be cumulatively considerable when combined with present and reasonably foreseeable cumulative projects identified in Section 6.1 that are in the vicinity of the Project.

In addition, the BAAQMD has separate cumulative thresholds for risks and hazards from local existing "past project" emissions combined with Project emissions. In the context of cumulative projects, the category of past projects is captured within the existing setting or environmental baseline. These thresholds are a cancer risk of 100 in a million, a non-cancer Hazard Index of 10.0, and an annual average $PM_{2.5}$ concentration of 0.8 $\mu g/m^3$. Existing nearby past project sources (e.g., within 1,000 feet of offsite sensitive receptors included in the project-level analysis, or 2,000 feet from the Project) with available BAAQMD toxic air contaminants (TACs) data for the Downtown San Anselmo site include the Gas & Shop gas station at 750 Sir Francis Drake Blvd., an emergency generator at 60 Park Way, the 76 Gas Station at 930 Sir Francis Drake Blvd, Fara's Auto Repair at 98 Sir Francis Drake Blvd, and M&R Cleaners at 90 Greenfield Avenue. (Note that these are existing sources of emissions and are not cumulative projects listed in Table 5-1.) There are no BAAQMD-identified sources within 1,000 feet of the Nursery site. There are no major roadways with substantial TAC emissions in the vicinity of the Project (the closest major roadway is Highway 101 approximately 2 miles east of the Downtown San Anselmo site). According to BAAQMD, existing health risks for receptors located at the source site are as follows (BAAQMD 2011; BAAQMD 2012a):

1. Gas & Shop gas station at 750 Sir Francis Drake Blvd. (ID G10858): 30.031 per million cancer risk and 0.027 chronic hazard index (no data available for annual average PM2.5 concentration);[2]
2. Emergency Generator at 60 Park Way (ID 15210): 0.35 per million cancer risk (no data available for annual average PM2.5 concentration or chronic hazard index);[1]
3. 76 Gas Station at 930 Sir Francis Drake Blvd. (ID G1875): 53.923 per million cancer risk and 0.049 chronic hazard index (no data available for annual average PM2.5 concentration) ;[1]
4. Fara's Auto Repair at 98 Sir Francis Drake Blvd. (ID G10710): 4.136 per million cancer risk and 0.004 chronic hazard index (no data available for annual average PM2.5 concentration);[1] and
5. M&R Cleaners at 90 Greenfield Avenue (ID 7710): 36.0 per million cancer risk and 0.096 chronic hazard index (no data available for annual average PM2.5 concentration).[1]

Note that these health risk values listed above are for receptors located at the source site, not at the maximally impacted Project sensitive receptors, and they represent risk at different locations. In order to estimate the maximum possible combined health risks from all of these sources at sensitive receptors within 1,000 feet of the Project site, the BAAQMD's distance multiplier tools for internal combustion engines and gas stations were used (BAAQMD 2012b; BAAQMD 2012c). These tools were used to calculate risk for the 76 Gas Station and the M&R Cleaners as follows. The 76 Gas Station is located 2,000 feet northwest of the Project site, so the closest sensitive receptor within 1,000 feet of the Project is also 1,000 feet from the 76 Gas Station. At 1,000 feet, the estimated cancer risk is 0.81 per million. The M&R Cleaners is located 1,300 feet southeast of the Project site, so the closest sensitive receptor within 1,000 feet of the Project is 300 feet from the M&R Cleaners. At 300 feet, the estimated cancer risk is 3.76 per million. Note that these two cancer risks occur at completely different locations; one 1,000 feet northwest of the site, and the second 1,000 feet southeast of the site. However, these health risks were combined to present a highly conservative estimate of health risk.

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2 Note that these health risk values are for receptors located at the source site, not at the closest onsite project sensitive receptor. Therefore, the use of these values presents a highly conservative estimate of health risk at Project receptor locations.

The maximum possible health risks from the other three sources, located at the source sites themselves, were added to these health risks to determine the total maximum health risks from all sources combined. These values are 0.35 per million cancer risk for the Emergency Generator at 60 Park Way, 30.03 per million cancer risk and 0.027 chronic hazard index for the Gas & Shop gas station, and 4.14 per million cancer risk and 0.004 chronic hazard index for Fara's Auto Repair. Combining all these values, the total increased cancer risk is 39.08 per million and the total increased in the chronic hazard index is 0.18. Adding the maximum mitigated Project health risks of 5.61 per million cancer risk and 0.09 chronic hazard index yields a total of 44.69 per million cancer risk and a total chronic hazard index of 0.27. Note that each of these health risk values occurs at a different sensitive receptor location, so the maximum health risk values at any actual individual sensitive receptor is substantially lower than these reported values. Therefore, the use of these values presents a highly conservative estimate of health risk at Project receptor locations. Since $PM_{2.5}$ concentration data were not available for these sources, $PM_{2.5}$ concentrations were not included in this analysis.

As explained above, the total combined risks from all six of the past project emission sources listed above plus the Project are 44.69 per million cancer and 0.27 chronic hazard index. These values would not exceed BAAQMD’s thresholds of significance for cumulative health risks and hazards of 100 per million cancer risk and 10 chronic hazard index (BAAQMD 2017b). Therefore, the proposed Project emissions would not combine with other past project emissions to result in a substantial cumulative effect with respect to health risk from exposure to TACs, and the potential contribution to air quality impacts associated with the Project would be less than cumulatively considerable due to implementation of Mitigation Measure 4.3-4 as identified in *Section 4.3, Air Quality and Greenhouse Gas Emissions*.

As described in Impact 4.3-5, combustion emissions from the use of diesel fuel in construction equipment could generate localized objectionable odors. If sensitive receptors are located in the immediate vicinity of these activities, odors could be perceivable and thus constitute a nuisance impact. However, any objectionable odors generated by Project construction and operational activities and perceived by sensitive receptors would occur on intermittent, short-term bases. Additionally, the California Code of Regulation Section 2485, which limits idling time of construction equipment, is incorporated into Mitigation Measure 4.3-1 and would further limit diesel odors generated by construction vehicles. Because the Project’s contribution to odors would be localized and short-term in nature, the potential contribution to cumulative odor impacts would be less than cumulatively considerable.

Operational activities associated with the Project would involve the use of diesel-powered construction equipment, such as excavators or bulldozers, that would generate exhaust in the form of both criteria air pollutants and criteria air pollutant precursors. In addition, exhaust emissions would be generated from vehicle trips associated with sediment removal and commuting workers. These activities would also generate fugitive dust (including PM_{10} and $PM_{2.5}$) during excavation and vehicle travel on both paved and unpaved surfaces. Implementation of the projects identified in Table 5-1 would also have the potential to contribute criteria air pollutants and criteria air pollutant precursors. As described under Impact 4.3-3, average daily operational equipment and vehicle exhaust emissions of ROG, NOx, PM_{10}, and $PM_{2.5}$ for the Project would not exceed the

BAAQMD's significance thresholds. Therefore, operational emissions would not result in an air quality standard being exceeded or make a cumulatively considerable contribution to an existing or projected air quality violation. Therefore, the potential contribution to air quality impacts associated with the Project would be less than cumulatively considerable.

5.4.3 Energy, Mineral, Forest and Agriculture Resources

Project implementation would not result in impacts to Mineral Resources, Forest or Agricultural Resources. Therefore, the Project would not have the potential to contribute to cumulative impacts for these issues. The following discussion analyze the cumulative impacts relative to the use of energy, oil, or natural gas.

Implementation of the projects identified in Table 5-1 would involve construction activities, and some projects (Victory Village Affordable Housing Project, 600 Red Hill Avenue and 754 Sir Francis Drake Boulevard) could be under construction during some portions of the construction period for the Project. Construction of all cumulative projects would require the use of fuel and energy, and the amount of fuel and energy consumed during construction would vary by project. As discussed under Impact 4.4-1, implementation of the Project would require the use of energy resources for construction of the Nursery Basin and elements that increase creek capacity in Downtown San Anselmo. Mitigation Measures 4.3-1a, (BAAQMD Basic Construction Measures) in Section 4.3, Air Quality and Greenhouse Gas Emissions, include measures that would reduce energy consumption and combustion of petroleum products by construction equipment, such as reducing vehicle and equipment engine idling times. Structure demolition would be subject to California Code of Regulations, Title 24, Part 11, 2016 California Green Building Code, which would also reduce Project energy use during construction.

The projects identified in Table 5-1 would be subject to the same regulatory framework as the Project for the use of fuel and energy during construction, which includes BAAQMD Basic Construction Measures and the California Green Building Code. Compliance with the measures identified would ensure compliance with regulatory policies to minimize the potential for air quality impacts from construction activities associated with the proposed Project. Therefore, the potential contribution to cumulative energy use impacts associated with the Project would be rendered less than cumulatively considerable through implementation of Mitigation Measure 4.3-1, as identified in Section 4.3, Air Quality.

Regarding operation-phase impacts related to energy use, most of the projects presented in Table 5-1 would involve energy or fuel use once they are operational. These projects include development that is similar to the current land uses or existing adjacent land uses (i.e., residential and commercial). As described under Impact 4.4-1, implementation of the Project would require the use of minimal energy resources, i.e., fuel for operation of equipment to maintain the proposed Nursery Basin. This use would be incremental. Therefore, the project would not make a cumulatively considerable contribution to a significant cumulative impact.

5.4.4 Biological Resources

As described in Section *4.5, Biological Resources*, the Project would have no impact related to conflicts with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other Adopted Local, Regional, or State Habitat Conservation Plan.

The geographic scope for the analysis of potential cumulative biology impacts includes the Ross Valley Watershed. Direct cumulative impacts could occur if any projects within the vicinity of the Nursery Basin site or the Downtown San Anselmo site would spatially overlap with these locations and occur at the same time. Of the projects presented in Table 5-1, the Victory Village Affordable Housing Project, 600 Red Hill Avenue, 754 Sir Francis Drake Boulevard, and one or more of the bridge removal projects, could be under construction during some portion of the construction period for the Project. However, none of them would spatially overlap with the locations for the Project.

Disturbance from the Project would occur in Fairfax Creek and San Anselmo Creek, which are tributaries to Corte Madera Creek. Other projects within the area would affect the same biological resources as the Project, primarily streams and riparian vegetation and wildlife that use these habitats, in the short term. The proposed Ross Valley Flood Protection and Watershed Program (Ross Valley Program) would implement region-wide flood risk reduction through bridge replacement, culvert enlargement, creek improvement and additional flood diversion and storage using FDS basins. Bridges at Azalea Avenue, Nokomis Avenue, Madrone Avenue, Center Boulevard, Bridge Boulevard and Winship Avenue would be removed and replaced with clear-span bridges that increase the conveyance of the creek at these locations. Downstream of the Ross Valley Program and proposed Project, the USACE's Corte Madera Creek Flood Risk Management Project would increase channel capacity and improve make improvements to aquatic habitat, including removal of the Denil fish ladder, which obstructs steelhead passage.

Impacts to biological resources associated with construction of the overlapping projects from Table 5-1, particularly those that would directly affect creek channels and their associated riparian corridors, such as activities under the Ross Valley Program, could include adverse effects to sensitive natural communities, special-status species habitat, and individuals of special-status species, both directly and indirectly. Construction activities have the potential to injure or kill individual fish by inadvertently bringing construction equipment into contact with them, by trapping or stranding them in a dewatering area, or otherwise directly physically damaging them. Adverse effects to special-status aquatic species and habitat in the Project area could arise during in-stream construction activities or other changes, including alteration of flow or water quality, that make habitat inhospitable for survival or reproduction. Impacts to special status species plants could occur, if present, by directly impacting them or indirectly changing habitat conditions. Project activities could affect existing wetlands and other (non-wetland) waters as a result of construction in the creek bed and along the lower banks of the creek channels. Construction activities could adversely affect special-status amphibians, such as California red-legged frog, western pond turtle, and other species with low potential to occur, such as foothill yellow-legged frog.

Implementation of projects identified in Table 5-1 could adversely affect sensitive natural communities such as riparian corridors and oak woodlands, and could include the removal of heritage trees or riparian trees. Activities including clearing, grubbing, excavation, and grading using heavy equipment could carry invasive non-native plants or plant pathogens from outside sources to the Project sites. Tree and shrub removal or pruning related to construction in or along creek channels would temporarily disturb cover for and impede use of the creek as a potential wildlife movement corridor. These activities could also directly or indirectly impact nesting birds by damaging or destroying nests, causing adults to abandon nests, or directly killing or injuring nesting birds. Additionally, construction and maintenance activities have the potential to cause elevated sound levels and vibrations from heavy construction equipment that could cause adult birds to abandon nests. Similarly, these activities could directly kill or injure roosting special-status bats, and elevated sound levels from construction and maintenance equipment could cause adult bats to abandon maternity roosts.

Implementation of these projects would also have the potential to result in long-term effects to biological resources. In many instances, in-channel improvements would enhance or improve upon existing conditions through restoration of a more natural creek channel; in other instances, compensatory mitigation associated with regulatory agency permits would bring about those enhancements. One of the goals of the Ross Valley Program is channel improvement that would “substantially restore natural hydrologic and ecological functions and processes.” While enhancement or restoration may not be feasible at every location within the channel system, opportunities are available and would be integrated into individual project designs. Where habitat conditions are substantially altered or lost, mitigation measures would be implemented within the watershed to provide compensatory mitigation. Implementation of individual projects would require project-specific environmental review, and regulatory permitting processes, including permit review and issuance by the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, California Department of Fish and Wildlife, and Regional Water Quality Control Board, all of which have permitting authority over projects that would impact resources under their jurisdiction. These regulatory programs require development and implementation of both project-specific and cumulative compensatory mitigation. The long-term cumulative effects of channel widening and flood risk reduction projects would include revegetation to more natural channels and removal of obstructions in the creeks. Widening channels will allow for more riparian vegetation growth, slower stream flow, and development of gravel bars, which would enhance habitat for listed species, including steelhead. Overall, over the long term, flood risk reduction would have a beneficial effect on biological resources.

As explained in Section 4.9, Biological Resources, Project implementation would result in biological resource impacts related to basin construction, in-channel work for the diversion structure, and removal of the San Anselmo structure. These impacts would be small both in terms of their size (estimated at 0.04 acres of wetlands or other waters, 0.59 acres of riparian corridor, and 0.43 acres of oak woodland) and the quality of the habitat for sensitive species presence and use. The Nursery site is adjacent to open space that provides valuable wildlife habitat, and approximately 0.21 acre of annual grassland upland habitat would be restored at the Nursery Basin Site, which would benefit terrestrial species. In the long term, Project activities at the Downtown San Anselmo Site would restore and enhance the riparian corridor and potentially enhance water flow and wildlife forage and shelter opportunities. The Project would avoid, minimize and mitigate for these impacts through implementation of Mitigation Measures 4.5-1 through 4.5-10 (identified in *Section 4.9, Biological Resources*). The Project's contribution to cumulative impacts would be less than cumulatively considerable due to the small size of the resources affected, their location within the watershed, and the presence of similar habitats within the watershed. Therefore, the Project's cumulative contribution to impacts to biological resources would be less than significant.

5.4.5 Cultural Resources

Impacts related to cultural resources are generally site-specific, and they depend on the specific localized resources affected and their potential to be found in the area. They are not typically additive or cumulative in nature. There are no known tribal cultural resources in the Project area. Therefore, there would be no impact to these resources associated with the Project. The following discussions analyze the potential for cumulative impacts to archaeological resources and human remains in the event of inadvertent discovery.

All identified current and reasonably foreseeable future projects in Table 5-1 that are within or in close proximity to the Project area that involve ground disturbance have the potential to combine with the impacts of the Project to result in cumulative impacts to unknown buried archaeological resources, human remains, or tribal cultural resources. As described in *Section 4.6, Cultural Resources*, desktop research and field exploration efforts were made to identify potential archaeological resources on the Project sites. None were found. Despite these efforts and results, the inadvertent discovery of unknown archaeological resources during construction from ground disturbing activities cannot be entirely discounted. However, the Marin County Development Code and other regulations (including the California Public Resources Code and the California Health and Safety Code; referenced in *Section 4.6, Cultural Resources*) list actions that must be taken upon encountering prehistoric or historic-era archaeological resources or other cultural resources. If such resources are encountered during construction and are determined to be significant, they would be avoided if feasible. If avoidance is not feasible, they would be appropriately treated in accordance with the requirements of those regulations. Similarly, if human remains are uncovered during construction, the County Coroner would be contacted and if the remains were found to be Native American the most likely descendent would be notified and the remains would be appropriately treated, as described in *Section 4.6, Cultural Resources*. Compliance with these requirements would reduce impacts associated with potential inadvertent discoveries during construction to a less-than-significant level. Because the Project would not impact cultural resources, and includes measures to minimize potential impact to previously undiscovered resources, its contribution to any cumulative impacts on cultural resources would not be significant.

5.4.6 Geology, Soils, Seismicity, and Paleontological Resources

The San Francisco Bay area is a seismically active region with a wide range of geologic and soil conditions that can vary greatly within a short distance. Accordingly, geologic, soils, and seismic impacts tend to be site-specific and depend on the local geology and soil conditions. For these reasons, the geographic scope for potential cumulative geologic and seismic impacts consists of the Project element locations and only the immediately adjacent areas. In general, to have a cumulative impact, two or more projects would have to spatially overlap and occur at the same time. Some of the projects shown in Table 5-1 would occur within the same timeframe as the Project; however, none of them would spatially overlap with the locations for the Project. Therefore, the Project would not contribute to impacts related to fault rupture, strong seismic shaking, ground failure or liquefaction, landslides, or unstable geologic units. Similarly, there are no paleontological resources in the Project area; therefore, the Project would not contribute to a cumulative impact.

Similar to the geographic limitations discussed above, it should be noted that geologic, seismic, and soils impacts are also generally time-specific, and could only be cumulative if two or more events occurred at the same time, as well as in the same location. The following discussions analyze the cumulative impacts related to erosion and loss of topsoil (the cumulative impacts related to erosion and scour in stream channels is addressed in *Section 5.4.8, Hydrology and Water Quality*, below).

If the projects included in Table 5-1 were constructed at the same time as the Project, the erosion effects could be cumulatively significant if appropriate measures were not taken. However, the state Construction General Permit, along with the County and City storm water management programs, would require each individual project with a construction footprint over 1 acre to prepare and implement a Stormwater Pollution Prevention Plan (SWPPP). The SWPPPs would describe best management practices (BMPs) to control runoff and prevent erosion. Through compliance with the Construction General Permit, the potential for erosion impacts would be reduced to less than significant levels. The state Construction General Permit (National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (Order 2009-0009-DWQ, NPDES No. CAS000002; as amended by Orders 2010-0014-DWQ and 2012-006-DWQ)) was developed to address cumulative conditions arising from construction throughout the state, and is intended to maintain cumulative effects of projects subject to this requirement below levels that would be considered significant. For example, two adjacent construction sites would each be required to implement BMPs to reduce and control the release of sediment and/or other pollutants in any runoff leaving their respective sites, including from erosion. The runoff water from both sites would be required to achieve the same action levels, measured as a maximum amount of sediment or pollutant allowed per unit volume of runoff water. Thus, even if the runoff waters were to combine after leaving the sites, the sediments and/or pollutants in the combined runoff would still be at concentrations below action levels and would not be cumulatively considerable (i.e., less than significant).

In regard to impacts related to causing substantial changes in topography, as described in Impact 4.7-5, the Project's largest topographic surface changes would be at the Nursery Basin, which would involve excavation to about 6 feet deep and construction of a 6- to 8-foot high levee on the southeast side. These changes would be limited to the basin site and designed to not adversely affect the surrounding area. At the Downtown San Anselmo site, there would be some regrading of the creek channel to make it more natural and to increase flow capacity, but the top of bank and bottom of the channel would not be substantially changed. These changes in topography would be localized and beneficial and would not contribute to adverse impacts on topography or drainage from other projects in the area. Therefore, combined cumulative effect of the Project's incremental effect and the effects of other projects is not significant.

As discussed in Impact 4.7-1, the Nursery Basin would be constructed in accordance with state and federal dam and levee design standards and the District is designing the Nursery Basin using US Army Corps of Engineers (USACE), Division of Safety of Dams (DSOD), Federal Emergency Management Agency (FEMA), and United States Society on Dams (USSD) guidance and design documents. Implementation of these standards consistent with state and federal dam and levee design guidance and existing regulatory requirements would ensure the impact related to seismic events would be less than significant. At the Downtown San Anselmo site, a building that straddles the creek would be removed, and improvements contributing to greater channel stability would be made within the creek channel. Therefore, the potential contribution to seismic hazard impacts associated with the Project would be less than cumulatively considerable.

As discussed in Impact 4.7-2, the bottom of the Nursery Basin would be vegetated, which would reduce erosion and the loss of topsoil. The improvements to flow within the channel would reduce the frequency of flooding the surrounding areas, which would reduce the loss of topsoil in adjacent areas caused by flooding. Therefore, the potential contribution to soil erosion associated with the Project would be less than cumulatively considerable.

5.4.7 Hazards and Hazardous Materials

The geographic area affected by the Project and its potential to contribute to cumulative impacts varies based on the environmental resource under consideration. The geographic scope of analysis for cumulative hazardous materials impacts encompasses and is limited to the Nursery Basin and Downtown San Anselmo sites and their immediate vicinity. Many impacts related to hazardous materials are largely site-specific and depend on the nature and extent of the hazardous materials release, and existing and future soil and groundwater conditions. For example, hazardous materials incidents tend to be limited to a smaller, more localized area surrounding the immediate location and extent of the release, and could only be cumulative if two or more hazardous materials releases overlap spatially. (An exception to this is a groundwater plume of contaminants released from an otherwise isolated source.) Consequently, the hazardous materials impacts related to routine use, accidental release, or being located on a listed hazardous materials site compiled pursuant to Government Code Section 65962.5 are site specific and are not cumulative in nature. In addition, impacts relative to hazardous materials are also time-specific.

As discussed in *Section 4.8, Hazards and Hazardous Materials*, the Project would have no impact with respect to being located within 0.25 mile of a school, two miles of an airport or airstrip, or within wildland fire hazards. The Project does not include the use or installation of septic tanks or alternative water disposal systems. Therefore, the Project could not contribute to cumulative impacts related to these topics and are not discussed further. The following discussions analyze the cumulative impacts related to other hazardous materials, the creation of hazards to the public or environment, and the potential to impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.

The projects identified in Table 5-1 would involve construction activities equipment that would use fuels, oil and lubricants, and cleaning solvents. In addition, alteration or demolition of existing structures may release hazardous building materials. Construction and demolition activities are required to comply with numerous hazardous materials and stormwater regulations designed to ensure that hazardous materials are transported, used, stored, and disposed of in a safe manner to protect worker safety, to reduce the potential for a release of construction-related fuels or other hazardous materials to affect stormwater and downstream receiving water bodies, and to respond to accidental spills, if any. Existing regulations require that demolition activities that may disturb or require the removal of materials that consist of, contain, or are coated with asbestos containing material (ACM), lead based paint (LBP), polychlorinated biphenyls (PCBs), mercury, and other hazardous materials must be inspected and/or tested for the presence of hazardous materials. If present, the hazardous materials shall be managed and disposed of in accordance with applicable laws and regulations.

The only hazardous materials cleanup site close to the Project would be the ongoing investigation of the former Chevron Station at 700/750 Sir Francis Drake Boulevard. However, the Downtown San Anselmo site is in the creek bed and does not have any known hazardous materials issues that could combine with any potential gasoline release from the former Chevron Station. Project construction would involve localized ground disturbance activities and these activities could result in encountering contaminated soil or groundwater. However, implementation of Mitigation Measures 4.8-2a (Check 700/750 Sir Francis Drake Boulevard Investigation Status), 4.8-2b (Health and Safety Plan), and 4.8-2c (Soil Management Plan) would reduce impacts associated with encountering potentially contaminated soil or groundwater to less than significant levels by controlling contact with and release of these materials into the environment. Therefore, there would be no significant cumulative impact to which the Project would contribute.

The Project would include use of construction equipment. However, the project sites identified in Table 5-1 are not located within proximity of the Project sites; therefore, Project construction activities would not make a cumulatively considerable contribution to hazardous materials use or exposure. With project implementation of mitigation measures identified in *Section 4.8, Hazards and Hazardous Materials*, and compliance with existing regulations, the construction-related impact relative to hazardous materials would be less than significant and its contribution would not be cumulatively considerable.

As discussed under Impact 4.8-3, the Nursery Basin would be accessed from Sir Francis Drake Boulevard, which is a designated emergency or evacuation route. Project traffic would not substantially disrupt traffic flow on these roadways. Access to the Downtown San Anselmo site would be by San Anselmo Boulevard and possibly Red Hill Avenue or Sir Francis Drake Boulevard. Red Hill Avenue is a designated emergency or evacuation route. Implementation of projects identified in Table 5-1, including construction activities for residential and commercial development would have the potential to affect designed emergency or evacuation routes. As discussed in *Section 4.15, Transportation and Circulation*, compliance with the requirements of the Country and other local jurisdictions would include preparation of a Traffic Management Plan, which would ensure that the effect of Project traffic is reduced to less than significant. Implementation of the Traffic Management Plan would provide adequate access such that Project construction, in combination with other construction projects, would not interfere with emergency response or evacuation activities. Therefore, the potential contribution to emergency evacuation routes associated with the Project would be less than cumulatively considerable.

The Nursery Basin would be operated as a temporary flood diversion and storage basin. Operation and maintenance activities would require occasional site visits using vehicles that would use fuel and oil. Contractors, the County, and the towns would be required to comply with numerous hazardous materials and stormwater regulations designed to ensure that hazardous materials are transported, used, stored, and disposed of in a safe manner to protect worker safety, to reduce the potential for a release of construction-related fuels or other hazardous materials, and to respond to accidental spills, if any. With compliance with existing regulations, the operation-related impact relative to hazardous materials would be less than significant and there would be no significant cumulative impact on these resources to which the Project would contribute.

5.4.8 Hydrology and Water Quality

The Project would have no impact related to creating or contributing to runoff water that would exceed the capacity of stormwater drainage systems, place housing within 100-year flood hazard areas, or place housing in an area with potential for inundation by seiche, tsunami or mudflow. Therefore, the Project would not have the potential to contribute to a significant cumulative impact of these kinds. The following discussions analyze the cumulative impacts relative to flooding, water quality, erosion and groundwater.

The geographic scope of cumulative impacts related to existing and future drainage and flooding includes projects in close proximity to the Project sites, as well as in the larger Ross Valley Watershed and the subwatersheds within it. The geographic scope of cumulative impacts on groundwater storage includes the unconfined groundwater of the Nursery Basin site.

Flooding within the Ross Valley and Cumulative Projects

As discussed in Chapter 3, *Project Description*, flooding regularly occurs both locally within the Towns of Fairfax and San Anselmo, as well as within the Ross Valley Watershed. The Flood Control District is implementing the Ross Valley Program, and is participating with the USACE in the implementation of the Corte Madera Creek Flood Risk Reduction Project, which would also address flooding within Ross Valley. A discussion focused on the implications of each of these projects relative to hydrology and water quality is provided below, followed by a discussion of other cumulative projects in the watershed.

Ross Valley Flood Protection and Watershed Program

The Ross Valley Flood Protection and Watershed Program (the Ross Valley Program) would implement a phased program over the next 30 years to achieve designated levels of flood protection: 10- to 25-year flood event protection (Phase 1) and 25- to 100-year flood event protection (Phase 2). As shown on Figure 3-3 in the Project Description (and Figure 5-1), the Ross Valley Program includes a combination of several flood control elements that, once collectively implemented, would provide flood risk reduction on a watershed-wide scale. The elements include flood diversion and storage (FDS) basins, located in the upper reaches of the watershed to detain peak flows into the creek network during flood events, bridge replacements in Fairfax, San Anselmo, and Ross to remove impediments to flows in the creek and reduce localized flooding, and creek improvements in the lower end of the watershed to increase capacity and stability in the lower reaches to handle flood flows as they move through the watershed. In addition to the FDS basins and elements that increase creek capacity, the Ross Valley Program includes additional flood risk reduction activities, including policies to encourage low impact development (LID), flood preparedness, and educational activities throughout the lifespan of the Ross Valley Program. These elements are proposed to reduce the frequency and severity of flooding in the Ross Valley.

These proposed elements have been included after technical analysis[3] determined that they were the most suitable actions that can be taken to reduce flooding risk in the Ross Valley Watershed, given the regional topography, the existing creek network, flow bottlenecks, and the constraints on available space to develop program elements. According to hydraulic model simulations, neither increasing creek capacity alone nor developing FDS basins alone would be sufficient to prevent flooding within the Ross Valley Watershed during a 100-year flood.[4] Notably, implementing all of the creek capacity elements alone will not provide the desired level of flood risk reduction. To achieve 100-year flood protection, some volume of flood flows will need to be captured in FDS basins. There is some flexibility in the sizing, locations, and operation of the FDS basins throughout the watershed; however, they must be located strategically to assist in meeting the flow rate targets in each subwatershed. By installing both FDS basins and elements that increase creek capacity, a 100-year flood event similar to the December 2005 flood, could be contained within the banks of the stream network, thereby reducing flood risk throughout Ross Valley. Therefore, implementation of the Ross Valley Program would have a beneficial effect on cumulative flooding and flood risk within the Ross Valley Watershed.

In order to meet the Ross Valley Program’s primary objective, which is to substantially reduce the frequency and severity of flooding within Ross Valley, a hydraulic analysis of the Ross Valley was undertaken to identify where flooding is occurring during various storm event scenarios.[5] Through this analysis a combination of critical reaches and flow targets was identified to support the design of the Ross Valley Program, as described below.

Critical Reaches

Based on the analysis, there are four “critical reaches” in Ross Valley where, during large floods, floodwaters overflow and escape from the creeks, and flow for extended distances on the

[3] This analysis included the *Capital Improvement Plan Study for Flood Damage Reduction and Creek Management for Flood Zone 9/Ross Valley* (CIP) (Stetson, 2011), the *Ross Valley Flow Reduction Study Report* (CH2M, 2015), and hydraulic modeling.

[4] The 100-year flood is the flood event that has a 1% chance of occurring or being exceeded in any year based on historical records and model projections.

[5] This analysis included the Capital Improvement Plan Study for Flood Damage Reduction and Creek Management for Flood Zone 9/Ross Valley (CIP) (Stetson, 2011) and hydraulic modeling.

historical floodplain as separate side-streams apart from the main channel. During very large floods, these floodwaters damage structures in the floodplain and threaten public safety. Owing to their limited conveyance capacity, these four critical reaches represent the weakest links in the creek system. Accordingly, they are the focus of the Ross Valley Program elements aimed at increasing creek capacity. The four critical reaches are:

1. Fairfax Creek critical reach, located within the Fairfax Subwatershed;
2. Sleepy Hollow Creek critical reach, located within the San Anselmo Subwatershed;
3. San Anselmo Creek critical reach, including downtown San Anselmo, located within the San Anselmo Subwatershed; and,
4. Corte Madera Creek and Ross Creek critical reach, located within the Ross Subwatershed.

Flow Targets

Increasing creek capacity in the critical reaches, while important, is not sufficient in all locations by itself to reduce flooding to protect life and property in the area. Rather, the Ross Valley Program must also reduce flows upstream of the critical reaches, an outcome that can be achieved by building FDS basins. Three locations in the watershed (one in each of the Fairfax, San Anselmo and Ross subwatersheds) have been assigned flow targets – meaning locations where flows should be reduced to specified levels in order to reduce flooding downstream in the critical reaches.

The three key flow targets are shown on Figure 5-1 and are as follows:

1. Fairfax Subwatershed: Target 100-year flow of 1,100 cubic feet per second (cfs) at the Fairfax Town Hall.
2. San Anselmo Subwatershed: Target 100-year flow of 4,540 cfs at Sycamore Bridge in San Anselmo.
3. Ross Subwatershed: Target 100-year flow of 5,540 cfs at the USGS Streamflow Gage at Ross.[6]

These targets were developed through hydraulic modeling to reflect the maximum flow rate that could be allowed at each location and still achieve containment of the anticipated flow from a 100-year flood event in the identified critical reaches, assuming all elements identified in the Ross Valley Program to increase the creek capacity are implemented.

U.S. Army Corps of Engineers Corte Madera Creek Flood Risk Reduction Project

The goal of the USACE Corte Madera Creek Flood Risk Reduction Project (also and formerly known as the Corte Madera Creek Flood control Project (Units 2, 3, and 4) is to enhance and improve Corte Madera Creek to reduce the risk of flooding in the communities of Ross and Kentfield. That project would include removal of a wooden fish ladder and increasing channel capacity in Lower Corte Madera Creek. Project benefits include flood reduction during large

[6] The flow target of 5,540 cfs at the USGS Streamflow Gage at Ross is intentionally in alignment with the proposed design flow rate for the USACE Project.

storms and ecosystem restoration. The Flood Control District is coordinating modeling of the Ross Valley Watershed with the USACE to ensure that implementation of the Ross Valley Program is integrated into the design of the project.

Development Projects

Implementation of the other projects in Table 5-1 may increase impervious surface areas associated with development. The largest of these projects is the 20-acre Victory Village Senior Housing project. Each of these development projects would be required to comply with federal, State, and local requirements regarding stormwater management, including Provision E.12 of the State Water Resources Control Board (State Water Board) under the Phase II NPDES Municipal Regional Permit. Provision E.12 of the 2013 MS4 permit includes post construction stormwater management requirements that permittees (such as Marin County) must incorporate into their land use approvals. Site design measures (such as stream setbacks and buffers, rooftop and impervious area disconnection, and vegetated swales) must be implemented for projects approved by the County that create or replace between 2,500 and 5,000 square feet of impervious surface. Projects that create and/or replace 5,000 square feet or more of impervious surface must implement measures for site design, source control, runoff reduction, storm water treatment and baseline hydromodification management as defined in the 2013 MS4 permit. These requirements have been adopted by Marin County, and are codified in Section 24.04.627 (Permanent Stormwater Controls for New and Redevelopment) of the Marin County Municipal Code. Compliance with local ordinances, design review, and Provision E.12 would reduce the contribution of these projects to flood conditions within the Ross Valley.

Cumulative Effects

Flooding

As explained in Chapter 3, *Project Description*, some projects identified as part of the Ross Valley Program are undergoing additional project-level review under CEQA because they have separate funding sources, timelines, or implementing agencies. The San Anselmo Flood Risk Reduction Project is one of these projects and has independent utility because it substantially reduces the existing levels of flood risk in the affected communities. As identified in *Section 4.9, Hydrology and Water Quality*, the Project, even with localized changes in water surface elevations, would make a meaningful contribution to the watershed-wide reduction in frequency and severity of flooding.[7]

Hydraulic modeling was conducted for the proposed Project along with the bridge replacement projects (at Winship Avenue, Azalea Avenue, Nokomis Avenue, Madrone Avenue, and Center

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7 Due to the size of the Nursery Basin, the Project's greatest reduction in flooding would occur during more frequent storms (the 10-year event), when approximately 300 fewer parcels in Fairfax, San Anselmo, and Ross would experience flooding. In addition, inundation depth would be decreased on 230 parcels. The depth of inundation associated with a 25-year event would also be reduced by the Project, although not by as much (reducing flooding depth on approximately 615 parcels; 20 parcels would be removed from the floodplain). The Project's reduction of flooding from a 100-year storm event is also limited because the basin's capacity is able to hold only a relatively small portion of that total runoff volume. With Project implementation, the depth of inundation would be reduced on approximately 470 parcels that currently experience flooding during the 100-year event, and 10 parcels would be removed from the inundated area.

Blvd-Sycamore Avenue), which are included in the near-term expected future conditions due to their funding status and construction schedule (construction planned to occur between 2019 and 2022). The model results are presented in several series of map figures and tables in reports provided in **Appendix D**. These results indicate that in the near-term expected future cumulative scenario, the floodplain extent and inundation depths would generally be reduced compared to existing conditions. In the 10-year event, the cumulative scenario would reduce the floodplain area, mostly containing the flood within the channel with the exception of a few locations in San Anselmo north of Center Boulevard. In the 25-year event, inundation depths would be reduced compared to existing conditions, and a greater area would be removed from the floodplain in upper San Anselmo. In lower San Anselmo, no new inundation in currently unaffected areas would occur, and additional areas would be removed from the floodplain. Areas where inundation depths would increase would be very limited. In the 100-year event, greater reductions in inundation depth compared to existing conditions would occur throughout San Anselmo, and increases in inundation depth would be limited (Stetson Engineers, 2017).

With Project implementation, the increased flooding in a limited area around the Winship Bridge (i.e., between Barber Avenue and the Sir Francis Drake Bridge) in the 25- and 100-year events would be avoided by placing flood barriers along the creek channel on affected properties. This would cause those flows to stay in the creek channel, increasing the volume of in-channel flow reaching the Sir Francis Drake Bridge. Downstream of the Sir Francis Drake Bridge, the creek channel has the extra capacity to contain the increased peak discharge of about 146 cfs; therefore, in the near-term cumulative scenario, implementation of the Project (along with flood barriers proposed as mitigation) would not increase flood risk in areas downstream (Stetson Engineers, 2018a and 2018b).

Implementation of the proposed Project and other elements of the Ross Valley Program would both individually and cumulatively reduce frequency and severity of flooding within the Ross Valley Watershed. Implementation of both the Ross Valley Program and the proposed Project would contribute to the reduction of peak flows to meet the 100-year flow target at the Ross Subwatershed of 5,540 cfs at the USGS Streamflow Gage at Ross.[8] The cumulative effect of the Project along with the Ross Valley Program, the U.S Army Corps Unit 4 and Unit 3 project, the bridge replacement projects, and other development projects in the watershed would be to reduce the frequency and severity of flooding in the watershed, a beneficial impact.

Levee Failure

Implementation of the Ross Valley Program would include four to six FDS basins to provide flood detention storage within the watershed. When considered cumulatively, additional detention storage of approximately 550 acre-feet would be provided within the Ross Valley. This Project includes one of the FDS basins contemplated under the Ross Valley Program. As discussed in Impact 4.9-6, the FDS basin levees, overflow weir, and the diversion structures would be designed to control and detain flood flows as their primary purpose. Modern flood control facilities are designed and constructed under conservative guidelines and criteria designed to

8 The flow target of 5,540 cfs at the USGS Streamflow Gage at Ross is intentionally in alignment with the proposed design flow rate for the USACE Project.

prevent failure. Levee failure can occur when the difference between the hydrostatic pressure on the water side and dry side of the levee leads to seepage of water beneath the levee (also called underseepage). As discussed in Section 4.7, *Geology, Seismicity, Soils, and Paleontological Resources*, the basin and its levee would also be designed and constructed in accordance with federal and state standards and regulations, which include specifications for fill composition, compaction, procedures, and slope limitations that would reduce the risk of damage or failure during or after an earthquake. Compliance with these regulations would reduce the Project's potential to contribute to the direct or indirect exposure of people or structures to a significant risk of loss, injury or death involving flooding and other water-related hazards, including flooding as a result of the failure of a levee or dam, or from increased debris deposition, to levels that would not be cumulatively considerable, and therefore would be less than significant.

Water Quality and Groundwater

Projects identified in Table 5-1 would have the potential to degrade water quality due to construction activities, including discharge of sediment and potential release of fuel and other chemicals during construction. Grading and earthmoving could alter local drainage patterns and redirect or concentrate stormflows, which could increase the risk of on-site and/or off-site erosion, sedimentation, or flooding. Additionally, under certain conditions, in-stream sediment management may be required when flows are present in Fairfax Creek. The Project's sediment removal activities would have the potential to contribute sediment to downstream areas. Project construction of the creek capacity improvements in downtown San Anselmo, the Nursery Basin, and the diversion and overflow structure in Fairfax Creek could degrade water quality as a result of construction-related soil disturbance and discharge of construction stormwater, or if fuels and other chemicals used during construction are spilled and entrained into stormwater runoff or dewatering discharges. Under the Construction General Permit issued by the RWQCB, the Project would be required to prepare and implement a SWPPP that would contain BMPs to control stormwater runoff and sediment during construction. Projects in Table 5-1 within the vicinity of Project sites that are over 1 acre in size also would be required to prepare and implement a SWPPP. The Construction General Permit has been developed to address cumulative conditions arising from construction throughout the state, and is intended to maintain the cumulative effects of projects subject to this requirement below levels that would be considered significant. BMPs from all projects' SWPPPs that slow and control runoff to reduce erosion would be effective in reducing effects on erosion, sedimentation, and flooding caused by construction activities. Implementation of Measure 4.9-1 (Implement Dewatering BMPs for In-Water Work) would reduce potential impacts related to in-stream sediment management activities. Therefore, the potential contribution to water quality impacts associated with the proposed Project would be less than cumulatively considerable due to implementation of mitigation measures as identified in *Section 4.9, Hydrology and Water Quality*.

Construction may require groundwater pumping to manage unconfined localized groundwater levels. No other projects are located in the project vicinity that would contribute to lowering of unconfined groundwater levels. Therefore, there would be no cumulative impact on groundwater to which the Project would contribute.

Erosion and Sedimentation

Construction of the Ross Valley Program could alter sediment and erosional processes within the watershed by changing flow volumes and velocities during storm events. Installation of structures in the creek channel would alter sediment transport, resulting in new patterns of sediment deposition and erosion. The Project would cause increased sediment deposition upstream of the diversion structure. Any or all of the FDS basins upstream of the Nursery Basin proposed as part of the Ross Valley Program could also locally affect sedimentation and erosion in Fairfax Creek if they include any structures in the creek channel (such as the diversion structure). This would be a potentially significant cumulative impact. As discussed in Impact 4.9-3, the Project would include annual sediment removal in compliance with the Flood Control District's existing Stream Maintenance Program as well as additional, occasional sediment removal during very wet years. Mitigation Measure 4.9-3a (Prioritize Nursery Basin Reach for Stream Maintenance) would reduce the Project's contribution to cumulative changes in sedimentation and erosion in Fairfax Creek to less than cumulatively considerable.

Like the proposed Project, implementation of elements of the Ross Valley Program, including bridge replacements, could change flow velocities in Fairfax and San Anselmo Creeks. In combination with other projects that alter structures in the San Anselmo Creek channel, in particular the bridge replacement projects, Project implementation could alter erosion and sediment deposition processes. To evaluate this potential impact, channel bed and bank materials were inventoried in the bridge project locations and compared with modelled stream flow velocities in these areas (CH2M, 2018). The modeling included replacement of the Azalea, Madrone, Nokomis, Center, Bridge Avenue, and Winship Bridges along with the proposed Project and removal of the fish ladder structure as part of the USACE Corte Madera Creek Flood Risk Reduction Project. The near-term cumulative projects would remove existing constrictions to channel flow in locations both upstream and downstream of 634-636 San Anselmo Avenue. The model results combined with the bed and bank material information indicate that changes in mobility of channel bed materials is minor compared to existing conditions (CH2M, 2018). Therefore, implementation of the Project along with the other near-term bridge replacement projects would not make a considerable contribution to a cumulative impact and would not be significant.

5.4.9 Land Use and Planning

A cumulative land use impact would occur if the Project, in combination with the cumulative projects in Table 5-1, were to result in the physical division of an established community or conflict with applicable land use plans, policies, or regulations adopted for the purpose of avoiding or mitigating an environmental effect. Implementation of the Project in conjunction with the related projects listed in Table 5-1 would result in the continued development (or redevelopment) of various land uses in the Project area. The Project would have no impact related to physically dividing an established community. Therefore, there would be no significant cumulative impact on these resources to which the Project would contribute. The following discussions analyze the cumulative impacts relative to conflicting with local land use plans and altering the character or functioning of a community, or present or planned use of an area.

The Project would be consistent with the General Plan policies of both the County of Marin and the Town of San Anselmo. Proposed improvements would not conflict with the land use plans for the area. The construction of the Nursery Basin would be a change in land use, but one that would not alter the existing character or function of the community. The removal of a single building in downtown San Anselmo and the resultant changes in the community's function and character would not be substantial. The Project and the past, present and probable or expected future projects identified as cumulative projects in Table 5-1 would be required to comply with applicable regulations and would not substantially change the mix of land uses in the vicinity of the two Project elements, or in the Ross Valley Watershed. Several of the other projects identified in Table 5-1, including the Ross Valley Program, may require discretionary actions such as permits and approvals by local jurisdictions. Each of these other projects would be required to demonstrate consistency with the goals, policies, and objectives of the land use plans in effect for that area, applicable regional plans, and compatibility with surrounding land uses. Due to the dispersed nature of the other planned and proposed projects, implementation of the other projects would not cumulatively interact with the proposed Project from a land use planning standpoint. Therefore, the Project's contribution to cumulative land use impacts would not be cumulatively considerable, and would therefore be less than significant.

5.4.10 Noise

The geographic context for changes in the noise and vibration environment in the vicinity of the Nursery Basin and Downtown San Anselmo sites is mainly suburban areas within the Ross Valley Watershed. To contribute to a cumulative noise impact, another project in close proximity would have to be constructed at the same time as Project construction activities. There are numerous projects in several locations in the Project areas, currently in the planning stages, that could be constructed in the foreseeable future and include similar construction activities. Cumulative projects that could occur at the same time as the Project include one or more of the bridge removal projects, the Victory Village Affordable Housing Project (2626 Sir Francis Drake Boulevard) near the Nursery Basin site and projects at 600 Red Hill Avenue and 754 Sir Francis Drake Boulevard near the Downtown San Anselmo site.

Pursuant to CEQA Guidelines Section 15130(a)(1), an EIR should not discuss impacts that do not result in part from the Project evaluated in the EIR. As described under Section 4.11. Noise, the Project would have no impact related to the following criteria:

1. Exposure of people to excess noise due to proximity to an airport or private airstrip.

Because the project sites would not involve locating people near or increasing use of an airport or private airstrip, there would be no significant cumulative noise impacts to which the Project would contribute. The following discussions analyze the cumulative impacts relative to an increase in noise and groundborne vibration.

Construction activities at the Nursery Basin site would result in noise levels that would be less than significant with mitigation. The only known cumulative projects that are likely to be constructed at the same time as the Project is the Victory Village Affordable Housing Project (2626 Sir Francis Drake Boulevard) near the Nursery Basin site, projects at 600 Red Hill Avenue and 754 Sir Francis Drake Boulevard near the Downtown San Anselmo site. and elements of the Ross Valley Program, including bridge removals. Although considerable uncertainty exists regarding the construction schedules for the cumulative projects, construction noise associated with nearby cumulative projects in combination with the Project would be a temporary significant cumulative impact. The use of equipment during Project construction and maintenance activities combined with other projects in the Program area could generate noise that would affect existing ambient noise conditions and could affect the same sensitive receptors. The Project's contribution to cumulative construction and maintenance noise would be a nuisance, but would be short in duration. Implementation of the construction noise reduction plan developed pursuant to the Countywide Plan would include measures to reduce constriction noise and would reduce impacts during construction to a less-than-significant level. Therefore, the project's contribution to potential cumulative noise impacts would be less than cumulatively considerable.

Construction activities would only occur within the construction hours established by their respective jurisdictions, making them exempt from local noise standards. Therefore, residences near Project construction areas would be exposed to noise levels that would not result in violation of either the Marin County code or Town of San Anselmo municipal code. Therefore, there would be no significant cumulative impact related to exceedance of noise standards to which the Project would contribute.

As discussed in *Section 4.11, Noise and Vibration*, there are no sensitive land uses or buildings close enough to the Project construction sites to be affected by vibration from construction activities. Thus, sensitive receptors or buildings in the vicinity would not be exposed to vibration levels that would result in either building damage or human annoyance. However, if Project-related construction activities were to coincide with another development in close physical proximity, the combined effect could result in the exposure of sensitive receptors or buildings to higher vibration levels than what was projected for the Project. Because the nearest cumulative project is 300 feet from where on-site Project-related construction activities would occur, the combined vibrations generated during the construction of the Project and nearby cumulative project would not expose existing sensitive land uses or buildings to vibration levels higher than what is estimated for the Project alone. The construction vibration associated with cumulative projects in combination with the Project would result in a less-than-significant cumulative impact, and the Project's contribution would not be cumulatively considerable.

The operation and maintenance activities associated with the Project elements would be similar to those already performed on the stream channels and banks, buildings, bridges, culverts, and other activities taken by the Flood Control District, Marin County Department of Public Works, and the Town of San Anselmo. These activities may include the use of off-road equipment such as lawn mowers, backhoes, and loaders. Sensitive receptors near the Nursery Basin and Downtown San Anselmo sites would not be exposed to noise levels that would exceed the applied FTA adverse community reaction threshold of 90 dBA Leq, and there would be no significant cumulative impact on these resources to which the Project would contribute.

5.4.11 Population and Housing

The analysis is based on projects identified in Table 5-1. As discussed in Section 3.5 of the Chapter 3, *Project Description*, construction is expected to generate a maximum construction crew size of 20-30 daily during the construction period for each of the Project elements (Downtown San Anselmo, 4-6 months and Nursery Basin, 7-8 months). Project construction could occur concurrent with other construction activity within San Anselmo. The Town of San Anselmo's Current Planning Application Report for the period between January 2015 and February 2018 indicates that 21 developments have been filed with the Town and are under review. Some of these projects would be under construction at the same time as the Project, including the projects shown in Table 5-1. The size of the regional construction work force and the surrounding region is expected to accommodate the demand for construction labor. Therefore, the cumulative growth-inducing impact of Project construction in combination with other concurrent construction projects within the City would be less than significant.

As described in Impact 4.12-1 and 4.12-3, operation of the Project would have no impact associated with direct inducement of population growth because the Project would not create housing, and thus would not affect population projections and policies in the Countywide Plan. Moreover, the Project would not indirectly contribute to population growth through the extension of roads or other infrastructure into areas lacking such services. As described in Impact 4.12-2, operation of the Project would not displace any housing or necessitate construction of replacement housing. Further, this Project would reduce flood risk in existing developed areas and in areas where growth is already anticipated in the Countywide Plan or in the Town of San Anselmo's General Plan. The Project would not allow additional growth beyond that, nor would it change the locations where this growth is planned to occur. Consequently, Project implementation would not affect current or projected population growth patterns within Marin County. Therefore, operation of the Project would not contribute to a direct cumulative growth inducement impact. The cumulative growth-inducing impact of Project operation in combination with other cumulative projects would be considered less than significant.

5.4.12 Public Services and Utilities

As described in *Section 4.13. Public Services and Utilities*, the Project would have no impact related to the provision of wastewater services or water supply. The Project would have a less than significant impact on storm drain facilities because some storm drain outfalls into San Anselmo Creek may need to be modified in downtown San Anselmo. Therefore, there would be no significant cumulative impact on these resources to which the Project would contribute. The following discussions analyze the cumulative impacts relative to the new or physically altered governmental facilities or increase the demand for new or increased staff, exceeding the permitted capacity of a suitable landfill, and compliance with federal, state, and local statutes and regulations related to solid waste.

Pubic Services

Some of these projects identified in Table 5-1 would be under construction at the same time as the Project (Victory Village Affordable Housing Project, 600 Red Hill Avenue, 754 Sir Francis

Drake Boulevard, and one or more of the bridge replacement projects). Incidents could occur during construction requiring law enforcement, fire protection, or emergency medical services. However, the Ross Valley Fire Department includes four stations to serve the area, and the Central Marin Police Authority had 56 full-time staff. As described in Impact 4.13-1, any incremental increase in demand for these services during construction would be temporary and could be accommodated by existing services. The increased need for law enforcement or fire protection services resulting from the Project and reasonably foreseeable projects is not expected to exceed levels anticipated by the Ross Valley Fire Department or the Central Marin Police Authority, or require the construction of new or physically altered governmental facilities that are not already planned. Therefore, the Project in combination with other projects in the cumulative scenario would have less than significant cumulative impacts related to public services.

Pursuant to CEQA Guidelines Section 15130(a)(1), an EIR should not discuss impacts that do not result in part from the Project evaluated in the EIR. As described in Impact 4.13-1, operation of the Project would not cause or contribute to a potential significant cumulative impact on public services. Therefore, there would be no significant cumulative impact on these resources to which the Project would contribute.

Utilities

As discussed in Impact 4.13-3, Marin County Ordinance 3389 requires all construction and demolition projects to reuse or recycle at least 50 percent of materials generated, and Zero Waste Marin ensures Marin County's compliance with state recycling mandates and provides residents and businesses with information on household hazardous waste collection, recycling, composting, and waste disposal. All Marin County projects would be required to implement these or similar regulatory requirements, and there is sufficient landfill capacity as discussed in Impact 4.13-2. Recycling construction and demolition debris helps local jurisdictions meet state and local waste diversion goals. As discussed in Impact 4.13-4, implementation of the Project would require the use of energy resources for construction of the Nursery Basin element and the Downtown San Anselmo element. This energy use would primarily be in the form of petroleum products and electricity, as well as indirect energy use related to the extraction, production, and transportation of goods and materials needed for construction. Although the Project would result in increased energy use during construction, local utilities and providers of fuel or power for construction equipment would have adequate energy supplies to serve the Project and no new utility infrastructure would need to be constructed. Therefore, cumulative impacts related to exceeding landfill capacity, compliance with federal, state, or local statutes and regulations related to solid waste, and requiring or resulting in the construction of new utility infrastructure would be less than cumulatively considerable.

During operation, as discussed in Impact 4.13-3, solid waste in the form of deposited sediment removed from creek channels would be generated by operation of the Project. The volumes would be above the amounts that are currently removed from creek channels as part of routine maintenance, but the volume removed would be limited by the Marin County Stream Maintenance Program, which would ensure that removed sediment would not exceed landfill capacity. Removed sediment would either be beneficially reused in appropriate restoration projects or disposed of at a permitted landfill. Other trash and debris removed during routine channel maintenance would be sent to permitted landfills for disposal and this disposal would not result in an inconsistency or violation of permit conditions at these facilities because the facilities are permitted and have adequate capacity to accept these non-hazardous wastes. Therefore, the project's contribution to cumulative impacts related to exceeding landfill capacity and compliance with federal, state, or local statutes and regulations related to solid waste would be less than cumulatively considerable. Similarly, the operation and maintenance of the Project would not increase the demand for water supply or water treatment systems and would thus not necessitate any new utility infrastructure for these systems. Therefore, the Project's would not contribute to cumulative impacts to these resources.

5.4.13 Parks and Recreation

Construction and operation of the Project would not require the designation of additional parkland to remain in conformance with locally acceptable or adopted park standards. Therefore, there would be no significant cumulative impact on these resources to which the Project would contribute. The following discussions analyze the cumulative impacts regarding whether construction and operation of the Project could increase the use of existing neighborhood and regional parks or other recreational facilities, and if construction and operation of Project would include recreational facilities and require the construction or expansion of recreational facilities.

Some of the projects identified in Table 5-1 would be under construction at the same time as the Project (Victory Village Affordable Housing Project, 600 Red Hill Avenue, 754 Sir Francis Drake Boulevard, and some of the bridge removal projects), and could result in short-term disruption of recreational facilities. The Project would include temporary impacts to the adjacent Creek Park during construction (approximately 4-6 months), because most of the park would be used for construction access or staging, and would temporarily decrease the amount of park area available to the public. It is therefore possible that some of the use that would have occurred at Creek Park during the construction period would be shifted to other recreational facilities within the Town of San Anselmo or in neighboring jurisdictions. Construction of Project facilities would occur during the same time frame and in the same vicinity as some other planned and proposed projects, which could also cause temporary park closures and shift public access and recreational use to other park facilities. This increased use of those facilities could cause congestion or other adverse effects. However, given the brief construction period of the Downtown San Anselmo element, there is a low probability of other projects listed in Table 5-1 that may include park closures occurring simultaneously with this Project. Therefore, the simultaneous construction of these projects would not substantially increase the use of existing neighborhood and regional parks or other recreational facilities, and substantial physical deterioration of those facilities would not occur and cumulative impacts would be less than significant.

As described in Impacts 4.14-1 and 4.14-2, operation of the Project would not cause or contribute to a potentially significant impact on parks or other recreational facilities. Therefore, there would be no significant cumulative impact on these resources to which the Project would contribute.

5.4.14 Transportation and Circulation

The Project would have no impact related to congestion management programs or Level of Service standards, changes in air traffic patterns, increased hazards due to design features, or conflict with adopted policies supporting alternative transportation. Therefore, there would be no significant cumulative impact on these resources to which the Project would contribute. The following discussions analyze the potential for cumulative impacts with regard to whether the Project would cause temporary increases in traffic volumes during construction, in relation to the existing traffic load and capacity of the road system; could conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system; could impede access to local streets or adjacent uses, including access for emergency vehicles; or could have an adverse effect on pedestrian and bicycle accessibility and safety.

Existing and probable future projects listed in Table 5-1 could contribute to cumulative impacts related to transportation and circulation. Project construction is expected to take place in a single season, probably during 2020, and construction of the Project facilities would occur in the same time frame and vicinity as other planned and proposed projects that would use the same roadways for access to the work sites during the construction period.

Of the projects included in Table 5-1, the Victory Village Affordable Housing Project, 600 Red Hill Avenue and 754 Sir Francis Drake Boulevard projects would overlap with construction activities of the Project. Additionally, several bridge replacement projects on San Anselmo Creek are proposed as part of the Ross Valley Program, and their planned implementation is roughly contemporaneous with the Project (ranging from 2019 through 2022).

Project construction-related truck traffic occurring on roadways in the peak direction on weekdays, during the hours of 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m., would coincide with peak-period traffic on access roadways and therefore would have the greatest potential to impede traffic flow, and overlap with a number of other cumulative projects. Project construction activities could impede access to local streets or adjacent uses, including access for emergency vehicles, could have an adverse effect on pedestrian and bicycle accessibility and safety, and could temporarily increase traffic safety hazards due to incompatible uses. The Project would implement a Traffic Management Plan (TMP), which would ensure that the effect of Project traffic is minimized, and would include measures that would provide for continuity of vehicular, pedestrian, and bicyclist traffic; reduce the potential for traffic accidents; and ensure worker safety in construction zones. Therefore, the Project’s contribution to traffic-related impacts would not be cumulatively considerable, and would therefore be less than significant.

The Project would have no impact related to any alterations of existing roadway features that would create a permanent change to access for emergency vehicles, or bicyclists and pedestrians. Therefore, there would be no significant cumulative impact on these resources to which the Project would contribute.

5.5 References

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CHAPTER 6
Alternatives

6.1 Introduction

This chapter presents the California Environmental Quality Act (CEQA) alternatives analysis for the San Anselmo Flood Risk Reduction Project (Project). The State CEQA *Guidelines*, Section 15126.6(a), state that an environmental impact report (EIR) must describe and evaluate a reasonable range of alternatives to the proposed Project that would feasibly attain most of the Project's basic objectives but would avoid or substantially lessen any identified significant adverse environmental effects of the proposed Project. Specifically, the State CEQA *Guidelines* (Section 15126.6) set forth the following criteria for selecting and evaluating alternatives:

1. ***Identifying Alternatives*****.** The selection of alternatives is focused on identifying those that would avoid or substantially lessen any of the significant effects of the project, are feasible, and would attain most of the basic objectives of the project. Factors that may be considered when addressing the feasibility of an alternative include site suitability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries, economic viability, and whether the proponent can reasonably acquire, control, or otherwise have access to an alternative site. An EIR need not consider an alternative whose impact cannot be reasonably ascertained and whose implementation is remote and speculative. The specific alternative of "no project" must also be evaluated. The "No Project" analysis shall discuss existing conditions at the time the environmental analysis is commenced, as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved (State CEQA *Guidelines*, Section 15126.6(e)).

2. ***Range of Alternatives.*** An EIR need not consider every conceivable alternative, but must consider and discuss a reasonable range of feasible alternatives in a manner that will foster informed decision-making and public participation. The "rule of reason" governs the selection and consideration of EIR alternatives, requiring that an EIR set forth only those alternatives necessary to permit a reasoned choice. The lead agency (the Marin County Flood Control and Water Conservation District; "Flood Control District") is responsible for selecting a range of project alternatives to be examined and for disclosing its reasons for the selection of the alternatives.

3. ***Evaluation of Alternatives.*** EIRs are required to include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with a proposed project. Matrices may be used to display the major characteristics and the environmental effects of each alternative. If an alternative would cause one or more significant effects that would not result from the project as proposed, the significant effects of the alternative must be discussed, but in less detail than the significant effects of the project.

6.2 Approach to Alternatives Selection

6.2.1 Overview

Consistent with CEQA,[1] the Flood Control District incorporated consideration of environmental impacts as well as environmental benefits into conceptualization, planning and design for the Project. The screening process for alternatives to be evaluated in the EIR included reviewing the potentially significant impacts attributable to Project implementation; reviewing scoping comments received during circulation of the Notice of Preparation; evaluating the feasibility of potential alternatives; and considering the ability of potential alternatives to meet most of the basic Project objectives. The Project objectives (presented in Chapter 3, *Project Description*) are reprinted in **Table 6-1** below for ease of reference. The range of alternatives was selected to foster informed decision-making and public participation in the CEQA process.

TABLE 6-1
SAN ANSELMO FLOOD RISK REDUCTION PROJECT OBJECTIVES

1. Reduce the risks related to both frequency and severity of flooding. 2. Provide multiple public benefits including environmental enhancements and recreational enhancements. 3. Provide a flood risk reduction project in balance with available and reasonably foreseeable funding.	4. Maintain the quality of adjoining neighborhoods. 5. Ensure basin design meets community needs. 6. Comply with local, state, and federal environmental laws and regulations. 7. Protect the public's health and safety.

Section 6.3 describes the selected alternatives and the environmental impacts of each compared to the impacts of the proposed Project. Section 6.4 describes the relative ability of each to meet the Project objectives and identifies the environmentally superior alternative. Section 6.5 describes the alternatives that were considered but rejected.

6.2.2 Alternatives Considered During Project Planning

As described in Chapter 1, *Introduction* and Chapter 3, *Project Description*, the Flood Control District has been engaged in addressing flooding in the Ross Valley since the large floods in 2005 and the subsequent passage of an annual Storm Drainage Fee in 2007. That fee provides funding to meet the following goals (Flood Control District, 2007):

1. Reduce damage due to flooding
2. Offer solutions for homes and businesses
3. Aid homeowners in repairing stream banks
4. Remove bottlenecks that impede water flow
5. Maintain natural creek functions
6. Reduce pollutants entering the San Francisco Bay
7. Incorporate habitat enhancements
8. Improve fish passage

[1] Public Resources Code Section 15004(b)(1).

In addition to the Storm Drainage Fee Fund, the San Anselmo Flood Risk Reduction Project has funding from a California Department of Water Resources (DWR) grant. The funds from that grant were first awarded in 2013 to the Town of San Anselmo based on an application submitted for the Memorial Park Detention Basin Project. In response to community concerns related to that project concept, the Town of San Anselmo coordinated with the Flood Control District to reallocate the DWR grant funds to a new project as long as a number of DWR conditions could be met. These requirements included being able to achieve a comparable level of overall flood risk reductions in a publicly acceptable project while enhancing environmental conditions and recreational opportunities. The proposed replacement project must also have a similar level of feasibility, which involves availability of rights of way, regulatory permissibility, and ability to fund it as the previously proposed project had.

Numerous alternatives were considered during development of both the San Anselmo Flood Risk Reduction Project and the Ross Valley Flood Protection and Watershed Program. As described on the Program's website (http://www.marinwatersheds.org/creeks-watersheds/ross-valley-flood-protection-watershed-program), The Program identifies several types of elements to reduce flood risk:

1. Creek Capacity Elements (including creek channel improvements and bridge replacement/improvement)[2]
2. Flood Diversion and Storage (FDS) Basins
3. Low Impact Development (LID) Policies
4. Flood Preparedness and Education
5. Creek Maintenance

The Ross Valley Flood Protection and Watershed Program also includes several different FDS basin sites, including the one at the former Sunnyside Nursery site analyzed in this EIR, and over 150 different creek channel improvements and bridge replacements, including improvements in downtown San Anselmo also analyzed in this EIR.

As described in Chapter 3, *Project Description*, the San Anselmo Flood Risk Reduction Project includes two project elements: (1) an FDS basin, referred to as "the Nursery Basin" Element because of its location at the former Sunnyside Nursery site, in the upstream portion of the Fairfax subwatershed, and (2) creek channel improvements/bridge building removal in downtown San Anselmo along San Anselmo Creek, referred to as the Downtown San Anselmo Element. Through its planning efforts, the Flood Control District considered numerous alternatives before ultimately determining that the San Anselmo Flood Risk Reduction Project would meet the District's project goals for reducing flood risk and severity, satisfy the State's grant criteria, and help achieve the long-term objectives and flow-improvement targets in the Ross Valley Flood Protection and Watershed Program. Other alternatives identified during project development are listed below. As indicated, some of these were found to meet CEQA criteria for alternatives

[2] The phrase "creek capacity elements" is used in this chapter to refer to the creek capacity improvements that are part of the alternatives to the Project. This phrase is intended to differentiate them from the "creek capacity improvements" that are part of the Downtown San Anselmo Element of the proposed Project.

(ability to reduce environmental impacts, ability to meet most of the Project's basic objectives, feasibility) and were retained for evaluation in this EIR, while others were eliminated from further consideration.

1. Alternatives featuring FDS basins with different design volumes (both increased- and reduced-capacity versions) and different drainage methods (passive using gravity only and active using a pump). Two such alternatives were included for analysis in the EIR and are described and evaluated in Section 6.3.
2. The Morningside Neighborhood Alternative involved removal and/or replacement of two flow-constraining bridges over, and channel improvements to Sleepy Hollow Creek, as well as a reduced-capacity FDS basin at the former Sunnyside Nursery site. This alternative was analyzed in the EIR and is described and evaluated in Section 6.3.
3. A Raised Building Alternative involving raising the bridge building in San Anselmo and removing its foundations from the creek channel (instead of removing it entirely). This alternative was included for analysis in the EIR and is described and evaluated in Section 6.3.
4. A No-Basin Alternative involved creek improvements in both San Anselmo Creek and Sleepy Hollow Creek (removing bridge buildings and/or replacing or removing bridges, adding flood walls, and making other improvements to creek channels). This alternative was eliminated from further consideration in the EIR (refer to Section 6.5 for more information).
5. A Sleepy Hollow Creek Watershed Alternative combined a different FDS basin site (at Brookside Elementary School) with improvements to Sleepy Hollow Creek, as well as removal or replacement of one or two flow-constraining bridges in the Morningside neighborhood of San Anselmo. This alternative was eliminated from further consideration in the EIR (refer to Section 6.5 for more information).
6. A Lefty Gomez Basin Alternative combined an FDS basin at the Lefty Gomez Field park with the above-described channel improvements in Sleepy Hollow Creek. This alternative was eliminated from further consideration in the EIR (refer to Section 6.5 for more information).
7. A Fairfax Creek Alternative combined a very large FDS basin (65 acre-feet capacity) at the former Sunnyside Nursery site with the removal of multiple bridge buildings in downtown San Anselmo and multiple creek improvements in San Anselmo Creek. This alternative was eliminated from further consideration in the EIR (refer to Section 6.5 for more information).
8. A Green Infrastructure and Flood-proofing Actions Alternative would have incorporated low-impact development policies, stormwater infiltration, rain barrels, and green infrastructure implemented at many distributed locations in the Ross Valley watershed. This alternative was eliminated from further consideration (refer to Section 6.5 for more information).
9. An Accelerated Implementation of Winship Bridge Replacement Project Alternative would accelerate the Winship Bridge replacement to ensure that the bridge replacement is complete prior to or concurrent with Project completion. This alternative was eliminated from further consideration in the EIR (refer to Section 6.5 for more information).
10. A Phased Implementation/Temporary Flow-Constraining Alternative would use temporary a flow-constraining system following the removal of the building at 634-636 San Anselmo Avenue to phase full implementation of the proposed Project until the Winship Bridge could be removed. This alternative was eliminated from further consideration in the EIR (refer to Section 6.5 for more information).

In addition, the original project concept was for a large FDS basin at Memorial Park along with various other flow capacity improvements. This FDS basin site was unacceptable to local residents and voters, and that alternative was eliminated from further consideration. As explained above, the DWR grant funding for a substitute project requires a comparable level of protection to the previously proposed project, which made some of the smaller FDS basins ineligible for State funding.

6.2.3 Selecting Alternatives for Analysis in the EIR

The selection of alternatives for the EIR focused on identifying alternatives capable of avoiding or reducing significant environmental impacts that would otherwise be attributable to the Project (described in Chapter 4, *Environmental Setting, Impacts, and Mitigation Measures* and Chapter 5, *Growth-Inducing and Cumulative Impacts* of this Draft EIR). Some project elements were also developed to address topics of interest to decision makers and the public, as expressed in the scoping process. The scope of alternatives reviewed also factored into consideration the fundamental purpose of the Flood Control District (to reduce the risk of flooding for the protection of life and property while utilizing sustainable practices), the goal of the Project (achieving specific targets for flood risk reduction), and its contributions to the Ross Valley Flood Protection and Watershed Program. Other factors considered included balancing impacts from construction activities against longer-term changes in flood risk.

6.3 Alternatives Selected for Analysis in the EIR

The alternatives selected for analysis in this EIR are:

1. Alternative 1: No Project Alternative
2. Alternative 2: Morningside Neighborhood/Passive Basin Alternative
3. Alternative 3: Raised Building Alternative
4. Alternative 4: Increased Capacity Basin Alternative

Table 6-2 summarizes the key similarities among and differences between the proposed Project and the “action” alternatives (i.e., excluding Alternative 1, No Project). The information contained in this EIR will be reviewed and considered by the Flood Control District Board of Directors prior to the making a decision to approve, disapprove, or modify the proposed Project. As part of its deliberations, the Board of Supervisors will decide whether to approve all or part of the proposed Project. The Board could adopt one of the alternatives, or parts of the alternatives, described in Section 6.3 in lieu of the Project as proposed.

6.3.1 Alternative 1: No Project

The State CEQA *Guidelines* require an EIR to include an evaluation of the No Project Alternative to provide decision-makers the information necessary to compare the relative impacts of approving the project and not approving the project. The No Project Alternative is defined as a continuation of existing conditions, as well as conditions that are reasonably expected to occur in the event that the proposed project is not implemented. The discussion below describes this alternative.

TABLE 6-2
SUMMARY OF ACTION ALTERNATIVES

Element	Proposed Project	Alternatives		
		2. Morningside/Passive Basin Alternative	**3. Raised Building Alternative**	**4. Increased Basin Capacity Alternative**
FDS Basin	31.6 acre-feet capacity at former Sunnyside Nursery Site	20 acre-feet capacity at former Sunnyside Nursery Site; no diversion structure	Same as Project	41 acre-feet capacity at former Sunnyside Nursery Site; pumped drainage
Creek Capacity Elements	*Downtown San Anselmo*: Remove bridge building at 634-636 San Anselmo Drive	*Downtown San Anselmo*: Retain bridge building at 634-636 San Anselmo Drive *Sleepy Hollow Creek*: Remove Morningside Bridge; remove and replace Mountain View Bridge	*Downtown San Anselmo*: Retain and raise 634-636 San Anselmo Drive, rebuilding foundation outside of creek channel	Same as Project
	San Anselmo Creek: Channel improvements in downtown San Anselmo	*Sleepy Hollow Creek*: Add limited flood barriers at bridge locations	*San Anselmo Creek*: Same channel capacity improvements as Proposed Project; reduced creek habitat improvements	

6.3.1.1 Description

Under the No Project Alternative, there would be no construction actions taken or changes to the existing flood risk management system or its current operations, maintenance, or management practices. There would be no FDS basin at the former Sunnyside Nursery site to temporarily detain peak stormwater runoff. The building at 634-636 San Anselmo Avenue would remain. The Flood Control District and the Town of San Anselmo’s Public Works Department would continue to maintain creek channels, bridges, culverts, and other parts of the existing system as they do now. Many of those activities are governed by permits issued for the Flood Control District’s Stream Maintenance Program.

As described in Chapter 3, *Project Description*, the San Anselmo Flood Risk Reduction Project, is consistent with the Flood Control District’s objectives to reduce flood risk within the Town of San Anselmo and within the San Anselmo Creek subwatershed without also increasing downstream flood risk in the Ross Valley/Corte Madera Creek watershed. The Flood Control District continues to work on evaluating larger, basin-wide goals of the Ross Valley Flood Protection and Watershed Program, which aims to eventually provide protection against the 100-year flood event. Consequently, if the proposed Project is not approved it is reasonable to expect that the Flood Control District eventually would pursue another project to meet the Project’s objectives, such as one of the alternatives characterized in Sections 6.3.2, 6.3.3, or 6.3.4 below.

6.3.1.2 Ability to Meet Project Objectives

Under the No Project Alternative, the Flood Control District’s objectives for flood risk reduction in the Towns of San Anselmo and Fairfax would not be met. The grant funding that was obtained for the original flood risk reduction project at Memorial Park would be lost because there would not be sufficient time to conceive, design, and obtain environmental clearance and permitting for a new project before the funds expire. The proposed Project's potential contribution to the overall level of flood risk reduction targets in the Corte Madera Creek watershed in the Ross Valley Flood Protection and Watershed Program would not be realized, meaning that the larger program goals would need to be met in some other way.

6.3.1.3 Environmental Impacts

Under the No Project Alternative, none of the impacts (discussed in Chapter 4, *Environmental Setting, Impacts, and Mitigation Measures*) attributable to the construction and operation of the Nursery Basin or of the building removal and creek channel improvements in downtown San Anselmo would occur.

Because none of the flood risk hazard reduction benefits of the proposed Project would occur under the No Project Alternative, existing flood risk in San Anselmo would persist. As described in Section 3.2 of this EIR, under current conditions, current creek capacity is at an approximately six-year level of flood protection, and several times in recent history San Anselmo Creek has overtopped its banks causing property damage and economic hardship to residents, businesses, and local governments, as well as environmental damage to resources within and near the creek.

6.3.2 Alternative 2: Morningside/Passive Basin Alternative

6.3.2.1 Description

This alternative includes a smaller and simpler version of the Nursery Basin involving limited work within the creek channel as compared to the proposed Project, and removal or replacement of two bridges along the lower portion of Sleepy Hollow Creek in the Morningside neighborhood of San Anselmo. This alternative does not include removal of the Bridge Building in Downtown San Anselmo. This alternative is based on a study performed by the Flood Control District's hydraulic engineering consultant (Stetson Engineers, 2017). Sleepy Hollow Creek is a tributary to San Anselmo Creek just upstream (about one-half mile) of Downtown San Anselmo. This alternative was selected for analysis because it would reduce the magnitude and severity of multiple impacts associated with the FDS basin, as proposed, would reduce some of the impacts at the Downtown San Anselmo site.

Site Location

This alternative would be located at the Nursery Basin site and along Sleepy Hollow Creek in the Morningside residential neighborhood of San Anselmo at the Morningside Drive and Mountain View Avenue bridges. **Figures 6-1** and **6-2** depict this alternative.

Components

FDS Basin (Nursery Basin Site)

The FDS basin considered in the Morningside/Passive Basin Alternative is a smaller version of the proposed Project's basin. It would be excavated less deeply and would have lower levees on its east and west sides. Its capacity would be 20 acre-feet as compared to a total of 31.6 acre-feet of storage for the Project (Stetson Engineers, 2018). The other primary difference with the basin under this alternative is the absence of a diversion structure and related improvements to raise side levees. Because water would not be actively redirected into the basin by a diversion structure, this component is referred to as a “passive” basin. Like the proposed Project, the side-weir along the left bank of the creek would have a crest elevation of 228 feet. At the time of incipient flooding downstream, water would begin to enter the basin over the side-weir. In contrast, in the proposed Project, an opening or openings in the diversion structure would be closed, thereby immediately reducing flows downstream, ponding water in the Fairfax Creek channel, and filling the basin more quickly.

Table 6-3 presents a systematic comparison of design, operation and construction features of the basin at the Nursery Basin site under the proposed Project, the Morningside/Passive Basin Alternative, and the Increased Basin Alternative (Alternative 4, presented below in Section 6.3.4). As shown, the dimensions of the basin would differ from the proposed Project in that the eastern embankment of the basin would be 6 feet lower and no western embankment would be needed; consequently, the capacity would be less and the maximum water surface elevation would be lower than in the proposed Project. In addition, because there would be no diversion structure, the Fairfax Creek channel would not provide the 5.6 acre-feet of flood storage capacity it would provide in the proposed Project.[3] Less sediment deposition would be expected in Fairfax Creek with the smaller, passively operated basin. The existing bridge would be the only vehicle access point to the site. The basin floor elevation, southern weir, ~~riser~~ outlet pipe, new stormwater drains from Deer Creek Court, floodwall, perimeter road width, and perimeter fence would be the same as described for the proposed Project.

Creek Capacity Elements

The Morningside Drive and Mountain View Avenue bridges are less than 400 feet apart along Sleepy Hollow Creek. At both locations, the creek is deeply incised, and the bridge soffits, stream banks, and retaining walls form relatively small cross-sectional areas through which normal flows can pass but that constrain high flows and cause flooding. Under this alternative, the Mountain View Avenue Bridge would be removed and replaced with a bridge with a similar vehicular carrying capacity, and the Morningside Drive Bridge would be removed but not replaced (Stetson Engineers, May 2017). **Table 6-4** presents a comparison of design, operation and construction features of the creek capacity improvements associated with the proposed Project (on San Anselmo Creek at the Downtown San Anselmo site), the Morningside/Passive Basin Alternative (on Sleepy Hollow Creek), and Alternative 3 – Raised Building Alternative (on San Anselmo Creek at the Downtown San Anselmo site), presented below in Section 6.3.3).

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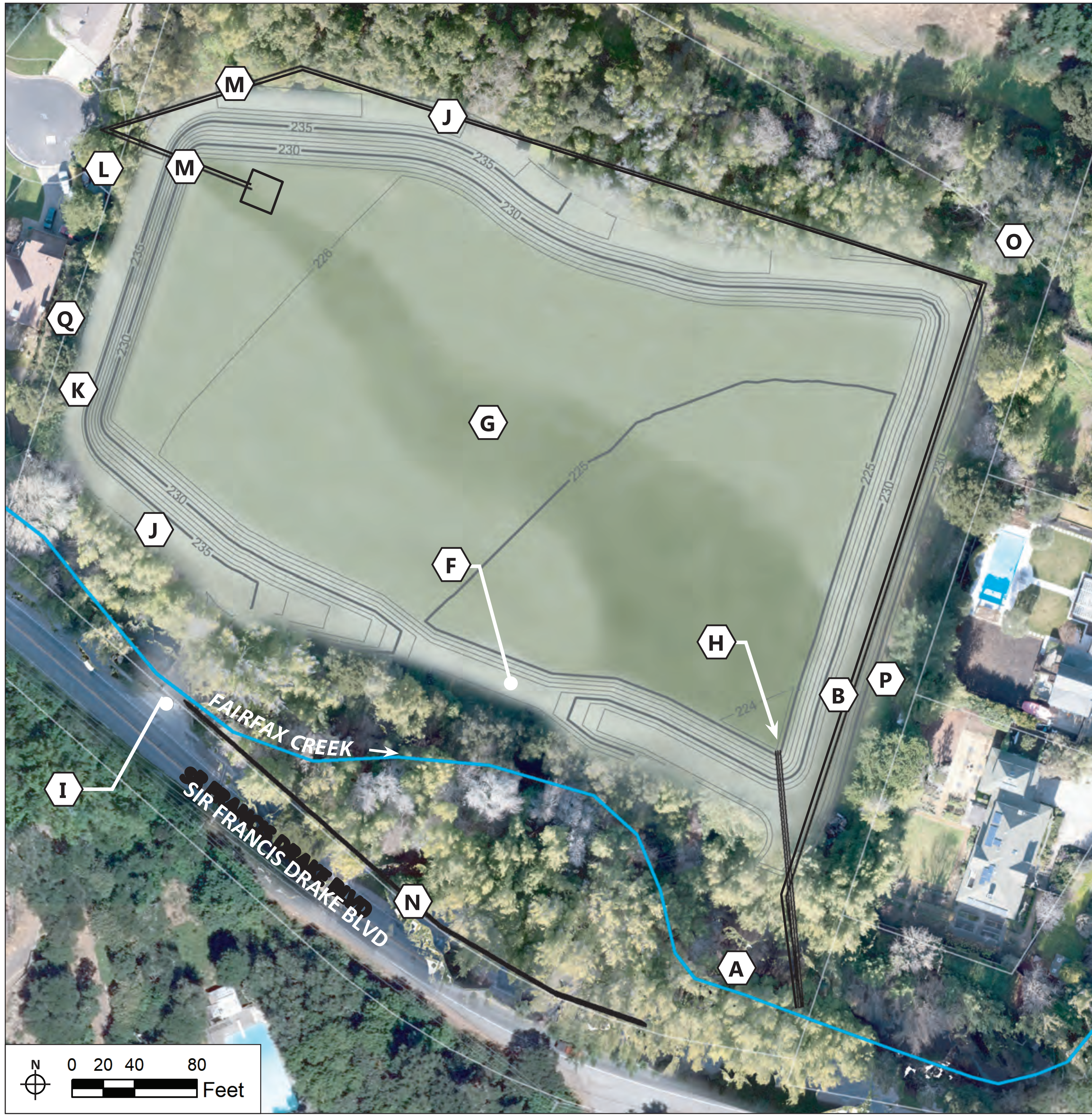
[3] As described in Chapter 3, *Project Description*, in the proposed Project, the total capacity of the Nursery Basin comes from storing 26.6 acre-feet in the basin itself and an additional 5 acre-feet in the channel of Fairfax Creek behind the diversion structure. In the Morningside/Passive basin Alternative, not only is the basin smaller, but no additional in-channel storage capacity would be created.



A.	**No Flood Diversion and Overflow Structure/Access Road.** *Primary difference between proposed Project and Alternative 2.*
B.	**East Levee**. *6 feet lower than proposed Project (232-foot elevation).*
F.	**Side-Weir.** *Same as proposed Project (228-foot elevation).*
G.	**Basin Floor.** *Same as proposed Project (226-223.8 foot elevation).*
H.	**Basin Drain.** *Same as proposed Project.*
I.	**Operations and Maintenance Vehicle Access.** *Only via existing or improved driveway bridge.*
J.	**Perimeter Road.** *Same width but lower elevation than proposed Project.*
K.	**West Levee.** *No berm needed on west side of basin.*
L.	**West Gate.** *Same as proposed Project.*
M.	**Deer Creek Court Stormwater Drains.** *Same as proposed Project.*
N.	**Floodwall/Road Barrier.** *Same as proposed Project.*
O.	**Perimeter Fence.** *Same as proposed Project.*
P.	**Setback – East.** *Same as proposed Project.*
Q.	**Setback – West.** *Same as proposed Project.*

SOURCE: Marin County Flood Control District, Geomorph Design, Walls Land+Water, and Stetson Engineers

San Anselmo Flood Risk Reduction Project . D211432.07

Figure 6-1
Morningside/Passive Basin Alternative:
Nursery Basin Site Plan

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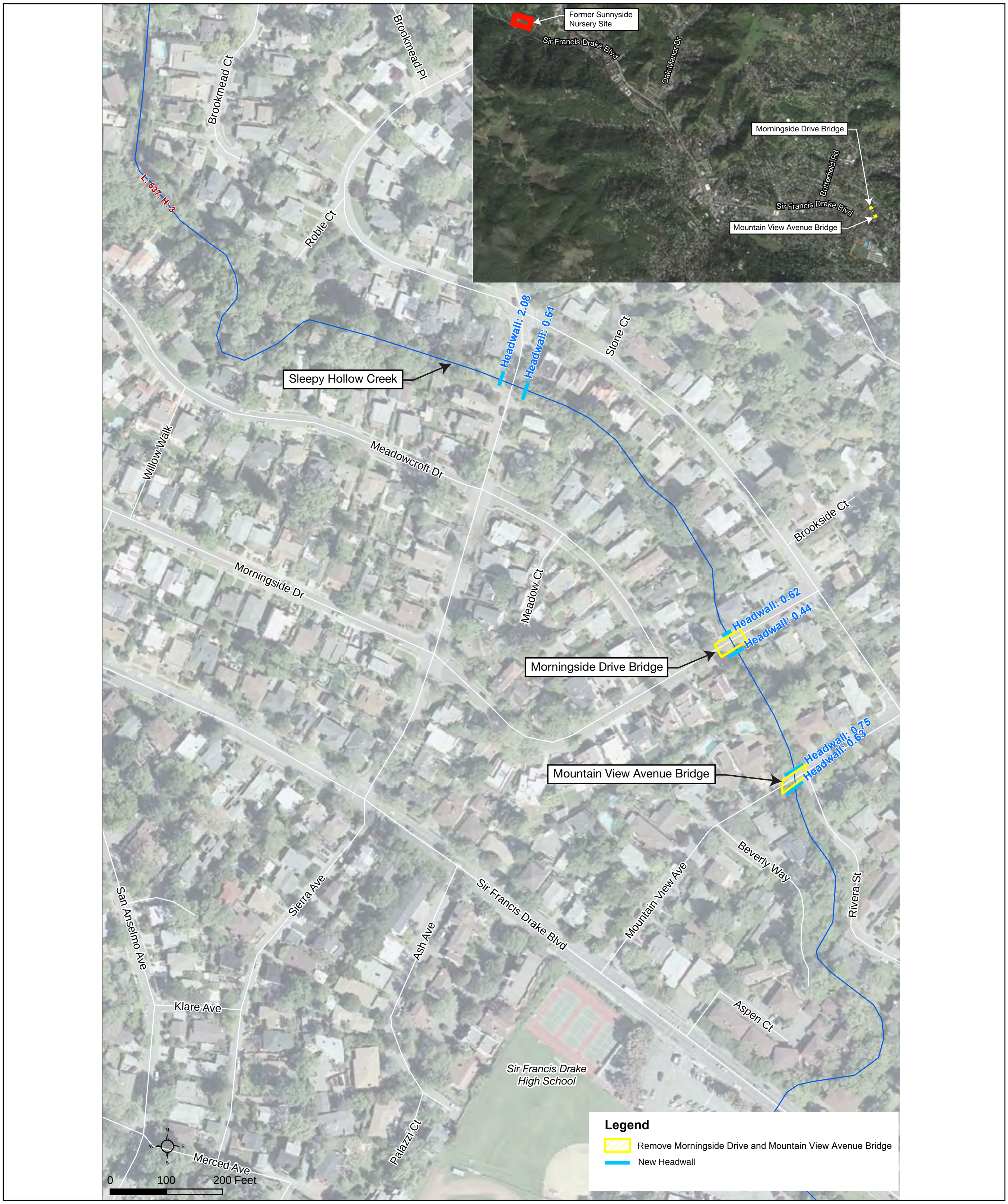


SOURCE: Stetson Engineers Inc., Morningside/Lower Sleepy Hollow Creek Study (Draft), May 2017

San Anselmo Flood Management Project . D211432.07

Figure 6-2
Morningside/Passive Basin Alternative
Creek Capacity Improvements

TABLE 6-3
COMPARISON OF FDS BASIN ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 4

Feature		Proposed Project (FDS Basin Element Only)	Alternatives (FDS Basin Element Only)	
			2: Morningside/Passive Basin	4: Increased Capacity Basin
Design and Operation				
Operational Capacity (acre feet)		31.6	20	41
Flow Diversion Structure		Structure would allow flows through one or more openings sized to allow passage of 400 cubic feet per second at all times: • ***Gated***: gate closed to reduce creek flows when overbank flooding is imminent downstream, allowing flows to pond and flow into basin via side weir. • ***Ungated***: always open for normal Fairfax Creek flows, sediment transport and wildlife movement Low point in diversion structure at 235 feet allows passage of flows from 1,000-year flood down creek.	No diversion structure. Existing creek channel passage persists. High creek flows enter basin via side-weir.	Same as proposed Project
Side-Weir		228-foot elevation segment of perimeter road. When WSE in creek exceeds 228 feet, flows enter basin.	Same as proposed Project	Same as proposed Project
Maximum Water Surface Elevation (Feet) within basin		235	230.5	Same as proposed Project
Basin Floor		226- to 223.8-feet elevation.	Same as proposed Project	Lower than proposed Project (~2.5 feet) to increase basin capacity: 223.6- to 221.3-feet elevation
Basin Drainage		Gravity via inlet in basin and pipeline draining to outlet in creek	Same as proposed Project	***Ponded water above 221.3 feet elevation***: gravity (same as proposed Project). ***Ponded water below 221.3 feet elevation***: pumped. Pumping would occur following cessation of gravity drainage operations and, absent creek overflow, following local rainfall events. Requires pump, pipe to discharge point into creek.
Levee Elevations	East	238 feet (1.5 feet above potential maximum WSE)	~6 feet lower than proposed Project: 232 foot elevation	Same as proposed Project
	West	238 feet (contains temporary peak volume storage under detention operations)	No levee needed	Same as proposed Project
Setbacks	East	50 feet between toe of levee and property line	25 feet	25 feet
	West	50 feet between top of basin cut slope and property line	25 feet	25 feet
O&M Vehicular Access		Two access roads: existing (potentially improved) access road plus access over diversion structure	Existing (potentially improved) access road only	Same as proposed Project

TABLE 6-3 (CONTINUED)
COMPARISON OF FDS BASIN ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 4

Feature	Proposed Project (FDS Basin Element Only)	Alternatives (FDS Basin Element Only)	
		2: Morningside/Passive Basin	4: Increased Capacity Basin
Design and Operation (cont.)			
Perimeter Road, Fencing	15-feet wide, 1.5 feet above maximum WSE; security fencing.	Similar to proposed Project but 4.5 feet lower	Same as proposed Project
Floodwall/Road Barrier	Floodwall adjacent to Sir Francis Drake Boulevard to prevent overflow onto roadway.	Same as proposed Project	Same as proposed Project
Bank Erosion Protection / Rock Protection	Vegetated rip-rap, other biotechnical bank erosion protection and stabilization on both banks of creek	Only at basin outfall discharge points	Same as proposed Project
Deer Creek Court Stormwater Drains and rip-rap energy dissipation structure	Ensure gravity drainage from Deer Creek Court cul-de-sac under potential maximum basin WSE.	Same as proposed Project	Same as proposed Project
Construction			
Project Disturbance Area	As shown on Figure 3-16 in Chapter 3 (approximately 5.4 acres)	Reduced area of disturbance in southeastern portion of site because no diversion structure/new access road would be constructed; otherwise similar to proposed Project	Same as proposed Project (deepening of basin to increase capacity would not increase areal extent of construction disturbance)
Staging Area and Construction Access	Within basin	Same as proposed Project	Same as proposed Project
Duration	8 months	2 months shorter than proposed Project	1-2 months longer than proposed Project
Construction Hours	8:00 a.m. to 5:00 p.m.	Same as proposed Project	Same as proposed Project
Estimated Maximum Construction Crew Size	20-30	Assumed to be incrementally less than proposed Project	Same
Temporary Road Closure	Temporary closure of westbound travel lane(s) of Sir Francis Drake Blvd. during floodwall construction	Same as proposed Project	Same as proposed Project
Construction Haul Routes	As described in Chapter 3	Same as proposed Project	Same as proposed Project
Demolition	Two onsite structures	Same as proposed Project	Same as proposed Project
Tree Removal	Removal of numerous trees as shown on Figure 3-16 in Chapter 3.	Fewer trees removed in the southeastern portion of the site compared to the proposed Project because there would be no diversion structure and less bank protection	Same as proposed Project
Construction Methods	As described in Table 3-4 in Chapter 3	Similar to activities, sequencing described in Table 3-4 but work in creek (stream diversion, clearing and grubbing, earthwork) substantially less (because no diversion structure/access road would be constructed)	Same as proposed Project plus installation of pump and pipeline to discharge point

NOTES: WSE = water surface elevation   FDS = flood diversion and storage

SOURCE: Stetson Engineers Inc., San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin, January 31, 2018.

TABLE 6-4
COMPARISON OF CREEK CAPACITY ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 3

Feature	Proposed Project (Creek Capacity Elements Only)	Alternatives (Creek Capacity Elements Only)	
		2: Morningside/Passive Basin	3: Raised Building Alternative
Site Characteristics			
Location	San Anselmo Creek in Downtown San Anselmo	Sleepy Hollow Creek at Mountain View Avenue and Morningside Drive	Same as proposed Project
Existing and neighboring Land Uses	Buildings house commercial uses above creek surrounded by commercial and recreational uses	Bridges are within low-density residential area	Same as proposed Project
Proximity to Sensitive Receptors	235 feet	Approximately 20 feet from Morningside Drive Bridge and 25 feet from Mountain View Avenue Bridge	Same as proposed Project
Design and Operation			
In-channel flood flow capacity	Removes flow-constricting bridge building and regrades removes structures from creek channel to increase flow capacity	Removes two flow-constricting bridges from the Sleepy Hollow Creek channel in Morningside Neighborhood	Same as proposed Project
Area benefiting from reduction in severity and magnitude of flooding	As shown in Figures 3-13a through 3-15c	Morningside neighborhood of San Anselmo	Same as proposed Project
Removal of existing structures restricting creek flow	Removal of 634-636 San Anselmo Avenue and building supports	Removal of Morningside Drive and Mountain View Avenue Bridges	Reinforced concrete abutment walls; 634-636 San Anselmo Avenue to be retained
Proposed design features	Improvements to channel (flood wall, bioengineered slope, etc.) as shown in Figure 3-11	Construct replacement bridge at Mountain View Drive; Morningside Bridge would not be replaced	Structural supports (new concrete wall, piers) for 634-636 San Anselmo Avenue building.
Floodwalls	Construct upper bank retaining wall as shown in Figure 3-11	In immediate vicinity of bridges only	Upper bank retaining wall similar to but at a reduced length relative to the proposed Project
Construction			
Project Disturbance Area	As shown on Figure 3-11 (approximately 0.3 acres)	Less than proposed Project (estimated at 0.1 acre for both bridges)	Less than Project (because floodwall and bioengineered slope construction would be less extensive)
Staging Area and Construction Access	As shown on Figure 3-11	Staging assumed to occur in a parking lot on Sir Francis Drake Boulevard; construction access via roadway.	Same as proposed Project
Duration	8 months	Assumed to be Same as Project. Bridge demolition/construction would occur in sequence (not concurrently)	13 months
Construction Hours	7:00 a.m. to 7:00 p.m.	Same as proposed Project	Same as proposed Project
Estimated Maximum Construction Crew Size (includes both management and contractor staff)	20-30	Less than proposed Project	Same as proposed Project

TABLE 6-4 (CONTINUED)
COMPARISON OF CREEK CAPACITY ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 3

Feature	Proposed Project (Creek Capacity Elements Only)	Alternatives (Creek Capacity Elements Only)	
		2: Morningside/Passive Basin	3: Raised Building Alternative
Construction (cont.)			
Temporary Road Closure	None	Morningside Drive and Mountain View Avenue closed during construction; projects would be construction in sequence. Morningside Drive permanently closed at Sleepy Hollow Creek.	Same as proposed Project
Construction Haul Routes	As described in Chapter 3	Routes to access Sir Francis Drake Boulevard: Broadmoor Avenue and Mountain View Avenue	Same as proposed Project
Demolition	Onsite structures as shown on Figure 3-11 including 634-636 San Anselmo Avenue	Existing bridge structures	Reinforced concrete abutment walls; excluding 634-636 San Anselmo Avenue (to be retained)
Tree Removal	8 trees to be removed (as shown on Figure 3-11)	Fewer than proposed Project (approximately 4 trees on Morningside Drive and 1 tree at Mountain View Avenue)	Fewer than proposed Project (because floodwall would not be extend as far)
Construction Methods	As described in Table 3-4 in Chapter 3	Similar to activities and sequencing described in Table 3-4 but work in creek (stream diversion, clearing and grubbing, earthwork) increased to two locations instead of one	Hydraulic jacks to raise building; construction of new concrete support piers outside of the channel and a new building-deck; and saws and other equipment to break up and remove old building foundation from creek channel

SOURCE: Geomorph Design, Memorandum from Matt Smeltzer to Flood Control District regarding Modifying Bridge-Building 2 – Summary Feasibility Evaluation, February 28, 2018; Stetson Engineers Inc., Morningside/Lower Sleepy Hollow Creek Study (Draft), May 2017; Stetson Engineers Inc., San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin, January 31, 2018.

Mountain View Avenue Bridge Removal and Replacement

The Mountain View Avenue Bridge is currently built on earthen fill that is placed over an inverted half-pipe culvert. The initial conceptual designs prepared as part of a Ross Valley-wide feasibility study of flood risk reduction options) for removing this bridge involve removing the road surface and decking and excavating the earthen fill and embankment out of the stream channel. The stream channel bottom would not be lowered from its current elevation, but it would be widened by several feet. Basic construction activities (mobilization, erosion control and stream diversion, demolition, clearing and grubbing as well as demobilization/clean-up) would be similar to that described for Downtown San Anselmo in Table 3-4 (in Chapter 3, *Project Description*). Concrete bridge footings would be placed on either side of Sleepy Hollow Creek, outside of the stream channel to allow for maximum flow capacity following construction. The span between the two bridge footings would be about 33 feet. To span that distance, a new roadway would be built atop the footings, and the new road decking and surface would be slightly higher than the existing road. The width of the bridge (approximately 30 feet, carrying two lanes of traffic, one in each direction) would be unchanged from the current condition, and there would be a 3-foot-wide sidewalk on the northern side of the bridge.

There is an existing sewer line under Rivera Street (east of Sleepy Hollow Creek) that crosses Sleepy Hollow Creek at a southeast-northwest angle to meet another existing sewer line on the northwest side of the existing bridge. That sewer line would be abandoned and replaced and new sewer manholes would also be installed along the new pipeline for maintenance.

Morningside Drive Bridge Removal

Under this alternative, the Morningside Drive Bridge would be removed to eliminate flow constrictions, but the bridge would not be replaced. Construction activities would consist of demolishing the road bed and underlying bridge structures, and installing permanent barriers on either side of Morningside Drive. Basic construction activities (mobilization, erosion control and stream diversion, demolition, clearing and grubbing as well as demobilization/clean-up) would be similar to that described for the Downtown San Anselmo Element in Table 3-4 (in Chapter 3, *Project Description*). The roadway and fill material would be excavated and transported offsite.

Other Creek Channel Improvements

Improvements to existing floodwalls and construction of new floodwalls would be limited to the immediate vicinity of the Mountain View Avenue and Morningside Drive bridges to help contain flows within the channel at these locations.

6.3.2.2 Ability to Meet Project Objectives

The Morningside/Passive Basin Alternative would meet some of the basic objectives of the project. Compared to the proposed Project, the lower-capacity basin would allow more of the peak flows in Fairfax Creek to remain in the channel and pass to the downstream communities of Fairfax, San Anselmo, and Ross. Like Downtown San Anselmo, the Morningside neighborhood (part of the Town of San Anselmo) has a recurring flood problem, so reductions in flood risk there would count toward the overall level of flood risk reduction intended for the Project. This alternative would result in substantial reductions in flood extent and in inundation depth to the Morningside neighborhood in the lower extent of Sleepy Hollow Creek, where reductions in inundation of up to 28, 24, and 7 inches would be realized in the 10-, 25-, and 100-year flood events, respectively (Stetson Engineers, 2018a).

On the whole, however, preliminary hydraulic modeling indicates that this alternative would provide less flood risk reduction benefit than the proposed Project. This alternative's FDS basin system is smaller and would not provide as much flood protection as the proposed Project. Further, as discussed in more detail in the Environmental Impacts section below, removing the flow-constraining bridge foundations on Sleepy Hollow Creek would pass those flows into San Anselmo Creek, where there is an existing flood risk that could be exacerbated, depending on the size of the flood event.

1. The Morningside neighborhood around the lower end of Sleepy Hollow Creek would receive substantial benefits from reduced flood extent and depth in the 10- and 25-year flood events; the benefits in the 100-year event would be lower. In all of these cases, there would be increases in flooding of varying sizes downstream in San Anselmo Creek, as discussed in the Environmental Impacts discussion below.
2. In downtown San Anselmo, there would be almost no reductions in flood extent or inundation in the 10-, 25-, or 100-year event.
3. The portions of Fairfax that would be subject to reduced flood inundation in the 10-year flood would benefit from this alternative, but the magnitude of those reductions would be less in both extent and depth. In the 25- and 100-year event, there would be little to no reductions in flood extent or depth of inundation in the Town of Fairfax.

The objective of providing multiple public benefits (environmental and recreational enhancements) would be reduced under this alternative because creek and riparian habitat enhancement would be less than the proposed Project, and the alternative would not add or enhance public access and recreational opportunities. The following objectives would be met: maintaining the quality of adjoining neighborhoods, complying with environmental laws and regulations, and protecting public health and safety. Because the roadway network has sufficient redundancy in the Morningside neighborhood to fully meet the existing demand with only one of them carrying motor vehicles, this alternative would maintain the quality of the nearby neighborhoods and continue to provide public safety. The local Public Works Department, Fire District and the neighbors are supportive of this alternative.

6.3.2.3 Environmental Impacts

Table 6-5 and **Table 6-6** present side by side comparisons of the impacts associated with the proposed Project and those associated with the Morningside/Passive Basin Alternative's Nursery Basin Element (Table 6-5) and its substitute for the creek capacity improvements in downtown San Anselmo (Table 6-6). A summary of the impacts associated with these two elements of this alternative is provided below, followed by a description of the effect of the alternative on the only significant and unavoidable adverse impact expected from the Project, which is the extent and depth of flooding (Impact 4.9-4).

Note that because the passive basin and one of the Morningside neighborhood bridge projects could be constructed at the same time, some of the construction-phase impacts described below would be additive to each other. Refer to Tables 6-5 and 6-6 for systematic consideration of individual environmental impacts.

Nursery Basin Element

As shown in Table 6-5, many of the impacts attributable to the Nursery Basin Element of the proposed Project would be the same or similar under this Morningside/Passive Basin Alternative. Overall, as indicated in Table 6-3, construction of the passive basin would involve less earthwork and other construction activities than the proposed Project. Notable exceptions are discussed below.

Air Quality/Greenhouse Gases (Impacts 4.3-1, 4.3-3, 4.3-4, 4.3-6). This alternative would have an increased average daily emissions because of its shorter schedule and greater volume of material for off-haul. There would also be a reduction in air quality emissions and greenhouse gas emissions associated with annual sediment removal operations anticipated for the proposed Project,

Biological Resources (Impacts 4.5-1 through 4.5-10). Because this alternative does not include building a diversion structure in Fairfax Creek, it would reduce the potential adverse effects on several biological resources in the construction and operation phase. There would be less tree removal. The lack of a diversion structure means that there would be less fill in waters and any wetlands that may be present, as well as in the riparian corridor. Together, these reductions reduce impacts on special-status species and habitats, including fish, amphibians, nesting birds, and others. The basin's operation would be passive, so the basin would fill on its own based on design elevations and not because water was actively directed into it through the use of a diversion structure. The lack of a diversion structure would result in a reduction in the expected volumes of sediment deposited and then needing to be removed from the Fairfax Creek channel, thus avoiding repeated disturbance or risk of direct effect from in-channel work.

Hydrology and Water Quality (Impacts 4.9-1, 4.9-2, 4.9-3). Because this alternative would not have a diversion structure, the passive basin would reduce hydrological and water quality-related impacts during the construction and operational phases, especially those associated with turbidity and in-water construction, and on hydrologic conditions such as sediment transport and deposition. By avoiding the need for repeated annual (or even more frequent) disturbances due to sediment removal, this alternative would reduce impacts on the aquatic resources and water quality conditions in the stream channel.

Transportation and Circulation (Impacts 4.3-1, 4.15-1, 4.15-2, 4.15-3, 4.15-4). Because this alternative would involve greater off-haul of excavated material, it could generate traffic congestion effects, impediments to local streets, pedestrian and bicycle accessibility, and traffic safety hazards that could be incrementally worse under this alternative.

TABLE 6-5
COMPARISON OF ENVIRONMENTAL IMPACTS OF FDS BASIN ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 4

Environmental Resource	Proposed Project	Alternative 2: Passive Basin Only	Alternative 4: Increased Capacity Basin
Aesthetics	**Impact 4.2-1:** The Project could have a substantial adverse effect on a publicly-accessible scenic vista. (Less than Significant)	**LTS=** Because the Nursery Basin site is barely visible from publicly accessible viewpoints, changes in the site's appearance (described under Impact 4.2-3, below) would not be noticeable in the context of broader scenic vistas. Like the proposed Project, this impact would be less than significant.	**LTS=** Because the Nursery Basin site is barely visible from publicly accessible viewpoints, changes in the site's appearance (described under Impact 4.2-3, below) would not be noticeable in the context of broader scenic vistas. Like the proposed Project, this impact would be less than significant.
	Impact 4.2-2: The Project could substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within view of a designated scenic public highway. (Less than Significant)	**LTS—** Because the proposed Project involves less tree removal and construction adjacent to Sir Francis Drake Boulevard, this alternative's effects on scenic resources would be incrementally less than with the proposed Project.	**LTS=** This alternative's effects on scenic resources would be the same as the proposed Project.
	Impact 4.2-3: The Project could substantially degrade the existing visual character or quality of the site and its surroundings, including alteration of the built environment or land use patterns. (Less than Significant)	**LTS—** Because the proposed Project involves less tree removal and would not open up views to the interior of the site adjacent to Sir Francis Drake Boulevard associated with the proposed discharge structure and new access road, this alternative's effects on the visual character of the site would be incrementally less than with the proposed Project.	**LTS=** This alternative's effects on the existing visual character of the site when viewed from off-site locations similar to the proposed Project's (the pump station and deepened basin are unlikely to be visible).
	Impact 4.2-4: The project could create a new source of substantial light, glare, or shadow which would adversely affect day or nighttime views in the area. (Less than Significant)	**LTS=** Like the proposed Project there would be no nighttime construction and no nighttime lighting (nor use of building materials associated with glare) during operations.	**LTS=** Like the proposed Project there would be no nighttime construction and no nighttime lighting (nor use of building materials associated with glare) during operations.
Air Quality (a)	**Impact 4.3-1:** Construction of the Project would generate criteria pollutant emissions that could exceed air quality standards or contribute substantially to an existing or projected air quality violation. (Less than Significant with Mitigation)	**LSM+** Alternative 2 has 20% less off-road equipment hours and 14% more heavy-duty truck trips, but construction work would occur over fewer workdays (23% fewer than proposed Project); consequently, there would be 38-55% higher daily criteria pollutant emissions. Like the proposed Project, implementation of Mitigation Measures 4.3-1 and 4.3-4 would reduce this impact to a less-than-significant level.	**LSM—** Alternative 4 has 12% more off-road equipment hours and 29% more heavy-duty truck trips, but the total number of workdays is 12% greater, resulting in 2-5% lower average daily criteria pollutant emissions. Like the proposed Project, implementation of Mitigation Measures 4.3-1 and 4.3-4 would reduce this impact to a less-than-significant level.
	Impact 4.3-2: Construction of the Project elements would result in emissions that could conflict with the 2017 Clean Air Plan. (Less than Significant with Mitigation)	**LSM=** Emissions are less than BAAQMD significance thresholds after implementation of Mitigation, so this alternative would not conflict with the 2017 Clean Air Plan.	**LSM=** Emissions are less than BAAQMD significance thresholds after implementation of Mitigation, so this alternative would not conflict with the 2017 Clean Air Plan.
	Impact 4.3-3: Operational activities proposed under the Project would generate criteria pollutant emissions that could exceed air quality standards and conflict with the 2017 Clean Air Plan. (Less than Significant)	**LTS—** This alternative has the same operational activities as the proposed Project but with slightly reduced frequency and extent, resulting in the somewhat reduced average daily and annual average criteria pollutant emissions.	**LTS+** This alternative has the same operational activities as the proposed Project but with slightly increased frequency and extent, resulting in incrementally increased average daily and annual average criteria pollutant emissions.
	Impact 4.3-4: Construction of the Project could expose sensitive receptors to toxic air contaminants, including diesel particulate matter emissions. (Less than Significant with Mitigation)	**LSM—** This alternative has 20% less off-road equipment hours and 14% more heavy-duty truck trips, resulting in 4% lower total DPM emissions, 36% lower cancer risk, 7% lower chronic hazard risk, and 2% lower maximum annual average PM2.5 concentrations. Like the proposed Project, implementation of Mitigation Measures 4.3- and 4.3-4 could reduce this impact to a less-than-significant level.[a]	**LSM+** Alternative 4 has 12% more off-road equipment hours and 29% more heavy-duty truck trips, resulting in 13% greater total DPM emissions, 21% greater cancer risk, 33% greater chronic hazard risk, and 3% greater maximum annual average PM2.5 concentrations. Like the proposed Project, implementation of Mitigation Measures 4.3-1 and 4.3-4 could reduce this impact to a less-than-significant level.
	Impact 4.3-5: Construction of the Project could result in objectionable odors. (Less than Significant)	**LTS=** This alternative has the same odor-generating activities as the proposed Project.	**LTS=** This alternative has the same odor-generating activities as the proposed Project.
	Impact 4.3-6: Construction and operation of the Project would result in GHG emissions that could have a significant impact on the environment and conflict with applicable plans and policies in place to reduce GHG emissions. (Less than Significant)	**LTS—** Alternative 2 has 20% less off-road equipment hours, 14% more heavy-duty truck trips, and slightly reduced operational activities, resulting in 1% lower annual average greenhouse gas emissions.	**LTS+** Alternative 4 has 12% more off-road equipment hours, 29% more heavy-duty truck trips, and the slightly increased operational activities, resulting in 24% higher annual average greenhouse gas emissions.
Energy, Mineral, Forest and Agricultural Resources	**Impact 4.4-1:** Implementation of the Project could use energy, oil, or natural gas in an inefficient manner; encourage activities that would result in the use of large amounts of energy, oil, or natural gas; result in the energy supplier not having the capacity to supply the Project's energy needs with existing or planned supplies; or require the development of new energy resources. (Less than Significant with Mitigation)	**LSM=** Like the proposed Project, implementation of this alternative would require the use of energy resources during construction (and, to a lesser extent, during operation), which would be reduced with implementation of Mitigation Measures 4.3-1 and 4.3-4. Like the proposed Project, this alternative would have no effect on mineral, forest, or agricultural resource.	**LSM+** Like the proposed Project, implementation of this alternative would require the use of energy resources during construction (and to a lesser extent during operation), which would be reduced with implementation of Mitigation Measures 4.3-1 and 4.3-4. This alternative's operation-phase energy consumption would be incrementally greater than the proposed Project because of pumping. Like the proposed Project, this alternative would have no effect on mineral, forest, or agricultural resource.

Table 6-5 (continued)
Comparison of Environmental Impacts of FDS Basin Elements: Proposed Project and Alternatives 2 and 4

Environmental Resource	Proposed Project	Alternative 2: Passive Basin Only	Alternative 4: Increased Capacity Basin
Biological Resources	**Impact 4.5-1:** Project implementation could have a substantial adverse effect on special-status aquatic species. (Less than Significant with Mitigation)	**LSM—** Under this alternative, most impacts to aquatic species and habitats would be similar to those in the proposed Project. However, the absence of a diversion structure would lead to reduced construction and operational impacts from reductions in in-stream construction, work in the riparian corridor, rock protection, and the degree of tree removal and periodic sediment removal needed. The same mitigation measures would be implemented.	**LSM+** Under this alternative, most impacts to aquatic species and habitats would be similar to those in the proposed Project. The primary differences are from construction of the deeper basin and operational actions that include a pump to assist the basin in draining, neither of which would differentially affect aquatic resources. However, there would also be an increased area of ground disturbance and bank protection for the second outflow pipe, which would slightly increase the effect on aquatic species and habitats. The same mitigation measures would be implemented.
	Impact 4.5-2: Project implementation could have a substantial adverse effect on special-status plant species. (Less than Significant with Mitigation)	**LSM—** Under this alternative, most impacts to special-status plants would be similar to those in the proposed Project. However, the reduced area of tree removal and work in the riparian corridor would reduce the chance of adversely affecting a rare plant. The same mitigation measures would be implemented.	**LSM=** Under this alternative, most impacts to rare plants would be similar to those in the proposed Project. The primary differences are from construction of the deeper basin and operational actions that include a pump to assist the basin in draining, neither of which would differentially affect plants. The same mitigation measures would be implemented.
	Impact 4.5-3: Project implementation could have a substantial adverse effect on special-status amphibians and terrestrial species. (Less than Significant with Mitigation)	**LSM—** Under this alternative, most impacts to amphibians and other special-status terrestrial species and habitats would be similar to those in the proposed Project. However, the absence of a diversion structure would lead to reduced construction and operational impacts from reductions in in-stream construction, work in the riparian corridor, rock protection, and the degree of tree removal and periodic sediment removal needed. The same mitigation measures would be implemented	**LSM+** Under this alternative, most impacts to amphibians and other terrestrial species and habitats would be similar to those in the proposed Project. The primary differences are from construction of the deeper basin and operational actions that include a pump to assist the basin in draining. These could have incrementally increased effects on amphibians, which might be more attracted to a deeper basin that would contain groundwater more often and in higher quantities. However, there would also be an increased area of ground disturbance and bank protection for the second outflow pipe, which would slightly increase the effect on amphibians and their habitats. The same mitigation measures would be implemented.
	Impact 4.5-4: Project implementation could have a substantial adverse effect on special-status nesting birds. (Less than Significant with Mitigation)	**LSM—** Under this alternative, most impacts to nesting birds would be similar to those in the proposed Project. However, the reduced area of tree removal would reduce the chance of adversely affecting a nesting bird. The same mitigation measures would be implemented.	**LSM=** Under this alternative, most impacts to nesting birds would be similar to those in the proposed Project. The primary differences are from construction of the deeper basin and operational actions that include a pump to assist the basin in draining, neither of which would differentially affect nesting birds. The same mitigation measures would be implemented.
	Impact 4.5-5: Project implementation could have a substantial adverse effect on Northern spotted owls. (Less than Significant with Mitigation)	**LSM—** Under this alternative, most impacts to Northern spotted owls would be similar to those in the proposed Project. However, the reduced area of tree removal would reduce the chance of adversely affecting individuals of this species. The same mitigation measures would be implemented.	**LSM=** Under this alternative, most impacts to Northern spotted owls would be similar to those in the proposed Project. The primary differences are from construction of the deeper basin and operational actions that include a pump to assist the basin in draining, neither of which would differentially affect Northern spotted owls. The same mitigation measures would be implemented.
	Impact 4.5-6: Project implementation could have a substantial adverse effect on special-status bats. (Less than Significant with Mitigation)	**LSM—** Under this alternative, most impacts to special-status bat species would be similar to those in the proposed Project. However, the reduced area of tree removal would reduce the chance of adversely affecting roosting bats. The same mitigation measures would be implemented.	**LSM=** Under this alternative, most impacts to special-status bat species would be similar to those in the proposed Project. The primary differences are from construction of the deeper basin and operational actions that include a pump to assist the basin in draining, neither of which would differentially affect bats. The same mitigation measures would be implemented.
	Impact 4.5-7: Project implementation could adversely affect sensitive natural communities. (Less than Significant with Mitigation)	**LSM—** This alternative would involve less work in sensitive natural communities such as the riparian corridor and oak woodlands than the proposed Project would because there would be no diversion structure and less earthwork to build the levees on the east and west sides of the basin. The impacts would therefore be somewhat lessened, though the same mitigation measures (including onsite replanting and offsite replacement mitigation as required by permits) would be implemented.	**LSM+** This alternative would involve a slightly increased amount of work in sensitive natural communities such as the riparian corridor and oak woodlands as the proposed Project. Impacts related to pump installation, a second outflow pipe, tree removal, and rock protection could affect incrementally larger areas of these communities than the proposed Project would. The same mitigation measures would be implemented.
	Impact 4.5-8: Project activities could adversely affect wetlands and other waters (Less than Significant with Mitigation)	**LSM—** This alternative would involve less work in wetlands and other waters than the proposed Project would because there would be no diversion structure in Fairfax Creek. The impacts would therefore be somewhat lessened, though the same mitigation measures (including onsite restoration and offsite replacement mitigation as required by permits) would be implemented.	**LSM+** This alternative would involve a slightly increased amount of work in wetlands and other waters as the proposed Project. Impacts related to pump installation, a second outflow pipe, tree removal, and rock protection could affect incrementally larger areas of these habitats than the proposed Project would. The same mitigation measures would be implemented.

TABLE 6-5 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF FDS BASIN ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 4

Environmental Resource	Proposed Project	Alternative 2: Passive Basin Only	Alternative 4: Increased Capacity Basin
Biological Resources (cont.)	**Impact 4.5-9:** Project construction could adversely affect riparian wildlife movement corridors. (Less than Significant with Mitigation)	**LSM—** This alternative would involve less work in the riparian corridor than the proposed Project would because there would be no diversion structure. Though the proposed Project would not completely impair riparian wildlife movement around or through that diversion structure, its absence in this alternative would further reduce the potential effects on those species' ability to move through the corridor. The impacts would therefore be lessened. The same mitigation measures would be implemented.	**LSM+** This alternative would involve a slightly amount of work in the riparian corridor as the proposed Project. Impacts related to pump installation, a second outflow pipe, tree removal, and rock protection could affect incrementally larger areas of these communities than the proposed Project would. The same mitigation measures would be implemented.
	Impact 4.5-10: Project construction would require tree removal. (Less than Significant with Mitigation)	**LSM—** This alternative would remove fewer trees than the proposed Project would because there would be no diversion structure built in the riparian area that currently has many trees. The impacts would therefore be somewhat lessened, though the same mitigation measures (including onsite replanting and offsite replacement mitigation as required by permits) would be implemented.	**LSM=** This alternative would remove a similar number of trees as the proposed Project would, and in the same locations. The impacts would be approximately the same, and the same mitigation measures would be implemented.
Cultural Resources	**Impact 4.6-1:** The Project would not cause a substantial adverse change in the significance of a historical resource or a landmark of local cultural or historical importance. (No Impact)	**NI=** Because this alternative would affect the generally the same structures as the proposed Project, no impacts to historical structures are expected.	**NI=** Because this alternative would affect the generally the same structures as the proposed Project, no impacts to historical structures are expected.
	Impact 4.6-2: The Project could cause a substantial adverse change in the significance of an archaeological resource. (Less than Significant)	The likelihood that construction could disturb an unrecorded archeological resource is similar to that of the proposed Project, and could be similarly addressed through implementation of the Marin County Development Code Section 22.20/04.0(D) and other regulations pertaining to inadvertent discoveries as described in Section 4.6.	The likelihood that construction could disturb an unrecorded archeological resource is similar to that of the proposed Project, and could be similarly addressed through implementation the Marin County Development Code Section 22.20/04.0(D) and other regulations pertaining to inadvertent discoveries as described in Section 4.6.
	Impact 4.6-3: The Project could disturb human remains, including those interred outside of dedicated cemeteries. (Less than Significant)	**LTS=** The likelihood that construction could disturb human remains associated with an unrecorded archeological site is the same as that of the proposed Project, and could be addressed through implementation of Mitigation Measure 4.6-2.	**LTS=** The likelihood that construction could disturb human remains associated with an unrecorded archeological site is similar to that of the proposed Project, and could be similarly addressed through implementation the Marin County Development Code Section 22.20/04.0(D) and other regulations pertaining to inadvertent discoveries as described in Section 4.6.
	Impact 4.6-4: The Project could cause a substantial adverse change in the significance of a tribal cultural resource. (Less than Significant)	**LTS=** The likelihood that construction could disturb tribal cultural resources associated with an unrecorded archeological site is the same as the proposed Project, and could be similarly addressed through implementation the Marin County Development Code Section 22.20/04.0(D) and other regulations pertaining to inadvertent discoveries as described in Section 4.6.	**LTS=** The likelihood that construction could disturb tribal cultural resources associated with an unrecorded archeological site is considered similar to that of the proposed Project, and could be similarly addressed through implementation the Marin County Development Code Section 22.20/04.0(D) and other regulations pertaining to inadvertent discoveries as described in Section 4.6.
Geology, Seismicity, Soils, and Paleontological Resources	**Impact 4.7-1:** The Project could expose people or structures to potential substantial adverse effects from hazards including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map or based on other substantial evidence of a known fault, strong seismic ground shaking, seismic-related ground failure, including liquefaction, landslides. (Less than Significant)	**LTS=** Like the proposed Project, the FDS basin under this alternative would be built to applicable standards related to seismic safety.	**LTS=** Like the proposed Project, the FDS basin under this alternative would be built to applicable standards related to seismic safety.
	Impact 4.7-2: The Project could result in substantial soil erosion or the loss of topsoil due to water forces and attendant siltation from excavation, grading, or fill. (Less than significant)	**LTS=** Like the proposed Project, construction of this alternative has the potential to result in substantial soil erosion. Implementation of best management practices, pursuant to the Construction General Permit, would address this issue.	**LTS=** Like the proposed Project, construction of this alternative has the potential to result in substantial soil erosion. Implementation of best management practices, pursuant to the Construction General Permit, would address this issue.
	Impact 4.7-3: The Project could cause adverse effects from being located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse, or slope instability. (Less than Significant)	**LTS=** Because no unstable geologic units or soils are present at the at Nursery Basin site, like the proposed Project, this alternative is not expected to result in on- or off-site landslides, lateral spreading, subsidence, liquefaction or collapse, or slope instability.	**LTS=** Because no unstable geologic units or soils are present at the at Nursery Basin site, like the proposed Project, this alternative is not expected to result in on- or off-site landslides, lateral spreading, subsidence, liquefaction or collapse, or slope instability.
	Impact 4.7-4: The Project could cause adverse effects from being located on expansive soil, as defined in Section 1803.5.3 of the CBC, creating substantial risks to life or property, including deformation of foundations or damage to structures. (Less than Significant)	**LTS=** Because no expansive soils are present at the at Nursery Basin site, like the proposed Project, this alternative is not expected to result in on- or off-site landslides, lateral spreading, subsidence, liquefaction or collapse, or slope instability.	**LTS=** Because no expansive soils are present at the Nursery Basin site, like the proposed Project, this alternative is not expected to result in on- or off-site landslides, lateral spreading, subsidence, liquefaction or collapse, or slope instability.

TABLE 6-5 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF FDS BASIN ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 4

Environmental Resource	Proposed Project	Alternative 2: Passive Basin Only	Alternative 4: Increased Capacity Basin
Geology, Seismicity, Soils, and Paleontological Resources (cont.)	**Impact 4.7-5:** The Project could cause substantial changes in topography from excavation, grading, or fill, including but not limited to ground surface relief features, geologic structures or unstable conditions, or unique geologic or physical features. (Less than Significant)	**LTS—** Topographic changes at the Nursery Basin site associated with this alternative would be less than with the proposed Project (e.g., no levee would be required on the western side of the basin and the levee on the eastern side of the basin would be six feet lower than the proposed Project, and none of the earthwork associated with construction of the diversion structure/new access road would be required – refer to Table 6-3 for details). Like the proposed Project, design features of the basin (cut slopes, bottom) would incorporate features (e.g., erosion control blankets, plantings along the outer toe of the eastern levee) to avoid impacts to the surrounding area.	**LTS=** Topographic changes at the Nursery Basin site associated with this alternative would somewhat greater that with the proposed Project in that the basin would be excavated to about 2.5 feet deeper that with the proposed Project to increase basin capacity. Like the proposed Project, design features of the basin (cut slopes, bottom) would incorporate features (e.g., erosion control blankets, plantings along the outer toe of the eastern levee) to avoid impacts to the surrounding area.
	Impact 4.7-6: The Project would not directly or indirectly destroy a unique paleontological resource or site or unique geologic feature. (No Impact)	**NI=** Like the proposed Project, this alternative is not expected to affect paleontological resources or unique geologic features because the geologic units associated with such resources are not present at the site.	**NI=** Like the proposed Project, this alternative is not expected to affect paleontological resources or unique geologic features because the geologic units associated with such resources are not present at the site.
Hazards and Hazardous Materials	**Impact 4.8-1:** The Project could create a significant hazard to the public or the environment through the routine transport, use, disposal of hazardous materials or reasonably foreseeable upset and accident conditions involving the release of hazardous materials or substances into the environment or create or increase exposure to an actual or potential human or public health hazard. (Less than Significant)	**LTS=** Like the proposed Project, construction of the basin under this alternative would involve the use of hazardous materials such as fuels and the removal of structures potentially containing hazardous building materials; compliance with existing regulations would mitigate address this impact.	**LTS=** Like the proposed Project, construction of the basin under this alternative would involve the use of hazardous materials such as fuels and the removal of structures potentially containing hazardous building materials; compliance with existing regulations would mitigate address this impact.
	Impact 4.8-2: The Project could create a significant hazard to the public or the environment from the Project's location on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5. (No Impact for FDS basin)	**NI=** As indicated in Impact 4.8-2 in Section 4.8, the former Sunnyside Nursery site is not listed as a hazardous material site.	**NI=** As indicated in Impact 4.8-2 in Section 4.8, the former Sunnyside Nursery site is not listed as a hazardous material site.
	Impact 4.8-3: The Project could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. (Less than Significant)	**LTS=** Like the proposed Project, this alternative would not interfere with an adopted emergency response plan or emergency evacuation plan, and preparation of a Traffic Management Plan would ensure that the effect of construction traffic is less than significant.	**LTS=** Like the proposed Project, this alternative would not interfere with an adopted emergency response plan or emergency evacuation plan, and preparation of a Traffic Management Plan would ensure that the effect of construction traffic is less than significant.
Hydrology and Water Quality	**Impact 4.9-1:** Project construction could violate water quality standards and/or waste discharge requirements, provide substantial additional sources of polluted runoff, or otherwise substantially degrade water quality. (Less than Significant with Mitigation)	**LSM—** Similar to the proposed Project, the passive basin would be required to comply with the Construction General Permit; implementation of best management practices and Mitigation Measure 4.9-1 would reduce construction impacts on water quality. Once operational, since there would be no diversion structure, no sediment removal from Fairfax Creek channel would be required; therefore, the water quality impact of this alternative would be reduced compared with the proposed Project.	**LSM=** Similar to the proposed Project, the increased capacity basin would be required to comply with the Construction General Permit; implementation of best management practices and Mitigation Measure 4.9-1 would reduce construction impacts on water quality This alternative's basin would also result in similar amounts of sediment accumulation upstream of the diversion structure; as a result, this alternative would have similar water-quality impacts to those of the proposed Project.
	Impact 4.9-2. The Project would not substantially deplete groundwater supplies, interfere substantially with groundwater recharge or absorption, or intersect groundwater by cuts or excavations such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level. (Less than Significant)	**LTS—** Because there would be less excavation (for the basin as well as the diversion structure) there would be incrementally less dewatering during construction. Similar to the proposed Project, no groundwater extraction would occur during operations. This alternative would have groundwater effects similar to those of the proposed Project because the Basin floor depth would be the same as the proposed Project.	**LTS+** Because there would be more excavation (e.g., for the deeper basin), there would be incrementally more dewatering during construction. Similar to the proposed Project, no groundwater extraction would occur during operations. While there would be more water stored in the basin relative to the proposed Project, the same seepage control would be installed at the Basin site and excavation would extend into the same layers as evaluated for the proposed Project; this alternative would thus have similar impacts on unconfined groundwater during Basin operation as the proposed Project.
	Impact 4.9-3. The Project could alter existing drainage patterns, potentially causing new erosion or siltation. (Less than significant with mitigation)	**LSM—** Because the passive basin would not include a diversion structure in Fairfax Creek, the volume of sediment deposited in Fairfax Creek would be reduced compared with the proposed Project. Little or no new sediment removal from the creek channel would be required, but similar protections against bank and channel erosion and scour would need to be implemented, also in reduced locations. Implementation of Mitigation Measure 4.9-3b Scour Analysis and Protection Measures would still be required.	**LSM=** Like the proposed Project, the increased capacity basin in this alternative would capture sediment upstream of the diversion structure, and potentially erode downstream of the diversion structure. Similar amounts and extents of erosion protection would be implemented as in the proposed Project. The potential effects from erosion or siltation would be similar and would require implementation of Mitigation Measures 4.9-1 and 4.9-2.

TABLE 6-5 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF FDS BASIN ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 4

Environmental Resource	Proposed Project	Alternative 2: Passive Basin Only	Alternative 4: Increased Capacity Basin
Hydrology and Water Quality (cont.)	**Impact 4.9-4:** The Project would substantially alter the existing drainage pattern of the watershed, altering patterns of flooding onsite and offsite. (Significant and Unavoidable) [*WHOLE PROJECT; the alternative analysis for this impact alone considers both the FDS basin and creek capacity elements acting together.*] For this impact, the effects of the different design options for the FDS basin and the different approaches to downstream improvements in creek channel capacity must be discussed together because the streams form a connected hydraulic system with interactions in overall flood risk that each Project element influences. Tables summarizing the changes in flood extent and inundation depth for all of the alternatives are presented as an addendum to Appendix D.	**SU+** The Morningside/Passive Basin alternative would increase flooding near the Sorich Creek confluence with San Anselmo Creek, but otherwise would have no effect on flooding throughout San Anselmo during the 10-year event (whereas the proposed Project would reduce flooding in San Anselmo). Flooding depth would be reduced in Fairfax, similar to the proposed Project. Flooding extent and depth would also be reduced in the Morningside neighborhood along Sleepy Hollow Creek. In the 25-year event, this alternative would result in slight increases in flooding depth in the area below the Mountain View replacement bridge, in the area between Sleepy Hollow Creek and Sorich Creek, and between the Sorich Creek confluence and downtown San Anselmo. Slight increases in flooding depth would also occur between Belle Avenue and Ross Creek. Otherwise this alternative generally would not decrease flood extent or inundation levels in Fairfax and San Anselmo, whereas the Sleepy Hollow/Morningside neighborhood would experience reductions in inundation depths of up to 24 inches. In the 100-year event, this alternative has no effect in Fairfax or downtown San Anselmo and only a minimal reduction in inundation extent or depth. Slight increases in inundation depth would occur downstream of the Mountain View bridge. Many of the effects of this alternative are due to the pairing of the passive basin with the removal of the two bridges in the Morningside neighborhood. To assess the effectiveness and potential for adverse impacts of the passive basin with the removal of the building at 634-636 San Anselmo Avenue, the passive basin with the removal of 634-636 San Anselmo Avenue was modeled. Those results indicated similar changes (both positive and negative) in the extent and depth of flooding as would be realized in the proposed Project. Those results are presented in full in Appendix D. In general, this modification of the alternative brings no adverse effects during the 10-year event. The areas where the proposed Project would result in new inundation or increased inundation depths during the 25-year and 100-year events (i.e., from Barber Avenue, past the Winship Bridge, and downstream to the Sir Francis Drake Bridge) would see similar, though slightly larger increases. The same areas that would be beneficially affected by the proposed Project would be benefitted by this alternative, but with less reduction inundation depth (typically by less than six inches) and fewer parcels removed from the flood plain. This alternative does avoid the risk of backwater flooding upstream of the Nursery Basin site along Fairfax Creek because the sediment-deposition effects arising from the diversion structure would not take place.	**SU=** The Increased Capacity Basin alternative would remove more area from the 10-year floodplain and would reduce the depth of inundation more than the proposed Project. During the 25-year event, it would reduce depth of inundation over a larger area in Fairfax and in much of downtown San Anselmo. However, in the vicinity of the Winship Bridge, it would have similar effects as the proposed Project in increasing inundation extent and depth. During the 100-year event, similar to the proposed Project, this alternative would not substantially affect inundation extent in Fairfax or San Anselmo; however, this alternative would reduce the depth of inundation over a larger area. Like the proposed Project, the diversion structure component of this alternative would bring a risk of backwater flooding from Fairfax Creek upstream of the project area if a large storm and flood event followed the deposition of substantial amounts of sediment in the creek channel behind the diversion structure. Mitigation Measure 4.9-4 would address the possible adverse effects related to increased flood risk or severity, which would be slightly reduced in this alternative relative to the proposed Project.
	Impact 4.9-5. The Project would not place within a 100-year flood hazard area structures which would impede or redirect flood flows. (Less than Significant)	**LTS=** Like the Project, the passive basin would not be built in the 100-year flood hazard area, but would redirect flood flows into the basin during operations to reduce downstream flood risk.	**LTS=** Like the Project, the increased capacity basin would not be built in the 100-year flood hazard area, but would redirect flood flows into the basin during operations to reduce downstream flood risk.
	Impact 4.9-6. The Project would not directly or indirectly expose people or structures to a significant risk of loss, injury or death involving flooding and other water-related hazards, including flooding as a result of the failure of a levee or dam, or from increased debris deposition. (Less than Significant)	**LTS=** Like the Project, the passive basin would be designed to avoid water-related hazards in the vicinity of the basin by building the levees and structures to modern engineering and design standards.	**LTS=** Like the Project, the increased capacity basin would be designed to avoid water-related hazards in the vicinity of the basin by building all levees and structures to modern engineering and design standards.
	Impact 4.9-7 The Project would not directly or indirectly cause inundation by seiche, tsunami, or mudflow. (No Impact)	**NI=** This alternative's basin is in the same location as the proposed Nursery Basin. There would similarly be no impact related to inundation by seiche, tsunami, or mudflow.	**NI=** This alternative's basin is in the same location as the proposed Nursery Basin. There would similarly be no impact related to inundation by seiche, tsunami, or mudflow.
Land Use and Planning	**Impact 4.10-1:** The Project would not physically divide an established community (No Impact)	**NI=** Like the proposed Project, this alternative would not involve changes in land use that could result in the division of an established community.	**NI=** Like the proposed Project, this alternative would not involve changes in land use that could result in the division of an established community.
	Impact 4.10-2: The Project would not conflict with local land use plans. (Less than Significant)	**LTS=** For reasons identified for the proposed Project in Table 4.10-3 (in Section 4.10), this alternative is not expected to conflict with policies contained in the Marin Countywide Plan.	**LTS=** For reasons identified for the proposed Project in Table 4.10-3 (in Section 4.10), this alternative is not expected to conflict with policies contained in the Marin Countywide Plan.
	Impact 4.10-3: The Project would not substantially alter the character or functioning of a community, or present or planned use of an area. (Less than Significant)	**LTS=** Similar to the proposed Project, development of this alternative at the Nursery Basin site would not adversely alter the character or functioning of the community.	**LTS=** Similar to the proposed Project, development of this alternative at the Nursery Basin site would not adversely alter the character or functioning of the community.

TABLE 6-5 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF FDS BASIN ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 4

Environmental Resource	Proposed Project	Alternative 2: Passive Basin Only	Alternative 4: Increased Capacity Basin
Noise and Vibration	**Impact 4.11-1:** Project construction could result in substantial temporary or periodic increase in ambient noise levels in the Project vicinity. (Less than Significant)	**LTS—** Like the proposed Project, construction of this alternative could expose nearby sensitive land uses to noise levels substantially higher than ambient conditions; through implementation of a noise reduction plan, this impact would be less than significant. Because construction would be two months shorter than with the proposed Project, residual noise impacts under this alternative also would be shorter.	**LTS+** Like the proposed Project, construction of this alternative could expose nearby sensitive land uses to noise levels substantially higher than ambient conditions; through implementation of a noise reduction plan, this impact would be less than significant. Because construction would last 1-2 months longer than with the proposed Project, residual noise impacts also would last longer.
	Impact 4.11-2: Project construction could expose people to or generate noise levels in excess of standards established in the local general plan, noise ordinance, or applicable standards of other agencies during construction. (Less than Significant)	**LTS=** Like the proposed Project, construction of this alternative would occur within hours allowable under the County's municipal code and this impact would be less than significant.	**LTS=** Like the proposed Project, construction of this alternative would occur within hours allowable under the County's municipal code and this impact would be less than significant.
	Impact 4.11-3: Project construction could expose people to or generate excessive groundborne vibration during construction. (Less than Significant)	**LTS=** Because the same types of construction equipment would be used under this alternative as with the proposed Project, this impact is anticipated to be less than significant.	**LTS=** Because the same types of construction equipment would be used under this alternative as with the proposed Project, this impact is anticipated to be less than significant.
	Impact 4.11-4: The Project could cause substantial permanent increases in ambient noise levels in the Project vicinity above levels existing without the Project during operations. (Less than Significant)	**LTS—** Maintenance activities for this alternative would be expected to be slightly reduced relative to the proposed Project because the frequency and extent of sediment removal would be reduced. This impact would be less than significant.	**LTS+** Maintenance activities for this alternative would be expected to be slightly increased relative to the proposed Project because the frequency and extent of sediment removal would be greater and because a pump would occasionally operate to drain the basin. This impact would be less than significant.
Population and Housing	**Impact 4.12-1:** The Project would not induce substantial population growth. (No Impact)	**NI=** Like the proposed Project, this alternative would not involve construction of housing, and the reduction in flood hazard is not expected to induce development.	**NI=** Like the proposed Project, this alternative would not involve construction of housing, and the reduction in flood hazard is not expected to induce development.
	Impact 4.12-2: The Project would not displace substantial numbers of existing housing units or people. (Less than Significant)	**LTS=** Like the proposed Project, this alternative would not displace substantial numbers of existing housing or people.	**LTS=** Like the proposed Project, this alternative would not displace substantial numbers of existing housing or people.
	Impact 4.12-3: The Project would not conflict with housing and population projections and policies as set forth in the Countywide Plan. (No Impact)	**NI=** For reasons stated under Impact 4.12-1 above, this alternative would not conflict with housing and population projections.	**NI=** For reasons stated under Impact 4.12-1 above, this alternative would not conflict with housing and population projections.
Public Services and Utilities	**Impact 4.13-1:** The Project could result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or increase the demand for new or increased staff and/or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for public services including, fire protection, police protection, schools or other public facilities. (Less than Significant)	**LTS=** Similar to the proposed Project, this alternative would not induce growth (refer to discussions above under population and housing).	**LTS=** Similar to the proposed Project, this alternative would not induce growth (refer to discussions above under population and housing).
	Impact 4.13-2: The Project's demand for solid waste disposal could exceed the permitted capacity of a suitable landfill. (Less than Significant)	**LTS=** Similar to the proposed Project, construction of this alternative would not generate substantial quantities of solid waste that could exceed the permitted capacity of a landfill; construction waste would be recycled in compliance with California's Green Building Code. This alternative would generate no waste during operations.	**LTS=** Similar to the proposed Project, construction of this alternative would not generate substantial quantities of solid waste that could exceed the permitted capacity of a landfill; construction waste would be recycled in compliance with California's Green Building Code. This alternative would generate no waste during operations.
	Impact 4.13-3: The Project would comply with federal, state, and local statutes and regulations related to solid waste. (Less than Significant)	**LTS=** For reasons stated in Impacts 4.13-1 and 4.13-2 above, this impact would be less than significant.	**LTS=** For reasons stated in Impacts 4.13-1 and 4.13-2 above, this impact would be less than significant.
	Impact 4.13-4: The Project could require or result in the construction of new power, natural gas, or communications system facilities or expansion of existing facilities, the construction of which would cause significant environmental effects. (Less than Significant)	**LTS=** Similar to the proposed Project, operation of this alternative would not use power or natural gas nor require any new communications system facilities.	**LTS+** Operation of the pump associated with this alternative would use electrical power accessed from the existing local distribution system and would not substantially increase overall demand from the existing systems. Thus, the provision of electricity for the pump would not require the construction of new or expansion of existing facilities.
Parks and Recreation	**Impact 4.14-1:** Construction and operation of the Project could increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated. (Less than Significant)	**LTS=** Implementation of this alternative is not expected to increase use of parks or other recreational facilities (refer to discussions under Population and Housing, above).	**LTS=** Implementation of this alternative is not expected to increase use of parks or other recreational facilities (refer to discussions under Population and Housing, above).

TABLE 6-5 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF FDS BASIN ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 4

Environmental Resource	Proposed Project	Alternative 2: Passive Basin Only	Alternative 4: Increased Capacity Basin
Parks and Recreation (cont.)	**Impact 4.14-2:** Construction and operation of the Project would include public access and recreational facilities or could require the construction or expansion of recreational facilities which could have an adverse physical effect on the environment. (Less than Significant for FDS basin)	**LTS=** Like the proposed Project, development of the FDS basin at the Nursery Basin site under this alternative would not include recreational facilities or require the construction or expansion of recreational facilities that could have an adverse effect on the environment.	**LTS=** Like the proposed Project, development of the FDS basin at the Nursery Basin site under this alternative would not include recreational facilities or require the construction or expansion of recreational facilities that could have an adverse effect on the environment.
	Impact 4.14-3: Construction and operation of the Project would not require the designation of additional parkland to remain in conformance with locally acceptable or adopted park standards. (No Impact)	**NI=** As described above under Population and Housing, this alternative would not induce growth, nor would it eliminate any existing parkland.	**NI=** As described above under Population and Housing, this alternative would not induce growth, nor would it eliminate any existing parkland.
Transportation	**Impact 4.15-1:** Construction activity associated with the Project would temporarily generate increased traffic volumes in relation to the existing traffic load and capacity of the road system (potentially resulting in a substantial increase in traffic congestion affecting vehicle or transit circulation), but would not conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system. (Less than Significant with Mitigation)	**LSM+** Like the proposed Project, if construction-related daily truck traffic associated with this alternative (which would be greater than the proposed Project – refer to Appendix B) were to occur on roadways in the peak direction during weekday peak hours, traffic flow could be impeded. Similarly, this impact could be mitigated through preparation and implementation of Traffic Management Plan (Mitigation Measure 4.15-1).	**LSM+** Like the proposed Project, if construction-related daily truck traffic associated with this alternative (which would be greater than the proposed Project – refer to Appendix B) were to occur on roadways in the peak direction during weekday peak hours, traffic flow could be impeded. Similarly, this impact could be mitigated through preparation and implementation of Traffic Management Plan (Mitigation Measure 4.15-1).
	Impact 4.15-2: Implementation of the Project could impede access to local streets or adjacent uses, including access for emergency vehicles. (Less than Significant with Mitigation)	**LSM+** For reasons discussed for the preceding impact, this alternative could impede access including for emergency vehicles. Similarly, implementation of Mitigation Measure 4.15-1 would address issue.	**LSM+** For reasons discussed for the preceding impact, this alternative could impede access including for emergency vehicles. Similarly, implementation of Mitigation Measure 4.15-1 would address issue.
	Impact 4.15-3: Implementation of the Project could have an adverse effect on pedestrian and bicycle accessibility and safety. (Less than Significant with Mitigation)	**LSM+** For reasons discussed under Impact 4.15-1, project construction could temporarily adversely affect pedestrian and bicycle accessibility and safety. Implementation of Mitigation Measure 4.15-1 would address this issue.	**LSM+** For reasons discussed under Impact 4.15-1, project construction could temporarily adversely affect pedestrian and bicycle accessibility and safety. Implementation of Mitigation Measure 4.15-1 would address this issue.
	Impact 4.15-4: Construction activity associated with the Project could temporarily increase traffic safety hazards due to incompatible uses (e.g., heavy truck traffic, and roadway wear-and-tear). (Less than Significant with Mitigation with Mitigation)	**LSM+** Similar to the proposed Project, increased roadway wear and tear from large construction trucks could increase traffic safety hazards. Implementation of Mitigation Measure 4.15-1 would address this issue.	**LSM+** Similar to the proposed Project, increased roadway wear and tear from large construction trucks could increase traffic safety hazards. Implementation of Mitigation Measure 4.15-1 would address this issue.

NOTES:
[a] ESA quantified air emissions associated with the FDS basin elements of Alternatives 2 and 4; those results are presented in Table 6-5. Refer to Appendix B for detailed air quality calculations.

LTS = Less than Significant
LSM = Less than Significant with Mitigation
SU = Significant and Unavoidable

\+ Impact would be greater under this alternative than under the proposed Project.
— Impact would be less under this alternative than under the proposed Project.
= Impact would be the same (or similar) under this alternative as under the proposed Project

TABLE 6-6
COMPARISON OF ENVIRONMENTAL IMPACTS OF CREEK CAPACITY ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 3

Environmental Resource	Proposed Project (Creek Capacity Element Only)	Alternative 2: Morningside/Passive Basin (Creek Capacity Element Only)	Alternative 3: Raised Building Alternative
Aesthetics	**Impact 4.2-1:** The Project could have a substantial adverse effect on a publicly-accessible scenic vista. (Less than Significant)	**LTS=** The location (at the Morningside Drive Bridge and Mountain View Avenue Bridge in the Morningside neighborhood of San Anselmo) and scale of the bridge replacement projects and resulting degree of visual change in the character and quality of the sites (described under Impact 4.2-3, below) are such that they would not be a noticeable in the context of broader scenic vistas. Like the proposed Project, this impact would be less than significant.	**LTS—** Changes to the site, described below under Impact 4.2-3, likely would be imperceptible (and less noticeable that under the proposed Project because the building at 634-636 San Anselmo Avenue would be preserved) when observed within the context of broader scenic vistas.
	Impact 4.2-2: The Project could substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within view of a designated scenic public highway. (Less than Significant)	**LTS—** Unlike the Downtown San Anselmo Element of the proposed Project, the bridge replacement sites associated with Alternative 2 are not visible from nearby designated scenic roadways or corridors (Sir Francis Drake Boulevard, Red Hill Avenue, or Center Boulevard).	**LTS=** As indicated for the proposed Project, limited views of the site would be available from motorists, bicyclists and pedestrians passing by on Center Street. Like the proposed Project, temporary and long-term effects on scenic resources (trees and vegetation that would be removed for construction) visible from designated scenic routes would be less than significant given the scope of the proposed changes (described in the next impact) and their limited visibility.
	Impact 4.2-3: The Project could substantially degrade the existing visual character or quality of the site and its surroundings, including alteration of the built environment or land use patterns. (Less than Significant)	**LTS=** This alternative would remove several trees and other vegetation adjacent to the existing bridges as well as the bridges themselves (which are not visually prominent). With revegetation of disturbed areas following construction, implementation of this alternative would not be expected to detract from the visual character of the area.	**LTS—** Unlike the proposed Project, this alternative would retain and elevate by 2 feet the building at 634-636 San Anselmo Avenue. Like the proposed Project, this alternative would involve disturbance within the creek channel (e.g., removal of trees and vegetation for the access road). In sum, the degree of visual change from existing conditions would be less under this alternative when compared to the proposed Project because the building would be preserved and less creek disturbance and restoration would occur. (Because this alternative does not involve as much restoration as the proposed Project, it would not enhance the visual linkage with Creek Park; consequently, this aspect of its aesthetic benefit would also be somewhat less than those of the proposed Project.)
	Impact 4.2-4: The Project could create a new source of substantial light, glare, or shadow which would adversely affect day or nighttime views in the area. (Less than Significant)	**LTS=** Like the proposed Project there would be no nighttime construction and no nighttime lighting (nor use of building materials associated with glare) during operations.	**LTS=** Like the proposed Project there would be no nighttime construction and no nighttime lighting (nor use of building materials associated with glare) during operations.
Air Quality	**Impact 4.3-1:** Construction of the Project would generate criteria pollutant emissions that could exceed air quality standards or contribute substantially to an existing or projected air quality violation. (Less than Significant with Mitigation)	**LSM=** The overall magnitude of daily construction activities is expected to be similar to the proposed Project (e.g., less ground disturbance and earthwork resulting in fewer truck trips, but work on two existing bridges rather than on one bridge building); consequently, daily criteria air pollution emissions would be less. Like the proposed Project, implementation of Mitigation Measures 4.3-1 and 4.3-4 could reduce this impact to a less-than-significant level.	**LSM=** The overall magnitude of daily construction activities is expected to be similar to the proposed Project (i.e., while less ground disturbance and earthwork might occur with more limited restoration; raising the bridge building would be more involved and take longer than removing it). Consequently, daily criteria air pollution emissions would be be similar. Like the proposed Project, implementation of Mitigation Measures 4.3-1 and 4.3-4 would reduce this impact to a less-than-significant level.
	Impact 4.3-2: Construction of the Project elements would result in emissions that could conflict with the 2017 Clean Air Plan. (Less than Significant with Mitigation)	**LSM=** Emissions are less than BAAQMD significance thresholds after implementation of Mitigation, so this alternative would not conflict with the 2017 Clean Air Plan.	**LSM=** Emissions are less than BAAQMD significance thresholds after implementation of Mitigation, so this alternative would not conflict with the 2017 Clean Air Plan.
	Impact 4.3-3: Operational activities proposed under the Project would generate criteria pollutant emissions that could exceed air quality standards and conflict with the 2017 Clean Air Plan. (Less than Significant)	**NI=** This alternative has the same operational activities as the proposed Project, resulting in the same average daily and annual average criteria pollutant emissions.	**NI=** This alternative has the same operational activities as the proposed Project, resulting in the same average daily and annual average criteria pollutant emissions.
	Impact 4.3-4: Construction of the Project could expose sensitive receptors to toxic air contaminants, including diesel particulate matter emissions. (Less than Significant with Mitigation)	**LSM—** Because the overall magnitude of construction activities is expected to less under this alternative (e.g., less ground disturbance and earthwork resulting in fewer truck trips), toxic air contaminant emissions would likely be incrementally less with this alternative. Like the proposed Project, implementation of Mitigation Measures 4.3-and 4.3-4 could reduce this impact to a less-than-significant level.	**LSM=** Because the overall magnitude of construction activities is expected to be similar to the proposed Project, toxic air contaminant emissions would likely be similar with this alternative. Like the proposed Project, implementation of Mitigation Measures 4.3-1 and 4.3-4 could reduce this impact to a less-than-significant level.
	Impact 4.3-5: Construction of the Project could result in objectionable odors. (Less than Significant)	**LTS=** This alternative has the same odor-generating activities as the proposed Project.	**LTS=** This alternative has the same odor-generating activities as the proposed Project.

TABLE 6-6 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF CREEK CAPACITY ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 3

Environmental Resource	Proposed Project (Creek Capacity Element Only)	Alternative 2: Morningside/Passive Basin (Creek Capacity Element Only)	Alternative 3: Raised Building Alternative
Air Quality (cont.)	**Impact 4.3-6:** Construction and operation of the Project would result in GHG emissions that could have a significant impact on the environment and conflict with applicable plans and policies in place to reduce GHG emissions. ((Less than Significant)	**LTS—** Because the overall magnitude of construction activities is expected to be similar to the proposed Project (e.g., less ground disturbance and earthwork resulting in fewer truck trips but work on two bridges rather than on one bridge building), annual average greenhouse gas emissions would likely be similar with this alternative.	**LSM+** Because the overall magnitude of construction activities (as opposed to daily) is expected to increase relative to the proposed Project, annual average greenhouse gas emissions would be slightly higher with this alternative.
Energy, Mineral, Forest and Agricultural Resources	**Impact 4.4-1:** Implementation of the Project could use energy, oil, or natural gas in an inefficient manner; encourage activities that would result in the use of large amounts of energy, oil, or natural gas; result in the energy supplier not having the capacity to supply the Project's energy needs with existing or planned supplies; or require the development of new energy resources. (Less than Significant with Mitigation)	**LSM=** Like the proposed Project, implementation of this alternative would require the use of energy resources during construction (and, to a lesser extent, during operation), which would be reduced with implementation of Mitigation Measures 4.3-1 and 4.3-4. Like the proposed Project, this alternative would have no effect on mineral, forest, or agricultural resource as none of these resources are present near the bridges.	**LSM=** Like the proposed Project, implementation of this alternative would require the use of energy resources during construction (and, to a lesser extent, during operation), which would be reduced with implementation of Mitigation Measures 4.3-1 and 4.3-4. Like the proposed Project, this alternative (which affects the same site as the proposed Project) would have no effect on mineral, forest, or agricultural resource.
Biological Resources	**Impact 4.5-1:** Project implementation could have a substantial adverse effect on special-status aquatic species. (Less than Significant with Mitigation)	**LSM-** Like the proposed Project, this alternative could adversely affect aquatic species, but the extent of stream affected would be less than with the proposed project: estimated disturbance of about 600 square feet of aquatic and riparian habitat at both bridge sites compared to over 5,000 square feet (0.12 acre of temporary and permanent) of aquatic and riparian habitat at the Downtown San Anselmo site (see Table 4.5-3 in Section 4.5). The construction approach to protecting resources during in-stream work would be the same and the same mitigation measures would be applied. There would less stream channel enhancement and thus incrementally less long-term benefit to aquatic species.	**LSM=** This alternative would have generally similar adverse impacts on aquatic species as the proposed Project would because the building would be raised instead of demolished. The construction approach to protecting resources during in-stream work would be the same and the same mitigation measures would be applied. The reduced extent of improvements to San Anselmo Creek and its riparian corridor would mean that aquatic species and habitats would not receive the same benefits as in the proposed Project.
	Impact 4.5-2: Project implementation could have a substantial adverse effect on special-status plant species. (Less than Significant with Mitigation)	**LSM-** Like the proposed Project, rare plants (if present in the riparian areas affected by the project) could be adversely affected under this alternative. As stated above, the extent of riparian habitat affected at the two bridge sites is less than that associated with the Downtown San Anselmo Element of the proposed Project. The construction approach to protecting resources would be the same and the same mitigation measures would be applied. There would also be less stream channel enhancement and thus less long-term benefit to aquatic species.	**LSM=** This alternative would have similar impacts on rare plants as the proposed Project would. The construction approach to protecting resources would be the same and the same mitigation measures would be applied.
	Impact 4.5-3: Project implementation could have a substantial adverse effect on special-status amphibians and other terrestrial species. (Less than Significant with Mitigation)	**LSM-** Like the proposed Project, this alternative could adversely affect special-status amphibians and other terrestrial species although the extent of stream reach affected would be less (see discussion under Impact 4.5-1, above). The construction approach to protecting resources during in-stream work would be the same and the same mitigation measures would be applied. There would also be less stream channel enhancement and thus less long-term benefit to these species.	**LSM=** This alternative would have generally similar adverse impacts on amphibians and other special-status terrestrial species as the proposed Project would because the building would be raised instead of demolished. The construction approach to protecting resources during in-stream work would be the same and the same mitigation measures would be applied. The reduced extent of improvements to San Anselmo Creek and its riparian corridor would mean that these species would not receive the same benefits as in the proposed Project.
	Impact 4.5-4: Project implementation could have a substantial adverse effect on special-status nesting birds. (Less than Significant with Mitigation)	**LSM-** This alternative would have incrementally less impact on nesting birds as the proposed Project, because somewhat fewer trees may need to be removed; the same mitigation measures for pre-construction surveys and buffer areas would be applied.	**LSM=** This alternative would have similar impacts on nesting birds as the proposed Project would. The relatively low numbers of trees to be removed in the proposed Project would not greatly change in this alternative. Raising the building instead of removing it would have similar potential to affect bird nests. The same mitigation measures would be applied.
	Impact 4.5-5: Project implementation could have a substantial adverse effect on Northern spotted owls. (Less than Significant with Mitigation)	**LSM=** Similar to the Downtown San Anselmo site, the areas around the two bridges are likely too developed and disturbed to provide suitable habitat for Northern spotted owls, although the potential for disturbance of nesting owls cannot be discounted. The same mitigation measures would be applied.	**LSM=** This alternative would have similar impacts on Northern spotted owls as the proposed Project would. The relatively low numbers of trees to be removed in the proposed Project would not greatly change in this alternative, and downtown San Anselmo is not suitable habitat for this species in any case. The same mitigation measures would be applied.
	Impact 4.5-6: Project implementation could have a substantial adverse effect on special-status bats species. (Less than Significant with Mitigation)	**LSM** This alternative would have generally similar adverse impacts on special-status bats as the proposed Project, because it also includes removal of structures (the bridges) and tree removal. The same mitigation measures for pre-construction surveys to protect roosting bats would be applied.	**LSM=** This alternative would have similar impacts on bats as the proposed Project would. The relatively low numbers of trees to be removed in the proposed Project would not greatly change in this alternative. Raising the building instead of removing it would have similar potential to affect roosting bats. The same mitigation measures would be applied.

Table 6-6 (continued)
Comparison of Environmental Impacts of Creek Capacity Elements: Proposed Project and Alternatives 2 and 3

Environmental Resource	Proposed Project (Creek Capacity Element Only)	Alternative 2: Morningside/Passive Basin (Creek Capacity Element Only)	Alternative 3: Raised Building Alternative
Biological Resources (cont.)	**Impact 4.5-7:** Project implementation could adversely affect sensitive natural communities. (Less than Significant with Mitigation)	**LSM-** For reasons stated under Impact 4.5-1, effects on sensitive natural communities including riparian corridor would be less than with the proposed Project. The construction approach to protecting resources during work in these communities would be the same and the same mitigation measures would be applied.	**LSM=** This alternative would have similar adverse impacts on sensitive natural communities such as riparian corridor or oak woodlands as the proposed Project would because the building would be raised instead of demolished. The construction approach to protecting resources during work in these communities would be the same and the same mitigation measures would be applied. The long-term outcome of the project would be to improve the riparian corridor, which would be a benefit that is slightly reduced in this alternative relative to the proposed Project.
	Impact 4.5-8: Project activities could adversely affect wetlands and other waters (Less than Significant with Mitigation)	**LSM-** For reasons stated under Impact 4.5-1, effects on jurisdictional wetlands and other waters would be less than with the proposed Project. The construction approach to protecting resources would be the same and the same mitigation measures would be applied.	**LSM=** This alternative would have similar adverse impacts on jurisdictional waters as the proposed Project would because the building would be raised instead of demolished. There are no wetlands at the downtown San Anselmo site. The construction approach to protecting resources would be the same and the same mitigation measures would be applied.
	Impact 4.5-9: Project construction could adversely affect riparian wildlife movement corridors. (Less than Significant with Mitigation)	**LSM-** For reasons stated under Impact 4.5-1, effects on riparian wildlife movement corridors would be less than with the proposed Project. The construction approach to protecting resources during work in that community would be the same, and the same mitigation measures would be applied. The long-term outcome of the project would be to improve the riparian corridor for species that use it, which would be a benefit that would be in this alternative relative to the proposed Project.	**LSM=** This alternative would involve a similar amount of work in the riparian corridor as the proposed Project would because the building would be raised instead of demolished. The construction approach to protecting resources during work in these communities would be the same and the same mitigation measures would be applied. The long-term outcome of the project would be to improve the riparian corridor for species that use it, which would be a benefit that would be slightly reduced in this alternative relative to the proposed Project.
	Impact 4.5-10: Project construction would require tree removal. (Less than Significant with Mitigation)	**LSM-** Although no tree counts were conducted in the areas around the bridges, as indicated in Table 6-4, this alternative is assumed to require removal of fewer trees, based on the areal extent of construction disturbance of riparian habitat. The same mitigation measures regarding replanting, replacement, and additional mitigation as needed.	**LSM=** This alternative would have similarly minor impacts related to tree removal as the proposed Project would (fewer than 10 trees to be removed). The same mitigation measures regarding replanting, replacement, and additional mitigation as needed.
Cultural Resources	**Impact 4.6-1:** The Project would not cause a substantial adverse change in the significance of a historical resource or a landmark of local cultural or historical importance. (No Impact)	**Cannot be Determined (presumed significant)** Residences in the immediate vicinity of the Morningside Drive and Mountain View Avenue are greater than 50 years old; upon further review, these buildings could be determined to be historic resources. Construction would occur as close as 15-20 feet from these structures. Refer to the Noise and Vibration below.	**NI=** Because this alternative would affect the generally the same structures as the proposed Project, no impacts to historical structures are expected.
	Impact 4.6-2: The Project could cause a substantial adverse change in the significance of an archaeological resource. (Less than Significant)	**LTS=** The likelihood that construction could disturb an unrecorded archeological resource is similar to that of the proposed Project, and could be addressed through implementation of regulations pertaining to inadvertent discoveries as described in Section 4.6.	**LTS=** The likelihood that construction could disturb an unrecorded archeological resource is similar to that of the proposed Project, and could be addressed through implementation of regulations pertaining to inadvertent discoveries as described in Section 4.6.
	Impact 4.6-3: The Project could disturb human remains, including those interred outside of dedicated cemeteries. (Less than Significant)	**LTS=** The likelihood that construction could disturb human remains associated with an unrecorded archeological site is considered similar to that of the proposed Project, and could be addressed through implementation of regulations pertaining to inadvertent discoveries as described in Section 4.6.	**LTS=** The likelihood that construction could disturb human remains associated with an unrecorded archeological site is the same as that of the proposed Project, and could be addressed through implementation of regulations pertaining to inadvertent discoveries as described in Section 4.6.
	Impact 4.6-4: The Project could cause a substantial adverse change in the significance of a tribal cultural resource. (Less than Significant)	**LTS=** The likelihood that construction could disturb tribal cultural resources associated with an unrecorded archeological site is considered similar to that of the proposed Project, and could be addressed through implementation of regulations pertaining to inadvertent discoveries as described in Section 4.6.	**LTS=** The likelihood that construction could disturb tribal cultural resources associated with an unrecorded archeological site is the same as the proposed Project, and could be addressed through implementation of regulations pertaining to inadvertent discoveries as described in Section 4.6.
Geology, Seismicity, Soils, and Paleontological Resources	**Impact 4.7-1:** The Project could expose people or structures to potential substantial adverse effects from hazards including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map or based on other substantial evidence of a known fault, strong seismic ground shaking, seismic-related ground failure, including liquefaction, landslides. (Less than Significant)	**LTS=** This alternative would improve the stability of the Morningside Bridge and channel banks at the bridges relative to existing conditions (thereby lessening exposure of people and structures to adverse effects from geologic hazards).	**LTS=** This alternative would improve the stability of the structure relative to existing conditions (thereby lessening exposure of people and structures to adverse effects from geologic hazards).

TABLE 6-6 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF CREEK CAPACITY ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 3

Environmental Resource	Proposed Project (Creek Capacity Element Only)	Alternative 2: Morningside/Passive Basin (Creek Capacity Element Only)	Alternative 3: Raised Building Alternative
Geology, Seismicity, Soils, and Paleontological Resources (cont.)	**Impact 4.7-2:** The Project could result in substantial soil erosion or the loss of topsoil due to water forces and attendant siltation from excavation, grading, or fill. (Less than Significant)	**LTS—** Because this alternative would involve a smaller area of disturbance (roughly 0.1 acre) the potential for soil erosion and siltation during construction would be incrementally less when compared to the proposed Project.	**LTS—** Because this alternative would involve a slightly reduced amount of disturbance in the creek the potential for soil erosion and siltation would be similar to the proposed Project.
	Impact 4.7-3: The Project could cause adverse effects from being located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse, or slope instability. (Less than Significant)	**LTS=** This alternative would remove constrictions on Sleepy Hollow Creek instead of San Anselmo Creek but would include the same construction best management practices, regulatory permits, and types of protections against slope instability, subsidence, and other geological and soil-related effects as the proposed Project.	**LTS=** Like the proposed Project, this alternative would include the same construction best management practices, regulatory permits, and types of protections against slope instability, subsidence, and other geological and soil-related effects as the proposed Project
	Impact 4.7-4: The Project could cause adverse effects from being located on expansive soil, as defined in Section 1803.5.3 of the CBC, creating substantial risks to life or property, including deformation of foundations or damage to structures. (Less than Significant but NI for Downtown San Anselmo)	**NI=** This section of Sleepy Hollow creek does not have expansive soils.	**NI=** This section of San Anselmo Creek does not have expansive soils.
	Impact 4.7-5: The Project could cause substantial changes in topography from excavation, grading, or fill, including but not limited to ground surface relief features, geologic structures or unstable conditions, or unique geologic or physical features. (Less than Significant)	**LTS=** This alternative would not result in a substantial adverse change to the topography of the Sleepy Hollow Creek channel.	**LTS=** Like the proposed Project, no substantial adverse change to the topography of the creek channel.
	Impact 4.7-6: The Project would not directly or indirectly destroy a unique paleontological resource or site or unique geologic feature. (No Impact)	**NI=** Construction of the creek capacity improvements along Sleepy Hollow Creek would occur in the same geologic units as the Downtown San Anselmo Element of the proposed Project and thus would not be expected to affect paleontological resources or unique geologic features.	**NI=** Like the proposed Project, this alternative is not expected to affect paleontological resources or unique geologic features because the geologic units associated with such resources are not present at the site.
Hazards and Hazardous Materials	**Impact 4.8-1:** The Project could create a significant hazard to the public or the environment through the routine transport, use, disposal of hazardous materials or reasonably foreseeable upset and accident conditions involving the release of hazardous materials or substances into the environment or create or increase exposure to an actual or potential human or public health hazard. (Less than Significant)	**LTS—** The potential for hazardous building materials to be encountered during removal of the bridge structures is less than with the proposed Project because the likelihood that such materials would be present in the bridges to be demolished (e.g., lead-based paint) is lower.	**LTS—** This alternative would involve less demolition than the proposed Project: i.e., 634-636 San Anselmo Avenue, which potentially contains hazardous building materials would not be demolished.
	Impact 4.8-2: The Project could create a significant hazard to the public or the environment from the Project's location on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5. (Less than Significant with Mitigation)	**LTS—** Construction at the bridges would not occur near any sites on the referenced hazardous materials list.	**LSM=** Like the proposed Project, this alternative would involve ground disturbance and potentially dewatering at a site that is included on a list of hazardous materials sites.
	Impact 4.8-3: The Project could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. (Less than Significant)	**LTS=** Neither Morningside Drive nor Mountain View Avenue are designated as emergency or evacuation routes.	**LTS=** Like the proposed Project, this alternative would not interfere with an adopted emergency response plan or emergency evacuation plan.
Hydrology and Water Quality	**Impact 4.9-1:** Project construction could violate water quality standards and/or waste discharge requirements, provide substantial additional sources of polluted runoff, or otherwise substantially degrade water quality. (Less than Significant with Mitigation)	**LSM=** Similar to the proposed Project, the removal or replacement of flow-constraining bridges on Sleepy Hollow Creek would be required to comply with the Construction General Permit; implementation of best management practices and Mitigation Measure 4.9-1 would reduce construction impacts on water quality. As a result, this alternative would have similar water-quality impacts to those of the proposed Project.	**LSM=** Similar to the proposed Project, raising the building at 634-636 San Anselmo Avenue would be required to comply with the Construction General Permit; implementation of best management practices and Mitigation Measure 4.9-1 would reduce construction impacts on water quality. As a result, this alternative would have similar water-quality impacts to those of the proposed Project.
	Impact 4.9-2. The Project would not substantially deplete groundwater supplies, interfere substantially with groundwater recharge or absorption, or intersect groundwater by cuts or excavations such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level. (Less than Significant)	**LTS=** In this alternative, removing two flow-constraining bridges and replacing one of them with a similarly sized bridge with foundations that would not be in the creek channel would not add impervious cover or otherwise interfere with groundwater recharge or flows or otherwise substantially deplete groundwater supplies or interfere with groundwater recharge.	**LTS=** Similar to the proposed Project, the elevation instead of demolition of the building at 634-636 San Anselmo Avenue under this alternative would not add impervious cover or otherwise interfere with groundwater recharge or flows or otherwise substantially deplete groundwater supplies or interfere with groundwater recharge.
	Impact 4.9-3. The Project could alter existing drainage patterns, potentially causing new erosion or siltation. (Less than Significant with Mitigation)	**LTS / Cannot be determined** Similar to the proposed Project, this alternative would remove flow-constraining structures and thus increase flow velocities through the stream reaches upstream and downstream, which could increase scour and erosion. These effects are expected to be similar to those of the proposed Project; Mitigation Measure 4.9-3b would reduce these impacts; however, they were not directly analyzed, so their effects cannot be quantified or directly compared to those in the proposed Project.	**LTS=** Similar to the proposed Project, raising the building would improve channel capacity and allow flood waters to remain in the creek channel and reduce overflow of the creeks banks onto and around nearby streets and buildings. The increase in flow volume and velocity could result in increased scour around existing structures in the creek and along creek banks and erosion of the channel bed. The impact would be similar to the proposed Project.

TABLE 6-6 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF CREEK CAPACITY ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 3

Environmental Resource	Proposed Project (Creek Capacity Element Only)	Alternative 2: Morningside/Passive Basin (Creek Capacity Element Only)	Alternative 3: Raised Building Alternative
Hydrology and Water Quality (cont.)	**Impact 4.9-4:** The Project would substantially alter the existing drainage pattern of the watershed, altering patterns of flooding onsite and offsite. (Significant and Unavoidable) [*WHOLE PROJECT; the alternative analyses for this impact consider both the FDS basin and creek capacity element acting together.*] For this impact, the effects of the different design options for the FDS basin and the different approaches to downstream improvements in creek channel capacity must be discussed together because the streams form a connected hydraulic system with interactions in overall flood risk that each Project element influences. Tables summarizing the changes in flood extent and inundation depth for all of the alternatives are presented as an addendum to Appendix D.	**SU+** Refer to Table 6-5.	**SU=** This alternative would neither increase nor decrease the extent or depth of flooding under any of the various flood events included in the modeling. The impact would be the same as the proposed Project. Mitigation Measure 4.9-4 would address the possible adverse effects related to increased flood risk or severity, which would be somewhat reduced in this alternative relative to the proposed Project.
	Impact 4.9-5. The Project would not place within a 100-year flood hazard area structures which would impede or redirect flood flows. (Less than Significant)	**LTS=** Similar to the proposed Project, this alternative would not place a new structure within a 100-yr flood hazard area; this alternative would also remove flow-impeding structures.	**LTS=** Similar to the proposed Project, this alternative would not place a new structure within a 100-yr flood hazard area; this alternative would also remove flow-impeding structures.
	Impact 4.9-6 Impact 4.9-6. The Project would not directly or indirectly expose people or structures to a significant risk of loss, injury or death involving flooding and other water-related hazards, including flooding as a result of the failure of a levee or dam, or from increased debris deposition. (Less than Significant)	**LTS=** This alternative would remove or replace existing bridges from the special flood hazard area and would not construct levees or other flood control or water detention facilities. For this reason this alternative would have effects similar to those of the proposed Project.	**LTS=** This alternative would raise an existing commercial building in the special flood hazard area and would not construct levees or other flood control or water detention facilities. For this reason this alternative would have effects similar to those of the proposed Project.
	Impact 4.9-7 The Project would not directly or indirectly cause inundation by seiche, tsunami, or mudflow. (No Impact)	**NI=** The bridges that would be modified in this alternative are in very close proximity to the proposed Project (less than one-half mile away) and is similarly not subject to these hazards. There would similarly be no impact related to inundation by seiche, tsunami, or mudflow.	**NI=** This alternative would take place in the same location as the proposed Project. There would similarly be no impact related to inundation by seiche, tsunami, or mudflow.
Land Use and Planning	**Impact 4.10-1:** The Project would not physically divide an established community (No Impact)	**LTS+** While the removal of the Morningside Bridge would permanently disrupt vehicular, pedestrian and bicycle travel currently using that bridge to cross Sleepy Hollow Creek, nearby Mountain View Bridge would continue to provide this function. Consequently, removal of the Morningside Bridge is not considered a substantial division of an established community.	**NI=** Like the proposed Project, this alternative would not involve changes in land use that could result in the division of an established community.
	Impact 4.10-2: The Project would not conflict with local land use plans. (Less than Significant)	**LTS=** There would be no change in land uses associated with this alternative. Like the proposed Project, this alternative would not conflict with local land use plans.	**LTS=** Like the proposed Project this alternative would not conflict with local land use plans. This alternative would involve less change in land use than the proposed Project because 634-636 San Anselmo building would be retained.
	Impact 4.10-3: The Project would not substantially alter the character or functioning of a community, or present or planned use of an area. (Less than Significant)	**LTS=** There would be no change in land use associated with this alternative.	**LTS—** This alternative would involve less change in land use than the proposed Project because 634-636 San Anselmo building would be retained, thereby lessening the degree of change in the character and functioning of the community.
Noise and Vibration	**Impact 4.11-1:** Project construction could result in substantial temporary or periodic increase in ambient noise levels in the Project vicinity. (Less than Significant)	**LTS+** Under this alternative, off-road construction could operate as close as 15-20 feet from residences along Morningside Drive. The two loudest pieces of construction equipment that are expected to be operating during the demolition and construction of the Morningside Bridge is a concrete saw and excavator. According to the Federal Highway Administration's (FHWA) *Roadway Construction Noise Model*, a concrete saw and excavator operating at the same time and place would expose the nearest residences to a noise level of 96 dBA L_{eq}. Demolition and construction activities would expose nearby residences to noise levels that would exceed the applied adverse reaction threshold of 90 dBA L_{eq}. However, as part of the Project design, a construction noise reduction plan will be prepared and submit to the Town for approval. Through the implementation of measures in the construction noise reduction plan, it is anticipated that construction-related noise levels would be reduced by requiring the Project to implement best management practices. Through implementation of a noise reduction plan, this impact would be less than significant.	**LTS=** Given that (a) the overall intensity of construction activities under this alternative generally would be similar to that of the proposed Project and (b) the distance to sensitive receptors (235 feet), this impact would be expected to be less than significant.

TABLE 6-6 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF CREEK CAPACITY ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 3

Environmental Resource	Proposed Project (Creek Capacity Element Only)	Alternative 2: Morningside/Passive Basin (Creek Capacity Element Only)	Alternative 3: Raised Building Alternative
Noise and Vibration (cont.)	**Impact 4.11-2:** Project construction could expose people to or generate noise levels in excess of standards established in the local general plan, noise ordinance, or applicable standards of other agencies during construction. (Less than Significant)	**LTS+** Demolition and Construction of the Morning Side Drive bridge would occur entirely within the Town of San Anselmo. As previously discussed under Impact 4.11-1 (above), this alternative could expose residences to construction noise levels of 96 dBA L_{eq}. Although the proposed demolition and construction activities would occur within the allowed construction hours identified in the Town of San Anselmo municipal code, noise levels generated during demolition and construction activities would exceed the Town's construction noise standard of 80 dBA L_{eq} from a distance of 50 feet from the construction equipment. Given noise levels associated with equipment expected to be used for bridge removal and construction and proximity to residences, this alternative is expected to generate noise levels in excess of standards established in the City of San Anselmo's municipal code. However, this impact is assumed to be less than significant after the implementation of a Project design measure that includes the development and implementation of a Town approved construction noise reduction plan, which would be reduce construction-related noise by requiring the Project to implement best management practices.	**LTS=** For reasons stated in the preceding discussion, this impact would be expected to be less than significant.
	Impact 4.11-3: Project construction could expose people to or generate excessive groundborne vibration during construction. (Less than Significant)	**LSM+** The residential buildings located near the Morningside Bridge are at least 50 years old and are considered historic. According to the Caltrans' *Transportation and Construction Vibration Guidance Manual*, historic buildings exposed to a vibration level of 0.12 in/sec PPV could result in building damage. Construction of the Morningside Bridge could require the use of a hoe ram. According to the Federal Transit Administration's (FTA) *Transited Noise and Vibration Impact Assessment Manual*, the operation of a hoe ram could generate vibration levels of 0.19 in/sec PPV from a distance of 15 feet. Given (a) vibration levels associated with equipment expected to be used for bridge removal and construction (such as hoe rams), (b) proximity to residences, and (c) the age of structures closest to construction (all residences surrounding the bridges are more than 50 years old), this alternative could generate vibration levels in excess of Caltrans' applied historic building damage threshold. This alternative would require mitigation (e.g., vibration control plan with performance standards) to reduce this impact to a less-than-significant level.	**LTS=** Given expected vibration levels from construction equipment and distance to sensitive receptors, this impact is expected to be less than significant.
	Impact 4.11-4: The Project could cause substantial permanent increases in ambient noise levels in the Project vicinity above levels existing without the Project during operations. (Less than Significant)	**LTS=** The bridge would not generate new noise increases following completion of construction. However, stream maintenance activities on Sleepy Hollow Creek in this alternative associated would be expected to be similar to the proposed Project.	**LTS=** Maintenance activities for this alternative would be expected to be similar to the proposed Project.
Population and Housing	**Impact 4.12-1:** The Project would not induce substantial population growth. (No Impact)	**NI=** Like the proposed Project, this alternative would not involve construction of housing, and the reduction in flood hazard is not expected to induce development.	**NI=** Like the proposed Project, this alternative would not involve construction of housing, and the reduction in flood hazard is not expected to induce development.
	Impact 4.12-2: The Project would not displace substantial numbers of existing housing units or people. (Less than Significant)	**LTS=** Like the proposed Project, this alternative would not displace substantial numbers of existing housing or people.	**LTS=** Like the proposed Project, this alternative would not displace substantial numbers of existing housing or people.
	Impact 4.12-3: The Project would not conflict with housing and population projections and policies as set forth in the Countywide Plan. (No Impact)	**NI=** For reasons stated under Impact 4.12-1 above, this alternative would not conflict with housing and population projections.	**NI=** For reasons stated under Impact 4.12-1 above, this alternative would not conflict with housing and population projections.
Public Services and Utilities	**Impact 4.13-1:** The Project could result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or increase the demand for new or increased staff and/or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for public services including, fire protection, police protection, schools or other public facilities. (Less than Significant)	**LTS=** Similar to the proposed Project, this alternative would not induce growth and thus would not increase the demand for or impact from public services or utilities (refer to discussions above under population and housing).	**LTS=** Similar to the proposed Project, this alternative would not induce growth and thus would not increase the demand for or impact from public services or utilities (refer to discussions above under population and housing).
	Impact 4.13-2: The Project's demand for solid waste disposal could exceed the permitted capacity of a suitable landfill. (Less than Significant)	**LTS=** Similar to the proposed Project, construction of this alternative would not generate substantial quantities of solid waste that could exceed the permitted capacity of a landfill; construction waste would be recycled in compliance with California's Green Building Code. This alternative would generate no waste during operations.	**LTS=** Similar to the proposed Project, construction of this alternative would not generate substantial quantities of solid waste that could exceed the permitted capacity of a landfill; construction waste would be recycled in compliance with California's Green Building Code. This alternative would generate no waste during operations.

TABLE 6-6 (CONTINUED)
COMPARISON OF ENVIRONMENTAL IMPACTS OF CREEK CAPACITY ELEMENTS: PROPOSED PROJECT AND ALTERNATIVES 2 AND 3

Environmental Resource	Proposed Project (Creek Capacity Element Only)	Alternative 2: Morningside/Passive Basin (Creek Capacity Element Only)	Alternative 3: Raised Building Alternative
Public Services and Utilities (cont.)	**Impact 4.13-3:** The Project would comply with federal, state, and local statutes and regulations related to solid waste. (Less than Significant)	**LTS=** For reasons stated in Impacts 4.13-1 and 4.13-2 above, this impact would be less than significant.	**LTS=** For reasons stated in Impacts 4.13-1 and 4.13-2 above, this impact would be less than significant.
	Impact 4.13-4: The Project could require or result in the construction of new power, natural gas, or communications system facilities or expansion of existing facilities, the construction of which would cause significant environmental effects. (Less than Significant)	**LTS=** Similar to the proposed Project, operation of this alternative would not use power or natural gas nor require any new communications system facilities.	**LTS=** Similar to the proposed Project, operation of this alternative would not use power or natural gas nor require any new communications system facilities.
Parks and Recreation	**Impact 4.14-1:** Construction and operation of the Project could increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated. (Less than Significant)	**LTS=** Implementation of this alternative is not expected to increase use of parks or other recreational facilities (refer to discussions under Population and Housing, above).	**LTS=** Similar to the proposed Project, construction of this alternative would temporarily use Creek Park for construction staging but the park would be restored following construction. In the long term, implementation of this alternative is not expected to increase use of parks or other recreational facilities (refer to discussions under Population and Housing, above).
	Impact 4.14-2: Construction and operation of the Project would include public access and recreational facilities or could require the construction or expansion of recreational facilities which could have an adverse physical effect on the environment. (Less than Significant with Mitigation)	**NI=** This alternative would not include addition, removal, or improvement of any public access and recreational facilities or require the construction of other facilities that would have an adverse physical effect on the environment.	**LSM=** Like the proposed Project, this alternative would remove (to accommodate construction staging and access) and then replace the deck and stairway features at the bridge building. The impacts of this change are analyzed under the other topics in this table, and the same construction practices and mitigation measures would apply.
	Impact 4.14-3: Construction and operation of the Project would not require the designation of additional parkland to remain in conformance with locally acceptable or adopted park standards. (No Impact)	**NI=** As described above under Population and Housing, this alternative would not induce growth, nor would it eliminate any existing parkland.	**NI=** As described above under Population and Housing, this alternative would not induce growth, nor would it eliminate any existing parkland.
Transportation	**Impact 4.15-1:** Construction activity associated with the Project would temporarily generate increased traffic volumes in relation to the existing traffic load and capacity of the road system (potentially resulting in a substantial increase in traffic congestion affecting vehicle or transit circulation), but would not conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system. (Less than Significant with Mitigation)	**LSM+** Like the proposed Project, construction would temporarily generate increased traffic volumes, potentially increasing traffic congestion, particularly on small residential streets near the bridges. Like the proposed Project, if construction-related daily truck traffic associated with this alternative (which would be greater than the proposed Project) were to occur on roadways in the peak direction during weekday peak hours, traffic flow could be impeded. This impact could be mitigated through preparation and implementation of Traffic Management Plan (Mitigation Measure 4.15-1).	**LSM+** Like the proposed Project, if construction-related daily truck traffic associated with this alternative (which would be greater than the proposed Project) were to occur on roadways in the peak direction during weekday peak hours, traffic flow could be impeded. Similarly, this impact could be mitigated through preparation and implementation of Traffic Management Plan (Mitigation Measure 4.15-1).
	Impact 4.15-2: Implementation of the Project could impede access to local streets or adjacent uses, including access for emergency vehicles. (Less than Significant with Mitigation)	**LSM+** For reasons discussed for the preceding impact, this alternative could impede access including for emergency vehicles, as would the temporary closure of Mountain View Avenue and permanent closure of Morningside Drive. Implementation of Mitigation Measure 4.15-1 would address issue for construction-phase access. During the operational phase, the existing redundancy of the surface roads would provide adequate emergency vehicle access across Sleepy Hollow Creek.	**LSM+** For reasons discussed for the preceding impact, this alternative could impede access including for emergency vehicles as described for the proposed Project. Similarly, implementation of Mitigation Measure 4.15-1 would address this issue.
	Impact 4.15-3: Implementation of the Project could have an adverse effect on pedestrian and bicycle accessibility and safety. (Less than Significant with Mitigation)	**LTS+** Bridge removal would temporarily adversely affect pedestrian and bicycle accessibility and safety. Implementation of Mitigation Measure 4.15-1 would address this issue.	**LTS=** Similar to the proposed Project, for reasons discussed under Impact 4.15-1, project construction could temporarily adversely affect pedestrian and bicycle accessibility and safety. Implementation of Mitigation Measure 4.15-1 would address this issue.
	Impact 4.15-4: Construction activity associated with the Project could temporarily increase traffic safety hazards due to incompatible uses (e.g., heavy truck traffic, and roadway wear-and-tear). (Less than Significant with Mitigation)	**LSM+** Similar to the proposed Project, increased roadway wear and tear from large construction trucks could increase traffic safety hazards. Implementation of Mitigation Measure 4.15-1 would address this issue.	**LSM+** Similar to the proposed Project, increased roadway wear and tear from large construction trucks could increase traffic safety hazards. Implementation of Mitigation Measure 4.15-1 would address this issue.

NOTES:

LTS = Less than Significant
LSM = Less than Significant with Mitigation
SU = Significant and Unavoidable

+ Impact would be greater under this alternative than under the proposed Project.
— Impact would be less under this alternative than under the proposed Project.
= Impact would be the same (or similar) under this alternative as under the proposed Project

Creek Capacity Element

Table 6-6 presents side by side comparisons of the impacts associated with the proposed Project and those associated with the creek capacity element of the Morningside/Passive Basin Alternative. As shown in Table 6-6, many of the impacts attributable to the Downtown San Anselmo Element of the proposed Project would be the same or similar under this alternative, though some would take place in different locations. Notable differences are as discussed below.

Biological Resources (Impacts 4.5-1, 4.5-3, 4.5-7, 4.5-8, 4.5-9, 4.5-10). Bridge removal at the two locations on Sleepy Hollow Creek would have the same types of construction impacts on water quality and biological resources as the Downtown San Anselmo Element of the proposed Project, largely because the nature of the work (removing structures from a creek channel) would be similar and thus use of the same or similar construction approaches and environmental protection measures would be warranted. Compared to the proposed Project, there would be less in-stream construction and fewer trees removed at the two bridge sites; consequently, the magnitude of impacts to aquatic and riparian habitat and associated special status species, jurisdictional wetlands and other waters of the U.S., and to nesting birds would be less. The long-term operational impacts to aquatic habitats and habitats in lower Sleepy Hollow Creek are not expected to be substantially different than they would be to San Anselmo Creek and would be beneficial to the stream and its habitats and species. The same types of standard stream maintenance program activities would be performed as take place currently and as would under the proposed Project.

Hydrology and Water Quality. With regard to hydrology and water quality, the potential for scour and erosion in Sleepy Hollow Creek was evaluated qualitatively based on hydraulic and geomorphologic principles. Removing flow-constraining bridges increases flow velocities and thus increases erosive potential. The proposed Project's potential increase on scour potential in San Anselmo Creek was not substantial. In this alternative, a similarly small effect is expected because the same types of design, monitoring, and mitigation strategies to assess and protect against potential increases in scour and erosion in San Anselmo Creek under the proposed Project would be employed as needed in Sleepy Hollow Creek to manage that potential and reduce it to a less than significant impact. Operations and maintenance activities for bridge removal and replacement would similar or less involved than for the proposed Project because comparatively little habitat restoration would occur.

Land Use (Impact 4.10-1). Removal of the Morningside Bridge would permanently modify vehicular, pedestrian, and bicycle travel. The presence of nearby Mountain View Bridge would continue to provide this function, so this impact would be less than significant but would be greater than in the proposed Project.

Noise and Vibration (Impacts 4.11-1, 4.11-1, 4.11-2, 4.11-3). Because construction would take place very close to residential structures, it would generate larger increases over ambient noise levels at sensitive receptor locations and could also have greater impacts from groundborne vibrations during construction. Unlike the Downtown San Anselmo site, the Morningside Drive and Mountain View Avenue bridges are surrounded by single family homes, and this alternative would relocate many of the impacts associated with the Downtown San Anselmo site from a commercial area to a residential area. Consequently, the severity of some construction-phase impacts would be greater than with the proposed Project. Residences are substantially closer (within 15-20 feet) to the bridges than the commercial structures that would be affected by the proposed Project. The effects of construction-phase noise and vibration impacts would thus be greater than with the proposed Project. Given the age of neighboring homes (the closest homes are all more than 50 years old), vibration from demolition of the bridges could adversely affect potential historic resources. Refer to discussions under Impacts 4.6-1 and 4.11-1 through 4.11-3 in Table 6-6. Because this alternative involves removing and replacing (in the case of Mountain View Avenue) two bridges less than 400 feet apart, as well as installation of a new pipeline, there would also be disruption to vehicular, pedestrian and bicycle travel. On the whole, compared to proposed changes at the Downtown San Anselmo site, the effects of implementation of the bridge projects under this alternative would be more disruptive to a greater number of residents.

Transportation and Circulation (Impacts 4.15-1, 4.15-2, 4.15-3, 4.15-4). Because construction would take place on smaller local roads, it could generate traffic congestion effects, impediments to local streets, pedestrian and bicycle accessibility, and traffic safety hazards that could be incrementally worse under this alternative.

Severity and Frequency of Flooding for the Morningside/Passive Basin Alternative (Impact 4.9-4)

This chapter has provided separate discussions of the impacts of the different basin designs and creek channel improvements options to allow full flexibility in mixing and matching the options for the two different Project elements. For this impact, however, the effects of the different design options for the FDS basin and the different approaches to downstream improvements in creek channel capacity must be discussed together because the streams form a connected hydraulic system with interactions in overall flood risk that each Project element influences. Appendix D presents the results of the hydraulic modeling conducted for each of the alternatives to the proposed Project; it contains figures and tables showing the changes in flood extent and inundation depth.

Implementation of the Morningside/Passive Basin Alternative would slightly increase flooding (approximately 1-4 inches) near the Sorich Creek confluence with San Anselmo Creek, but otherwise would have no effect on flooding in San Anselmo during the 10-year event (whereas the proposed Project would reduce flooding in San Anselmo). Flooding extent and depth would be reduced in Fairfax, similar to but slightly less than the proposed Project, and would also be reduced in the Morningside neighborhood along the lower portion of Sleepy Hollow Creek.

In the 25-year event, this alternative would result in almost no changes to flood extent or depth in Fairfax. In the Morningside neighborhood, along Sleepy Hollow Creek, this would cause slight increases (1-6 inches) in a few locations between the Mountain View replacement bridge and Sir Francis Drake Boulevard but would reduce depth by up to 24 inches over a large area of flooding in this neighborhood. Further downstream, in the area along San Anselmo Creek from its confluence with Sleepy Hollow Creek, past Sorich Creek, and into downtown San Anselmo, there would be slight increases in inundation depth of 1-2 inches. A similar increase in inundation depth would occur in lower downtown San Anselmo upstream of the Ross Creek confluence.

In the 100-year event, this alternative would have no substantial effect in Fairfax or downtown San Anselmo. In the Morningside neighborhood, there are reductions of 3-5 inches in areas upstream of the Mountain View replacement bridge and increases in flooding of up to 3 inches in the area below the Mountain View replacement bridge.

Importantly, the Morningside/Passive Basin Alternative would avoid the risk of increased backwater flooding upstream of the diversion structure because of increased sediment deposition in the Fairfax Creek channel. This risk is fully described in the Impact 4.9-4 discussion in Section 4.9, Hydrology and Water Quality and discussed in some detail in a later section of this chapter regarding the identification of an environmentally superior alternative.

Modified Alternative: Passive Basin with Removal of 634-636 San Anselmo Avenue

As described above, many of the adverse effects of the Morningside/Passive Basin Alternative are associated with removal of the two bridges on Sleepy Hollow Creek. The intent of this modified alternative is to pair the passive basin (which reduces many environmental impacts compared to the other FDS basin options evaluated) with the Downtown San Anselmo Element of the proposed Project. The trade-off of this modified alternative, however, is that this alternative's effectiveness in reducing flood extent or inundation depth is less than the Project as proposed.

The Flood Control District conducted modeling for a combined Passive Basin/Downtown San Anselmo alternative. Those results, summarized herein and presented in full in Appendix D, indicated similar results (both positive and negative) regarding changes in the extent and depth of flooding as would occur with the proposed Project. In general, this modified alternative would reduce the adverse effects on biological resources, water quality, noise, and traffic. However, all of these reductions would be to impacts that were determined to be less than significant, although some would be less than significant only with implementation of mitigation measures. This alternative would create no new significant adverse impacts. This alternative would reduce the area in which flood extent or inundation depth would occur in a 10-year event. These would be the same locations that would benefit from the proposed Project, but the reductions in depth under this alternative would be somewhat lessened.

With regard to the one significant and unavoidable impact of the Project (small areas of increased flooding), it is important to note that this modified alternative would eliminate it in one area but would not reduce it in the other. It would avoid the risk of backwater flooding from Fairfax Creek from sediment deposition upstream of the diversion structure, which would eliminate one form of a significant and unavoidable impact. The other areas that would have increased flooding in the 25-year event under the proposed Project (i.e., from Barber Avenue, past the Winship Bridge, and downstream to the Sir Francis Drake Bridge) would have a similar increase (several inches) for the 25-year event under this modified alternative. In the 100-year event, the depth and extent of inundation would be similar to that of the proposed Project.

6.3.3 Alternative 3: Raised Building Alternative

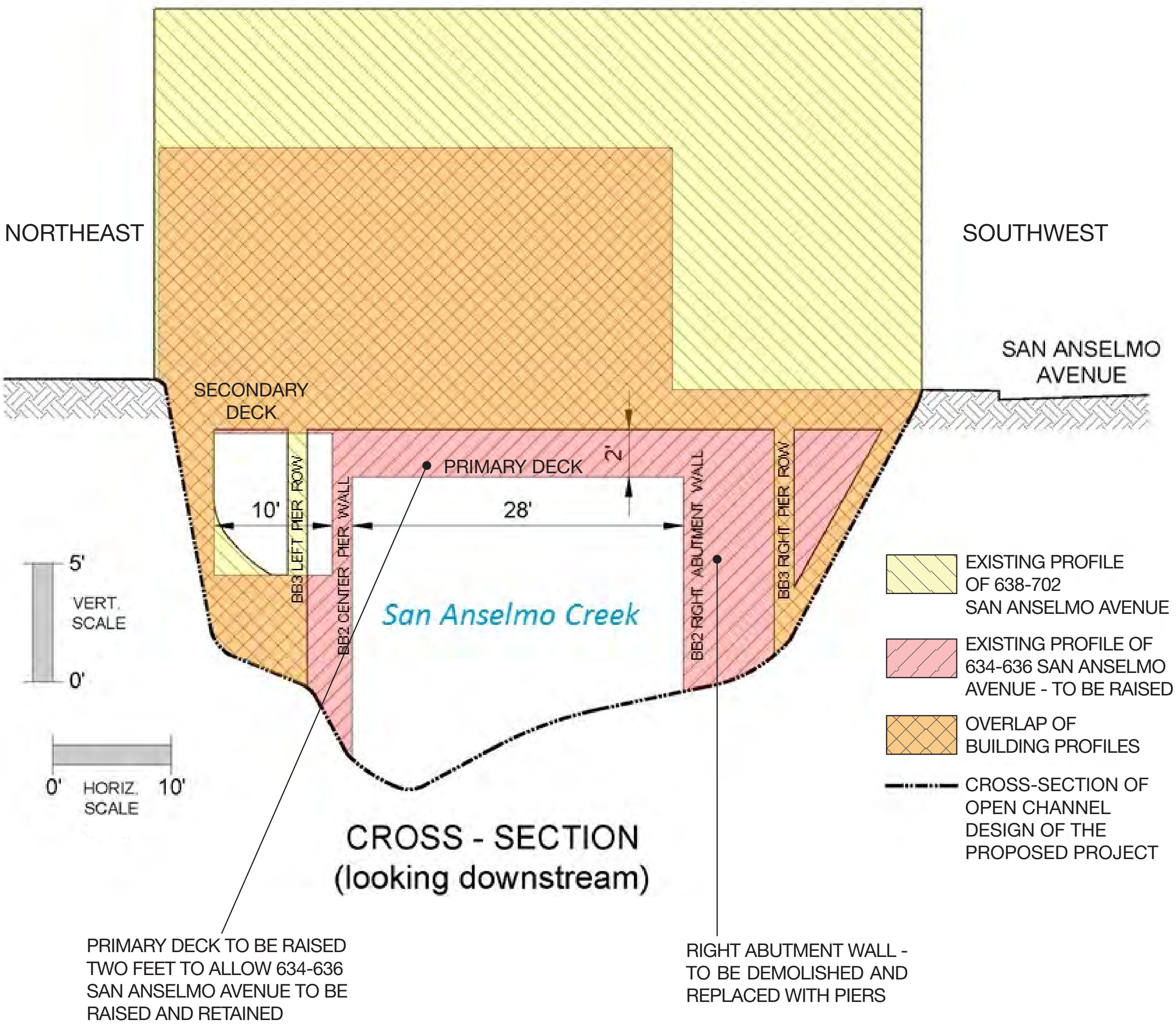
6.3.3.1 Description

The Raised Building Alternative was developed in response to community interest in preserving rather than removing the bridge building at 634-636 San Anselmo Avenue (refer to scoping comments presented in Appendix A). This alternative fosters public participation, consistent with State CEQA *Guidelines* Section 15126.6(a). This alternative would achieve a comparable level of flood risk reduction as the proposed Project by raising the bridge building at 634-636 San Anselmo Avenue out of the creek channel (Geomorph Design, 2018). This alternative would use the same design for the Nursery Basin as the proposed Project, which is described in *Chapter 3, Project Description*. That element would be unchanged in this Raised Building Alternative and is discussed only minimally hereafter.

The existing single-story wood-framed commercial building at 634-636 San Anselmo Avenue would be raised to a higher elevation. Its supporting bridge deck and abutments would be modified or replaced as needed to support the building provide a large enough culvert to reduce or eliminate the current flow impairment. It is the bridge deck and abutments/foundations that cause the hydraulic channel restriction. To be acceptable for flood protection, the modified building would need to be configured to better match the alignment and dimensions of the foundation and deck of the building immediately upstream (638-702 San Anselmo Avenue).

The existing bridge structure consists of two reinforced concrete decks (see **Figure 6-3**, below). The primary deck spans 28 feet across the creek. The secondary deck is higher, and it spans 10 feet from a pier wall in the creek channel to an abutment retaining wall on the northeastern bank. The primary deck needs to be raised about two feet; the secondary deck does not need to be raised for flood risk reduction purposes, but it may need to be raised as one unit with the primary deck to avoid separating the building above both decks.

It is not likely to be feasible to raise the wood-framed building independent from the bridge decks without damaging the building itself. Rather, it is likely the building and decks would be raised as one unit. This may be done by placing hydraulic jacks on temporary foundations on the creek channel. These foundations would support closely-spaced rows of steel girders under the existing deck. Construction crews would then saw-cut through the tops of the existing abutment and pier walls and lift the building-deck as one unit. With the existing building-deck unit supported by the jacked girders, the existing left abutment wall and pier wall would be extended by constructing an 18-inch-wide, 24-inch-deep beam running along the top of each wall the length of the building-deck unit. The failing right abutment would be demolished, and a row of 24-inch-diameter concrete piers supporting a 24-inch-wide, 24-inch-deep beam running the length of the building-deck unit would be constructed in its place. The building-deck unit would be lowered onto the beams and fastened in place. Existing fill (landward of the former right abutment wall) would be removed, and an engineered slope and upper bank retaining wall would be constructed. Finally, a new deck spanning between the raised building-deck unit and the new upper bank retaining wall would be constructed, and this new deck area would be fitted with an Americans with Disabilities Act (ADA)-compliant step-up (with lift) or ramp from the neighboring sidewalk level. The finished floor would be about



Note: Cross-Section of San Anselmo Creek looking downstream from the 638-702 San Anselmo Avenue culvert outlet to the 634-636 San Anselmo Avenue culvert inlet. The 638-702 San Anselmo Avenue bridge-building structure (yellow) provides substantially larger culverts than the 634-636 San Anselmo Avenue bridge-building structure (red/orange). The red area indicates the portion of the 634-636 San Anselmo Avenue bridge-building structure that is more constrictive to flood flows than the 638-702 San Anselmo Avenue structure immediately upstream. Note that the 634-636 San Anselmo Avenue culvert has a 2-ft lower ceiling than 638-702 San Anselmo Avenue. Also note that the 634-636 San Anselmo Avenue culvert substantially fills the right side of the channel. Removing 634-636 San Anselmo Avenue under the proposed project would allow construction of the open channel design cross-section indicated by the bold dashed line. To be comparable hydraulically to removal, the Modify Alternative would need to substantially revise the 634-636 San Anselmo Avenue bridge structure to raise the culvert ceiling and remove the fill on the right side of the channel.

SOURCE: Geomorph Design, Memorandum: Modifying Bridge-Building 2 - Summary Feasibility Evaluation, February 28, 2018.

Figure 6-3
Concept of Raised Building Alternative

2 feet higher than sidewalk level. Note that this proposed construction method for raising this building carries with it an unknown risk of damage to the building frame, concrete deck, or both due to the building's age and the unknown condition of the existing concrete and steel reinforcement in the bridge deck. Raising and modifying an existing building that spans a creek is not commonly done. Further inspection is needed to determine if the existing building and deck have adequate strength for this alternative. The process described here to raise the building deck and add a new foundation structure is one technique for raising and reconstructing the building. Variations of this technique are possible but the general process is similar to what is described. Because this alternative would preserve and replace the building supports, this alternative would not include the extensive restoration improvements to San Anselmo Creek described in Chapter 3, *Project Description* (i.e., regrading and sloping portions of both banks of the channel with bio-stabilization protection methods and vegetating the slopes with riparian woodland shrubs).

6.3.3.2 Ability to Meet Project Objectives

This Raised Building Alternative has the same design as the Nursery Basin for the proposed Project. As explained above, there is some chance the building at 634-634 San Anselmo Avenue could be damaged during its raising. Assuming the building is undamaged during its raising, the flood risk reduction benefits would have a similar effect on the creek capacity in downtown San Anselmo as the proposed Project would; therefore, its ability to meet the project objectives associated with reducing flood risk would be similar. However, the retention of the bridge building at 634-636 San Anselmo Avenue would not allow the same degree of stream channel habitat and riparian corridor improvements as would full removal. Moreover, keeping the building in place would not allow for the same degree of planned public access improvements that would be part of the proposed Project, including increased visibility of the creek and the new sidewalk and patio area above the restored creek channel. Nor would it facilitate future improvements to Creek Park. Raising the building would take longer (Geomorph Design, 2018 estimated it would take at least 66% longer) and be costlier than removing it. The existing tenants would have to be temporarily relocated during construction. It is thus unclear whether this alternative would provide flood risk reduction in balance with available and reasonably foreseeable funding, as intended by the grant. The other objectives include maintaining the quality of adjoining neighborhoods, complying with environmental laws and regulations, and protecting the public health and safety. These would all be met. Therefore, this Raised Building Alternative would partially meet project objectives.

6.3.3.3 Environmental Impacts

Table 6-6 presents side by side comparisons of the impacts associated with the proposed Project and those associated with the creek capacity element of Alternative 3. As stated above, the Nursery Basin Element of the Raised Building Alternative is unchanged from that in the proposed Project; consequently, the impacts would be as characterized throughout Chapter 4, *Environmental Setting, Impacts, and Mitigation Measures*. As shown in Table 6-6, most of the impacts attributable to the Downtown San Anselmo Element of the proposed Project would be the same or similar under this alternative. Notable exceptions include the following:

1. ***Aesthetics, Land Use and Planning (Impacts 4.2-1, 4.2-3, 4,10-2 and 4.10-3)***. Retaining the building at 634-636 San Anselmo Avenue would diminish the degree of change, in terms of visual resources (an Aesthetics impact) and community character (a Land Use and Planning impact), at this location in comparison to the proposed Project. Both of these were evaluated as less-than-significant impacts in the proposed Project, so reducing them would not change any significance determinations. Some aesthetic benefits, including replacement of flood walls with more natural appearing bioengineered slopes and establishing visual linkage with Creek Park, would not be realized under this alternative.
2. ***Hazardous Building Materials (Impact 4.8-1)***. As described in Section 4.8, the building at 634-636 San Anselmo Avenue may contain asbestos and other hazardous building materials. Preservation of the building would reduce the potential for release of such materials during demolition; however, this was already a less-than-significant impact under the proposed Project.
3. ***Transportation and Circulation (Impacts 4.15-1, 4.15-2, and 4.15-4).*** There would be slight increases in construction truck trips compared to the proposed Project. In both cases, these construction impacts would be mitigated to less-than significant-levels with the implementation of the Traffic Management Plan required by Mitigation Measure 4.15-1.

Severity and Frequency of Flooding for the Raised Building Alternative (Impact 4.9-4)

Tables summarizing the changes in flood extent and inundation depth are presented in Appendix D, which shows the results of the hydraulic modeling conducted for the proposed Project and alternatives. This alternative would have the same hydraulic and hydrologic effects on flooding as the proposed Project, and it would have the same impact significance. Compared to the proposed Project, this alternative would neither increase nor decrease the extent or depth of flooding under any of the various flood events included in the modeling. That impact would remain significant and unavoidable, and it would be about the same with this alternative.

6.3.4 Alternative 4: Increased Capacity Basin

6.3.4.1 Description

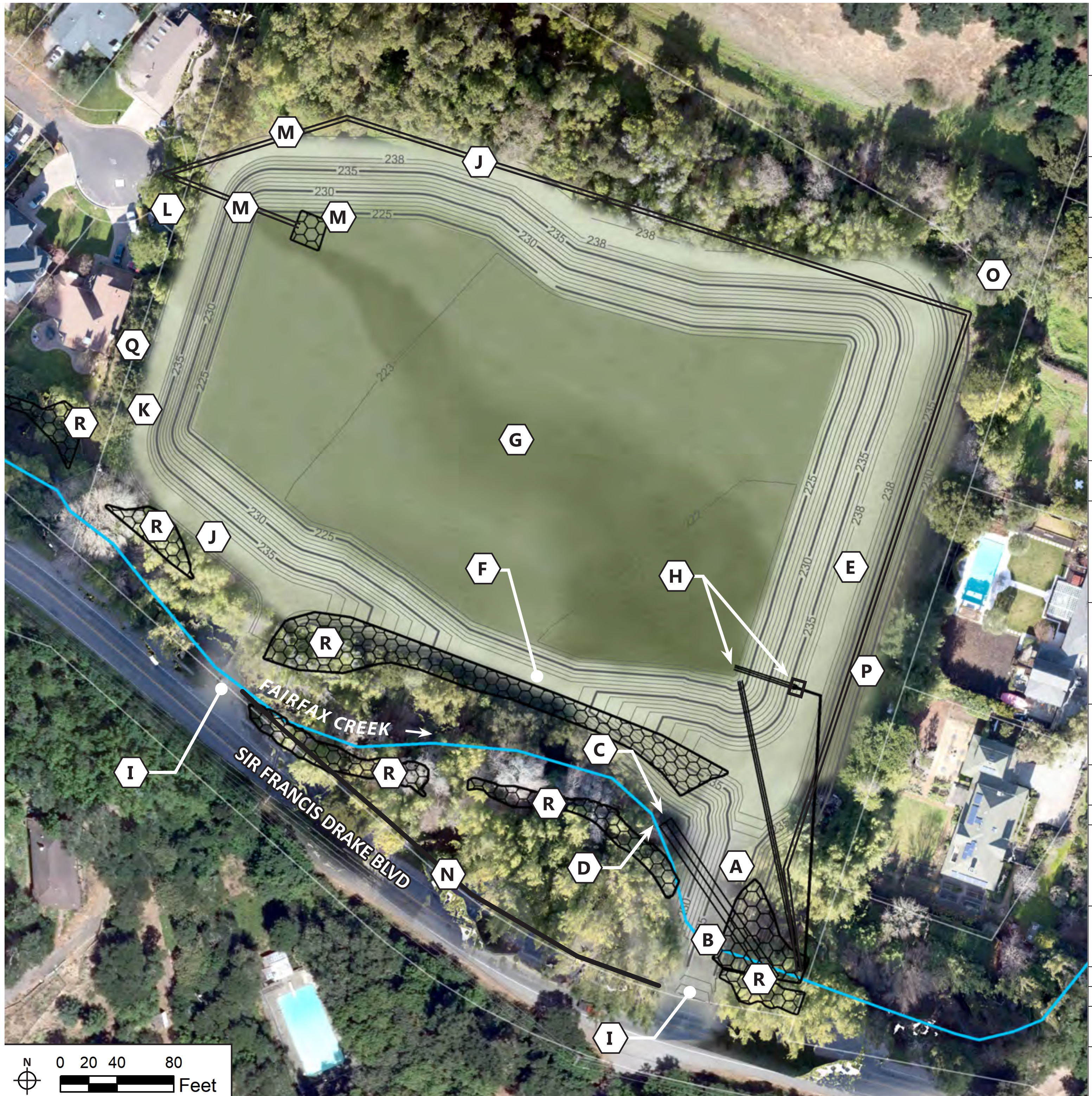
The Increased Capacity Basin Alternative would make the same changes to San Anselmo Creek in downtown San Anselmo as the proposed Project would (i.e., removing the building at 634-636 San Anselmo Avenue and making other creek capacity and channel improvements), but it would construct a larger capacity FDS basin at the former Sunnyside Nursery site, shown on **Figure 6-4** (Stetson Engineers, 2018). This alternative was selected for analysis to investigate whether the provision of additional flood detention capacity could lessen the magnitude of downstream flooding associated with the proposed Project. Additional flooding is identified in Chapter 4 as the only significant and unavoidable impact of the Project. The total capacity of the Increased Capacity basin design would be 41 acre-feet, compared to 31.6 acre-feet for the Project. The bottom elevation of this basin would be 2.5 feet deeper than in the proposed Project. At the southeast corner of the basin, a deeper pocket would be excavated to a depth of 10 feet below the rest of the basin floor to create a sump. A pump would be installed to fully drain the deeper basin when needed. It would also have narrowed setbacks (25 feet instead of 50 feet) from the adjacent property lines on the east and west sides. The top elevation of the eastern embankment (and thus its height as viewed from outside) would be unchanged from that in the proposed Project. The diversion structure, side weir, gated and open openings, ~~riser~~ outlet pipeline, perimeter road, vehicle access, western embankment, floodwall, and perimeter fence would be the same as described for the proposed Project.

As planned, the pump would be a 60 horsepower vertical sump pump to be powered by electricity from the existing grid. It would actively drain the sump and the basin prior to large storm events, shut down during events to reduce peak downstream flows, and then turn on again after the peak discharge has passed. The discharge pipe would empty into Fairfax Creek downstream of the diversion berm at the same point as the primary, passive gated outlet. This basin design necessitates a somewhat more involved operational regime for the Nursery Basin. First, due to the increased depth, more groundwater could emerge in the basin and collect in the sump. Ponded water above the elevation of the top of the sump would passively drain, as in the proposed Project, but any water below that elevation would need to be pumped out as needed to avoid creating breeding habitat for mosquitoes. Alternatively, the pump could cycle on and off at appropriate intervals (e.g. once per week or whatever proved necessary) or when triggered by a float system that automatically turns the pump on and off when water elevations in the sump reach certain levels.

Prior to forecast weather events, the pump would drain any ponded water in the basin or its sump. The pump would be designed to completely empty the basin within 24 hours. As in the proposed Project, before such an event, part of the opening or openings in the diversion structure and the drain pipe gates inside the basin would close and cause water to pond behind the diversion berm in the Fairfax Creek channel. It would then spill over and fill the basin. If the combined storage capacity of the basin and the creek channel behind the diversion berm is exceeded, water would drain over the diversion berm and into downstream Fairfax Creek. Once the storm had passed, and the peak flows had diminished, the passive drain would be opened and the pump switched back on to quickly drain the basin.

6.3.4.2 Ability to Meet Project Objectives

This alternative would meet the Project objectives for flood risk reduction. The larger basin would provide a somewhat greater degree of reduction without increasing downstream risk. The environmental enhancements proposed under the Project (creek channel and stream bank improvements) would be fully realized at the downtown San Anselmo site. Like the Project, this alternative would also add public access and recreational enhancements by improving views of the creek in downtown San Anselmo. The other Project objectives (maintaining the quality of adjoining neighborhoods, complying with environmental laws and regulations, and protecting the public health and safety) would all be met.



A.	**Flow Diversion and Overflow Structure**. Concrete diversion structure with gated opening(s) required to immediately reduce flow passing downstream by partially closing the opening(s) and allowing water to begin filling the basin. The exact dimensions and configuration of the gated opening(s) would be developed during final design to support sediment transport.
B.	**Spillway**. Same as Option 2. The 235-foot elevation spillway would be overtopped only if the gated opening is closed for detention operations and high Fairfax Creek flows continue or rise. Spillway passes estimated 1,000-year flood downstream to Fairfax Creek without basin water surface elevation rising above 236.5 feet – preventing the basin water surface elevation from overtopping the basin.
C.	**Gated Opening**. Same as Option 2. Automatic or manual mechanical gate closure initiates detention operations to immediately reduce flow passing downstream in Fairfax Creek when overbank flooding of vulnerable downstream areas is imminent.
D.	**Ungated Opening**. Same as Option 2. Ungated opening remains always open and suitable for fish passage, sediment transport, and wildlife movement.
E.	**East Levee**. Same as Option 2. 238-foot fill levee top elevation contains temporary basin storage under detention operations. Provides 1.5 feet residual freeboard under potential maximum basin water surface elevation.
F.	**Side-weir**. Same as Option 2. Fairfax Creek begins shallow overflow into the basin while the gated opening remains open when natural high water surface elevations are higher than the 228-foot elevation perimeter road weir segment. Weir and side slopes are rock-armored to prevent erosion by overflow. Under detention operations, the basin drain outlet is closed & the gated opening under the diversion structure is closed and the water surface elevation would rise and fill the basin. At cessation of natural high flows or emergency detention operations, both gates are opened and basin stored water passes back to Fairfax Creek over weir and through outlet pipe. Side slopes may be gradually ramped for maintenance vehicles to access basin floor, and to access Fairfax Creek bed if needed for sediment maintenance.
G.	**Basin Floor**. About 2.5 feet lower than Option 2. Bottom elevation varies from 223.6 feet at northwest corner to 221.3 at southwest corner.
H.	**Basin Drain**. Augmented by Pump Station. If basin receives overflow from Fairfax Creek, upper portion of temporary basin storage drains back to Fairfax Creek by gravity via open storm drain outlet pipe with inlet at elevation 221.3 feet in southeast corner of basin. Because Fairfax Creek bed elevation at basin drain outlet is higher than the drain inlet – approximately 222.4 – a pump is required to eliminate the remainder of temporary ponded water. Pump also required to drain remainder of ponded water following local rainfall runoff entering basin absent overflow from Fairfax Creek.
I.	**Operations and Maintenance Vehicle Access**. Same as Option 2. Access provided by existing or improved driveway bridge, diversion structure, and gated access from Deer Creek Ct cul-de-sac. For the short duration that the basin water surface elevation rises above the spillway, only the driveway bridge and Deer Creek Ct gate would provide vehicle access to basin perimeter. Access ramps to the basin floor may be provided from east, west levees, and side-weir.
J.	**Perimeter Road**. Same as Option 2. 15-foot-wide road for routine maintenance and operations vehicle access. Perimeter road top elevation of 238 feet on west side of basin provides freeboard above the 236.5-foot potential maximum basin water surface elevation.
K.	**West Levee**. Same as Option 2. 238-foot fill levee top elevation contains temporary peak volume storage under detention operations. Provides 1.5 feet residual freeboard for potential maximum basin water surface elevation.
L.	**West Gate**. Same as Option 2. Locked vehicle access gate through fence.
M.	**Deer Creek Court Stormwater Drains and Rip Rap Energy Dissipation Structure**. Same as Option 2. Maximum potential water surface elevations in basin and Fairfax Creek may rise above the existing Deer Creek Ct cul-de-sac storm drain inlet. New storm drain provided to basin floor and to Fairfax Creek downstream from the diversion structure for preventing inundation of cul-de-sac.
N.	**Floodwall/Road Barrier**. Same as Option 2. 238-ft top elevation floodwall provided bordering Sir Francis Drake Blvd for preventing basin overflow onto roadway by providing 1.5 feet residual freeboard for potential maximum basin water surface elevation.
O.	**Perimeter Fence**. Same as Option 2. Security fencing.
P.	**Setback – East**. Narrower than Option 2. Toe of fill levee minimum 25 feet from property line.
Q.	**Setback – West**. Narrower than Option 2. Same as Option 6. Top of basin cut slope minimum 25 feet from property line.
R.	**Rip-Rap Bank Protection.** Same as Option 2. Vegetated rip-rap and other biotechnical bank erosion protection and stabilization both banks Fairfax Creek for protecting habitat and facilities from hydraulic and sediment transport and deposition dynamics during operations.

SOURCE: Marin County Flood Control District, Geomorph Design, Walls Land+Water, and Stetson Engineers

Figure 6-4
Increased Capacity Basin Alternative - Nursery Basin Site Plan

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6.3.4.3 Environmental Impacts

Table 6-5 presents side by side comparisons of the impacts associated with the proposed Project and those associated with the FDS basin in this Increased Capacity Basin Alternative. As stated above, the Downtown San Anselmo Element of the Increased Capacity Basin Alternative would be unchanged from the proposed Project; consequently, the impacts would be as characterized throughout Chapter 4. As shown in Table 6-5, most of the impacts attributable to the Nursery Basin Element of the proposed Project would be the same or similar under this alternative; notable exceptions include the following:

1. ***Air Quality and Greenhouse Gas Emissions; Energy Use (Impacts 4.3-1, 4.3-3, 4.3-4, 4.3 6; 4.4-1)***. In this alternative, the larger FDS basin would necessitate increased earthmoving and off-hauling (by truck) of the excavated material. This would increase construction dust and emissions of criteria pollutants and greenhouse gases in total, but would do so over a longer construction period, which would decrease the average daily emissions. The total emissions and average annual emissions would increase. During the operations phase, there would be slight increases in these emissions and in overall energy use due to the need to operate the sump pump and from occasional maintenance visits to assess the pump and its functioning.
2. ***Biological Resources (Impacts 4.5-1, 4.5-3, 4.5-7, 4.5-8, 4.5-9).*** In this alternative, there would be a slightly increased area of ground disturbance in Fairfax Creek and its riparian corridor to place the second outflow pipe, the pump system, and the bank protection. This would incrementally increase the potential impacts on amphibians and aquatic species and habitats, as well as the riparian area and jurisdictional waters of the U.S. (including any wetlands that are present).
3. ***Hydrology and Water Quality (Impact 4.9-2).*** This alternative's FDS basin would be more deeply excavated, which would increase the necessary amount of construction dewatering and associated best management practices.
4. ***Noise (Impacts 4.11-1, 4.11-4).*** This alternative's longer construction period would increase the duration of construction noise-related disturbances, but would not cause an overall increase in noise levels. Operation of the basin's pump would be a new source of occasional noise during the operational phase, but it is a small (60 hp) electric pump and not expected to be audible at the nearest sensitive receptors.
5. ***Transportation and Circulation (Impacts 4.15-1 through 4.15-4).*** There would be slight increases in construction truck trips compared to the proposed Project (because of greater off-hauling of material). The impacts of these additional construction truck trips would be mitigated to less than significant levels with the implementation of the Traffic Management Plan required by Mitigation Measure 4.15-1.

Severity and Frequency of Flooding for Alternative 4 (Impact 4.9-4)

Tables summarizing the changes in flood extent and inundation depth are presented in Appendix D, which shows the results of the hydraulic modeling conducted for each of the alternatives to the proposed Project. These changes to flooding are the only significant and unavoidable impact expected to result from the proposed Project.

Implementation of the Increased Capacity Basin Alternative would remove more area from the 10-year floodplain and would reduce the depth of inundation more than the proposed Project.

During the 25-year event, it would reduce depth of inundation over a larger area in Fairfax and in much of downtown San Anselmo. However, in the vicinity of the Winship Bridge, it would have similar effects as the proposed Project in increasing inundation extent and depth. During the 100-year event, similar to the proposed Project, this alternative would not substantially reduce the extent of inundation in Fairfax or San Anselmo. That impact, though incrementally reduced by this Larger Capacity Basin Alternative, would remain significant and unavoidable in those few locations near the Winship Bridge whose owners would not accept a flood barrier on their properties. This alternative would bring a larger benefit in the 10-year flood event by reducing the depth of inundation over a larger area than the proposed Project would. Finally, the degree of backwater flooding upstream of the diversion structure in Fairfax Creek would be similar to that in the proposed Project.

6.4 Comparison of Alternatives

6.4.1 Ability to Meet Project Objectives

For ease of reference, **Table 6-7** summarizes the discussion in Section 6.3 regarding the ability of the alternatives to meet project objectives.

6.4.2 Environmental Trade-Offs among Alternatives and Environmentally Superior Alternative

The text below summarizes a comparison of the significant impacts of the proposed Project and Alternatives 1 (No Project), 2 (Morningside/Passive Basin Alternative), 3 (Raised Building Alternative), and 4 (Increased Capacity Basin Alternative), and also discusses the environmentally superior alternative. The State CEQA *Guidelines* require the identification of an environmentally superior alternative. If it is determined that the “no project” alternative would be the environmentally superior alternative, then the EIR must also identify an environmentally superior alternative among the other project alternatives (Section 15126.6).

6.4.2.1 No Project Alternative

As described in Section 6.3.1, the No Project Alternative would avoid all of the environmental impacts of constructing and operating the proposed Project. However, because there would be no reduction in flood risk under the No Project Alternative, the intended benefits of the Project and all of the other alternatives would not be achieved. The severity and frequency of San Anselmo Creek flooding under current conditions would persist, resulting in property damage and economic hardship to residents and businesses. The flooding that is expected to continue under the No Project Alternative would result in numerous adverse environmental impacts to resources within and near the creek. In addition, stream channels and banks and their associated riverine and riparian habitats would not be enhanced by removal of concrete and other materials. In consideration of the impacts identified for the proposed Project and the three “action” alternatives, the No Project Alternative is not considered the environmentally superior alternative.

TABLE 6-7
SUMMARY OF ABILITY OF PROJECT AND ALTERNATIVES TO MEET PROJECT OBJECTIVES

Project Objective	Proposed Project	Alternative 1: No Project	Alternative 2: Morningside/ Passive Basin Alternative	Alternative 3: Raised Building Alternative	Alternative 4: Increased Capacity Basin Alternative
	Would the project or alternative meet the objective?				
1. Reduce the risks related to both frequency and severity of flooding.	Yes	No	Partial (some improvement but not as much as intended by project or its grant funding)	Yes	Yes
2. Provide multiple public benefits including environmental enhancements and recreational enhancements.	Yes	No	Partial (reduced environmental enhancements and no recreational benefits)	Partial (both environmental enhancements and recreational benefits would be minimal)	Yes
3. Provide a flood risk reduction project in balance with available and reasonably foreseeable funding.	Yes	No	Yes	Yes (at an increased cost)	Yes
4. Maintain the quality of adjoining neighborhoods.	Yes	Yes	Yes	Yes	Yes
5. Ensure basin design meets community needs.	Yes	No	Partial (reduced basin capacity would not provide intended flood risk reduction)	Yes	Yes
6. Comply with local, state, and federal environmental laws and regulations.	Yes	Yes	Yes	Yes	Yes
7. Protect the public's health and safety.	Yes	No	Yes	Yes	Yes

6.4.2.2 Environmental Trade-offs among Action Alternatives

The environmental impacts of the action alternatives vary; as a result, there are trade-offs in the environmental impacts of each, summarized below.

Flood Risk

Reduction in flood risk (extent and inundation depth) in the Fairfax-San Anselmo area is the fundamental purpose and key environmental benefit, in terms of avoided impacts, of the proposed Project. Most of the alternatives provide similar flood risk reduction except for the Morningside/Passive Basin Alternative, due to the reduced capacity provided by the FDS basin in that alternative and because of the different hydrologic effects of shifting the creek capacity improvements into Sleepy Hollow Creek. Also, some of the benefits in reduced flood risk would occur in a portion of the Morningside neighborhood instead of in downtown San Anselmo.

As discussed in Section 4.9, Hydrology and Water Quality (Impact 4.9-4), the only significant and unavoidable impact of the proposed Project is that it could increase flood risk in two locations and for different reasons:

1. The first location is along a short section of San Anselmo Creek near the Winship Bridge. Flows in San Anselmo Creek in the 25-year event that are currently constrained by the foundations of the building at 634-636 San Anselmo Avenue would instead be passed downstream and would be constrained by the Winship Bridge. In the Morningside/Passive Basin Alternative, this effect would be reduced because the building at 634-636 San Anselmo Avenue would remain in place. Instead, the removal of the two bridge foundations in Sleepy Hollow Creek in the Morningside/Passive Basin Alternative would pass increased flows from Sleepy Hollow Creek into San Anselmo Creek, where capacity would remain limited and increase flood inundation depths in portions of downtown San Anselmo, both upstream and downstream of the project area. In the Increased Capacity Basin Alternative, this effect would be incrementally reduced because of the larger capacity of the upstream FDS basin at the Nursery Basin site.

2. The second location is along Fairfax Creek upstream from the diversion structure. Because the diversion structure would detain water in the creek channel, the sediments carried by Fairfax Creek would settle out and deposit in the channel upstream of the diversion structure. That reduces storage capacity and changes the timing of the operation of the basin system. If substantial deposition were to occur prior to subsequent large storms and flood events and before it could be removed from the channel by the Flood Control District, there could be an increased risk of backwater flooding (i.e., additional pooling of water beyond that intended by the design) that could extend upstream into the Deer Creek Court area to the west of the Nursery Basin site.

As discussed in Section 4.9, if Mitigation Measure 4.9-4: Provide Flood Protection to Substantially Affected Areas were implemented on all of the adversely affected areas, the adverse impacts would be fully mitigated in both locations. However, because the Flood Control District can neither compel private landowners to accept a flood barrier on their properties nor fully control the schedule for implementing the Winship Bridge Replacement Project, this impact must be considered significant and unavoidable.

Alternatively, this impact could be avoided in the San Anselmo area if removal of the Winship Bridge from San Anselmo Creek (described in Chapter 5, *Growth-Inducing and Cumulative Impacts*) were to be completed prior to removal of 634-636 San Anselmo Avenue. This is expected to happen in time to avoid this potential effect, but that is not certain. That external project would not affect the potential for backwater flooding along Fairfax Creek upstream of the FDS basin site, and so Mitigation Measure 4.9-4 is the only option to reduce this impact to a less-than-significant level.

FDS Basin Elements

Among the FDS basin elements considered, the severity and magnitude of many construction- and operational-phase impacts at and in the vicinity of the Nursery Basin site would generally be less with the passive basin than with either the proposed Project or the Increased Capacity Basin Alternative because construction of the diversion structure would not occur, resulting in less extensive conversion and disturbance of aquatic and riparian habitat and associated special-status species within Fairfax Creek. The passive basin would also remove fewer trees, which would also reduce the changes to the visibility of the site from Sir Francis Drake Boulevard (an Aesthetic and Visual Resources impact). While daily truck trips and associated air pollution emissions would be greater than under either the proposed Project or the Increased Capacity Alternative on a *daily* basis, there would be fewer truck trips *overall* and the duration of construction (and thus construction-related traffic, air quality and noise impacts) would be two months shorter. The passive basin would also reduce operational impacts associated with the need to remove deposited sediment from behind the diversion structure; this annual removal of deposited material would be a repeated impact to the stream channel, water quality, and aquatic and amphibian wildlife species. The different basin designs are otherwise quite similar in both the proposed Project and the action alternatives with regard to increases in scour/erosion potential and other hydraulic impacts.

Creek Capacity Elements

Among the creek capacity elements considered, the severity and magnitude of impacts to the natural (as opposed to human) environment would be less with the Morningside/Passive Basin Alternative than with either the proposed Project or the Increased Capacity Basin Alternative because the extent of disturbance to stream habitat would be less. However, implementing creek capacity improvements on Sleepy Hollow Creek instead of on San Anselmo Creek at the downtown location would essentially transfer impacts to a location surrounded by residences, which are more sensitive to construction-phase disturbance (e.g., noise and vibration, transportation, land use) than commercial uses. Under the Raised Building Alternative, almost all of the impacts attributable to the Downtown San Anselmo Element of the proposed Project also would occur; consequently, this alternative offers little environmental advantage. construction-phase truck trips would be incrementally greater under this alternative, and some environmental benefits of the Project (converting flood walls to bioengineered slopes) would not be realized. This alternative would also have somewhat reduced impacts from changes in community function and character and visual impacts (both of which would be less than significant in the proposed Project) from retaining the bridge building.

6.4.2.3 Environmentally Superior Alternative

One of the main goals of identifying an environmentally superior alternative under CEQA is to reduce or eliminate significant and unavoidable impacts from the Project being considered. By that definition, because the Morningside/Passive Basin Alternative would avoid the potential for Project-related backwater flooding upstream of the FDS basin site and is the only alternative that would do that, it the environmentally superior alternative.

However, the Morningside/Passive Basin Alternative would increase flood risk in portions of downtown San Anselmo that would not be adversely affected by the proposed Project, and it would not wholly avoid the significant and unavoidable impact of increased flood risk near the Winship Bridge (i.e., between Barber Avenue and the Sir Francis Drake Bridge). If, however, either implementation of Mitigation Measure 4.9-4 or the Winship Bridge Replacement Project could be assured to occur prior to removal of the bridge building at 634-636 San Anselmo Avenue, then an alternative combining the passive basin component of the Morningside/Passive Basin Alternative with the Downtown San Anselmo Element of the proposed Project would be considered environmentally superior based on the environmental trade-offs described in the preceding sections. This combined alternative would reduce construction impacts on biological, water quality, and most hydrologic impacts, including the sediment deposition and backwater flooding upstream of the diversion structure, compared to the proposed Project. It would also reduce flood risk compared to existing conditions, but the flood risk reductions would be less than the proposed Project. Therefore, it would not be as effective in reducing or avoiding adverse environmental impacts. Accordingly, this modified alternative would be the environmentally superior alternative, but it would have less overall benefit from flood reduction. Further, in those locations that would experience increased flood risk in the proposed Project (as compared to the existing conditions), there would be an additional incremental increase in those risks from this modified alternative. This combination was not one of the initial alternatives because the modeling of all of the combinations of different design elements was not completed when this alternatives analysis began.

Finally, if Mitigation Measure 4.9-4: Provide Flood Protection to Substantially Affected Areas were implemented on all of the adversely affected areas, the adverse impacts would be mitigated to a less-than-significant level, and this modified alternative would be the environmentally superior alternative. However, as discussed in Section 4.9.3.3, the Flood Control District cannot compel private landowners to accept a flood barrier on their properties. Also, as discussed in Chapter 5, *Growth-Inducing and Cumulative Impacts*, under the expected future conditions, the significant and unavoidable impact would be avoided by the replacement of the Winship Bridge, which would take its flow-constraining foundations out of San Anselmo Creek, allowing flows to pass downstream and avoiding the increased flood risk upstream of the bridge. This bridge removal is part of the Ross Valley Program; it is recommended by the Ross Town Council for construction in 2020.

6.5 Alternatives Considered but Eliminated from Further Analysis

This section discusses several possible alternatives to the proposed Project that the Flood Control District considered but rejected from further analysis because the alternative would fail to reduce the potential environmental impacts of the project or would increase impacts compared to the proposed Project, because they were not feasible to implement, and/or because they failed to meet most of the basic objectives of the Project. These potential alternatives and the reasons for their rejection are summarized in **Table 6-8** and described below.

6.5.1 No-Basin Alternative

6.5.1.1 Description

As its name implies, the No-Basin Alternative would have attempted to achieve a comparable level of flood risk reduction as the originally proposed Memorial Park Basin Alternative and as the proposed Project, but it would do so without any FDS basins. This alternative was based on the recognition that it can be difficult to obtain approval from local residents for construction of a multi-use flood storage and diversion basin. It instead focuses on removing flow constraints and improving channel capacity.

TABLE 6-8
ALTERNATIVES CONSIDERED BUT REJECTED FROM FURTHER CONSIDERATION

Potential Alternative Identified	Description	Ability to Meet Project Objectives / Reasons for Rejection
No-Basin Alternative	• Would have removed more flow-constraints and added more creek capacity improvements	• Would not meet most Project Objectives: would not provide a sufficient reduction in flood risk • Reduced impacts associated with basin construction • Increased impacts associated with in-stream construction; similar operational impacts
Memorial Park Basin Alternative	• The originally funded project • Would have included a large, dual-use FDS basin in a reconfigured playing field at Memorial Park; during periods without extreme flooding, park would remain open for current uses	• Would meet most of the project objectives • Similar or potentially reduced construction impacts as proposed Project; similar operational effects • Not acceptable to the community; would not have complied with local ordinance Measure D
Sleepy Hollow Creek Watershed Alternative	• Construct FDS basin at Brookside Elementary School • Remove or replace Morningside Drive Bridge • Extensive Sleepy Hollow Creek channel improvements	• Would not meet project objectives • Would have similar or increased adverse environmental impacts from construction with less flood risk reduction
Fairfax Creek Alternative 1	• Construct FDS basin at former Sunnyside Nursery site • Remove building at 634-646 San Anselmo Avenue; modify or replace building at 540-546 San Anselmo Avenue • San Anselmo Creek improvements, including removing concrete weir and other flow constraints • Add a public access trail to the perimeter of the basin property to connect to a trail in the Loma Alta Open Space area to the north	• Would meet project objectives • Would result in increased downstream flood risk • High environmental impacts during construction phase • Public access trail not feasible for lack of connectivity options, parking, or other amenities
Lefty Gomez Basin Alternative (Fairfax Creek Alternative 2)	• Construct multi-use FDS basin at former Lefty Gomez Field site • Sleepy Hollow Creek channel improvements	• Would meet project objectives • Not acceptable to the community • Similar or increased construction impacts; similar operational impacts
Green Infrastructure and Flood-proofing Actions Alternative	• Low-impact development policies • Stormwater infiltration • Green infrastructure • Flood proofing • Home elevation	• Would not meet project objectives • Components already part of Ross Valley Flood Protection and Watershed Program • Would not provide a sufficient reduction in flood risk
Accelerated Implementation of Winship Bridge Replacement Project Alternative	• Accelerate Winship Bridge replacement to ensure that Winship Bridge replacement is complete prior to or concurrent with Project completion.	• Would meet project objectives • Infeasible (Flood Control District does not fully control implementation schedule of Winship Bridge Replacement Project)
Phased Implementation/ Temporary Flow-Constraining Alternative	• Install temporary flow-constraining systems in place of building foundations at 634-634 San Anselmo Avenue • Once Winship Bridge is removed, the flow-constraining system would be removed as well	• Would not meet project objectives in the short term; could in the long-term • Reasons for Rejection - Infeasible (Flood Control District does not control implementation of Winship Bridge Replacement Project) - Uncertainty of outcome not acceptable to Flood Control District

This potential alternative included the removal of the building bridge at 634-636 San Anselmo Avenue, and replacement or modification of building bridges at 540-546 San Anselmo Avenue and 638-702 San Anselmo Avenue. It also included structural modifications to a building that overhangs the creek (at 510-524 San Anselmo Avenue). and the replacement of the Sir Francis Drake Blvd. bridge in the Town of Ross (not far downstream of the San Anselmo border). It also included additional downstream creek flow improvement measures, such as flood walls/flood barriers, channel enlargements and biotechnical bank stabilization.

6.5.1.2 Reasons for Rejection

While detailed two-dimensional hydraulic modeling was not conducted for this alternative, a preliminary analysis of the hydraulic performance of this alternative indicated that it has the potential to reduce localized flooding in the areas where the improvements would be made. However, a simplified version of the hydraulic modeling completed for the other alternatives under consideration was sufficient to indicate that some temporary detention of peak flows is necessary to meet objectives of the Project and the DWR grant requirement of providing a comparable level of flood risk reduction to the original Memorial Park FDS basin (Geomorph Design, 2016). This alternative would not reduce flooding enough to meet that target. It would also have increased downstream flood risk.

6.5.2 Memorial Park Basin Alternative

6.5.2.1 Description

The original plan for a flood risk reduction project in and around the Town of San Anselmo included a large FDS basin at Memorial Park. That basin would have had capacity for up to 80 acre-feet of water from Sorich Creek, a small tributary to San Anselmo Creek a short distance upstream of that confluence. This project concept was the one that the California Department of Water Resources' grant was intended to fund. However, in November of 2015, voters in the Town of San Anselmo passed a voter-sponsored initiative (Measure D) to prohibit the Town government and the Flood Control District from building a basin at Memorial Park.

6.5.2.2 Reasons for Rejection

Following the passage of Measure D, the Memorial Park Basin Alternative was no longer feasible due to its rejection by the community and presumed (based on Measure D) failure to meet the project's objectives to ensure basin design meets community needs and to maintain the quality of adjoining neighborhoods. This alternative was removed from further analysis and consideration, but its level of flood risk reduction became the target for subsequent migration of the grant funds to a replacement project, which is now the proposed Project.

6.5.3 Sleepy Hollow Creek Watershed Alternative

6.5.3.1 Description

The Sleepy Hollow Creek Watershed Alternative included upstream detention at Brookside Elementary School (4 acre-feet), replacing the Morningside Drive Bridge, and implementing channel improvements and creek restoration components including those described in the Morningside/Passive Basin Alternative, plus much more extensive enhancements that would begin at the confluence with San Anselmo Creek and continue upstream towards Brookside Elementary School. This alternative also included several channel improvements along Sleepy Hollow Creek, including replacement or removal of the Morningside Drive Bridge, and slope stabilization, restoration and habitat enhancements along Sleepy Hollow Creek between the confluence point at San Anselmo Creek and the area upstream of Arroyo Avenue. Construction of a multi-purpose FDS basin at this location would require reconstructing sport field facilities below grade and enhancing recreational facilities at the school. The size and location of the site limited this FDS basin to approximately 4 acre-feet of storage, as compared to the 80 acre-feet that could have been provided by the original Memorial Park Project and comparable combined reductions in flood risk from the currently proposed Project.

6.5.3.2 Reasons for Rejection

As explained above, the multi-purpose detention basin at Brookside Elementary School site would have brought a small flow reduction benefit of 4 acre-feet. This was an insufficient amount of flood risk reduction to meet the objectives of this project, even in combination with the creek channel capacity improvements. In fact, making the flow capacity improvements to Sleepy Hollow Creek without also providing more upstream storage could have exacerbated flood risk problems downstream in downtown San Anselmo.

6.5.4 Fairfax Creek Alternative 1

6.5.4.1 Description

In many ways, this alternative is a larger version of the proposed Project. Fairfax Watershed Alternative 1 included an FDS basin at the former Sunnyside Nursery site, removing one building bridge and replacing another in downtown San Anselmo and implementing a set of creek restoration improvements (including removing deposited sediment, a concrete weir, and other structural impairments to creek flow), also in downtown San Anselmo. It also would have added a public access trail around a portion of the perimeter of the Nursery Basin property to connect to a trail in the Loma Alta Open Space area immediately adjacent to the northern edge of the property.

The buildings that would have been removed were 634-636 San Anselmo Avenue (the same as in the proposed Project) and 540-546 San Anselmo Avenue. The latter of these buildings could have been permanently removed, modified or rebuilt in order to remove creek channel capacity constraints. In addition, the portion of San Anselmo Creek between these two structures would have been improved to add capacity. Concrete foundations and a weir would have been removed. Slope stabilization, creek restoration and habitat enhancements along San Anselmo Creek could reduce localized flooding while providing top-of-bank recreational opportunities, and could improve public access along San Anselmo Creek through the downtown area.

The FDS basin at the former Sunnyside Nursery site was originally conceptualized as having approximately 65 acre-feet of storage capacity. This capacity was also the initial plan for the proposed Project, but due to site constraints and input from neighbors, the Flood Control District reduced the planned capacity for a basin at this location, as in the proposed Project.

6.5.4.2 Reasons for Rejection

The Fairfax Creek Alternative 1 is similar to the proposed Project in that it would have the same FDS basin site (and presumably the same capacity, as described above) and would address creek channel capacity improvements in the downtown portion of San Anselmo Creek. The main difference is that this alternative also would have removed several other flow constraining structures at substantial additional cost, necessitated acquisition of more parcels of land and buildings, and would have created more substantial changes in the visual character and land use in downtown San Anselmo than the proposed Project. Overall, there would have been increased levels of construction relative to the proposed Project, involving greater construction impacts due to more in-stream work with a greater potential for adverse impacts on biological resources.

Without adding more upstream storage in the form of FDS basins, the added flow capacity from the full implementation of this alternative would have increased the delivery of peak stream flows to the downstream communities in the Ross Valley, including Kentfield, Ross, and Corte Madera. The proposed downtown San Anselmo improvements would have increased the water surface elevation downstream more than could be compensated for by the revised former Sunnyside Nursery site FDS basin alone. This would have increased the overall flood risk of the larger Ross Valley at an increased cost and an increased level of construction-related environmental impacts, making it infeasible to implement.

Finally, the public access trail element of this alternative was determined to be infeasible at this location because there is no safe parking area along Sir Francis Drake Boulevard and because there is no other trail or public access feature or amenity to connect to the Loma Alta trail. For all of these reasons, this alternative was removed from further consideration, and a scaled-down version of it became the proposed Project.

6.5.5 Lefty Gomez Basin Alternative

6.5.5.1 Description

The Lefty Gomez Basin Alternative was originally called Fairfax Watershed Alternative 2. It included a large, multi-use FDS basin (up to 90 acre-feet) at Lefty Gomez Field, which is a large ballfield adjacent to White Hill Middle School, in the Fairfax subwatershed. It would also include minor creek improvements to improve channel capacity on Sleepy Hollow Creek, near the Morningside Bridge. It would not include work in downtown San Anselmo or bridge removals. In a study of possible FDS basin sites (CH2M 2015), this site ranked highest for flood risk reduction because it could store a large amount of storm water (very close to that of the Memorial Park FDS

Basin in the initial project concept). It also would have afforded opportunities to incorporate recreational enhancements to Lefty Gomez Field, which would have been reconstructed in the footprint of that FDS basin. It would not have required purchase of any private property for the basin location (as the Flood Control District did for the former Sunnyside Nursery property), because the field is a public/quasi-publicly-owned facility. However, acquisition of temporary or permanent easements would have been necessary for approximately 10 parcels along Sleepy Hollow Creek, where the creek improvements would have been made. This alternative would have required close coordination with the school district and public outreach with the parents of students, residents near the school, and the community.

6.5.5.2 Reasons for Rejection

The public in the Towns of San Anselmo and Fairfax expressed similar concern about the FDS basin at the Lefty Gomez Field as they did about the Memorial Park basin location. Due to community resistance to incorporate flood diversion and storage into an existing park facility, this option was not as acceptable or feasible to construct. Therefore, it would not have achieved the objective of meeting community needs. Subsequently, the Flood Control District was able to acquire the property that until recently had been the site of the Sunnyside Nursery. That property is only one-quarter mile upstream of Lefty Gomez Field, and the proposed FDS basin at that location would be able to hold a comparable volume of water to the basin that could have been constructed at the Lefty Gomez Field location. Given those considerations, the Lefty Gomez Field Alternative was removed from further consideration.

6.5.6 Green Infrastructure and Flood-proofing Actions Alternative

6.5.6.1 Description

In several instances, including at the scoping meetings for this Project and for the Ross Valley Program, recommendations have been made to the Flood Control District to consider implementing or encouraging sets of spatially distributed actions that do not depend on large structural actions to be implements in discrete locations (such as an FDS basin is). These smaller and widespread actions would collectively increase stormwater infiltration and thereby decrease the volume in the creeks, thereby decreasing the likelihood of overtopping those creek channels Some of the measures to increase stormwater infiltration would be policies that the Flood Control District and local Towns could use to encourage private landowners to implement on their land. Others would be smaller efforts undertaken by the Flood Control District or other communities in Marin County. Suggestions for these have included:

1. Low-impact development policies such as setbacks
2. Rain gardens, rain barrels and cisterns
3. Other infrastructure projects like green streets
4. A catch basin in Creek Park
5. Raising single-family homes
6. Flood-proofing commercial buildings

For the purposes of this EIR, these different concepts were grouped into a single alternative for discussion in this chapter.

6.5.6.2 Reasons for Rejection

These potential solutions can have some effectiveness in reducing flood risk when taken in aggregate in many locations within a watershed. However, even in the aggregate, they would not achieve the most basic project objectives of intended levels of flood risk reduction. Further, most of them would be implemented by individual property owners or other entities and not directly by the Flood Control District. Therefore, these solutions are best viewed not an alternative to the proposed Project but as efforts that could be made in addition to it. In fact, these different solutions are element types that are included in the Ross Valley Flood Protection and Watershed Program being undertaken now by the Flood Control District. These elements will complement the outcomes of the proposed Project.

6.5.7 Accelerated Implementation of Winship Bridge Replacement Project Alternative

6.5.7.1 Description

As discussed in Section 4.9, Hydrology and Water Quality, the Project would result in new inundation during the 25-year event upstream of Winship Avenue, due in part to the channel constriction caused by the Winship Bridge. This impact could be avoided if the Winship Bridge Replacement Project were to be completed prior to removal of 634-636 San Anselmo Avenue. The Winship Bridge Replacement Project is fully funded and likely to occur concurrent with construction of the proposed Project (i.e., it is expected to be completed between 2019 and 2022). This alternative would seek to accelerate implementation of the Winship Bridge Replacement Project to ensure that the Winship Bridge replacement project is complete prior to or concurrent with completion of the proposed Project.

6.5.7.2 Reason for Rejection

As discussed in Section 4.9, Hydrology and Water Quality and in Chapter 5, *Growth-Inducement and Cumulative Impacts*, the Winship Bridge replacement project is funded jointly by the California Department of Transportation, the Town of Ross (which is also the CEQA lead agency), and by the Flood Control District. If completion of the Winship Bridge replacement prior to completion of the proposed Project could be assured, this alternative would avoid the potentially significant impact associated with increased inundation levels and would meet all Project objectives. However, because the Flood Control District cannot fully control implementation of the Winship Bridge replacement project, consistent with CEQA,[4] this alternative is considered infeasible. Also, this alternative would not reduce the potential for backwater flooding upstream of the diversion structure in Fairfax Creek in the proposed Project.

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4 State CEQA *Guidelines* Section 15126.6(f)(1).

6.5.8 Phased Implementation/Temporary Flow-Constraining Alternative

6.5.8.1 Description

Under this alternative, the proposed Project would be constructed as described throughout this EIR, with the Nursery Basin being built and operated as described and with the same impacts. The Downtown San Anselmo Element would be the same as well, except that following the removal of the building foundation and implementation of all of the other creek channel improvements, a temporary system of flow-constraining components would be installed to retain water in the same way that the building foundation does in the existing condition. Those components could include an inflatable weir, flow baffles, or some other temporary and manageable system of flow constraints. The intent would be to not pass flows downstream and into the area near the Winship Bridge and instead maintain the current flooding regime in downtown San Anselmo until such time and the Winship Bridge can be removed. Once the Winship Bridge is removed, the flow-constraining system would be as well, and the result would be full completion of the proposed Project. Therefore, this alternative is a phased implementation of the proposed Project.

This alternative would avoid increasing downstream flooding near the Winship Bridge, and it would still reduce the extent and depth of flooding in downtown San Anselmo because of the upstream FDS basin at the Nursery Basin site. However, it would reduce the benefit and the effectiveness of the Project during the period between completion of the San Anselmo Flood Risk Reduction Project and the removal of the Winship Bridge.

6.5.8.2 Reason for Rejection

This alternative would not meet project objectives in the short term. During that time, the temporary flow-constraining system would undo much of the potential benefit of the Project. During the longer term, it would fully implement the proposed Project and meet the same objectives it would. However, the Flood Control District does not control the Winship Bridge Replacement Project. If the Winship Bridge removal were to not be completed for some reason, this system would become permanent and result in a substantial amount of ongoing flooding in the areas that were targeted for flood reduction by the funding source. This uncertainty of outcome makes this alternative infeasible and unacceptable to the Flood Control District. Also, this alternative would not reduce the potential for backwater flooding upstream of the diversion structure in Fairfax Creek in the proposed Project.

6.6 References

CH2M, Ross Valley Flow Reduction Study Report, November 2015.

Geomorph Design, Memorandum from Matt Smeltzer to Flood Control District regarding Modifying Bridge-Building 2 – Summary Feasibility Evaluation, February 28, 2018.

Geomorph Design, Technical Memorandum: “Proxy” Plans for Preventing Potential Downstream Effects of the Proposed Downtown San Anselmo Creek Restoration Project, December 2, 2016.

Stetson Engineers Inc., Morningside/Lower Sleepy Hollow Creek Study (Draft), May 2017.

Stetson Engineers Inc. (Stetson Engineers 2018a), Report on Hydraulic Analysis of the Morningside Alternative, May 2, 2018.

Stetson Engineers Inc. (Stetson Engineers 2018b), San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin, January 31, 2018.

CHAPTER 7
Report Preparation

7.1 Persons Responsible for Report Preparation and Contributors to the EIR

7.1.1 Marin County Community Development Agency

- Rachel Reid, Environmental Planning – Planning Manager

7.1.2 Marin County Department of Public Works

- Liz Lewis, Planning Manager
- Russ Eberwein, Senior Engineer
- Tony Williams, Flood Control Division Manager
- Liz Lotz, Resource Specialist GIS

7.1.3 Marin County Parks and Open Space

- Kristina Tierney, Open Space Planner

7.1.4 Environmental Science Associates

- Jim O'Toole, Project Director
- Dave Halsing, Project Manager
- Karen Lancelle, Deputy Project Manager, Hydrology and Water Quality
- Dave Davis, Aesthetics and Visual Resources
- Matthew Fagundes, Air Quality, Greenhouse Gas Emissions, Energy Resources
- Brian Schuster, Air Quality, Greenhouse Gas Emissions, Energy Resources
- Liza Ryan, Biological Resources
- Jill Sunahara, Biological Resources
- Heidi Koenig, RPA, Cultural Resources
- Michael Burns, Geology, Hazards and Hazardous Materials
- Ari Frink, Hydrology and Water Quality, Project Associate

- Luke Evans, Land Use, Recreation
- Stan Armstrong, Noise
- Alena Maudru, Population and Housing, Public Services and Utilities, Project Associate
- Jack Hutchison, PE, TE, Transportation and Circulation
- Meryka Dirks, Cumulative Impacts
- Jill Hamilton, Alternatives
- Wes McCullough, GIS
- Lisa Bautista, Desktop Publishing
- Anthony Padilla, Production
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7.1.5 Stetson Engineers

- James Reilly, Lead Engineer
- Xiaoqing Zeng, Project Engineer

7.1.6 Geomorph Design

- Matt Smeltzer

7.1.7 Consultant to the Marin County Community Development Agency

- Dan Sicular

7.1.8 Walls Land Water +Design

- Scott Walls

APPENDIX A

Notice of Preparation and Scoping Report

NOTICE OF PREPARATION AND NOTICE OF PUBLIC SCOPING MEETING FOR THE SAN ANSELMO FLOOD RISK REDUCTION PROJECT ENVIRONMENTAL IMPACT REPORT

The Marin County Flood Control and Water Conservation District (Flood Control District) will be preparing an Environmental Impact Report (EIR) for the San Anselmo Flood Risk Reduction Project (Project). The Project involves implementing various flood risk reduction measures in Fairfax and San Anselmo to achieve a 25 year level of flood protection, located in central eastern Marin County.

The Project proposes several flood reduction elements (elements) designed to reduce flood risk in the watershed. Proposed elements include:

- Increasing creek and floodplain capacity to convey floodwaters.
- Removing or modifying buildings to convey floodwaters
- Enlarging some channels through the removal or modification of existing obstructions to flow.
- Reducing peak discharge and attenuating flows by increasing floodplain detention storage

This Project is part of the overall Ross Valley Watershed and Flood Risk Reduction Program that includes approximately 180 potential elements to increase the capacity of Corte Madera Creek and its tributaries as well as up to five or more detention basins located throughout the watershed. When implemented in concert, these elements provide flood risk reduction on a watershed-wide scale.

Project construction is estimated to occur over portions of two years in 2019 and 2020. In addition to certification of this EIR, regulatory permits from State and Federal agencies are required to construct these projects. Additional details about the Project are provided online at http://www.marinwatersheds.org/rossvalleywatershed-org/.

The Flood Control District is the lead agency, pursuant to the State Guidelines for the California Environmental Quality Act (State CEQA Guidelines Section 15050) for the preparation of an EIR. This EIR is being prepared by the Flood Control District in accordance with CEQA, the State of California CEQA Guidelines, and County Environmental Impact Review Guidelines. This EIR is being prepared as a project-level EIR, pursuant to the State Guidelines for the California Environmental Quality Act (State CEQA Guidelines Section 15161). This EIR will evaluate the following topical issues, but will focus on some issues more than others:

1) Aesthetics and Visual Resources	6) Geology, Soils, and Seismicity	11) Population and Housing
2) Air Quality and Greenhouse Gas Emissions	7) Hazards and Hazardous Materials	12) Public Services and Utilities
3) Biological Resources	8) Hydrology and Water Quality/Climate Change	13) Parks and Recreation
4) Cultural Resources	9) Land Use and Planning	14) Transportation, Circulation and Parking
5) Energy, Mineral, Forest and Agricultural Resources	10) Noise	

To ensure that the EIR for this San Anselmo Flood Risk Reduction Project is thorough and adequate, and meets the needs of all agencies reviewing it, we are soliciting comments on specific issues to be included in the environmental review. Public comments on the scope of issues to be evaluated in the EIR are encouraged. Details of the proposed Project elements are available on the Program website: http://www.marinwatersheds.org/rossvalleywatershed-org/.

To maximize public involvement a public scoping session meeting is planned for **Thursday, April 20, 2017 from 7:00 p.m. to 9:00 p.m. at the San Anselmo Town Hall, 525 San Anselmo Avenue, San Anselmo, CA 94960.** A presentation on the Project will begin at 7:10pm. Informational stations about the Project will be available for review and input before the meeting at 6:30 p.m. and after the meeting until 9:00 p.m. Public agencies, community groups and interested members of the public are invited to attend this meeting and present oral or written comment on the proposed Project. Hard copies of the scoping session materials will not be distributed in advance of the meeting; however can be found on the Ross Valley Watershed Program website, http://www.marinwatersheds.org/rossvalleywatershed-org/, and will be available in hard copy at the scoping session. You may also subscribe to the Program website and receive notices about future meetings and new information posted to the site.

If you wish to comment during the Notice of Preparation (NOP) comment period, or if you cannot attend the scoping meeting, we will accept written comments about the scope of the environmental report until the close of the NOP comment period at **4:00 p.m. on May 8, 2017**. Commenters are advised to mail written comments (postmarked on or before May 4) to the attention of Rachel Reid, Environmental Planning Manager at 3501 Civic Center Drive, Suite 308, San Rafael, CA 94903. Comments can also be submitted via email to

EnvPlanning@marincounty.org before the end of the comment period deadline. Please direct questions about the Project description to Liz Lewis, Planning Manager in the Department of Public Works at (415) 473-7226 or lizlewis@marincounty.org.

Rachel Reid,
Environmental Planning Manager

The San Anselmo Town Hall is accessible to persons with disabilities. If you require American Sign Language interpreters, assistive listening devices, or if you require this document in an alternate format (example: Braille, Large Print, Audiotape, CD-ROM), or if you require other accommodations to participate in this meeting, you may request them by calling (415) 473-2255 (voice/TTY) or 711 for the California Relay Service or e-mailing disabilityaccess@marincounty.org at least **four working days** in advance of the event.

Responses to NOP and Disposition of NOP Responses

This appendix contains written responses to letters received by the Marin County Flood Control & Water Conservation District (Flood Control District) in response to the NOP, submitted by interested individuals and organizations related to the San Anselmo Flood Risk Reduction Project Environmental Impact Report (EIR). Also included are responses to comments received during the scoping meeting held April 20, 2017, at San Anselmo Town Hall. The scoping period closed on May 8, 2017. Seven written comments were received and four speakers provided comments during the scoping meeting. **Table A-1** includes a summary of the comments received by Flood Control District for the EIR in response to the NOP. Responses to the comments are provided in the table.

The comment letters received on the NOP follow Table A-1.

TABLE A-1
SUMMARY OF PUBLIC COMMENTS RECEIVED IN RESPONSE TO THE NOP

Date	Commenter (Organization)	Summary of Comment(s) or Topic(s)	EIR Topic and Section
April 20, 2017	Sally Goldman	• The aesthetic value of a restored creek in the downtown San Anselmo area would be a benefit to the community and the EIR should discuss that	• Section 4.2, Aesthetics and Visual Resources
April 20, 2017	Brian Hennessy	• Effects of detention basin use on local groundwater hydrology, ground settlement, and liquefaction	• Section 4.7, Geology, Seismicity, Soils, and Paleontological Resources • Section 4.9, Hydrology and Water Quality
April 20, 2017	Lise Stampfu Jorme	• Cumulative effects of upstream flood reductions on downstream communities and ecosystems should be described and evaluated	• Chapter 5, Growth-Inducing and Cumulative Effects
		• Evaluate the long-term impact of sea level rise on project effectiveness	• Section 4.9, Hydrology and Water Quality
April 20, 2017	Richard Lee	• Witnessed creek levels at various location in downtown San Anselmo, Ross, and College of Marin during winter 2016/2017 flood events	• Chapter 3, Project Description
		• Recalls activities during the flood event on the evening of 1/10/17 including the flood siren sounding, peak creek levels, flooding in downtown areas, and road closures on Sir Francis Drake Boulevard	• Section 4.9, Hydrology and Water Quality
		• Concludes that the capacity of the creek in the College of Marin/Ross areas is similar to that of downtown San Anselmo, and that most of the improvements under consideration will not prevent flooding	• Section 4.9, Hydrology and Water Quality
April 20, 2017	Carol Page	• CEQA process should include improved provision of information to the public	• Chapter 1, Introduction (CEQA process) • Chapter 3, Project Description
		• The project could increase flood risks to downstream areas	• Section 4.9, Hydrology and Water Quality
April 20, 2017	Anne Petersen	• Include description and analysis of the sequencing of different implemented flood protection actions on downstream communities	• Chapter 3, Project Description • Section 4.9, Hydrology and Water Quality
		• Include noise analysis of any pumps or other infrastructure designed to help manage flooding	• Section 4.11, Noise
April 26, 2017	Suzuki Cady + 76 other area residents	• Detention basins are unpopular to the residents, who voted down a flood basin project in San Anselmo in 2015 and have spoken out against their use and location at several flood advisory board meetings	• Chapter 3, Project Description
		• Detention basins are hazardous due to stormwater surging in and out at high velocity, and stormwater debris containing hazardous materials	• Section 4.9, Hydrology and Water Quality

TABLE A-1 (CONTINUED)
SUMMARY OF PUBLIC COMMENTS RECEIVED IN RESPONSE TO THE NOP

Date	Commenter (Organization)	Summary of Comment(s) or Topic(s)	EIR Topic and Section
April 26, 2017 (cont.)	Suzuki Cady + 76 other area residents (cont.)	• Examples of deaths due to flash floods and drowning in detention basins	• Section 4.9, Hydrology and Water Quality
		• Detention basins can fail and flood nearby residents	• Section 4.9, Hydrology and Water Quality
		• Detention basins are susceptible to clogged drains from trash, debris, and stormwater detritus	• Section 4.9, Hydrology and Water Quality
		• Detention basins require dams and spillways, which may fail over time	• Section 4.9, Hydrology and Water Quality
		• Detention basins are expensive to build and maintain, who will pay for their future maintenance?	• Chapter 3, Project Description
		• Earthquake damage to the detention basin is likely	• Section 4.7, Geology, Seismicity, Soils, and Paleontological Resources
		• Want to know who will be liable for a levee or spillway breach impacting those who live downstream	• The EIR evaluates direct, indirect, and cumulative physical effects of the project on the environment; Liability related to possible project failure is not subject to analysis under CEQA.
		• Detention basins don't work for Ross Valley due to being unpopular, hazardous, expensive, and should therefore be removed from the flood control plan	• Chapter 3, Project Description
		• Examples of what can be done instead of a detention basin	• Chapter 6, Alternatives
April 28, 2017	Sharaya Souza	• CEQA was amended in 2014 with Assembly Bill 52 (AB 52) to create a separate category of cultural resources, "tribal cultural resources", and public agencies shall, when feasible, avoid damaging effects to any tribal cultural resources • AB 52 applies to any project for which a notice of preparation or a notice of negative declaration or mitigated negative declaration is filed on or after July 1, 2015 • The Native American Heritage Commission (NAHC) recommends consultation with California Native American tribes that are traditionally and culturally affiliated with the geographic area as early as possible • This comment letter summarizes AB 52 and the additional requirements it has added to CEQA including, but not limited to, a fourteen-day period to provide Notice of Completion of an Application/Decision to undertake a project, mandatory topics of consultation if requested by a tribe, confidentially of information submitted by a tribe during the environmental review process, and recommended mitigation measures.	• Section 4.6, Cultural Resources

TABLE A-1 (CONTINUED)
SUMMARY OF PUBLIC COMMENTS RECEIVED IN RESPONSE TO THE NOP

Date	Commenter (Organization)	Summary of Comment(s) or Topic(s)	EIR Topic and Section
April 28, 2017 (cont.)1	Sharaya Souza (cont.)	• Senate Bill 18 (SB 18) applies to local governments and requires local governments to contact, provide notice to, refer plans to, and consult with tribes prior to the adoption or amendment of a general plan or a specific plan, or the designation of open space. • Some of SB 18's provisions include tribal consultation, no statutory time limit of SB 18 tribal consultation, confidentially, and conclusion of SB 18 tribal consultation. • Neither AB 52 nor SB 18 precludes agencies from initiating tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52 and SB 18 • Several actions for adequately assessing the existence and significance of tribal cultural resources and planning for avoidance, preservation in place, or barring both, mitigation of project-related impacts to tribal cultural resources are recommended by the NAHC	
April 30, 2017	Kathleen Gundry and Bill Maly	• Project design/components seem to be focused on (1) retention basins to keep a percentage of the water from flowing through the creek during storm events, and (2) flood walls and channel changes to speed up creek flow	• Chapter 3, Project Description • Chapter 6, Alternatives
		• Suggest that the county considers broadening the scope of the project or including a program of distributed Best Management Practices in residential and commercial designs	• Chapter 3, Project Description • Chapter 6, Alternatives
		• Concerned about project objectives being to alleviate flooding, and suggest they should include water quality and habitat objectives	• Chapter 3, Project Description
		• Ensure that the San Anselmo flooding project does not worsen the situation for neighbors downstream	• Section 4.9, Hydrology and Water Quality
		• Planning for improvement of stormwater management in the watershed seems imperative for long term impacts from sea-level rise on Marin communities	• Section 4.9, Hydrology and Water Quality
		• Take a more expansive, environmentally responsible approach than solutions associated with the Army Corps of Engineers	• Chapter 3, Project Description
May 8, 2017	Jean Jung	• Opposes the suggested removal of 634-636 San Anselmo Avenue	• Chapter 6, Alternatives
		• Suggests various ideas to help water flow through the area including dredging the creek and removing the weir	• Chapter 6, Alternatives

TABLE A-1 (CONTINUED)
SUMMARY OF PUBLIC COMMENTS RECEIVED IN RESPONSE TO THE NOP

Date	Commenter (Organization)	Summary of Comment(s) or Topic(s)	EIR Topic and Section
May 8, 2017 (cont.)	Jean Jung (cont.)	• Voices concern about the impacts of demolishing buildings on San Anselmo Avenue on loss of business and revenue, and does not think it is the most economical solution[1]	• This comment addresses the merits of the project and not the scope or content of the EIR, which is required under CEQA to address potential physical impacts of the proposed project.
May 8, 2017	Garril Page	• Beneficial and adverse effects on all stakeholders should be thorough as review of environmental effects[2]	• The EIR evaluates direct, indirect, and cumulative physical effects of the project on the environment. Other effects are not subject to analysis under CEQA.
		• The EIR should include the potential of this project, even in concept stage, as a deterrent to good community relations which then translate into quantifiable impacts on Aesthetics and Visual resources.	• Section 4.2 Aesthetics and Visual Resources
		• Adversarial attitudes over a structure that is perceived to be responsible for flooding can cause great harm even without a project: less business, empty storefronts, and unpleasant associations do not add to San Anselmo's "ambiance". Where future vacancies and loss of current amenities result from Project, these diminish the community as well as individuals.	• This comment addresses the merits of the proposed project and not the scope of the EIR. • The EIR focuses on physical environmental effects rather than social and economic effects
		• Changes in community relations associated with the project could affect Land Use, Population and Housing	• Section 4.10, Land Use Planning • Section 4.12, Population and Housing
		• Nursery Basin positive and negative topographic changes should be documented	• Chapter 3, Project Description
		• Aesthetic and visual effects analyses of floodwalls and structural changes should include all direct and indirect effects, including effects from root cutting	• Section 4.2, Aesthetics and Visual Resources
		• To the degree relationships and social behaviors in downtown San Anselmo, the Nursery Basin community, and the Winship Bridge neighborhood become divisive, fragmented by the Project and influences of the flawed Project process, these are identifiable as cultural losses. There have been Project and Program presentations which cause confusion and dissension instead of enabling real progress toward a shared goal. Factual errors about the Project/Program are acknowledged in public meetings, yet left uncorrected. Meeting protocols have stifled public participation, creating frustration.	• The EIR evaluates direct, indirect, and cumulative physical effects of the project on the environment. Other effects are not subject to analysis under CEQA. • Chapter 1, Introduction (CEQA process)

[1] Consistent with CEQA, economic or social effects of a project are not to be treated as significant effects on the environment (CEQA Guidelines Section 15131).
[2] Consistent with CEQA, economic or social effects of a project are not to be treated as significant effects on the environment (CEQA Guidelines Section 15131).

TABLE A-1 (CONTINUED)
SUMMARY OF PUBLIC COMMENTS RECEIVED IN RESPONSE TO THE NOP

Date	Commenter (Organization)	Summary of Comment(s) or Topic(s)	EIR Topic and Section
May 8, 2017 (cont.)	Garril Page (cont.)	• A process driven more by reliance on consultants, grant acquisition and subsequent deadlines, has resulted in wasted funding that precludes solutions that might enhance communities through better-supported local projects. This is a cultural loss.	• Chapter 1, Introduction (CEQA process)
		• When residents are forced to pay fees, yet feel unrepresented by the process, community culture suffers. Flood control as a process loses both credibility, support, and instead engenders ill-will. This is a cultural loss.	• The EIR evaluates direct, indirect, and cumulative physical effects of the project on the environment. Other effects are not subject to analysis under CEQA.
		• Biological resources effects analyses of floodwalls and structural changes should include all direct and indirect effects, including effects from root cutting.	• Section 4.5, Biological Resources
		• More information about changes to creek hydraulics and sediment transport is needed to adequately address impacts to biological resources	• Section 4.5, Biological Resources • Section 4.9, Hydrology and Water Quality
		• Sources of sediment, sediment particle sizes, and sediment analysis methods should be included in the document	• Section 4.9, Hydrology and Water Quality
		• Describe the conditions under which sediment will be deposited in the downtown reaches of San Anselmo Creek, and conditions under which sediment will be flushed into lower San Anselmo, Corte Madera, and Ross Creeks, including quantification of the transit and deposition patterns for defined, various sized sediments	• Section 4.9, Hydrology and Water Quality
		• Describe how sedimentation patterns will affect flows in downtown reaches of San Anselmo Creek	• Section 4.9, Hydrology and Water Quality
		• Describe whether the project will include testing for residual toxins at the Nursery Basin site, what testing methods may be used, and whether written testing reports will be available to homeowners and the surrounding community	• Section 4.8, Hazards and Hazardous Materials
		• Describe whether the project at the Nursery Basin will include groundwater monitoring wells and describe the monitoring process	• Section 4.9, Hydrology and Water Quality
		• Describe whether the project will include testing or monitoring to protect air, soil, and water during and after construction, whether written reports to the surrounding community will be provided for a specified period of time, and what the period of reporting will be	• Mitigation measures developed for the project are identified in Chapters 4 and 5 of this EIR; the final mitigation monitoring and reporting program will be adopted as part of project approval. (CEQA Guidelines Sections 15091 and 15097)
		• Describe efforts to coordinate with Ross Valley Sanitary District to protect from floodwater pollution associated with sewer overflow conditions, spills, and pipeline breaks or blockages during project construction and operation	• Section 4.13, Public Services and Utilities

TABLE A-1 (CONTINUED)
SUMMARY OF PUBLIC COMMENTS RECEIVED IN RESPONSE TO THE NOP

Date	Commenter (Organization)	Summary of Comment(s) or Topic(s)	EIR Topic and Section
May 8, 2017 (cont.)	Garril Page (cont.)	• Evaluation of hazards and utility service interruption should account for inconvenience, liability, and emergency response, as well as identifying entity responsible for organizing and executing plans	• Section 4.13, Public Services and Utilities
		• Describe steps that will be undertaken to help educate and prepare residents for the disruptive impacts to their daily lives by this Project	• Section 4.13, Public Services and Utilities
		• Describe emergency dewatering plans for the Nursery Basin	• Chapter 3, Project Description
		• Describe number of spillways at Nursery Basin	• Chapter 3, Project Description
		• Describe plans to dewater the Nursery Basin after each flood event, and estimate time required to empty Basin	• Chapter 3, Project Description
		• Describe whether rodent extermination is planned at Nursery Basin	• Chapter 3, Project Description
		• Identify who is responsible for Nursery Basin embankment integrity.	• Chapter 3, Project Description
		• Describe the size of the vegetative buffer surrounding the Nursery Basin.	• Chapter 3, Project Description
		• Describe how the stormwater collection system would be maintained free of leaves and debris, and which agency would be responsible for maintenance.	• Chapter 3, Project Description
		• Are there detention basins comparable to the Nursery Basin? Where are the comparable basins?	• This comment is on the merits of the proposed project and not the scope of the EIR.
		• Included by reference are comments from Garril Page on the Program EIR dated February 24, 2017	• Included by reference are responses to comments from Garril Page on the Program EIR, dated February 24, 2017.

-----Original Message-----
From: Brian Hennessy [mailto:hennessydds@comcast.net]
Sent: Thursday, April 20, 2017 8:55 PM
To: EnvPlanning
Cc: Brian Hennessy
Subject: Sunnyside Detention basin attention Rachel Reid

Rachel, I live at 16 Deer Creek Court ; the adjacent property on the western and creek side of the planned Sunnyside basin. I would hope and expect the EIR to address some hydrology questions I have. Common sense would tell me that when water is retained in the creek (first part of basin) and Sunnyside my water table will rise. When released it will fall. This will create at the very least increase settling of my house, which we've lived in for twenty five years. The increase in saturated soil under my house will also increase the risk of liquefaction. Look forward to your response, Brian

From: Richard Lee [mailto:rlbuilder@comcast.net]
Sent: Thursday, April 20, 2017 10:29 PM
To: EnvPlanning
Subject: Flood project comment

Hi Rachel,

I attended the 4/20/17 flood project meeting at San Anselmo Town Hall and made a comment at the end of the meeting regarding capacity of the creeks from downtown San Anselmo through Kentfield at the College of Marin. I'd like to follow up with a more thorough explanation of what I saw and the conclusions I draw from this winter's flood events.

For the flood events of 12/15/16, 1/10/17, and 2/7/17 I witnessed creek levels at various locations in downtown San Anselmo, Ross, and College of Marin. I also carefully followed rainfall rates and online creek level postings. I wish to call attention to conditions for the flood event on the evening of 1/10/17:

- San Anselmo flood siren sounded at approximately 7:00 pm
- Peak creek level at downtown San Anselmo was >13 feet according to the online gauge information
- Tide level at 7:30 pm was approximately +2.0 ft and rising with a high tide of +5.0 ft expected at 11:00 pm
- Flooding was beginning in downtown San Anselmo, Ross, and in the College of Marin parking lot just upstream of College Avenue.
- The entire Ross Creek canal from the concrete section through College of Marin till where it opens up to the wider, more natural portion was FULL or within an inch or two of full.
- Sir Francis Drake Blvd. through Ross was closed, I assume because of flooding there.

The overall flood project concerns much more than the snapshot I describe above, but I have to conclude that capacity of the creek in the College of Marin/Ross areas is already very similar to that of downtown San Anselmo. If that is a reasonable conclusion, then most if not all of the improvements under consideration for downtown San Anselmo will not prevent flooding. I would argue that detention basins should be of higher priority than any improvements in downtown San Anselmo until the capacity of the entire creek can be improved.

I would appreciate it if you would circulate my comments to appropriate parties. Thank you for your consideration.

Regards,
Richard

Richard Lee Fine Carpentry
101 Hilldale Drive

San Anselmo, CA 94960
415-497-1253 ph.
#874967

From: Suzuki C [mailto:suzukicady@gmail.com]
Sent: Wednesday, April 26, 2017 12:24 PM
To: EnvPlanning
Subject: Attn: Rachel Reed, comments on SAN ANSELMO FLOOD RISK REDUCTION PROJECT

Hello Rachel,

Please submit the following comments on the SAN ANSELMO FLOOD RISK REDUCTION PROJECT for its EIR:

The following letter is co-signed by 77 area residents.

Detention basins are unpopular.

Residents in San Anselmo voted down a flood basin project slated for Memorial Park in 2015.

Many residents have spoken out against their use (or their locations) at countless Flood Zone 9 Ross Valley flood advisory board meetings. Perhaps that is why the flood advisory board has chosen not to record their meetings — a bad faith policy.

Detention basins are hazardous.

Storm water surges in and out of these structures at high velocity. Storm water debris contains hazardous materials.

Following a flash flood in Hawaii, a girl drowned in a 4-ft high flood basin which had a drain blocked by debris, while trying to save a friend who had fallen in.

Las Vegas had a flash flood last year where three people drowned in municipal flood control facilities (July 1-3). One body was found in a detention basin the day after the storm, and two others were swept away and drowned in flood channels that divert water into detention basins there. One was a woman trapped by debris in the rushing waters of the channel. Rescuers tried unsuccessfully to save her. Las Vegas has spent $1.7 billion on its flood control, by the way.

Detention basins can fail.

A detention basin failed in Mesa, Arizona, due to improper maintenance, and flooded the 200 homes nearby. Since those homes weren't previously in a flood zone, the 200 residents affected did not have flood insurance. (Lots of stories like this over the past few years.)

Detention basins are susceptible to clogged drains from trash, debris and storm water detritus. They require a lot of timely maintenance.

Detention basins require dams and spillways. Levees and spillways tend to fail over time (observe the Oroville Dam and Spillway this year).

Detention basins are expensive.

Building them is extremely expensive. Maintaining them is, too — a cost with no end.

Impossible to know how well the flood basins would be maintained over time — or who will pay for all their future maintenance needs, upgrades, renovations, and retrofits.

Earthquake damage to the structures is likely at some point.

Who would be liable for any levee or spillway breaches impacting those who live downstream of them?

Detention basins don't work for the Ross Valley.

Because flood detention basins are unpopular, hazardous, expensive, and complicated, they are not the right path forward for the Ross Valley. They should be removed from its flood control program.

What can be done instead?

Matt Smeltzer, P.E. Engineer/Geomorphologist, has a submitted a powerful approach to address flooding in San Anselmo: Creek daylighting and restoration.

Downtown San Anselmo creek restoration is an extremely effective, sustainable, environmentally-friendly, less-expensive solution. Watch his presentation to the San Anselmo Town Council (link below).

Let's proceed down that path.

Thank you,
Suzuki Cady, Fairfax; Dine DeMarlie, Fairfax; Doug Addis, Fairfax; Kelly Alpert, Fairfax; Richard Alpert, Fairfax; Ling Shien Bell, Fairfax; Mark Bell, Fairfax; Claudia Belshaw, Fairfax; David Belshaw, Fairfax; Patty Bredt, Fairfax; Wendy Botwin, Fairfax; Tracy Brien, Fairfax (business); Ellen Caldwell, San Anselmo; Susanne Chaney, Fairfax; Nancy Clothier, Fairfax; Jim Collier, Fairfax; Dottie Escue, Fairfax; Ellen Floyd, Fairfax; Evangeline Fugazzotto, Fairfax; Cormac Gannon, Fairfax; Marc Hammerman, Fairfax; Nancy Hammerman, Fairfax; Sandy Handsher, Fairfax; Pamela Hayes, Fairfax; Jim Hill, Fairfax; Karl Hoagland, Fairfax; Janet Knudsen, Fairfax; Russell Knudsen, Fairfax; Gail Koffman, Fairfax; Janusz Kolodziejczyk, Fairfax; Henry Kyburg, Fairfax; Jennifer Laursen, Fairfax; Stefan Laursen, Fairfax; Ralph Lewin, Fairfax; Lindsay London Stocker, Fairfax; Christine Margetic, Fairfax; Merrell Maschino, Fairfax; Petra McClinton, Fairfax; Katya McCullogh, San Anselmo; Rick Meissner, Fairfax; Glenn Miwa, Fairfax, San Anselmo (business); Laura Miwa, Fairfax, San Anselmo (business); Nancy Morita, Fairfax; Megan Murdock, Fairfax; Robert Murdock, Fairfax; Joseph Odom, Fairfax; Nancy Okada, San Anselmo; Garril Page, San Anselmo; Diana Perdue, Fairfax; Jamie Redford, Fairfax; Kyle Redford, Fairfax; Tina Salter, Fairfax; Otis Scarecroe, Fairfax; Akiko Schertell, Fairfax; Cathy Shea, Fairfax; George Shea, Fairfax; Cristina Simmons, Fairfax; John Simmons, Fairfax; Sabrina Simmons, Fairfax; Douglas Smith, Fairfax; Mark Solomons, Fairfax; Michael Stocker, Forest Knolls; George Taylor, Fairfax; Ben Tedder, Fairfax; Camila Tedder, Fairfax; Claire Thuesen, Fairfax; Thue Thuesen, Fairfax; Claudia Tomaso, Fairfax; Lew Tremaine, Fairfax; Martha Ture, Fairfax; Michael Van Metre, Fairfax; Bryan

Vidinsky, San Anselmo; Tom Vogelheim, Fairfax; Scott Walker, Fairfax; Birgit Wick, Fairfax; Mark Woodrow, Fairfax; Gordon Wright, Fairfax

Links to Sources:

http://bit.ly/2oxcMeB (Research Assessing the Safety Hazards Associated with Detention Basins)
twitter.com/SaveLeftyGomez (links to multiple articles)
www.saveleftygomez.com/news (links to multiple articles)
Matt Smeltzer's Creek Restoration presentation to San Anselmo Town Council, 10/25/16 (Agenda Item 10)
http://bayareane.ws/2qfq2AP (Greener Solutions article by Warren Karlenzig)
http://www.saveleftygomez.com/detention-basin-failures.html (links to multiple articles)
http://www.saveleftygomez.com/ (Save White Hill School/Lefty Gomez Field)
http://www.facebook.com/saveleftygomez/ (links to multiple articles)

STATE OF CALIFORNIA Edmund G. Brown Jr., Governor
NATIVE AMERICAN HERITAGE COMMISSION
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West Sacramento, CA 95691
Phone (916) 373-3710
Fax (916) 373-5471
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Website: http://www.nahc.ca.gov
Twitter: @CA_NAHC

April 28, 2017

Rachel Reid
Marin County

Sent by Email: EnvPlanning@marincounty.org

RE: SCH#2017042041, San Anselmo Flood Risk Reduction Project, Marin County

Dear Ms. Reid:

The Native American Heritage Commission has received the Notice of Preparation (NOP) for the project referenced above. The California Environmental Quality Act (CEQA) (Pub. Resources Code § 21000 et seq.), specifically Public Resources Code section 21084.1, states that a project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment. (Pub. Resources Code § 21084.1; Cal. Code Regs., tit.14, § 15064.5 (b) (CEQA Guidelines Section 15064.5 (b)). If there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, an environmental impact report (EIR) shall be prepared. (Pub. Resources Code § 21080 (d); Cal. Code Regs., tit. 14, § 15064 subd.(a)(1) (CEQA Guidelines § 15064 (a)(1)). In order to determine whether a project will cause a substantial adverse change in the significance of a historical resource, a lead agency will need to determine whether there are historical resources with the area of project effect (APE).

CEQA was amended significantly in 2014. Assembly Bill 52 (Gatto, Chapter 532, Statutes of 2014) (AB 52) amended CEQA to create a separate category of cultural resources, "tribal cultural resources" (Pub. Resources Code § 21074) and provides that a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment. (Pub. Resources Code § 21084.2). Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource. (Pub. Resources Code § 21084.3 (a)). **AB 52 applies to any project for which a notice of preparation or a notice of negative declaration or mitigated negative declaration is filed on or after July 1, 2015.** If your project involves the adoption of or amendment to a general plan or a specific plan, or the designation or proposed designation of open space, on or after March 1, 2005, it may also be subject to Senate Bill 18 (Burton, Chapter 905, Statutes of 2004) (SB 18). **Both SB 18 and AB 52 have tribal consultation requirements.** If your project is also subject to the federal National Environmental Policy Act (42 U.S.C. § 4321 et seq.) (NEPA), the tribal consultation requirements of Section 106 of the National Historic Preservation Act of 1966 (154 U.S.C. 300101, 36 C.F.R. § 800 et seq.) may also apply.

The NAHC recommends consultation with California Native American tribes that are traditionally and culturally affiliated with the geographic area of your proposed project as early as possible in order to avoid inadvertent discoveries of Native American human remains and best protect tribal cultural resources. Below is a brief summary of portions of AB 52 and SB 18 as well as the NAHC's recommendations for conducting cultural resources assessments. **Consult your legal counsel about compliance with AB 52 and SB 18 as well as compliance with any other applicable laws.**

AB 52

AB 52 has added to CEQA the additional requirements listed below, along with many other requirements:

1. Fourteen Day Period to Provide Notice of Completion of an Application/Decision to Undertake a Project: Within fourteen (14) days of determining that an application for a project is complete or of a decision by a public agency to undertake a project, a lead agency shall provide formal notification to a designated contact of, or

tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, to be accomplished by at least one written notice that includes:

   a. A brief description of the project.
   b. The lead agency contact information.
   c. Notification that the California Native American tribe has 30 days to request consultation. (Pub. Resources Code § 21080.3.1 (d)).
   d. A "California Native American tribe" is defined as a Native American tribe located in California that is on the contact list maintained by the NAHC for the purposes of Chapter 905 of Statutes of 2004 (SB 18). (Pub. Resources Code § 21073).

2. Begin Consultation Within 30 Days of Receiving a Tribe's Request for Consultation and Before Releasing a Negative Declaration, Mitigated Negative Declaration, or Environmental Impact Report: A lead agency shall begin the consultation process within 30 days of receiving a request for consultation from a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project. (Pub. Resources Code § 21080.3.1, subds. (d) and (e)) and prior to the release of a negative declaration, mitigated negative declaration or environmental impact report. (Pub. Resources Code § 21080.3.1(b)).

   a. For purposes of AB 52, "consultation shall have the same meaning as provided in Gov. Code § 65352.4 (SB 18). (Pub. Resources Code § 21080.3.1 (b)).

3. Mandatory Topics of Consultation If Requested by a Tribe: The following topics of consultation, if a tribe requests to discuss them, are mandatory topics of consultation:

   a. Alternatives to the project.
   b. Recommended mitigation measures.
   c. Significant effects. (Pub. Resources Code § 21080.3.2 (a)).

4. Discretionary Topics of Consultation: The following topics are discretionary topics of consultation:

   a. Type of environmental review necessary.
   b. Significance of the tribal cultural resources.
   c. Significance of the project's impacts on tribal cultural resources.
   d. If necessary, project alternatives or appropriate measures for preservation or mitigation that the tribe may recommend to the lead agency. (Pub. Resources Code § 21080.3.2 (a)).

5. Confidentiality of Information Submitted by a Tribe During the Environmental Review Process: With some exceptions, any information, including but not limited to, the location, description, and use of tribal cultural resources submitted by a California Native American tribe during the environmental review process shall not be included in the environmental document or otherwise disclosed by the lead agency or any other public agency to the public, consistent with Government Code sections 6254 (r) and 6254.10. Any information submitted by a California Native American tribe during the consultation or environmental review process shall be published in a confidential appendix to the environmental document unless the tribe that provided the information consents, in writing, to the disclosure of some or all of the information to the public. (Pub. Resources Code § 21082.3 (c)(1)).

6. Discussion of Impacts to Tribal Cultural Resources in the Environmental Document: If a project may have a significant impact on a tribal cultural resource, the lead agency's environmental document shall discuss both of the following:

   a. Whether the proposed project has a significant impact on an identified tribal cultural resource.
   b. Whether feasible alternatives or mitigation measures, including those measures that may be agreed to pursuant to Public Resources Code section 21082.3, subdivision (a), avoid or substantially lessen the impact on the identified tribal cultural resource. (Pub. Resources Code § 21082.3 (b)).

7. Conclusion of Consultation: Consultation with a tribe shall be considered concluded when either of the following occurs:

   a. The parties agree to measures to mitigate or avoid a significant effect, if a significant effect exists, on a tribal cultural resource; or
   b. A party, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached. (Pub. Resources Code § 21080.3.2 (b)).

8. Recommending Mitigation Measures Agreed Upon in Consultation in the Environmental Document: Any mitigation measures agreed upon in the consultation conducted pursuant to Public Resources Code section 21080.3.2 shall be recommended for inclusion in the environmental document and in an adopted mitigation monitoring and reporting program, if determined to avoid or lessen the impact pursuant to Public Resources Code section 21082.3, subdivision (b), paragraph 2, and shall be fully enforceable. (Pub. Resources Code § 21082.3 (a)).

9. Required Consideration of Feasible Mitigation: If mitigation measures recommended by the staff of the lead agency as a result of the consultation process are not included in the environmental document or if there are no agreed upon mitigation measures at the conclusion of consultation, or if consultation does not occur, and if substantial evidence demonstrates that a project will cause a significant effect to a tribal cultural resource, the lead agency shall consider feasible mitigation pursuant to Public Resources Code section 21084.3 (b). (Pub. Resources Code § 21082.3 (e)).

10. Examples of Mitigation Measures That, If Feasible, May Be Considered to Avoid or Minimize Significant Adverse Impacts to Tribal Cultural Resources:
    a. Avoidance and preservation of the resources in place, including, but not limited to:
        i. Planning and construction to avoid the resources and protect the cultural and natural context.
        ii. Planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.
    b. Treating the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:
        i. Protecting the cultural character and integrity of the resource.
        ii. Protecting the traditional use of the resource.
        iii. Protecting the confidentiality of the resource.
    c. Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.
    d. Protecting the resource. (Pub. Resource Code § 21084.3 (b)).
    e. Please note that a federally recognized California Native American tribe or a nonfederally recognized California Native American tribe that is on the contact list maintained by the NAHC to protect a California prehistoric, archaeological, cultural, spiritual, or ceremonial place may acquire and hold conservation easements if the conservation easement is voluntarily conveyed. (Civ. Code § 815.3 (c)).
    f. Please note that it is the policy of the state that Native American remains and associated grave artifacts shall be repatriated. (Pub. Resources Code § 5097.991).

11. Prerequisites for Certifying an Environmental Impact Report or Adopting a Mitigated Negative Declaration or Negative Declaration with a Significant Impact on an Identified Tribal Cultural Resource: An environmental impact report may not be certified, nor may a mitigated negative declaration or a negative declaration be adopted unless one of the following occurs:
    a. The consultation process between the tribes and the lead agency has occurred as provided in Public Resources Code sections 21080.3.1 and 21080.3.2 and concluded pursuant to Public Resources Code section 21080.3.2.
    b. The tribe that requested consultation failed to provide comments to the lead agency or otherwise failed to engage in the consultation process.
    c. The lead agency provided notice of the project to the tribe in compliance with Public Resources Code section 21080.3.1 (d) and the tribe failed to request consultation within 30 days. (Pub. Resources Code § 21082.3 (d)).

The NAHC's PowerPoint presentation titled, "Tribal Consultation Under AB 52: Requirements and Best Practices" may be found online at: http://nahc.ca.gov/wp-content/uploads/2015/10/AB52TribalConsultation_CalEPAPDF.pdf

SB 18

SB 18 applies to local governments and requires local governments to contact, provide notice to, refer plans to, and consult with tribes prior to the adoption or amendment of a general plan or a specific plan, or the designation of open space. (Gov. Code § 65352.3). Local governments should consult the Governor's Office of Planning and Research's "Tribal Consultation Guidelines," which can be found online at: https://www.opr.ca.gov/docs/09_14_05_Updated_Guidelines_922.pdf

Some of SB 18's provisions include:

1. Tribal Consultation: If a local government considers a proposal to adopt or amend a general plan or a specific plan, or to designate open space it is required to contact the appropriate tribes identified by the NAHC by requesting a "Tribal Consultation List." If a tribe, once contacted, requests consultation the local government must consult with the tribe on the plan proposal. **A tribe has 90 days from the date of receipt of notification to request consultation unless a shorter timeframe has been agreed to by the tribe.** (Gov. Code § 65352.3 (a)(2)).
2. No Statutory Time Limit on SB 18 Tribal Consultation. There is no statutory time limit on SB 18 tribal consultation.
3. Confidentiality: Consistent with the guidelines developed and adopted by the Office of Planning and Research pursuant to Gov. Code section 65040.2, the city or county shall protect the confidentiality of the information concerning the specific identity, location, character, and use of places, features and objects described in Public Resources Code sections 5097.9 and 5097.993 that are within the city's or county's jurisdiction. (Gov. Code § 65352.3 (b)).
4. Conclusion of SB 18 Tribal Consultation: Consultation should be concluded at the point in which:
    a. The parties to the consultation come to a mutual agreement concerning the appropriate measures for preservation or mitigation; or
    b. Either the local government or the tribe, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached concerning the appropriate measures of preservation or mitigation. (Tribal Consultation Guidelines, Governor's Office of Planning and Research (2005) at p. 18).

Agencies should be aware that neither AB 52 nor SB 18 precludes agencies from initiating tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52 and SB 18. For that reason, we urge you to continue to request Native American Tribal Contact Lists and "Sacred Lands File" searches from the NAHC. The request forms can be found online at: http://nahc.ca.gov/resources/forms/

NAHC Recommendations for Cultural Resources Assessments

To adequately assess the existence and significance of tribal cultural resources and plan for avoidance, preservation in place, or barring both, mitigation of project-related impacts to tribal cultural resources, the NAHC recommends the following actions:

1. Contact the appropriate regional California Historical Research Information System (CHRIS) Center (http://ohp.parks.ca.gov/?page_id=1068) for an archaeological records search. The records search will determine:
    a. If part or all of the APE has been previously surveyed for cultural resources.
    b. If any known cultural resources have been already been recorded on or adjacent to the APE.
    c. If the probability is low, moderate, or high that cultural resources are located in the APE.
    d. If a survey is required to determine whether previously unrecorded cultural resources are present.

2. If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
    a. The final report containing site forms, site significance, and mitigation measures should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum and not be made available for public disclosure.
    b. The final written report should be submitted within 3 months after work has been completed to the appropriate regional CHRIS center.

3. Contact the NAHC for:
    a. A Sacred Lands File search. Remember that tribes do not always record their sacred sites in the Sacred Lands File, nor are they required to do so. A Sacred Lands File search is not a substitute for consultation with tribes that are traditionally and culturally affiliated with the geographic area of the project's APE.

b. A Native American Tribal Consultation List of appropriate tribes for consultation concerning the project site and to assist in planning for avoidance, preservation in place, or, failing both, mitigation measures.

4. Remember that the lack of surface evidence of archaeological resources (including tribal cultural resources) does not preclude their subsurface existence.
   a. Lead agencies should include in their mitigation and monitoring reporting program plan provisions for the identification and evaluation of inadvertently discovered archaeological resources per Cal. Code Regs., tit. 14, section 15064.5(f) (CEQA Guidelines section 15064.5(f)). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American with knowledge of cultural resources should monitor all ground-disturbing activities.
   b. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the disposition of recovered cultural items that are not burial associated in consultation with culturally affiliated Native Americans.
   c. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the treatment and disposition of inadvertently discovered Native American human remains. Health and Safety Code section 7050.5, Public Resources Code section 5097.98, and Cal. Code Regs., tit. 14, section 15064.5, subdivisions (d) and (e) (CEQA Guidelines section 15064.5, subds. (d) and (e)) address the processes to be followed in the event of an inadvertent discovery of any Native American human remains and associated grave goods in a location other than a dedicated cemetery.

If you have any questions, please contact me at my email address: sharaya.souza@nahc.ca.gov.

Sincerely,

Sharaya Souza
Staff Services Analyst
cc: State Clearinghouse

From: Kathleen Gundry [mailto:kgundry@verizon.net]
Sent: Sunday, April 30, 2017 9:08 PM
To: EnvPlanning
Cc: wmaly@verizon.net
Subject: San Anselmo Flood Risk Reduction Project EIR Scoping Comments

To: Rachel Reid, Environmental Planner, Marin County Community Development Agency

From: Kathleen Gundry and Bill Maly, 70 Barber Ave, San Anselmo, CA 949660

Re: San Anselmo flood risk reduction EIR/Programmatic EIR for the Ross Valley watershed

We are San Anselmo residents who own a home on San Anselmo Creek. Though our house is too high to be at risk of flooding, we want our community to be protected from frequent floods so that downtown merchants no longer lose revenue days and other neighbors do not have to live in fear of flood waters in their homes every time it rains.

We attended the EIR scoping meeting on April 20, 2017, at the San Anselmo Town Hall to learn about the project and the EIR process. These comments address the proposed San Anselmo Flood Risk Reduction project within the context of the broader Ross Valley project. We hope these comments can be used to shape the composition of the project or the evaluated alternatives with the intent of reducing environmental impacts on water quality and stream health, while meeting the objectives of flood risk reduction in San Anselmo and in the broader Ross Valley.

Project Design. Current Project components seem to be mostly focused on two types of relatively large-scale engineering solutions to reduce flood risk: (1) retention basins to keep a percentage of the water from flowing through the creek during storm events, and (2) flood walls and channel changes to speed up creek flow. We suggest that the county consider broadening the scope of the project or including in the evaluated alternatives a program of distributed Best Management Practices in residential and commercial design—such as rain gardens, rain barrels and cisterns, and other infrastructure projects like green streets.

Project objectives. The flooding problem is closely linked to stream health. If the main objective is to alleviate flooding, this leads to a project design aimed at speeding up creek flow, which is not conducive to a healthy stream environment. We suggest that the project objectives include water quality and habitat objectives. This would ensure that the EIR would include measurement of stream pollution, microorganism content, and species diversity, and address those impacts and measures to mitigate them. We also want to make sure the long-overdue solution to San Anselmo's flooding problem does not worsen the situation for our downstream neighbors and thereby create the need for other large-scale engineering projects downstream to deal with increased water flows.

A project design that seeks to reduce runoff by reducing impervious surfaces and capturing water in a variety of ways may also be able to reduce the speed of creek flow—by reducing runoff from neighborhoods into the creek—thus improving stream health and reducing the potential downstream impacts of flooding and pollution runoff during a storm event. Though planning for improvement of storm water management in the watershed may seem like a long-term goal that will not provide immediate relief from flooding, it seems imperative in light of the inevitable sea-level rise and its impact on Marin communities. In addition, a healthy stream environment could be an asset to the aesthetics of the community, facilitating development of creek-focused development to replace the current structures that essentially cover the creek with concrete buildings.

While solutions associated with the Army Corps of Engineers are probably a necessary part of the plan to reduce flooding, we would like to see the plan take a more expansive, environmentally responsible approach. Here are a few links that you may find useful in considering an enhanced storm water management program:

Center for Watershed Protection (www.cwp.org).

City of Philadelphia's plans for green storm water management: http://www.phillywatersheds.org/what_were_doing/documents_and_data/cso_long_term_control_plan

City of Los Angeles storm water management planning programs:

- http://www.lastormwater.org/
- Low Impact Development guides and ordinances: http://www.lastormwater.org/green-la/
- Detailed watershed management plans that incorporate low impact development: http://www.lastormwater.org/green-la/enhanced-watershed-management-program/

We look forward to the next steps in the EIR process and hope that the project that takes shape will benefit the immediate San Anselmo community and the greater Ross Valley and San Francisco Bay.

Kathleen Gundry and Bill Maly

70 Barber Ave.

San Anselmo, CA 94960

-----Original Message-----
From: Jean Jung [mailto:jeanmjung@earthlink.net]
Sent: Monday, May 08, 2017 10:26 PM
To: EnvPlanning
Subject: flood mitigation issues.

I have owned property in fairfax since 1972. I also now am a part owner of a building at 574 San Anselmo Ave. San Anselmo, CA.I have owned and operated Gold Dreams Jewelry in San Anselmo since 1989. I have witnessed and have been impacted by the flood of 1982, 1987 and 2005.

I strongly oppose the suggested removal of 634-636 San Anselmo Ave. Removing the buildings in no way would guarantee the area wouldn't flood but it would destroy the downtown business community.

If the creek was dredged and the weir removed that would help water flow. I would think that creating a catch basin in the park on the opposite side of the creek from 634-636 would help water flow. Making the creek wider from the park side would also make water flow easier. If flood gates were created along the creek depositing water in to a detainment area built under the park and then releasing the water as the flow decreased is an idea that seems to have merit. This would be in addition to a possible basin in Fairfax.

It was stated that removing the building was the most economical solution which makes no sense to me. Purchasing buildings and then paying to have them demolished destroying the businesses along San Anselmo while the work was being done and then the aftermath of people no longer coming down to the avenue since they would no longer think about shopping there would create a serious drain on the economy of San Anselmo. Much of the loss of business and revenue can not be measured in an economic forecast. Additionally the lives of the business owners and members of the community would be seriously impacted in a negative way.

There are many ideas as to ways to solve the flooding issue in Fairfax, San Anselmo and the other towns in the Ross valley. It seems like a broader view of the possibilities would help find a solution that would save the buildings and the business community.

Sincerely,

Jean M. Jung
415 453-3050

Comment on Project EIR

May 8. 2017

My comment is primarily on Alternative 2A, Removal of Building Bridge 2 (# 634-636 San Anselmo Ave), creek improvements/flood barriers, and Nursery Detention Basin, which may include creek alterations and removal of the Winship Bridge.

Undeniably, ambiance, and San Anselmo's small town character are a major part of San Anselmo's appeal. To the extent this perception is lessened, the entire community and surrounding area are adversely affected.

1. Aesthetics and Visual Resources

a.) Flooding in downtown San Anselmo is historic, a condition that has been recognized for decades. This Project is new. Comparing the effects of flooding versus the effects of the proposed Project is appropriate, and the comparison of beneficial and adverse effects on all stakeholders should be as thorough as the review of other Environmental Effects. Lines of sandbags can be viewed as deleterious or as a sign of community spirit and resilience.

b.) At the May 3, 2017, merchants' meeting, several commenters identified negative impacts already experienced by residents and merchants in downtown areas due to their inclusion in, or proximity to, this project. The EIR should include the potential of this project, even in concept stage, as a deterrent to good community relations which then translate into quantifiable impacts on Aesthetics and Visual resources.

c.) Adversarial attitudes over a structure that is perceived to be responsible for flooding can cause great harm even without a project: less business, empty storefronts, and unpleasant associations do not add to San Anselmo's "ambiance". Where future vacancies and loss of current amenities result from Project, these diminish the community as well as individuals.

d.) Those affected by the Nursery Basin, including those homeowners who felt compelled to defensive legal action, can be included under (b.) above and consideration of the Nursery Basin neighbors' community relations applies equally to (c.) above which affects Land Use, Population and Housing also.

e.) The Nursery Basin site should clearly identify both positive and negative elevations of the basin's design in terms of pre-project ground levels. This is an obvious Aesthetic and Visual Resource effect needing documentation and inclusion.

d.) All floodwalls and structural changes should document both above grade and below grade changes as these affect Aesthetic and Visual Resources both immediately and well into the future. For example, trees that suffer root cuts, may take years to to die.

2. Cultural Resources

a.) To the degree relationships and social behaviors in downtown San Anselmo, the Nursery Basin community, and the Winship Bridge neighborhood become divisive, fragmented by the Project and influences of the flawed Project process, these are identifiable as cultural losses. There have been Project and Program presentations which cause confusion and dissension instead of enabling real progress toward a shared goal. Factual errors about the Project/Program are acknowledged in public meetings, yet left uncorrected. Meeting protocols have stifled public participation, creating frustration.

b.) A process driven more by reliance on consultants, grant acquisition and subsequent deadlines, has resulted in wasted funding that precludes solutions that might   enhance communities through better-supported local projects. This is a cultural loss.

c.) When residents are forced to pay fees, yet feel unrepresented by the process, community culture suffers. Flood control as a process loses both credibility, support, and instead engenders ill-will. This is a cultural loss.

3. Biological Resources, Water Quality

a.) All floodwalls and structural changes should document both above grade and below grade changes because these affect Biological Resources both immediately and well into the future. Vegetation that suffers root damage may take years to to die. Impacts on creek resources, riparian and benthic losses may take several years to become apparent.

b.) Hydraulic changes caused by altered sediment deposition and transit patterns heavily impact creek modification projects. Comments on the critical topic of Biological Resources in and along San Anselmo Creek are impeded because the Project is not designed, hydraulic models are incomplete, discharge and channel capacities are unknown.

c.) What are the sources of sediment deposition being studied?

d.) Under what conditions will additional sediment deposit in the downtown reaches of San Anselmo Creek, how will this affect flows, what maintenance will be required, and who will be charged with the performance of this maintenance?

e.) Under what conditions will sediment be flushed downstream into lower San Anselmo, Corte Madera and Ross Creeks? The response should include quantification of the transit and deposition patterns for defined, various sized sediment?

f.) What sediment particle sizes are being studied and what analysis methods considered appropriate to the studies being performed?

g.) Prior uses of the Nursery Basin may result in toxic residues at the site. Will the project include testing to assure there are no residual toxins? What methods of testing? What assurances will be made to neighboring homeowners? Will these include written reports to the surrounding community?

4. Natural Resources, Soils, Hazards, Water Quality

a.) Past uses of the Nursery Basin may result in a toxic subterranean plume moving toward neighboring homes. Will the project include monitoring wells? What will be the monitoring process: depth, type and frequency of testing, and will it include providing reports to homeowners?

b.) Will the project include testing to assure safe air, soil, water during and after construction? What assurances will be made to neighboring homeowners? Will these include written reports to the surrounding community for a specified period? If so, define the period of time?

5. Utilities and Service Systems

a.) Floodwaters are known to spread pollution. What efforts will be made to assure the Project coordinates with RVSD to assure protection from sewer overflow conditions, spills, breaks and blockages both during and post-construction?

b.) Hazards and interruption to electric and gas services should take full account of all aspects of inconvenience and liability, including plans for emergency response. Who is responsible for organizing and execution of these plans?

c.) What steps will be undertaken to help educate and prepare residents for the disruptive impacts to their daily lives by this Project?

6. Land Use and Planning, Parks & Recreation, Hazards

a.) Recent flood events have been during serial storms. What plans exist for dewatering the Nursery Basin on an emergency basis? Detail the design plans for freeboard allowance and emergency spillway use.

b.) How many spillways will the Nursery Basin have?

c.) Detention basins that impound water between events pose a hazard, especially if the Nursery Basin is used as a park or recreational area. What design and plans exist for completely dewatering the basin after each event? How much time is needed to empty the basin?

d.) What means of rodent extermination is planned for the Nursery Basin?

Who is responsible for maintaining embankment integrity?

e.) The nursery basin is located in a wooded area. What size vegetative buffer is planned?

f.) How will the stormwater collection system be maintained free of leaves and debris? Who is responsible for this task?

g.) Basin sites shown in community meeting presentations are multiple-acre, flat, sunny, grassy areas with gradually-sloped, low embankment walls and located in a floodplain. The Nursery Basin site appears unlike any sites in those presentation slides and photographs. Are there detention basins comparable to the Nursery Basin? Where are the comparable basins?

Since there is overlap between the Program and Project EIRs and in order to minimize repetition, I include by reference relevant portions of my Comment on the PEIR, dated Feb 24, 2017, attached below.

Thank you for the opportunity Comment on the Project EIR.

//s//

Garril Page
San Anselmo.

1

(PLEASE PRINT LEGIBLY) Date: 4/20/17

Project EIR: SA Flood Risk Reduction

MARIN COUNTY ENVIRONMENTAL REVIEW
PUBLIC SCOPING SESSION
PUBLIC TESTIMONY SIGN-IN CARD

Name: Sandy Guldman

Email:

Representing: Friends of CM Creek

Please submit this card to staff; and
LIMIT YOUR COMMENTS TO 3 MINUTES MAXIMUM.

2

(PLEASE PRINT LEGIBLY) Date: 4/20/2017

Project EIR:

MARIN COUNTY ENVIRONMENTAL REVIEW
PUBLIC SCOPING SESSION
PUBLIC TESTIMONY SIGN-IN CARD

Name: ANNE PETERSEN

Email: annepetersen129@gmail.com

Representing: Kentfield

- Please submit this card to staff; and
- **LIMIT YOUR COMMENTS TO 3 MINUTES MAXIMUM.**

3

(PLEASE PRINT LEGIBLY) Date: APRIL 20, 2017

Project EIR: San Anselmo

MARIN COUNTY ENVIRONMENTAL REVIEW
PUBLIC SCOPING SESSION
PUBLIC TESTIMONY SIGN-IN CARD

Name: ~~John Bartolomi~~ withdrew

Email: john.bartolomi@outlook.com

Representing: John Bartolomi - Homeowner

- Please submit this card to staff; and
- **LIMIT YOUR COMMENTS TO 3 MINUTES MAXIMUM.**

4

(PLEASE PRINT LEGIBLY) Date: April 19 2016

Project EIR:

MARIN COUNTY ENVIRONMENTAL REVIEW
PUBLIC SCOPING SESSION
PUBLIC TESTIMONY SIGN-IN CARD

Name: Garrett Page

Email: [illegible]

Representing:

- Please submit this card to staff; and
- **LIMIT YOUR COMMENTS TO 3 MINUTES MAXIMUM.**

(PLEASE PRINT LEGIBLY) Date:

Project EIR:

MARIN COUNTY ENVIRONMENTAL REVIEW
PUBLIC SCOPING SESSION
PUBLIC TESTIMONY SIGN-IN CARD

5

Name: LISE STAMPFLI TORME

Email: LSTAMPFLI@EARTHLINK.net

Representing: Flood Mitigation League of Ross Valley

- Please submit this card to staff; and
- **LIMIT YOUR COMMENTS TO 3 MINUTES MAXIMUM.**

APPENDIX B
Air Quality Calculations

Table of Contents

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B-1 Summary Tables

Tables for EIR

Updated: 4/16/2018

Alt 4 Nursery Site Detention Basin - Option 6
Alt 2 Nursery Site Detention Basin - Option 7

Green = use in EIR

Impact Summary

	Impact compared to project					
Alternative	**4.3-1**	**4.3-2**	**4.3-3**	**4.3-4**	**4.3-5**	**4.3-6**
Alternative 2 (Option 7)	Greater Than	Same As	Less Than	Less Than	Same As	Less Than
Alternative 4 (Option 6)	Less Than	Same As	Less Than	Greater Than	Same As	Greater Than

	Activity				Construction, Unmit					Operational Emissions, Unmit	
	WorkDays	**Off-Road hrs**	**Total Truck T**	**Haul Truck Tr**	**Daily NOx**	**Total DPM**	**Total Cancer**	**HI (Res)**	**PM2.5 (Res)**	**Daily NOx**	**Total GHGs**
Project	147	5,588	4,141	2,663	32.1	138.49	34.6	6.6	0.47	0.332	553.5
Alternative 2 (Option 7)	113	4,438	4,712	3,459	49.5	132.22	21.9	5.9	0.45	0.332	549.1
Alternative 4 (Option 6)	165	6,508	5,350	3,628	31.3	156.19	42.0	8.8	0.48	0.332	674.6
Percent change compared to project											
Alternative 2 (Option 7)	-23%	-21%	14%	30%	54%	-5%	-37%	-11%	-4%	0%	-1%
Alternative 4 (Option 6)	12%	16%	29%	36%	-2%	13%	21%	34%	3%	0%	22%

Criteria Pollutant Tables

CONSTRUCTION

Source	Unmitigated Average Daily Emissions (lbs/day)				Mitigated Average Daily Emissions (lbs/day)				
	ROG	NO_x	Exhaust PM10	Exhaust PM2.5	ROG	NO_x	Exhaust PM10	Exhaust PM2.5	
Nursery Site Detention Basin									
Off-Road Equipment	1.0	11.3	0.5	0.5	0.3	6.3	<0.1	<0.1	
On-Road Trucks	0.7	14.4	0.2	0.2	0.7	14.4	0.2	0.2	
Worker Trips	0.3	0.2	<0.1	<0.1	0.3	0.2	<0.1	<0.1	
Subtotal	*2.0*	*25.8*	*0.8*	*0.7*	*1.3*	*20.9*	*0.4*	*0.3*	
Bridge Building #2 Demolition and Riparian Restoration									
Off-Road Equipment	0.6	5.7	0.3	0.3	0.2	4.1	<0.1	<0.1	
On-Road Trucks	0.4	6.3	<0.1	<0.1	0.4	6.3	<0.1	<0.1	
Worker Trips	0.3	0.2	<0.1	<0.1	0.3	0.2	<0.1	<0.1	
Subtotal	*1.2*	*12.2*	*0.4*	*0.4*	*0.8*	*10.7*	*0.2*	*0.2*	
Nursery Site Detention Basin - Option 6									
Off-Road Equipment	1.1	11.4	0.5	0.5	0.3	6.7	<0.1	<0.1	
On-Road Trucks	0.9	17.3	0.3	0.3	0.9	17.3	0.3	0.3	
Worker Trips	0.3	0.2	<0.1	<0.1	0.3	0.2	<0.1	<0.1	
Subtotal	*2.2*	*28.9*	*0.8*	*0.7*	*1.5*	*24.1*	*0.4*	*0.4*	
Nursery Site Detention Basin - Option 7									
Off-Road Equipment	0.9	9.8	0.4	0.4	0.3	5.5	<0.1	<0.1	
On-Road Trucks	1.1	21.7	0.3	0.3	1.1	21.7	0.3	0.3	
Worker Trips	0.3	0.2	<0.1	<0.1	0.3	0.2	<0.1	<0.1	
Subtotal	*2.3*	*31.8*	*0.8*	*0.7*	*1.6*	*27.5*	*0.5*	*0.4*	
Total Average Daily Emissions									***NOT THE SUM - see below***
Project	**2.7**	**32.1**	**1.0**	**0.9**	**1.7**	**26.3**	**0.5**	**0.4**	
Alt 4 - Option 6	**2.5**	**31.3**	**0.9**	**0.8**	**1.7**	**26.4**	**0.5**	**0.4**	
Alt 2 - Option 7	**3.8**	**49.5**	**1.4**	**1.2**	**2.7**	**42.9**	**0.8**	**0.7**	
BAAQMD Construction Threshold	**54**	**54**	**82**	**54**	**54**	**54**	**82**	**54**	
Exceeds Threshold?									
Project	No	No	No	No	No	No	No	No	
Alt 4 - Option 6	No	No	No	No	No	No	No	No	
Alt 2 - Option 7	No	No	No	No	No	No	No	No	
Alternative 2 (Option 7)	41.5%	54.2%	37.5%	38.6%	53.9%	62.8%	62.6%	66.8%	
Alternative 4 (Option 6)	-5.0%	-2.3%	-5.6%	-5.1%	-2.8%	0.2%	-0.3%	1.2%	

Impact 4.3-1	
Summary	**Compared to project**
Alternative 2 (Option 7)	Greater Than
Alternative 4 (Option 6)	Less Than

Actual Data: Average lbs/day	**ROG**	**NOX**	**PM10 Exh**	**PM2.5 Ex**	**ROG**	**NOX**	**PM10 Exh**	**PM2.5 Ex**	***WorkDays***
Nursery Site Detention Basin									
Off-Road	1.0449	11.2818	0.4848	0.4519	0.3181	6.3098	0.0675	0.0675	*147*
Haul Trucks	0.4480	11.8272	0.1907	0.1824	0.4480	11.8272	0.1907	0.1824	*147*
Onsite trucks	0.2721	2.5322	0.0279	0.0267	0.2721	2.5322	0.0279	0.0267	*147*
Worker	0.2746	0.2051	0.0670	0.0282	0.2746	0.2051	0.0670	0.0282	*147*
Bridge Building #2 Demolition and Riparian Restoration									
Off-Road	0.5859	5.6848	0.2802	0.2623	0.2212	4.1387	0.0654	0.0654	*75*
Haul Trucks	0.1901	5.0190	0.0809	0.0774	0.1901	5.0190	0.0809	0.0774	*75*
Onsite trucks	0.1621	1.3220	0.0154	0.0147	0.1621	1.3220	0.0154	0.0147	*75*
Worker	0.2746	0.2051	0.0670	0.0282	0.2746	0.2051	0.0670	0.0282	*75*
Nursery Site Detention Basin - Option 6									
Off-Road	1.0847	11.4431	0.4996	0.4672	0.3411	6.6557	0.0793	0.0793	*165*
Haul Trucks	0.5409	14.2794	0.2302	0.2203	0.5409	14.2794	0.2302	0.2203	*165*
Onsite trucks	0.3143	3.0061	0.0328	0.0313	0.3143	3.0061	0.0328	0.0313	*165*
Worker	0.2746	0.2051	0.0670	0.0282	0.2746	0.2051	0.0670	0.0282	*165*
Nursery Site Detention Basin - Option 7									
Off-Road	0.9345	9.8455	0.4298	0.4030	0.2933	5.5438	0.0732	0.0732	*113*
Haul Trucks	0.6806	17.9668	0.2897	0.2771	0.6806	17.9668	0.2897	0.2771	*113*
Onsite trucks	0.3839	3.7767	0.0408	0.0389	0.3839	3.7767	0.0408	0.0389	*113*
Worker	0.2746	0.2051	0.0670	0.0282	0.2746	0.2051	0.0670	0.0282	*113*
Total Average Daily Emissions									

Project	2.6584	32.0865	0.9967	0.8844	1.7455	26.3257	0.4698	0.3995	*147*
Alt 1 - Option 6	2.5242	31.3369	0.9407	0.8394	1.6959	26.3689	0.4686	0.4043	*165*
Alt 2 - Option 7	3.7627	49.4782	1.3705	1.2260	2.6865	42.8560	0.7640	0.6663	*113*
	unmitigated	*unmitigated*	*unmitigated*	*unmitigated*	*mitigated*	*mitigated*	*mitigated*	*mitigated*	

OPERATION

Source	Average Daily Emissions (lbs/day)				Maximum Annual Emissions (tons/year)			
	ROG	NO_x	PM10	PM2.5	ROG	NO_x	PM10	PM2.5
Nursery Site Detention Basin								
Off-Road Equipment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
On-Road Trucks	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Worker Trips	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	*<0.1*	*0.3*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*
Bridge Building #2 Demolition and Riparian Restoration								
Off-Road Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
On-Road Trucks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Worker Trips	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Nursery Site Detention Basin - Option 6								
Off-Road Equipment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
On-Road Trucks	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Worker Trips	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	*<0.1*	*0.3*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*
Nursery Site Detention Basin - Option 7								
Off-Road Equipment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
On-Road Trucks	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Worker Trips	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	*<0.1*	*0.3*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.1*
Total Average Daily Emissions								
Project	**<0.1**	**0.3**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**
Alt 1 - Option 6	**<0.1**	**0.3**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**
Alt 2 - Option 7	**<0.1**	**0.3**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**
BAAQMD Construction Threshold	**54**	**54**	**82**	**54**	**54**	**54**	**82**	**54**
Exceeds Threshold?								
Project	No	No	No	No	No	No	No	No
Alt 4 - Option 6	No	No	No	No	No	No	No	No
Alt 2 - Option 7	No	No	No	No	No	No	No	No

Impact 4.3-3	
Summary	**Compared to project**
Alternative 2 (Option 7)	Less Than
Alternative 4 (Option 6)	Less Than

	Lbs/day				Tons/Year				
Actual Data: Average lbs/day	**ROG**	**NOX**	**PM10 T**	**PM2.5 T**	**ROG**	**NOX**	**PM10 T**	**PM2.5 T**	
Nursery Site Detention Basin									
Off-Road	0.0059	0.0652	0.0021	0.0020	0.0011	0.0119	0.0004	0.0004	
On-Road Trucks	0.0103	0.2659	0.0041	0.0039	0.0019	0.0485	0.0008	0.0007	
Worker Trips	0.0015	0.0011	0.0004	0.0002	0.0003	0.0002	0.0001	0.0000	
Pump	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Subtotal	0.0178	0.3323	0.0066	0.0060	0.0081	0.0606	0.0012	0.0011	
Bridge Building #2 Demolition and Riparian Restoration									
Off-Road Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	no emissions
On-Road Trucks	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Worker Trips	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Pump	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Subtotal	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Nursery Site Detention Basin - Option 6									
Off-Road	0.0059	0.0652	0.0021	0.0020	0.0011	0.0119	0.0004	0.0004	same as project
On-Road Trucks	0.0103	0.2659	0.0041	0.0039	0.0019	0.0485	0.0008	0.0007	
Worker Trips	0.0015	0.0011	0.0004	0.0002	0.0003	0.0002	0.0001	0.0000	
Pump	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Subtotal	0.0178	0.3323	0.0066	0.0060	0.0032	0.0606	0.0012	0.0011	
Nursery Site Detention Basin - Option 7									
Off-Road	0.0059	0.0652	0.0021	0.0020	0.0011	0.0119	0.0004	0.0004	same as project
On-Road Trucks	0.0103	0.2659	0.0041	0.0039	0.0019	0.0485	0.0008	0.0007	
Worker Trips	0.0015	0.0011	0.0004	0.0002	0.0003	0.0002	0.0001	0.0000	
Pump	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Subtotal	0.0178	0.3323	0.0066	0.0060	0.0032	0.0606	0.0012	0.0011	
Total Average Daily Emissions									
Project	0.0178	0.3323	0.0066	0.0060	0.0081	0.0606	0.0012	0.0011	
Alt 4 - Option 6	0.0178	0.3323	0.0066	0.0060	0.0032	0.0606	0.0012	0.0011	
Alt 2 - Option 7	0.0178	0.3323	0.0066	0.0060	0.0032	0.0606	0.0012	0.0011	
	unmitigated	*unmitigated*	*unmitigated*	*unmitigated*					

HRA Tables

CONSTRUCTION

CANCER RISK — **Unmitigated**

Element	Cancer Risk			Chronic Hazard Index		
	Residential Receptor	Daycare Receptor	School Receptor	Residential Receptor	Daycare Receptor	School Receptor
Nursery Site Detention Basin						
Maximum Cancer Risk	34.6	0.0	3.4	0.1	0.0	<0.1
BAAQMD Cancer Threshold	**10**	**10**	**10**	**1**	**1**	**1**
Exceeds Threshold?	Yes	No	No	No	No	No
Bridge Building #2 Demolition and Riparian Restoration						

Actual Values

Cancer Risk			Chronic Hazard Index		
Residential Receptor	Daycare Receptor	School Receptor	Residential Receptor	Daycare Receptor	School Receptor
34.60	0.00	3.44	0.108	0.000	0.083

Element	Residential Receptor	Daycare Receptor	School Receptor	Residential Receptor	Daycare Receptor	School Receptor							
Maximum Cancer Risk	18.0	2.1	0.3	0.2	<0.1	<0.1		18.03	2.06	0.30	0.186	0.011	0.014
BAAQMD Cancer Threshold	**10**	**10**	**10**	**1**	**1**	**1**							
Exceeds Threshold?	Yes	No	No	No	No	No							
Nursery Site Detention Basin - Option 6													
Maximum Cancer Risk	42.0	0.0	4.0	0.1	0.0	<0.1		42.00	0.00	3.99	0.110	0.000	0.085
BAAQMD Cancer Threshold	**10**	**10**	**10**	**1**	**1**	**1**							
Exceeds Threshold?	Yes	No	No	No	No	No							
Nursery Site Detention Basin - Option 7													
Maximum Cancer Risk	21.9	0.0	2.5	0.1	0.0	<0.1		21.86	0.00	2.50	0.102	0.000	0.079
BAAQMD Cancer Threshold	**10**	**10**	**10**	**1**	**1**	**1**							
Exceeds Threshold?	Yes	No	No	No	No	No							
Alternative 2 (Option 7)	-36.8%	#DIV/0!	-27.3%	-4.9%	#DIV/0!	-4.9%							
Alternative 4 (Option 6)	21.4%	#DIV/0!	15.8%	2.7%	#DIV/0!	2.7%							

Impact 4.3-4	
Summary	**Compared to project**
Alternative 2 (Option 7)	Less Than
Alternative 4 (Option 6)	Greater Than

Mitigated

Element	Cancer Risk			Chronic Hazard Index									
	Residential Receptor	Daycare Receptor	School Receptor	Residential Receptor	Daycare Receptor	School Receptor							
Nursery Site Detention Basin													
Maximum Cancer Risk	6.6	0.0	0.7	<0.1	0.0	<0.1	4.04	6.56	0.00	0.65	0.020	0.000	0.016
BAAQMD Cancer Threshold	**10**	**10**	**10**	**1**	**1**	**1**							
Exceeds Threshold?	No	No	No	No	No	No							
Bridge Building #2 Demolition and Riparian Restoration													
Maximum Cancer Risk	5.6	0.6	<0.1	<0.1	<0.1	<0.1	4.56	5.61	0.64	0.09	0.058	0.003	0.004
BAAQMD Cancer Threshold	**10**	**10**	**10**	**1**	**1**	**1**							
Exceeds Threshold?	No	No	No	No	No	No							
Nursery Site Detention Basin - Option 6													
Maximum Cancer Risk	8.8	0.0	0.8	<0.1	0.0	<0.1	5.29	8.76	0.00	0.83	0.023	0.000	0.018
BAAQMD Cancer Threshold	**10**	**10**	**10**	**1**	**1**	**1**							
Exceeds Threshold?	No	No	No	No	No	No							
Nursery Site Detention Basin - Option 7													
Maximum Cancer Risk	5.9	0.0	0.7	<0.1	0.0	<0.1	4.02	5.86	0.00	0.67	0.027	0.000	0.021
BAAQMD Cancer Threshold	**10**	**10**	**10**	**1**	**1**	**1**							
Exceeds Threshold?	No	No	No	No	No	No							

PM2.5 CONCENTRATIONS

Element	Unmitigated: Average Annual PM2.5 Exhaust Concentrations (ug/m3)			Mitigated: Average Annual PM2.5 Exhaust Concentrations (ug/m3)		
	Residential Receptor	Daycare Receptor	School Receptor	Residential Receptor	Daycare Receptor	School Receptor
Nursery Site Detention Basin						
Average Annual PM2.5 Exhaust Concent	0.47	0.00	0.36	0.10	0.00	0.08
BAAQMD Cancer Threshold	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**
Exceeds Threshold?	Yes	No	Yes	No	No	No
Bridge Building #2 Demolition and Riparian Restoration						
Average Annual PM2.5 Exhaust Concent	0.82	0.05	0.06	0.28	0.02	0.02
BAAQMD Cancer Threshold	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**
Exceeds Threshold?	Yes	No	No	No	No	No
Nursery Site Detention Basin - Option 6						
Average Annual PM2.5 Exhaust Concent	0.48	0.00	0.37	0.11	0.00	0.09
BAAQMD Cancer Threshold	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**
Exceeds Threshold?	Yes	No	Yes	No	No	No
Nursery Site Detention Basin - Option 7						
Average Annual PM2.5 Exhaust Concent	0.45	0.00	0.35	0.13	0.00	0.10
BAAQMD Cancer Threshold	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**
Exceeds Threshold?	Yes	No	Yes	No	No	No
Alternative 2 (Option 7)	-3.6%	#DIV/0!	-3.6%	#DIV/0!	33.0%	#REF!
Alternative 4 (Option 6)	3.4%	#DIV/0!	3.4%	#DIV/0!	13.3%	#REF!

Actual Values

Unmitigated: Average Annual PM2.5 Exhaust Concentrations (ug/m3)			Mitigated: Average Annual PM2.5 Exhaust Concentrations (ug/m3)		
Residential Receptor	Daycare Receptor	School Receptor	Residential Receptor	Daycare Receptor	School Receptor
0.47	0.00	0.36	0.10	0.00	0.08
0.82	0.05	0.06	0.28	0.02	0.02
0.48	0.00	0.37	0.11	0.00	0.09
0.45	0.00	0.35	0.13	0.00	0.10

Impact 4.3-4	
Summary	**Compared to project**
Alternative 2 (Option 7)	Less Than
Alternative 4 (Option 6)	Greater Than

GHG Tables

Source	Total Annual Emissions (metric tons)		
	Construction	Operation	Cons+Ops
Nursery Site Detention Basin			
Off-Road Equipment	120.4	16.0	136.4
On-Road Trucks	281.6	12.9	294.5
Worker Trips	31.6	0.4	32.0
Subtotal	*433.6*	*29.3*	*462.9*
Bridge Building #2 Demolition and Riparian Restoration			
Off-Road Equipment	38.1	0.0	38.1
On-Road Trucks	65.8	0.0	65.8
Worker Trips	16.1	0.0	16.1
Subtotal	*120.0*	*0.0*	*120.0*
Nursery Site Detention Basin - Option 6			
Off-Road Equipment	141.1	16.0	157.1
On-Road Trucks	378.1	12.9	391.0
Worker Trips	35.5	0.4	35.9
Subtotal	*554.6*	*42.8*	*597.5*
Nursery Site Detention Basin - Option 7			

Off-Road Equipment	81.2	16.0	97.2
On-Road Trucks	323.7	12.9	336.5
Worker Trips	24.3	0.4	24.7
Subtotal	*429.1*	*29.3*	*458.4*
Total Annual Emissions			
Project	553.5	29.3	582.8
Alt 4 - Option 6	674.6	42.8	717.4
Alt 2 - Option 7	549.1	29.3	578.4
Total Emissions Amortized over 30 Years			
Project	18.5	29.3	47.8
Alt 4 - Option 6	22.5	42.8	65.3
Alt 2 - Option 7	18.3	29.3	47.6
BAAQMD Threshold	**1,100**	**1,100**	**1,100**
Exceeds Threshold?			
Project	No	No	No
Alt 4 - Option 6	No	No	No
Alt 2 - Option 7	No	No	No
Alternative 2 (Option 7)	-0.8%		
Alternative 4 (Option 6)	21.9%		

Impact 4.3-6			
Summary	**Compared to project**		
Alternative 2 (Option 7)	Less Than	Less Than	Less Than
Alternative 4 (Option 6)	Greater Than	Greater Than	Greater Than

Actual Data: Annual MTCO2e	**Construction CO2e**	**Operation CO2**	**Cons+Ops CO2e**	
Nursery Site Detention Basin				
Off-Road	120.40	15.99	136.39	
Haul Trucks	235.64	12.89	248.53	
Onsite trucks	45.92		45.92	
Worker	31.61	0.43	32.04	
Pump	0.00	0.00	0.00	
Subtotal	433.57	29.31	462.88	
Bridge Building #2 Demolition and Riparian Restoration				
Off-Road	38.08	0.00	38.08	no emissions
On-Road Trucks	51.02	0.00	51.02	
Onsite trucks	14.74		14.74	
Worker	16.13	0.00	16.13	
Pump	0.00	0.00	0.00	
Subtotal	119.96	0.00	119.96	
Nursery Site Detention Basin - Option 6				
Off-Road	141.09	15.99	157.08	
On-Road Trucks	319.34	12.89	332.23	
Onsite trucks	58.72		58.72	
Worker	35.48	0.43	35.91	
Pump	0.00	13.53	13.53	
Subtotal	554.63	42.84	597.47	
Nursery Site Detention Basin - Option 7				
Off-Road	81.18	15.99	97.17	
On-Road Trucks	275.17	12.89	288.06	
Onsite trucks	48.48		48.48	
Worker	24.30	0.43	24.73	
Pump	0.00	0.00	0.00	
Subtotal	429.13	29.31	458.44	
Total Average Annual Emissions				
Project	553.53	29.31	582.84	
Alt 4 - Option 6	674.59	42.84	717.43	
Alt 2 - Option 7	549.09	29.31	578.40	Assumes all during 1 year
Total Emissions Amortized over 30 Years				
Project	18.45	29.31	47.76	
Alt 4 - Option 6	22.49	42.84	65.33	
Alt 2 - Option 7	18.30	29.31	47.61	

unmitigated

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B-2 Operational Emissions

Operational Emissions

Updated: 4/16/2018

Operational truck trips for material removal for 2A and 6
Operational excavator and backhoe operations for 2A and 6
Operational pump for alt 6

Emissions Summary

	Average Daily Emissions (lbs/day)				Maximum Annual Emissions (tons/year)				Total Emissions (MTCO2e)				
	ROG	NOX	PM10 Exh	PM2.5 Exh	ROG	NOX	PM10 Exh	PM2.5 Exh	CO2	CH4	N2O	CO2e	
Nursery Site Detention Basin													
Off-Road Equipment	0.01	0.07	0.00	0.00	0.01	0.01	0.00	0.00	2.92	0.00	0.00	2.92	NOT USED - CalEEMod instead
On-Road Trucks	0.01	0.27	0.00	0.00	0.00	0.05	0.00	0.00	12.32	0.00	0.56	12.89	
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.43	
Pump	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total	0.02	0.33	0.01	0.01	0.01	0.06	0.00	0.00	15.67	0.00	0.57	16.24	
Bridge Building #2 Demolition and Riparian Restoration													
Off-Road Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NOT USED - CalEEMod instead
On-Road Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pump	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Nursery Site Detention Basin - Option 6													
Off-Road Equipment	0.01	0.07	0.00	0.00	0.00	0.01	0.00	0.00	2.92	0.00	0.00	2.92	NOT USED - CalEEMod instead
On-Road Trucks	0.01	0.27	0.00	0.00	0.00	0.05	0.00	0.00	12.32	0.00	0.56	12.89	
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.43	
Pump	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.53	
Total	0.02	0.33	0.01	0.01	0.00	0.06	0.00	0.00	15.67	0.00	0.57	29.77	
Nursery Site Detention Basin - Option 7													
Off-Road Equipment	0.01	0.07	0.00	0.00	0.00	0.01	0.00	0.00	2.92	0.00	0.00	2.92	NOT USED - CalEEMod instead
On-Road Trucks	0.01	0.27	0.00	0.00	0.00	0.05	0.00	0.00	12.32	0.00	0.56	12.89	
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.43	
Pump	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total	0.02	0.33	0.01	0.01	0.00	0.06	0.00	0.00	15.67	0.00	0.57	16.24	

Truck Trips

Truck Operations

Daily Sediment (CY)	290	
Daily Truck Loads	33	
Truck Capacity (CY)	8.8	
Annual Sediment (CY)	1,600	
Annual Truck Loads	182	
Annual one-way trips	364	
Annual VMT	7,283	20-mile one-way trip to Redwood Landfill
Days of trucking	6	
Annual Idling hours	46	15 min idling per roundtrip
Onsite VMT		

PD Page 30:

Sediment may be removed at least annually from Fairfax Creek to maximize flood control effectiveness by maintaining the storage capacity in the channel. One routine, annual sediment removal would occur in the dry season to reduce effects on water quality and aquatic species. The amount of sediment removed in that routine maintenance action would vary depending on storm events and sediment moving into the creek each year. During especially wet years, a second sediment removal action may be necessary. This second removal could occur between large winter storms to restore detention capacity. The depth of sediment removal would be feathered in the up and downstream edges of the area to match the existing channel gradient. The removal would be done using a bulldozer in the creek and an excavator working from the maintenance access road, top of the diversion structure, or top of the side-weir, as needed to reach the deposited material. Up to 1,600 cubic yards of sediment may be removed from Fairfax Creek per sediment removal event. Removed sediment would be hauled to Redwood Landfill. Approximately 290 cubic yards, requiring 33 truckloads, would be generated each day during sediment removal; about one week would be required to remove 1,600 cubic yards of sediment.

Calculated EFs - Onsite Trucks tab

	ROG	NOX	PM10	PM2_5	CO2	CH4	N2O
Running Emissions (g/mi)	0.219409436	5.791844	0.09337962	0.08934006	1652.954936	0.254775	77.42681
Idling Emissions (g/hr)	2.498328858	40.6292	0.06610876	0.06324892	6271.596817	0.116041	

	Average Daily Emissions (lbs/day)				Maximum Annual Emissions (tons/year)				Total Emissions (MTCO2e)			
	ROG	NOX	PM10 Exh	PM2.5 Exh	ROG	NOX	PM10 Exh	PM2.5 Exh	CO2	CH4	N2O	CO2e
Nursery Site Detention Basin	0.01	0.27	0.00	0.00	0.002	0.049	0.001	0.001	12.32	0.00	0.56	12.89
Bridge Building #2 Demolition and Riparian R	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00
Nursery Site Detention Basin - Option 6	*0.01*	*0.27*	*0.00*	*0.00*	*0.002*	*0.049*	*0.001*	*0.001*	*12.32*	*0.00*	*0.56*	*12.89*
Nursery Site Detention Basin - Option 7	*0.01*	*0.27*	*0.00*	*0.00*	*0.002*	*0.049*	*0.001*	*0.001*	*12.32*	*0.00*	*0.56*	*12.89*

Off-Road Equipment - NOT USED

Excavator Operations

hrs/day	10
days	6
total hours	60

Emission Factors

					Emission Factors (g/hp-hr) - Unmitigated						Emission Factors (g/hp-hr) - Mitigated Tier 4 Interim					
Equipment Type	**CalEEMod Equip HP**		**HP Source**	**LF**	ROG	NOX	PM10	PM2.5	CO2	CH4	ROG	NOX	PM10	PM2.5	CO2	CH4
336 Excavator	Excavators	266	http://www.r	0.38	0.162	1.77986	0.058	0.053	481.2361	0.152	0.08	1.29	0.008	0.008	481.2361	0.152

*= EF * HP * LF * lbs/g * equip hrs*

	Average Daily Emissions (lbs/day)				Maximum Annual Emissions (tons/year)				Total Emissions (MTCO2e)			
	ROG	NOX	PM10 Exh	PM2.5 Exh	ROG	NOX	PM10 Exh	PM2.5 Exh	CO2	CH4	N2O	CO2e
Nursery Site Detention Basin	0.006	0.065	0.002	0.002	0.001	0.012	0.000	0.000	2.92	0.0009	0.0001	2.92
Bridge Building #2 Demolition and Riparian R	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.0000	0.0000	0.00
Nursery Site Detention Basin - Option 6	*0.006*	*0.065*	*0.002*	*0.002*	*0.001*	*0.012*	*0.000*	*0.000*	*2.92*	*0.0009*	*0.0001*	*2.92*
Nursery Site Detention Basin - Option 7	*0.006*	*0.065*	*0.002*	*0.002*	*0.001*	*0.012*	*0.000*	*0.000*	*2.92*	*0.0009*	*0.0001*	*2.92*
CalEEMod Comparison	0.006	0.065	0.002	0.002	0.001	0.012	0.000	0.000	0.000			
Here vs. CalEEMod	0%	0%	-1%	-2%	0%	0%	-1%	-2%	#DIV/0!			

Worker Trips

Workers/day	10	conservative assumption
One-way trips/day	20	
one-way trip distance	10.8	CalEEMod default
days	6	
Total annual VMT	1296	

Calculated EFs (g/mi)

Vehicle Type	ROG	NOX	PM10	PM2_5	CO2	CH4	N2O
Weighted Average	0.192195934	0.143548	0.04690031	0.01972737	327.6578282	0.420809	3.733709

see *WorkerCommute* tab

*= 20 one-way trips/day * 10.8 miles per one-way trip * 6 days * grams per mile / 365 days per year (convert to MT for GHGs*

	Average Daily Emissions (lbs/day)				Maximum Annual Emissions (tons/year)				Annual Emissions (MTCO2e)				
Site	ROG	NOX	PM10	PM2_5	ROG	NOX	PM10 Exh	PM2.5 Exh	CO2	CH4	N2O	CO2e	
Nursery Site Detention Basin	0.0015	0.0011	0.0004	0.0002	0.000	0.000	0.000	0.000	0.42	0.0005	0.0048	0.43	
Bridge Building #2 Demolition and Riparian R	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.0000	0.0000	0.00	*no excavation / sediment removal*
Nursery Site Detention Basin - Option 6	0.0015	0.0011	0.0004	0.0002	0.000	0.000	0.000	0.000	0.42	0.0005	0.0048	0.43	
Nursery Site Detention Basin - Option 7	0.0015	0.0011	0.0004	0.0002	0.000	0.000	0.000	0.000	0.42	0.0005	0.0048	0.43	

Excavator Operations

Water Pump

This is ONLY for Nursery Site Option 6

Pump Operations

pump type	Flygt Vertical Pump: Model LL 3400	
pump HP	60	
pump kW	40	http://www.xylemwatersolutions.com/scs/denmark/da/produkter/avloppsvattenpumpar/pumpermedstortflow/Documents/vertical%20column%20pumps%20web.pdf
Efficiency	70%	
kWh per hour	57.14	
daily hours per event	24	
Annual events	50	Email from Dave Halsing on 4/4/18 says 2; but NOAA indicates 4 main storm periods for the 2016-2017 rainy season: https://www.cnrfc.noaa.gov/storm_summaries/janfeb2017storms.php. Assume 5 to be safe
annual hours	1200	
PG&E Emission Factor (lbs CO2e/MWh)	435	https://www.pge.com/en_US/about-pge/environment/what-we-are-doing/fighting-climate-change/fighting-climate-change.page

Total Emissions (MTCO2e) **13.53**

Alts Section page 6-16:

The pump (approximately 10 horsepower; to be powered by electricity from the existing grid) would be installed to actively drain the sump and the basin prior to large storm events, shut down during events to reduce peak downstream flows, and then turn again after the peak discharge has passed. The discharge rate of the pumping system would need to be 1,170 gallons per minute in order to meet the design requirements; this is a rate that can be accommodated with a standard vertical turbine pump. The discharge pipe would empty into Fairfax Creek downstream of the diversion berm at the same point as the primary, passive gated outlet.

Flygt LL & NL 3000 capacities and sizes

Model	max. Capacity (at 60 Hz)	Head range	Motor 50Hz kW / rpm	Motor 60Hz hp / rpm	Discharge tube Ø mm /inch	Diffuser material	Propeller Material
NL 3102	70 l/s	1,5-7,5m	3,1 kW / 1440	5 hp / 1720	500 / 20"	Cast iron	Cast iron or SS
NL 3127	90 l/s	1,5-8,5m	7,5 kW / 1455	10 hp / 1735	600 / 24"	Cast iron	Cast iron or SS
LL 3152	240 l/s	1,5-6,5 m	8,8 kW / 955	14 hp / 1155	600 / 24"	Cast iron	Cast iron or SS
LL 3201	360 l/s	2- 9,5 m	22 kW / 970	30 hp / 855	800 / 32"	Cast iron	Cast iron or SS
LL 3300	540 l/s	3-15 m	37 kW / 725	60 hp / 870	800 / 32"	Cast iron	Cast iron or SS
NL 3300	520 l/s	3-23 m	27 kW / 725	60 hp / 875	800 / 32"	Cast iron	Cast iron or SS
NL 3300	520 l/s	3-23 m	44 kW / 975	75 hp / 1170	800 / 32"	Cast iron	Cast iron or SS
LL 3356	560 l/s	5-21 m	55 kW / 730	135 hp / 880	800 / 32"	Cast iron	Cast iron or SS
LL 3356	760 l/s	8-38 m	160 kW / 985	310 hp / 1185	800 / 32"	Cast iron	Cast iron or SS
LL 3400	600 l/s	3,5-8 m	40 kW / 490	60 hp / 505	900 / 36"	Cast iron	Cast iron or SS
LL 3400	700 l/s	4-11 m	70 kW / 585	110 hp / 590	900 / 36"	Cast iron	Cast iron or SS
LL 3400	840 l/s	5-16 m	140 kW / 730	150 hp / 705	900 / 36"	Cast iron	Cast iron or SS
LL 3400	1050 l/s	8-26 m		355 hp / 880	900 / 36"	Cast iron	Cast iron or SS
LL 3400	1200 l/s	10-30 m	375 kW / 985		900 / 36"	Cast iron	Cast iron or SS
LL 3602	1300 l/s	2-7 m	70 kW / 415		1200 / 48"	Cast iron	Cast iron or SS
LL 3602	1550 l/s	3-11 m	135 kW / 485	185 hp / 500	1200 / 48"	Cast iron	Cast iron or SS
LL 3602	1850 l/s	5-15 m	125 kW / 585	310 hp / 590	1200 / 48"	Cast iron	Cast iron or SS
LL 3602	2200 l/s	6-22 m	430 kW / 740	565 hp / 710	1200 / 48"	Cast iron	Cast iron or SS

B-3 Construction Schedule

Construction Schedule

Updated: 4/3/2018

NO OVERLAP BETWEEN PROJECTS; assume BB2 starts when nursery ends

Source: San Anselmo Flood Options 2, 6 and 7 Equip and Work Durations R6_BS

Nursery Site Detention Basin — changes from original modeling

Item	Operation	Duration	Start Date	End Date	Workdays
1	Mobilization/Erosion Control	5	1/1/2019	1/7/2019	5
2	Demo Wood Framed Building	1	1/8/2019	1/8/2019	1
3	Demo Misc Structures	5	1/9/2019	1/15/2019	5
4	Clearing & Grubbing	3	1/16/2019	1/20/2019	3
5	Remove Trees	3	1/21/2019	1/23/2019	3
6	Remove septic tanks	1	1/24/2019	1/24/2019	1
7	Remove Fire Hydrant & Water Valve	1	1/25/2019	1/27/2019	1
8	Remove OH Electrical & Poles	2	1/28/2019	1/29/2019	2
9	Remove Fencing	1	1/30/2019	1/30/2019	1
10	Abandon Water Well	1	1/31/2019	1/31/2019	1
11	Top Soil Stripping/Stockpile	2	2/1/2019	2/4/2019	2
12	Excavation (Cut)	18	2/5/2019	2/28/2019	18
13	Over-excavation beneath berm	3	3/1/2019	3/5/2019	3
14	Over-excavation at spillway	3	3/6/2019	3/10/2019	3
15	Backfill Over-Excavated Areas	7	3/11/2019	3/19/2019	7
16	Off-Haul Trucks				0
17	Catch Basins, Manholes, Drainage Pi	15	3/20/2019	4/9/2019	15
18	Precast Box Culvert (6'x4' & 10'x5'),	8	4/10/2019	4/21/2019	8
19	Construct Overflow Weir/Floodwall	20	4/22/2019	5/19/2019	20
20	Pour Concrete Overflow Weir/Flood	3	5/20/2019	5/22/2019	3
21	Embankment (Berm)	6	5/23/2019	5/30/2019	6
22	Riprap	10	5/31/2019	6/13/2019	10
23	Riprap Trucks				0
24	Seepage cutoff wall 3' x 7'	13	1/2/1900	1/18/1900	13
25	Finish Grade Slopes/Seasonal Chann	2	1/19/1900	1/22/1900	2
26	Place Topsoil	1	1/23/1900	1/23/1900	1
27	Plantings	5	1/24/1900	1/30/1900	5
28	Hydroseeding	1	1/31/1900	1/31/1900	1
29	Fence	5	2/1/1900	2/7/1900	5
30	Demobilization	2	2/8/1900	2/9/1900	2
	Total	**147**	**1/1/2019**	**7/24/2019**	**147**
				Total Days	**204**
				Years	**0.56**

Bridge Building #2 Demolition and Riparian Restoration — changes from original modeling

Item	Operation	Duration	Start Date	End Date	Workdays
1	Mobilization/Erosion Control/Stream Diversion	5	1/1/2019	1/7/2019	5
2	Demo Wood Framed Building	2	1/8/2019	1/9/2019	2
3	Demo Concrete Structures	15	1/10/2019	1/30/2019	15
4	Clearing & Grubbing, Tree Removal	2	1/31/2019	2/3/2019	2
5	Top Soil Stripping/Stockpile	1	2/4/2019	2/4/2019	1
6	1/2 Ton Riprap. Slope Transition Structure	10	2/5/2019	2/18/2019	10
7	Terrace Flood Plain	2	2/19/2019	2/20/2019	2
8	Flood Walls	9	2/21/2019	3/5/2019	9
9	Storm Drain	1	3/6/2019	3/6/2019	1
10	Bioengineered Slope	14	3/7/2019	3/26/2019	14
11	Place Topsoil	1	3/27/2019	3/27/2019	1
12	Plantings	10	3/28/2019	4/10/2019	10
13	Guardrail	1	4/11/2019	4/11/2019	1
14	Demobilization	2	4/12/2019	4/15/2019	2
	Total	**75**	**1/1/2019**	**4/15/2019**	**75**
				Total Days	**104**
				Years	**0.28**

Alternative 4

Nursery Site Detention Basin - Option 6

Item	Operation	Duration	Start Date	End Date	Workdays
1	Mobilization/Erosion Control	5	1/1/2019	1/7/2019	5
2	Demo Wood Framed Building	1	1/8/2019	1/8/2019	1
3	Demo Misc Structures	5	1/9/2019	1/15/2019	5
4	Clearing & Grubbing	3	1/16/2019	1/20/2019	3
5	Remove Trees	3	1/21/2019	1/23/2019	3
6	Remove septic tanks	1	1/24/2019	1/24/2019	1
7	Remove Fire Hydrant & Water Valve	1	1/25/2019	1/27/2019	1
8	Remove OH Electrical & Poles	2	1/28/2019	1/29/2019	2
9	Remove Fencing	1	1/30/2019	1/30/2019	1
10	Abandon Water Well	1	1/31/2019	1/31/2019	1
11	Top Soil Stripping/Stockpile	2	2/1/2019	2/4/2019	2
12	Excavation (Cut)	23	2/5/2019	3/7/2019	23
13	Over-excavation beneath berm	3	3/8/2019	3/12/2019	3
14	Over-excvation at spillway	3	3/13/2019	3/17/2019	3
15	Backfill Over-Excavated Areas	7	3/18/2019	3/26/2019	7
16	Off-Haul Trucks				
17	Catch Basins, Manholes, Drainage Pi	15	3/27/2019	4/16/2019	15
18	Precast Box Culvert (6'x4' & 10'x5'),	8	4/17/2019	4/28/2019	8
19	Storm Water Lift Station	15	4/29/2019	5/19/2019	15
20	Construct Overflow Weir/Floodwall	20	5/20/2019	6/16/2019	20
21	Pour Concrete Overflow Weir/Flood	3	6/17/2019	6/19/2019	3
22	Embankment (Berm)	4	6/20/2019	6/25/2019	4
23	Riprap	10	6/26/2019	7/9/2019	10
24	Riprap Trucks				0
25	Seepage cutoff wall 3' x 7'	13	1/2/1900	1/18/1900	13
26	Finish Grade Slopes/Seasonal Chann	2	1/19/1900	1/22/1900	2
27	Place Topsoil	1	1/23/1900	1/23/1900	1
28	Plantings	5	1/24/1900	1/30/1900	5
29	Hydroseeding	1	1/31/1900	1/31/1900	1
30	Fence	5	2/1/1900	2/7/1900	5
31	Demobilization	2	2/8/1900	2/9/1900	2
	Total	**165**	**1/1/2019**	**8/19/2019**	**165**
				Total Days	**230**
				Years	**0.63**

Alternative 2

Nursery Site Detention Basin - Option 7

Item	Operation	Duration	Start Date	End Date	Workdays
1	Mobilization/Erosion Control	5	1/1/2019	1/7/2019	5
2	Demo Wood Framed Building	1	1/8/2019	1/8/2019	1
3	Demo Misc Structures	5	1/9/2019	1/15/2019	5
4	Clearing & Grubbing	2	1/16/2019	1/17/2019	2
5	Remove Trees	3	1/18/2019	1/22/2019	3
6	Remove septic tanks	1	1/23/2019	1/23/2019	1
7	Remove Fire Hydrant & Water Valve	1	1/24/2019	1/24/2019	1
8	Remove OH Electrical & Poles	2	1/25/2019	1/28/2019	2
9	Remove Fencing	1	1/29/2019	1/29/2019	1
10	Abandon Water Well	1	1/30/2019	1/30/2019	1
11	Top Soil Stripping/Stockpile	1	1/31/2019	1/31/2019	1
12	Excavation (Cut)	19	2/1/2019	2/27/2019	19
13	Over-excavation beneath berm	3	2/28/2019	3/4/2019	3
14	Backfill Over-Excavated Areas	4	3/5/2019	3/10/2019	4
15	Off-Haul Trucks				
16	Catch Basins, Manholes, Drainage Pi	15	3/11/2019	3/31/2019	15
17	Construct Overflow Weir/Floodwall	20	4/1/2019	4/28/2019	20

18	Pour Concrete Overflow Weir/Flood	3	4/29/2019	5/1/2019	3
19	Embankment (Berm)	1	5/2/2019	5/2/2019	1
20	Riprap	9	5/3/2019	5/15/2019	9
21	Riprap Trucks				0
22	Finish Grade Slopes/Seasonal Chann	2	5/16/2019	5/19/2019	2
23	Place Topsoil	1	5/20/2019	5/20/2019	1
24	Plantings	5	5/21/2019	5/27/2019	5
25	Hydroseeding	1	5/28/2019	5/28/2019	1
26	Fence	5	5/29/2019	6/4/2019	5
27	Demobilization	2	6/5/2019	6/6/2019	2
	Total	**113**	**1/1/2019**	**6/6/2019**	**113**
				Total Days	**156**
				Years	**0.43**

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B-4 Off-Road Construction Emissions

Off-road Construction Equipment Emissions

Updated: 4/12/2018

Summary Emissions

	Unmitigated Average Daily Emissions (lbs/day criteria, MTCO2/yr GHGs)								Mitigated Average Daily Emissions (lbs/day, MTCO2/yr GHGs) - Tier 4 Interim								Mitigated Average Daily Emissions (lbs/day, MTCO2/yr GHGs)) - Tier 4 Interim							
	ROG	NOX	Exhaust PM10	Exhaust PM2.5	CO2	CH4	N2O	CO2e	ROG	NOX	Exhaust PM10	:haust PM2	CO2	CH4	N2O	CO2e	ROG	NOX	Exhaust PM10	Exhaust PM2.5	CO2	CH4	N2O	CO2e
Nursery Site Detention Basin	1.045	11.282	0.485	0.452	118.617	0.035	0.003	120.395	0.318	6.310	0.068	0.068	118.617	0.035	0.003	120.395	0.318	6.310	0.068	0.068	118.617	0.035	0.003	120.395
Bridge Building #2 Demolition and Rip	0.586	5.685	0.280	0.262	37.521	0.011	0.001	38.076	0.221	4.139	0.065	0.065	37.521	0.011	0.001	38.076	0.221	4.139	0.065	0.065	37.521	0.011	0.001	38.076
Nursery Site Detention Basin - Option	1.085	11.443	0.500	0.467	139.026	0.040	0.004	141.089	0.341	6.656	0.079	0.079	139.026	0.040	0.004	141.089	0.341	6.656	0.079	0.079	139.026	0.040	0.004	141.089
Nursery Site Detention Basin - Option	0.934	9.845	0.430	0.403	80.000	0.023	0.002	81.177	0.293	5.544	0.073	0.073	80.000	0.023	0.002	81.177	0.293	5.544	0.073	0.073	80.000	0.023	0.002	81.177

No renewable diesel included

Pollutant	Nursery Unmitigated	For HRA - Total Annual PM (lbs) Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Unmitigated	Nursery6 Mitigated	Nursery7 Jnmitigate	Nursery7 Mitigated	
PM10 - DPM	71.2657	9.9231	21.0130	4.9078	82.4391	13.0792	48.5678	8.2709	
PM2.5	66.4262	9.9231	19.6760	4.9078	77.0959	13.0792	45.5334	8.2709	
		9.0198		4.5751		11.9034		7.5130	<old mitigated with gens and plate compactors tier 4

Emission Factors

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
					Emission Factors (g/hp-hr) - Unmitigated						Emission Factors (g/hp-hr) - Mitigated Tier 4 Interim						Mitigated EFs percent reduction					
Equipment Type	CalEEMod Equipment	HP	HP Source	LF	ROG	NOX	PM10	PM2.5	CO2	CH4	ROG	NOX	PM10	PM2.5	CO2	CH4	ROG	NOX	PM10	PM2.5	CO2	CH4
450 Backhoe	Tractors/Loaders/Backhoes	137	http://www.ritch	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151	0.06	2.15	0.008	0.008	*477.9151*	*0.151*	-78%	-23%	-94%	-94%	0%	0%
966 Wheel Loader	Tractors/Loaders/Backhoes	170	http://www.ritch	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151	0.06	2.15	0.008	0.008	*477.9151*	*0.151*	-78%	-23%	-94%	-94%	0%	0%
336 Excavator	Excavators	266	http://www.ritch	0.38	0.162	1.77986	0.058	0.053	481.2361	0.152	0.08	1.29	0.008	0.008	*481.2361*	*0.152*	-51%	-28%	-86%	-85%	0%	0%
Air Compressor	Air Compressor	63	http://www.sulla	0.48	0.538	3.706	0.26	0.26	568.299	0.048	0.12	2.74	0.112	0.112	*568.299*	*0.048*	-78%	-26%	-57%	-57%	0%	0%
963 Track Loader	Tractors/Loaders/Backhoes	150	http://www.ritch	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151	0.06	2.15	0.008	0.008	*477.9151*	*0.151*	-78%	-23%	-94%	-94%	0%	0%
Skidsteer Loader	Skid Steer Loader	65	CalEEMod defaul	0.37	0.199	2.65586	0.122	0.112	482.3844	0.153	0.12	2.74	0.112	0.112	*482.3844*	*0.153*	-40%	3%	-8%	0%	0%	0%
CP433 Compactor	Other Construction Equipment	105	http://www.ritch	0.42	0.55	5.04831	0.379	0.349	482.2177	0.153	0.11	2.14	0.008	0.008	*482.2177*	*0.153*	-80%	-58%	-98%	-98%	0%	0%
Plate Compactor	Plate Compactors	8	CalEEMod defaul	0.43	0.661	4.142	0.161	0.161	568.299	0.059	0.661	4.142	0.161	0.161	*568.299*	*0.059*	0%	0%	0%	0%	0%	0%
5kW Generator	Generator Sets	10	5k~7HP	0.74	0.662	4.617	0.224	0.224	568.299	0.059	0.662	4.617	0.224	0.224	*568.299*	*0.059*	0%	0%	0%	0%	0%	0%
D6 Dozer	Crawler Tractors	245	http://www.cat.c	0.43	0.38	4.9721	0.187	0.172	483.4489	0.153	0.08	1.29	0.008	0.008	*483.4489*	*0.153*	-79%	-74%	-96%	-95%	0%	0%
140M Grader	Graders	213	http://www.cat.c	0.41	0.36	4.86575	0.156	0.144	486.3288	0.154	0.08	1.29	0.008	0.008	*486.3288*	*0.154*	-78%	-73%	-95%	-94%	0%	0%
CP64 Compactor	Other Construction Equipment	156	http://www.cat.c	0.42	0.412	4.4331	0.233	0.215	480.4518	0.152	0.06	2.15	0.008	0.008	*480.4518*	*0.152*	-85%	-52%	-97%	-96%	0%	0%
Hydroseeder	Other Construction Equipment	125	http://www.finn	0.42	0.412	4.4331	0.233	0.215	480.4518	0.152	0.06	2.15	0.008	0.008	*480.4518*	*0.152*	-85%	-52%	-97%	-96%	0%	0%

CalEEMod Emission Factors

Equipment Type	Year	Low HP	High HP	TOG	ROG	CO	NOX	SO2	PM10	PM2.5	CO2	CH4
Air Compressors	2019	6	15	1.951	0.748	3.562	4.647	0.008	0.241	0.241	568.299	0.067
Air Compressors	2019	16	25	4.106	0.787	2.501	4.596	0.007	0.222	0.222	568.299	0.071
Air Compressors	2019	26	50	9.076	1.129	5.283	4.546	0.007	0.287	0.287	568.299	0.101
Air Compressors	2019	51	120	9.123	0.538	3.718	3.706	0.006	0.26	0.26	568.299	0.048
Air Compressors	2019	121	175	12.833	0.401	3.204	2.874	0.006	0.15	0.15	568.299	0.036
Air Compressors	2019	176	250	14.416	0.304	1.132	2.469	0.006	0.078	0.078	568.299	0.027
Air Compressors	2019	251	500	24.559	0.293	1.086	2.193	0.005	0.075	0.075	568.299	0.026
Air Compressors	2019	501	750	38.104	0.294	1.086	2.247	0.005	0.076	0.076	568.299	0.026
Air Compressors	2019	751	1000	56.984	0.324	1.182	4.073	0.005	0.102	0.102	568.299	0.029
Crawler Tractors	2019	26	50	2.648469	2.225	7.58896	5.85476	0.005	0.64	0.589	525.9767	0.166
Crawler Tractors	2019	51	120	0.901167	0.757	4.08842	6.39347	0.005	0.535	0.492	486.9909	0.154
Crawler Tractors	2019	121	175	0.615173	0.517	3.37886	5.38191	0.005	0.3	0.276	481.6222	0.152
Crawler Tractors	2019	176	250	0.45175	0.38	1.60445	4.9721	0.005	0.187	0.172	483.4489	0.153
Crawler Tractors	2019	251	500	0.37933	0.319	2.21938	3.93412	0.005	0.153	0.141	485.8645	0.154
Crawler Tractors	2019	501	750	0.316919	0.266	1.35585	3.34253	0.005	0.123	0.113	483.3879	0.153
Crawler Tractors	2019	751	1000	0.547243	0.46	2.02037	7.21215	0.005	0.211	0.194	486.2545	0.154
Excavators	2019	16	25	0.75855	0.637	4.59698	4.19867	0.005	0.25	0.23	536.9132	0.17
Excavators	2019	26	50	0.75855	0.637	4.59698	4.19867	0.005	0.25	0.23	536.9132	0.17
Excavators	2019	51	120	0.386598	0.325	3.52421	3.36874	0.005	0.211	0.194	478.2452	0.151
Excavators	2019	121	175	0.293021	0.246	3.08163	2.53264	0.005	0.122	0.112	482.6838	0.153
Excavators	2019	176	250	0.220917	0.186	1.12671	2.24187	0.005	0.068	0.063	482.2503	0.153
Excavators	2019	251	500	0.192898	0.162	1.1135	1.77986	0.005	0.058	0.053	481.2361	0.152
Excavators	2019	501	750	0.209677	0.176	1.17289	1.98661	0.005	0.067	0.062	479.2876	0.152
Generator Sets	2019	6	15	1.758	0.662	3.562	4.617	0.008	0.224	0.224	568.299	0.059
Generator Sets	2019	16	25	3.356	0.731	2.501	4.596	0.007	0.214	0.214	568.299	0.066
Generator Sets	2019	26	50	6.208	0.779	4.076	4.215	0.007	0.222	0.222	568.299	0.07
Generator Sets	2019	51	120	8.233	0.405	3.396	3.446	0.006	0.206	0.206	568.299	0.036
Generator Sets	2019	121	175	10.727	0.29	2.929	2.669	0.006	0.118	0.118	568.299	0.026
Generator Sets	2019	176	250	11.695	0.211	1.036	2.285	0.006	0.064	0.064	568.299	0.019
Generator Sets	2019	251	500	17.492	0.199	1.015	2.056	0.005	0.062	0.062	568.299	0.018
Generator Sets	2019	501	750	28.675	0.202	1.015	2.104	0.005	0.062	0.062	568.299	0.018
Generator Sets	2019	1001	9999	71.228	0.261	1.103	3.829	0.005	0.087	0.087	568.299	0.023
Graders	2019	26	50	3.11378	2.616	8.27912	5.94463	0.005	0.737	0.678	503.7509	0.159
Graders	2019	51	120	1.228249	1.032	4.6424	8.1592	0.005	0.665	0.612	479.9011	0.152
Graders	2019	121	175	0.724541	0.609	3.65586	6.01354	0.005	0.337	0.31	489.0419	0.155
Graders	2019	176	250	0.428358	0.36	1.35927	4.86575	0.005	0.156	0.144	486.3288	0.154
Graders	2019	251	500	0.384059	0.323	1.52849	3.21794	0.005	0.124	0.114	482.5879	0.153
Graders	2019	501	750	13.635	0.335	1.255	2.276	0.005	0.08	0.08	568.299	0.03
Other Construction Equipment	2019	6	15	1.370834	1.152	5.54123	5.20338	0.005	0.437	0.402	539.7349	0.171
Other Construction Equipment	2019	16	25	1.370834	1.152	5.54123	5.20338	0.005	0.437	0.402	539.7349	0.171
Other Construction Equipment	2019	26	50	1.370834	1.152	5.54123	5.20338	0.005	0.437	0.402	539.7349	0.171
Other Construction Equipment	2019	51	120	0.655004	0.55	3.7535	5.04831	0.005	0.379	0.349	482.2177	0.153
Other Construction Equipment	2019	121	175	0.490382	0.412	3.25619	4.4331	0.005	0.233	0.215	480.4518	0.152
Other Construction Equipment	2019	251	500	0.277883	0.233	1.66739	2.85547	0.005	0.103	0.094	485.4127	0.154
Plate Compactors	2019	6	15	0.79	0.661	3.469	4.142	0.008	0.161	0.161	568.299	0.059
Skid Steer Loaders	2019	16	25	0.531282	0.446	3.73957	3.75009	0.005	0.154	0.141	539.2667	0.171
Skid Steer Loaders	2019	26	50	0.531282	0.446	3.73957	3.75009	0.005	0.154	0.141	539.2667	0.171
Skid Steer Loaders	2019	51	120	0.2373	0.199	3.27736	2.65586	0.005	0.122	0.112	482.3844	0.153
Tractors/Loaders/Backhoes	2019	16	25	1.095082	0.92	5.20327	4.60928	0.005	0.33	0.304	527.6843	0.167
Tractors/Loaders/Backhoes	2019	26	50	1.095082	0.92	5.20327	4.60928	0.005	0.33	0.304	527.6843	0.167
Tractors/Loaders/Backhoes	2019	51	120	0.437701	0.368	3.63777	3.69257	0.005	0.247	0.227	485.8548	0.154
Tractors/Loaders/Backhoes	2019	121	175	0.321856	0.27	3.12158	2.78412	0.005	0.14	0.129	477.9151	0.151
Tractors/Loaders/Backhoes	2019	176	250	0.291458	0.245	1.22027	3.14683	0.005	0.102	0.094	481.4206	0.152
Tractors/Loaders/Backhoes	2019	251	500	0.245176	0.206	1.38918	2.34458	0.005	0.082	0.075	479.0826	0.152
Tractors/Loaders/Backhoes	2019	501	750	0.311873	0.262	1.6025	3.12046	0.005	0.117	0.107	478.9216	0.152

Tier	Low HP	High HP	CO,g/bhp-hr	NOx,g/bhp-hr	PM10,g/bhp-hr	PM2.5,g/bhp-h	ROG,g/bhp-hr
Tier 1	25	49	4.1	5.26	0.48	0.48	1.74
Tier 1	50	74	6.9	6.54	0.552	0.552	1.19
Tier 1	75	119	6.9	6.54	0.552	0.552	1.19
Tier 1	120	174	6.9	6.54	0.274	0.274	0.82
Tier 1	175	299	6.9	5.93	0.108	0.108	0.38
Tier 1	300	599	6.9	5.93	0.108	0.108	0.38
Tier 1	600	750	6.9	5.93	0.108	0.108	0.38
Tier 1	751	2000	6.9	5.93	0.108	0.108	0.38
Tier 2	25	49	4.1	4.63	0.28	0.28	0.29
Tier 2	50	74	3.7	4.75	0.192	0.192	0.23
Tier 2	75	119	3.7	4.75	0.192	0.192	0.23
Tier 2	120	174	3.7	4.17	0.128	0.128	0.19
Tier 2	175	299	2.6	4.15	0.088	0.088	0.12
Tier 2	300	599	2.6	3.79	0.088	0.088	0.12
Tier 2	600	750	2.6	3.79	0.088	0.088	0.12
Tier 2	751	2000	2.6	3.79	0.088	0.088	0.12
Tier 3	25	49	4.1	4.63	0.28	0.28	0.29
Tier 3	50	74	3.7	2.74	0.192	0.192	0.12
Tier 3	75	119	3.7	2.74	0.192	0.192	0.12
Tier 3	120	174	3.7	2.32	0.112	0.112	0.12
Tier 3	175	299	2.6	2.32	0.088	0.088	0.12
Tier 3	300	599	2.6	2.32	0.088	0.088	0.12
Tier 3	600	750	2.6	2.32	0.088	0.088	0.12
Tier 3	751	2000	2.6	2.32	0.088	0.088	0.12
Tier 4 Interim	25	49	4.1	4.55	0.128	0.128	0.12
Tier 4 Interim	50	74	3.7	2.74	0.112	0.112	0.12
Tier 4 Interim	75	119	3.7	2.14	0.008	0.008	0.11
Tier 4 Interim	120	174	3.7	2.15	0.008	0.008	0.06
Tier 4 Interim	175	299	2.6	1.29	0.008	0.008	0.08
Tier 4 Interim	300	599	2.6	1.29	0.008	0.008	0.08
Tier 4 Interim	600	750	2.6	1.29	0.008	0.008	0.08
Tier 4 Interim	751	2000	2.6	2.24	0.048	0.048	0.12
Tier 4 Final	25	49	4.1	2.75	0.008	0.008	0.12
Tier 4 Final	50	74	3.7	2.74	0.008	0.008	0.12
Tier 4 Final	75	119	3.7	0.26	0.008	0.008	0.06
Tier 4 Final	120	174	3.7	0.26	0.008	0.008	0.06
Tier 4 Final	175	299	2.2	0.26	0.008	0.008	0.06
Tier 4 Final	300	599	2.2	0.26	0.008	0.008	0.06
Tier 4 Final	600	750	2.2	0.26	0.008	0.008	0.06
Tier 4 Final	751	2000	2.6	2.24	0.016	0.016	0.06

Source: Offroad_Efs

Emissions by Site / Alternative

*= EF * HP * LF * lbs/g * equip hrs*

Equipment Recap	Hrs/day	Days	Equip Hrs	Equipment Type	HP	LF	Emission Factors (g/hp-hr) - Unmitigated ROG	NOX	PM10	PM2.5	CO2	CH4	Emission Factors (g/hp-hr) - Mitigated Tier 4 Interim ROG	NOX	PM10	PM2.5	CO2	CH4	Emissions (lbs) - Unmitigated ROG	NOX	PM10	PM2.5	CO2	CH4	Emissions (lbs) - Mitigated ROG	NOX	PM10	PM2.5	CO2	CH4
Bridge Building #2 Demolition and Riparian Restoration			**5,581**		**1,588**																									
Pickup Trucks Superintendent, Forema	10	225	2250																											
450 Backhoe: Items 1, 14	8	7	56	450 Backhoe	137	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151	0.06	2.15	0.008	0.008	477.9151	0.151	1.689696467	17.42339899	0.876139	0.807299	2990.857	0.944978	0.375488	13.45499	0.050065	0.050065	2990.857	0.944978
Flatbed Truck: Items 1-5, 8, 9, 12-14	8	48	384																											
966 Wheel Loader: Item 2	8	2	16	966 Wheel Loader	170	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151	0.06	2.15	0.008	0.008	477.9151	0.151	0.599058184	6.17722175	0.310623	0.286217	1060.366	0.335029	0.133124	4.770278	0.01775	0.01775	1060.366	0.335029
336 Excavator: Items 2, 3, 4, 6, 7 & 9	8	51	404	336 Excavator	266	0.38	0.162	1.77986	0.058	0.053	481.2361	0.152	0.08	1.29	0.008	0.008	481.2361	0.152	14.58465722	160.238568	5.221667	4.771524	43325.08	13.68437	7.2023	116.1371	0.72023	0.72023	43325.08	13.68437
End Dump/Highside: Items 2-4, 6, 10	8	122	976																											
Watertruck: Items 2, 3, 4, 5, 6, 8, 10	8	47	376																											
Air Compressor: Items 2, 3, 8, 13	8	27	216	Air Compressor	63	0.48	0.538	3.706	0.26	0.26	568.299	0.048	0.12	2.74	0.112	0.112	568.299	0.048	7.747336637	53.36734122	3.744066	3.744066	8183.65	0.691212	1.72803	39.4567	1.612828	1.612828	8183.65	0.691212
963 Track Loader: Items 3, 4, 6 & 9	8	28	224	963 Track Loader	150	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151	0.06	2.15	0.008	0.008	477.9151	0.151	7.400130514	76.30685691	3.837105	3.535618	13098.64	4.138592	1.644473	58.92697	0.219263	0.219263	13098.64	4.138592
Skidsteer Loader: Items 5, 7, 10, 11, 1:	8	28	224	Skidsteer Loader	65	0.37	0.199	2.65586	0.122	0.112	482.3844	0.153	0.12	2.74	0.112	0.112	482.3844	0.153	2.363473783	31.54299236	1.448964	1.330196	5729.16	1.817143	1.42521	32.5423	1.330196	1.330196	5729.16	1.817143
CP433 Compactor: Items 7, 10	8	16	128	CP433 Compactor	105	0.42	0.55	5.04831	0.379	0.349	482.2177	0.153	0.11	2.14	0.008	0.008	482.2177	0.153	6.84456516	62.82452135	4.716528	4.343188	6001.037	1.904034	1.368913	26.63158	0.099557	0.099557	6001.037	1.904034
Plate Compactor: Items 7, 10	8	16	128	Plate Compactor	8	0.43	0.661	4.142	0.161	0.161	568.299	0.059	0.661	4.142	0.161	0.161	568.299	0.059	0.641659289	4.020806011	0.156289	0.156289	551.6707	0.057274	0.641659	4.020806	0.156289	0.156289	551.6707	0.057274
5kW Generator: Items 8, 10, 13	8	24	192	5kW Generator	10	0.74	0.662	4.617	0.224	0.224	568.299	0.059	0.662	4.617	0.224	0.224	568.299	0.059	2.073602709	14.46196935	0.701642	0.701642	1780.1	0.184807	2.073603	14.46197	0.701642	0.701642	1780.1	0.184807
Ready Mix Truck	8	1	7																											
Nursery Site Detention Basin			**10,820**		**4,000**																									
Pickup Trucks Superintendent, Forema	10	441	4410																											
450 Backhoe: Items 1, 10, 27, 29, 30	10	18	180	450 Backhoe	137	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151	0.06	2.15	0.008	0.008	477.9151	0.151	5.431167216	56.00378248	2.816161	2.594891	9613.47	3.037431	1.206926	43.24818	0.160923	0.160923	9613.47	3.037431
Flatbed Truck: Items 1-15, 19-22, 24, 2	10	120	1200																											
966 Wheel Loader: Item 2-7, 11-18, 21	10	100	1000	966 Wheel Loader	170	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151	0.06	2.15	0.008	0.008	477.9151	0.151	37.44113653	386.0763594	19.41392	17.88854	66272.91	20.9393	8.320253	298.1424	1.109367	1.109367	66272.91	20.9393
336 Excavator: Items 2-7, 12-14, 17, 1ł	10	84	840	336 Excavator	266	0.38	0.162	1.77986	0.058	0.053	481.2361	0.152	0.08	1.29	0.008	0.008	481.2361	0.152	30.32453482	333.1692997	10.85693	9.92099	90081.86	28.45265	14.97508	241.4731	1.497508	1.497508	90081.86	28.45265
D6 Dozer: Items 11- 15, 21, 25	10	41	410	D6 Dozer	245	0.43	0.38	4.9721	0.187	0.172	483.4489	0.153	0.08	1.29	0.008	0.008	483.4489	0.153	36.18566906	473.4704346	17.80716	16.37878	46036.64	14.56949	7.618036	122.8408	0.761804	0.761804	46036.64	14.56949
140M Grader: Items 15, 21, 25, 26	10	16	160	140M Grader	213	0.41	0.36	4.86575	0.156	0.144	486.3288	0.154	0.08	1.29	0.008	0.008	486.3288	0.154	11.0897194	149.8883393	4.805545	4.435888	14981.25	4.743936	2.464382	39.73816	0.246438	0.246438	14981.25	4.743936
End Dump/Highside: Items 2-7	10	14	140																											
Watertruck: Items 11-18, 21, 25, 26, 2	10	66	660																											
Air Compressor: Items 1, 2, 8, 9, 17-20	10	50	500	Air Compressor	63	0.48	0.538	3.706	0.26	0.26	568.299	0.048	0.12	2.74	0.112	0.112	568.299	0.048	17.93364962	123.5355121	8.66682	8.66682	18943.63	1.600028	4.000071	91.33494	3.733399	3.733399	18943.63	1.600028
CP64 Compactor: Items 15, 21	10	13	130	CP64 Compactor	156	0.42	0.412	4.4331	0.233	0.215	480.4518	0.152	0.06	2.15	0.008	0.008	480.4518	0.152	7.736580892	83.24523484	4.375299	4.037293	9021.976	2.854273	1.126687	40.37293	0.150225	0.150225	9021.976	2.854273
Plate Compactor: Items 17, 18	10	23	230	Plate Compactor	8	0.43	0.661	4.142	0.161	0.161	568.299	0.059	0.661	4.142	0.161	0.161	568.299	0.059	1.152981534	7.2248858	0.280832	0.280832	991.2833	0.102914	1.152982	7.224886	0.280832	0.280832	991.2833	0.102914
5kW Generator: Items 8, 9, 17-20, 29	10	54	540	5kW Generator	10	0.74	0.662	4.617	0.224	0.224	568.299	0.059	0.662	4.617	0.224	0.224	568.299	0.059	5.832007619	40.67428879	1.973368	1.973368	5006.532	0.519771	5.832008	40.67429	1.973368	1.973368	5006.532	0.519771
Hydroseeder: item 28	10	1	10	Hydroseeder	125	0.42	0.412	4.4331	0.233	0.215	480.4518	0.152	0.06	2.15	0.008	0.008	480.4518	0.152	0.476860262	5.130993271	0.269681	0.248847	556.0883	0.175929	0.069446	2.48847	0.009259	0.009259	556.0883	0.175929
Ready Mix Truck: Item 20, 24	10	16	160																											
Boom Truck: Item 8, 19, 20	10	25	250																											
Nursery Site Detention Basin - Option 6			**12,490**		**4,920**																									
Pickup Trucks Superintendent, Forema	10	495	4950																											
450 Backhoe: Items 1, 10, 28, 30, 31	10	18	180	450 Backhoe	137	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151	0.06	2.15	0.008	0.008	477.9151	0.151	5.431167216	56.00378248	2.816161	2.594891	9613.47	3.037431	1.206926	43.24818	0.160923	0.160923	9613.47	3.037431
Flatbed Truck: Items 1-15, 20-25, 28, 3	10	123	1230																											
966 Wheel Loader: Item 2-7, 11-19, 22	10	118	1180	966 Wheel Loader	170	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151	0.06	2.15	0.008	0.008	477.9151	0.151	44.1805411	455.5701041	22.90843	21.10848	78202.03	24.70838	9.817898	351.808	1.309053	1.309053	78202.03	24.70838
336 Excavator: Items 2-7, 12-14, 17-1ç	10	104	1040	336 Excavator	266	0.38	0.162	1.77986	0.058	0.053	481.2361	0.152	0.08	1.29	0.008	0.008	481.2361	0.152	37.54466216	412.4953234	13.44192	12.28313	111529.9	35.22709	18.54057	298.9668	1.854057	1.854057	111529.9	35.22709
D6 Dozer: Items 11-15, 22, 26	10	44	440	D6 Dozer	245	0.43	0.38	4.9721	0.187	0.172	483.4489	0.153	0.08	1.29	0.008	0.008	483.4489	0.153	38.83340094	508.1146127	19.11012	17.57722	49405.17	15.63555	8.175453	131.8292	0.817545	0.817545	49405.17	15.63555
140M Grader: Items 15, 22, 26, 27	10	14	140	140M Grader	213	0.41	0.36	4.86575	0.156	0.144	486.3288	0.154	0.08	1.29	0.008	0.008	486.3288	0.154	9.703504471	131.1522969	4.204852	3.881402	13108.59	4.150944	2.156334	34.77089	0.215633	0.215633	13108.59	4.150944
End Dump/Highside: Items 2-7	10	14	140																											
Watertruck: Items 11-19, 22, 26, 27, 2	10	84	840																											
Air Compressor: Items 2, 3, 8, 9, 17-21	10	75	750	Air Compressor	63	0.48	0.538	3.706	0.26	0.26	568.299	0.048	0.12	2.74	0.112	0.112	568.299	0.048	26.90047444	185.3032681	13.00023	13.00023	28415.45	2.400042	6.000106	137.0024	5.600099	5.600099	28415.45	2.400042
CP64 Compactor: Items 15, 22	10	11	110	CP64 Compactor	156	0.42	0.412	4.4331	0.233	0.215	480.4518	0.152	0.06	2.15	0.008	0.008	480.4518	0.152	6.546337678	70.43827563	3.702176	3.416171	7633.98	2.415154	0.95335	34.16171	0.127113	0.127113	7633.98	2.415154
Plate Compactor: Items 17-19	10	38	380	Plate Compactor	8	0.43	0.661	4.142	0.161	0.161	568.299	0.059	0.661	4.142	0.161	0.161	568.299	0.059	1.904926013	11.93676784	0.463983	0.463983	1637.772	0.170031	1.904926	11.93677	0.463983	0.463983	1637.772	0.170031
5kW Generator: Items 8, 9, 17-21, 30	10	69	690	5kW Generator	10	0.74	0.662	4.617	0.224	0.224	568.299	0.059	0.662	4.617	0.224	0.224	568.299	0.059	7.452009736	51.97270234	2.521526	2.521526	6397.235	0.664152	7.45201	51.9727	2.521526	2.521526	6397.235	0.664152
Hydroseeder: item 29	10	1	10	Hydroseeder	125	0.42	0.412	4.4331	0.233	0.215	480.4518	0.152	0.06	2.15	0.008	0.008	480.4518	0.152	0.476860262	5.130993271	0.269681	0.248847	556.0883	0.175929	0.069446	2.48847	0.009259	0.009259	556.0883	0.175929
Ready Mix Truck: Item 21, 25	10	16	160																											
Boom Truck: Item 8, 20, 21	10	25	250																											
Nursery Site Detention Basin - Option 7			**8,030**		**2,850**																									
Pickup Trucks Superintendent, Forema	10	339	3390																											
450 Backhoe: Items 1, 9, 10, 23, 25, 26	10	19	190	450 Backhoe	137	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151	0.06	2.15	0.008	0.008	477.9151	0.151	5.732898728	59.11510373	2.972614	2.739052	10147.55	3.206177	1.273977	45.65086	0.169864	0.169864	10147.55	3.206177
Flatbed Truck: Items 1-14, 17-20, 23, 2	10	94	940																											
966 Wheel Loader: Item 2-7, 11, 12, 1(	10	50	500	966 Wheel Loader	170	0.37	0.27	2.78412	0.14	0.129	477.9151	0.151	0.06	2.15	0.008	0.008	477.9151	0.151	18.72056826	193.0381797	9.706961	8.944272	33136.45	10.46965	4.160126	149.0712	0.554684	0.554684	33136.45	10.46965
336 Excavator: Items 2-7, 12, 13, 16, 2	10	59	590	336 Excavator	266	0.38	0.162	1.77986	0.058	0.053	481.2361	0.152	0.08	1.29	0.008	0.008	481.2361	0.152	21.29937565	234.01177	7.625702	6.968314	63271.78	19.9846	10.51821	169.6061	1.051821	1.051821	63271.78	19.9846
D6 Dozer: Items 11-14, 17, 18	10	30	300	D6 Dozer	245	0.43	0.38	4.9721	0.187	0.172	483.4489	0.153	0.08	1.29	0.008	0.008	483.4489	0.153	26.47731882	346.4417814	13.02963	11.98447	33685.34	10.6606	5.574172	89.88353	0.557417	0.557417	33685.34	10.6606
140M Grader: Items 14, 19, 21,22	10	8	80	140M Grader	213	0.41	0.36	4.86575	0.156	0.144	486.3288	0.154	0.08	1.29	0.008	0.008	486.3288	0.154	5.544859698	74.94416965	2.402773	2.217944	7490.625	2.371968	1.232191	19.86908	0.123219	0.123219	7490.625	2.371968
End Dump/Highside: Items 2-7	10	13	130																											
Watertruck: Items 11-14, 16, 19, 21, 2	10	47	470																											
Air Compressor: Items 2, 3, 8, 9, 16-18	10	52	520	Air Compressor	63	0.48	0.538	3.706	0.26	0.26	568.299	0.048	0.12	2.74	0.112	0.112	568.299	0.048	18.65099561	128.4769326	9.013492	9.013492	19701.38	1.664029	4.160073	94.98834	3.882735	3.882735	19701.38	1.664029
CP64 Compactor: Items 14, 19	10	5	50	CP64 Compactor	156	0.42	0.412	4.4331	0.233	0.215	480.4518	0.152	0.06	2.15	0.008	0.008	480.4518	0.152	2.975608035	32.01739801	1.682807	1.552805	3469.991	1.097797	0.433341	15.52805	0.057779	0.057779	3469.991	1.097797
Plate Compactor: Items 16	10	15	150	Plate Compactor	8	0.43	0.661	4.142	0.161	0.161	568.299	0.059	0.661	4.142	0.161	0.161	568.299	0.059	0.751944479	4.711882044	0.183151	0.183151	646.4891	0.067118	0.751944	4.711882	0.183151	0.183151	646.4891	0.067118
5kW Generator: Items 8, 9, 16-18, 25	10	46	460	5kW Generator	10	0.74	0.662	4.617	0.224	0.224	568.299	0.059	0.662	4.617	0.224	0.224	568.299	0.059	4.96800649	34.64846823	1.681017	1.681017	4264.823	0.442768	4.968006	34.64847	1.681017	1.681017	4264.823	0.442768
Hydroseeder: item 25	10	1	10	Hydroseeder	125	0.42	0.412	4.4331	0.233	0.215	480.4518	0.152	0.06	2.15	0.008	0.008	480.4518	0.152	0.476860262	5.130993271	0.269681	0.248847	556.0883	0.175929	0.069446	2.48847	0.009259	0.009259	556.0883	0.175929
Boom Truck: Item 8, 17, 18	10	25	250																											

Source: San Anselmo Flood Options 2, 6 and 7 Equip and Work Durations R6_BS

B-5 Worker Commutes

Worker Commute Emissions

Updated: 4/4/2018

Calculated using EMFAC2017 EFs for LDA, LDT1, LDT2 (CalEEMod "LD_Mix")

Assumptions

Workers/day	30	PD says 20-30 workers/day
One-way trips/day	60	
Trip length (one-way)	10.8	CalEEMod default
Vehicle Types:		
LDA	50%	CalEEMod Appendix 2: 50% light-duty auto (or passenger car), 25% light-duty truck type 1 (LDT1), and 25% light-duty truck type 2 (LDT2)
LDT1	25%	
LDT2	25%	

EMFAC2017 Emission Factors

Total Emissions by Aggregated Speed — Emissions = tons/day; Fuel = 1000 gallons/day

calendar_year	season_mo	sub_area	vehicle_cla	fuel	pollutant	emission
2019	Annual	Marin (SF)	LDA	Gas	NOx	0.494985
2019	Annual	Marin (SF)	LDA	Gas	PM10	0.220537
2019	Annual	Marin (SF)	LDA	Gas	PM2_5	0.0924
2019	Annual	Marin (SF)	LDA	Gas	ROG	0.65551
2019	Annual	Marin (SF)	LDT1	Gas	NOx	0.109347
2019	Annual	Marin (SF)	LDT1	Gas	PM10	0.025784
2019	Annual	Marin (SF)	LDT1	Gas	PM2_5	0.011013
2019	Annual	Marin (SF)	LDT1	Gas	ROG	0.16832
2019	Annual	Marin (SF)	LDT2	Gas	NOx	0.309677
2019	Annual	Marin (SF)	LDT2	Gas	PM10	0.088606
2019	Annual	Marin (SF)	LDT2	Gas	PM2_5	0.036974
2019	Annual	Marin (SF)	LDT2	Gas	ROG	0.343634
2019	Annual	Marin (SF)	LDA	Gas	CH4	1.679103
2019	Annual	Marin (SF)	LDA	Gas	CO2	1390.704
2019	Annual	Marin (SF)	LDA	Gas	N2O	14.79877
2019	Annual	Marin (SF)	LDT1	Gas	CH4	0.299203
2019	Annual	Marin (SF)	LDT1	Gas	CO2	186.4021
2019	Annual	Marin (SF)	LDT1	Gas	N2O	2.494028
2019	Annual	Marin (SF)	LDT2	Gas	CH4	0.798757
2019	Annual	Marin (SF)	LDT2	Gas	CO2	718.0189
2019	Annual	Marin (SF)	LDT2	Gas	N2O	7.730588

Default_Marin_2019_Annual_Worker_emission

Aggregated VMT

calendar_ye	sub_area	vehicle_cla	fuel	vmt
2019	Marin (SF)	LDA	Gas	4279849
2019	Marin (SF)	LDT1	Gas	492237.3
2019	Marin (SF)	LDT2	Gas	1725363

Calculated EFs (g/mi)

Vehicle Type	Fuel	VMT	ROG	NOX	PM10	PM2_5	CO2	CH4	N2O
LDA	Gas	4,279,849	0.138946	0.10492	0.0467464	0.019586	294.7828	0.3559138	3.136845
LDT1	Gas	492,237	0.310211	0.201525	0.0475201	0.020298	343.536	0.5514257	4.596451
LDT2	Gas	1,725,363	0.18068	0.162826	0.0465884	0.01944	377.5298	0.4199815	4.064694
Weighted Average			0.192196	0.143548	0.0469003	0.019727	327.6578	0.4208087	3.733709

Worker Trip Emissions

*= 60 one-way trips/day * 10.8 miles per one-way trip * grams per mile * lbs per gram*

	Average Daily Emissions (lbs/day)				Annual Emissions (MTCO2e)			
Site	**ROG**	**NOX**	**PM10**	**PM2_5**	**CO2**	**CH4**	**N2O**	**CO2e**
Nursery Site Detention Basin	0.2746	0.2051	0.0670	0.0282	31.21	0.04	0.36	31.61
Bridge Building #2 Demolition and Riparia	0.2746	0.2051	0.0670	0.0282	15.92	0.02	0.18	16.13
Nursery Site Detention Basin - Option 6	0.2746	0.2051	0.0670	0.0282	35.03	0.04	0.40	35.48
Nursery Site Detention Basin - Option 7	0.2746	0.2051	0.0670	0.0282	23.99	0.03	0.27	24.30

B-6 Construction Haul Truck Emissions

HD Trucks

Updated: 4/4/2018

Includes semi-highside, semi-end dumps, bottom dumps, water trucks, ready mix, and boom trucks. Flatbed (MDV) and pickup trucks (LDHT) not included.

Calculated using EMFAC2017 EFs for HHDT

Assumptions

Trip lengths (one-way) 20 From R6 spreadsheet: *Bottom dump trucks haul an average of 14.5 CY to Redwood Landfill in Petaluma. Flagging required at SFDB. Quantity = (Excavation - Embankment) + 20%*

Note: ~21 miles from Nursery to Redwoord ~18 miles from BB2 to Redwood, and 20 mile CalEEMod default. So use 20 for all trucks.

Summary of Emissions

				Average Daily Emissions (lbs/day)				Total Emissions (MTCO2e)			
	Total One-Way Trips	Total VMT	Average Daily Miles	ROG	NOX	PM10 Exh	PM2.5 Exh	CO2	CH4	N2O	CO2e
Nursery Site Detention Ba	6,808	136,160	926	0.4480	11.8272	0.1907	0.1824	225.07	0.03	10.54	235.64
Bridge Building #2 Demoli	1,474	29,480	393	0.1901	5.0190	0.0809	0.0774	48.73	0.01	2.28	51.02
Nursery Site Detention Ba	9,226	184,520	1,118	0.5409	14.2794	0.2302	0.2203	305.00	0.05	14.29	319.34
Nursery Site Detention Ba	7,950	159,000	1,407	0.6806	17.9668	0.2897	0.2771	262.82	0.04	12.31	275.17

	For HRA - Total Annual PM (lbs)							
Pollutant	Nursery Unmitigated	Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Jnmitigatei	Nursery6 Mitigated	Nursery7 Unmitigatec	Nursery7 Mitigated
PM10 - DPM	28.0309	*28.0309*	11.8952	*11.8952*	33.8426	*33.8426*	42.5817	*42.5817*
PM2.5	26.8182	*26.8182*	11.3806	*11.3806*	32.3786	*32.3786*	40.7396	*40.7396*

Emission Factors

Calculated EFs (g/mi) - Onsite Trucks tab

ROG	NOX	PM10	PM2_5	CO2	CH4	N2O
0.219409436	5.791843668	0.093379625	0.089340063	1652.955	0.254775	77.426806

HD Truck Trips

Green = CalEEMod Entry   CalEEMod NOT USED

Source: San Anselmo Flood Options 2, 6 and 7 Equip and Work Durations R6_BS

Nursery Site Detention Basin

Item	Operation	Work Days	Daily round trips (loads)	Total One-way trips	rtps/day
1	Mobilization/Erosion Control	5	2	20	4
2	Demo Wood Framed Building	1	4	8	8
3	Demo Misc Structures	5	4	40	8
4	Clearing & Grubbing	3	2	12	4
5	Remove Trees	3	2	12	4
6	Remove septic tanks	1	2	4	4
7	Remove Fire Hydrant & Water	1	2	4	4
8	Remove OH Electrical & Poles	2	7	28	14
9	Remove Fencing	1	2	4	4
10	Abandon Water Well	1	2	4	4
11	Top Soil Stripping/Stockpile	2	12	48	24
12	Excavation (Cut)	18	12	432	24
13	Over-excavation beneath bern	3	12	72	24
14	Over-excavation at spillway	3	12	72	24
15	Backfill Over-Excavated Areas	7	12	168	24
16	Off-Haul Trucks	13.61	142	3,866	284
17	Catch Basins, Manholes, Drain	15	12	360	24
18	Precast Box Culvert (6'x4' & 1C	8	12	192	24
19	Construct Overflow Weir/Floo	20	7	280	14
20	Pour Concrete Overflow Weir/	3	12	72	24
21	Embankment (Berm)	6	12	144	24
22	Riprap	10	32	640	64
23	Riprap Trucks	0	0	0	0
24	Seepage cutoff wall 3' x 7'	13	7	182	14
25	Finish Grade Slopes/Seasonal (	2	12	48	24
26	Place Topsoil	1	12	24	24
27	Plantings	5	2	20	4
28	Hydroseeding	1	12	24	24
29	Fence	5	2	20	4
30	Demobilization	2	2	8	4
	Total			**6,808**	

0 HHDT rtps/day
0 Min
284 Max

Bridge Building #2 Demolition and Riparian Restoration

Item	Operation	Work Days	Daily round trips (loads)	Total One-way trips	rtps/day
1	Mobilization/Erosion Cc	5	1	10	2
2	Demo Wood Framed Bu	2	8	32	16
3	Demo Concrete Structu	15	10	300	20
4	Clearing & Grubbing, Tr	2	8	32	16
5	Top Soil Stripping/Stock	1	6	12	12
6	1/2 Ton Riprap. Slope Tı	10	34	680	68
7	Terrace Flood Plain	2	6	24	12
8	Flood Walls	9	2	36	4
9	Storm Drain	1	6	12	12
10	Bioengineered Slope	14	11	308	22
11	Place Topsoil	1	1	2	2
12	Plantings	10	1	20	2
13	Guardrail	1	1	2	2
14	Demobilization	2	1	4	2
	Total			**1,474**	

0 HHDT rtps/day
2 Min
68 Max

Nursery Site Detention Basin - Option 6

Item	Operation	Work Days	Daily round trips (loads)	Total One-way trips	rtps/day
1	Mobilization/Erosion Control	5	2	22	4.339394
2	Demo Wood Framed Building	1	4	8	8.339394
3	Demo Misc Structures	5	4	42	8.339394
4	Clearing & Grubbing	3	4	25	8.339394
5	Remove Trees	3	4	25	8.339394
6	Remove septic tanks	1	2	4	4.339394
7	Remove Fire Hydrant & Water	1	2	4	4.339394
8	Remove OH Electrical & Poles	2	7	29	14.33939
9	Remove Fencing	1	2	4	4.339394
10	Abandon Water Well	1	2	4	4.339394
11	Top Soil Stripping/Stockpile	2	12	49	24.33939
12	Excavation (Cut)	23	12	560	24.33939
13	Over-excavation beneath bern	3	12	73	24.33939
14	Over-excvation at spillway	3	12	73	24.33939
15	Backfill Over-Excavated Areas	7	12	170	24.33939
16	Off-Haul Trucks	20.32	142	5,772	284
17	Catch Basins, Manholes, Drain	15	12	365	24.33939
18	Precast Box Culvert (6'x4' & 1C	8	12	195	24.33939
19	Storm Water Lift Station	15	12	365	24.33939
20	Construct Overflow Weir/Floo	20	7	287	14.33939
21	Pour Concrete Overflow Weir/	3	12	73	24.33939
22	Embankment (Berm)	4	12	97	24.33939
23	Riprap	10	32	643	64.33939
24	Riprap Trucks	0	0	0	0
25	Seepage cutoff wall 3' x 7'	13	7	186	14.33939
26	Finish Grade Slopes/Seasonal (	2	12	49	24.33939
27	Place Topsoil	1	12	24	24.33939
28	Plantings	5	2	22	4.339394
29	Hydroseeding	1	12	24	24.33939
30	Fence	5	2	22	4.339394
31	Demobilization	2	2	9	4.339394
	Total			**9,226**	

Source: XXX

0 HHDT rtps/day
0 Min
284 Max

Nursery Site Detention Basin - Option 7

Item	Operation	Work Days	Daily round trips (loads)	Total One-way trips	rtps/day
1	Mobilization/Erosion Cc	5	3	30	6
2	Demo Wood Framed Bu	1	5	10	10
3	Demo Misc Structures	5	5	50	10
4	Clearing & Grubbing	2	5	20	10
5	Remove Trees	3	5	30	10
6	Remove septic tanks	1	3	6	6
7	Remove Fire Hydrant &	1	3	6	6
8	Remove OH Electrical &	2	8	32	16
9	Remove Fencing	1	3	6	6
10	Abandon Water Well	1	3	6	6
11	Top Soil Stripping/Stock	1	13	26	26
12	Excavation (Cut)	19	13	494	26
13	Over-excavation beneat	3	13	78	26
14	Backfill Over-Excavated	4	13	104	26
15	Off-Haul Trucks	19.42	142	5,516	284
16	Catch Basins, Manholes	15	13	390	26
17	Construct Overflow We	20	8	320	16
18	Pour Concrete Overflow	3	8	48	16
19	Embankment (Berm)	1	13	26	26
20	Riprap	9	32	576	64
21	Riprap Trucks	0	0	0	0
22	Finish Grade Slopes/Sea	2	13	52	26
23	Place Topsoil	1	13	26	26
24	Plantings	5	3	30	6
25	Hydroseeding	1	13	26	26
26	Fence	5	3	30	6
27	Demobilization	2	3	12	6
	Total			**7,950**	

Source: XXX

0 HHDT rtps/day
0 Min
284 Max

For CalEEMod Entry

	Nursery Site	BB2	Nursery Site - Option 6	Nursery Site - Option 7	
Worker Trips					
Total Trips (one-way)	8,820	4,500	9,900	6,780	
Daily Trips (one-way)	60	60	60	60	*PD: 20-30 crew per day*
Pickups					
Total Trips (one-way)	735	375	825	565	

Daily Trips (one-way)	5	5	5	5
Haul Truck Trips (includes water trucks)				
Total Trips (one-way)	6,808	1,474	9,226	7,950
Daily Trips (one-way)	46	20	56	70

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B-7 Construction Onsite Truck Emissions

Onsite Trucks and Idling + Pickup Truck loads

Updated: 4/12/2018

Includes all HD trucks (semi-highside, semi-end dumps, bottom dumps, water trucks, ready mix, boom trucks, misc trucks), MD trucks (flatbed), and pickup trucks

Truck Types:	EMFAC Type	
Semi-Highside Dumps	HHDT	
Semi-End Dumps	HHDT	
Bottom Dumps	HHDT	
Water Trucks	HHDT	
Ready Mix Trucks	HHDT	
Boom Trucks	HHDT	
Miscellaneous	HHDT	e.g. porta potty service truck
Flatbed Trucks	MDV	e.g. Ford Superduty F550 utility bed truck (6500-8000lbs), from Rick Hutts at CH2M
Pickup trucks	LDT2	

EMFAC Type	Description
LDT2	Light-Duty Trucks (3751-5750 lbs)
MDV	Medium-Duty Trucks (5751-8500 lbs)
LHDT1	Light-Heavy-Duty Trucks (8501-10000 lbs)

Assumptions

avg. speed traveling onsite (mph)	5	assumption
Time spend moving onsite	20%	assumption
Time spend idling (water trucks)	15%	assumption
Onsite Haul truck idling time per round t	15	standard assumption
	2	hrs driving onsite
	0.281	

GHG Scaling Factors (for Tables tab)			
2	LDT2	CH4:CO2	0.0011124
	LDT2	N2O:CO2	0.0107666
	HHDT	CH4:CO2	0.0001541
	HHDT	N2O:CO2	0.0468415

Summary of Emissions

	Average Daily Emissions (lbs/day)				Total Emissions (MTCO2e)			
	ROG	NOX	PM10 Exh	PM2.5 Exh	CO2	CH4	N2O	CO2e
Nursery Site Detention Basin								
Onsite Trucks	0.21	2.03	0.0269	0.0257	35.2583	0.0212	1.3882	36.6676
Pickup Truck Travel	0.03	0.03	0.0003	0.0003	4.0513	0.0045	0.0436	4.0994
Idling	0.03	0.48	0.0008	0.0007	4.9232	0.0001	0.2306	5.1539
Total	**0.27**	**2.53**	**0.0279**	**0.0267**	**44.2327**	**0.0258**	**1.6624**	**45.9209**
Bridge Building #2 Demolition and Riparian Restoration								
Onsite Trucks	0.12	1.08	0.0147	0.0140	11.0646	0.0071	0.3839	11.4556
Pickup Truck Travel	0.03	0.03	0.0003	0.0003	2.0670	0.0023	0.0223	2.0915
Idling	0.01	0.22	0.0004	0.0003	1.1408	0.0000	0.0534	1.1943
Total	**0.16**	**1.32**	**0.0154**	**0.0147**	**14.2723**	**0.0094**	**0.4596**	**14.7414**
Nursery Site Detention Basin - Option 6								
Onsite Trucks	0.25	2.40	0.0316	0.0302	45.2514	0.0269	1.8240	47.1023
Pickup Truck Travel	0.03	0.03	0.0003	0.0003	4.5473	0.0051	0.0490	4.6014
Idling	0.04	0.58	0.0009	0.0009	6.7059	0.0001	0.3141	7.0201
Total	**0.31**	**3.01**	**0.0328**	**0.0313**	**56.5047**	**0.0321**	**2.1871**	**58.7239**
Nursery Site Detention Basin - Option 7								
Onsite Trucks	0.31	3.00	0.0392	0.0375	37.5365	0.0220	1.5558	39.1143
Pickup Truck Travel	0.03	0.03	0.0003	0.0003	3.1142	0.0035	0.0335	3.1512
Idling	0.05	0.75	0.0012	0.0012	5.9376	0.0001	0.2781	6.2159
Total	**0.38**	**3.78**	**0.0408**	**0.0389**	**46.5884**	**0.0255**	**1.8675**	**48.4814**

For HRA - Total Annual PM (lbs)								
Pollutant	Nursery Unmitigated	Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Unmitigated	Nursery6 Mitigated	Nursery7 Jnmitigate	Nursery7 Mitigated
PM10 - DPM	4.0641	*4.0641*	2.2164	*2.2164*	4.7792	*4.7792*	5.9471	*5.9471*
PM2.5	3.8820	*3.8820*	2.1142	*2.1142*	4.5661	*4.5661*	5.6835	*5.6835*

EMFAC2017 Emission Factors - Running

Total Emissions by Speed Bin

Located here: \\sfo-file01\PROJECTS\SFO\211xxx\D211432.07 - San Anselmo Flood Management Project\03 Working Documents\ADEIR\AQ-GHG\EMFAC

GHGs = CO2e

Emissions = tons/day; Fuel = 1000 gallons/day

calendar_year	season_month	sub_area	vehicle_class	fuel	speed	process	pollutant	emission
2019	Annual	Marin (SF)	LDT2	Gas	5	RUNEX	NOx	0.0005838
2019	Annual	Marin (SF)	LDT2	Gas	5	RUNEX	PM10	2.99404E-05
2019	Annual	Marin (SF)	LDT2	Gas	5	RUNEX	PM2_5	2.75307E-05
2019	Annual	Marin (SF)	LDT2	Gas	5	RUNEX	ROG	0.000374098
2019	Annual	Marin (SF)	MDV	Gas	5	RUNEX	NOx	0.000418823
2019	Annual	Marin (SF)	MDV	Gas	5	RUNEX	PM10	1.78584E-05
2019	Annual	Marin (SF)	MDV	Gas	5	RUNEX	PM2_5	1.64318E-05
2019	Annual	Marin (SF)	MDV	Gas	5	RUNEX	ROG	0.000309439
2019	Annual	Marin (SF)	HHDT	Gas	5	RUNEX	NOx	1.31626E-05
2019	Annual	Marin (SF)	HHDT	Gas	5	RUNEX	PM10	7.05067E-09
2019	Annual	Marin (SF)	HHDT	Gas	5	RUNEX	PM2_5	6.48283E-09
2019	Annual	Marin (SF)	HHDT	Gas	5	RUNEX	ROG	4.45331E-06
2019	Annual	Marin (SF)	LDT2	Dsl	5	RUNEX	NOx	5.21127E-06
2019	Annual	Marin (SF)	LDT2	Dsl	5	RUNEX	PM10	4.64778E-07
2019	Annual	Marin (SF)	LDT2	Dsl	5	RUNEX	PM2_5	4.44672E-07
2019	Annual	Marin (SF)	LDT2	Dsl	5	RUNEX	ROG	8.42136E-06
2019	Annual	Marin (SF)	MDV	Dsl	5	RUNEX	NOx	1.09871E-05
2019	Annual	Marin (SF)	MDV	Dsl	5	RUNEX	PM10	1.05508E-06
2019	Annual	Marin (SF)	MDV	Dsl	5	RUNEX	PM2_5	1.00944E-06
2019	Annual	Marin (SF)	MDV	Dsl	5	RUNEX	ROG	1.38642E-05
2019	Annual	Marin (SF)	HHDT	Dsl	5	RUNEX	NOx	0.031148598
2019	Annual	Marin (SF)	HHDT	Dsl	5	RUNEX	PM10	0.00039545
2019	Annual	Marin (SF)	HHDT	Dsl	5	RUNEX	PM2_5	0.000378343
2019	Annual	Marin (SF)	HHDT	Dsl	5	RUNEX	ROG	0.003037706
2019	Annual	Marin (SF)	LDT2	Gas	5	RUNEX	CH4	0.002245772
2019	Annual	Marin (SF)	LDT2	Gas	5	RUNEX	CO2	2.461724828
2019	Annual	Marin (SF)	LDT2	Gas	5	RUNEX	N2O	0.013199865
2019	Annual	Marin (SF)	MDV	Gas	5	RUNEX	CH4	0.001690529
2019	Annual	Marin (SF)	MDV	Gas	5	RUNEX	CO2	1.647719749
2019	Annual	Marin (SF)	MDV	Gas	5	RUNEX	N2O	0.009049638
2019	Annual	Marin (SF)	HHDT	Gas	5	RUNEX	CH4	2.32629E-05
2019	Annual	Marin (SF)	HHDT	Gas	5	RUNEX	CO2	0.008429718
2019	Annual	Marin (SF)	HHDT	Gas	5	RUNEX	N2O	0.000137184
2019	Annual	Marin (SF)	LDT2	Dsl	5	RUNEX	CH4	9.7789E-06
2019	Annual	Marin (SF)	LDT2	Dsl	5	RUNEX	CO2	0.025332393
2019	Annual	Marin (SF)	LDT2	Dsl	5	RUNEX	N2O	0.001186606
2019	Annual	Marin (SF)	MDV	Dsl	5	RUNEX	CH4	1.60992E-05
2019	Annual	Marin (SF)	MDV	Dsl	5	RUNEX	CO2	0.062392098
2019	Annual	Marin (SF)	MDV	Dsl	5	RUNEX	N2O	0.002922536
2019	Annual	Marin (SF)	HHDT	Dsl	5	RUNEX	CH4	0.00352734
2019	Annual	Marin (SF)	HHDT	Dsl	5	RUNEX	CO2	6.47514176
2019	Annual	Marin (SF)	HHDT	Dsl	5	RUNEX	N2O	0.30330503

Default_Marin_2019_Annual_Speed_v2_emissions

Default_Marin_2019_Annual_Speed_v2_ghg

VMT by speed bin (miles/day)

calendar_year	sub_area	vehicle_class	fuel	speed	vmt
2019	Marin (SF)	LDT2	Gas	5	2585.05952
2019	Marin (SF)	MDV	Gas	5	1432.986202
2019	Marin (SF)	HHDT	Gas	5	1.427760007
2019	Marin (SF)	LDT2	Dsl	5	29.55078501
2019	Marin (SF)	MDV	Dsl	5	58.6098394
2019	Marin (SF)	HHDT	Dsl	5	1513.044123

Default_Marin_2019_Annual_Speed_v2_vmt

Total Emissions by Aggregated Speed

GHGs = CO2e

Emissions = tons/day; Fuel = 1000 gallons/day

calendar_year	season_month	sub_area	vehicle_class	fuel	process	pollutant	emission
2019	Annual	Marin (SF)	LDT2	Gas	DIURN	ROG	0.01583614
2019	Annual	Marin (SF)	LDT2	Gas	HOTSOAK	ROG	0.0366876
2019	Annual	Marin (SF)	LDT2	Gas	RESTLOSS	ROG	0.01553303
2019	Annual	Marin (SF)	LDT2	Gas	RUNEX	NOx	0.21109379
2019	Annual	Marin (SF)	LDT2	Gas	RUNEX	PM10	0.00298832
2019	Annual	Marin (SF)	LDT2	Gas	RUNEX	PM2_5	0.00274791
2019	Annual	Marin (SF)	LDT2	Gas	RUNEX	ROG	0.03919917
2019	Annual	Marin (SF)	LDT2	Gas	RUNLOSS	ROG	0.12549189
2019	Annual	Marin (SF)	LDT2	Gas	STREX	NOx	0.09858348
2019	Annual	Marin (SF)	LDT2	Gas	STREX	PM10	0.00050805
2019	Annual	Marin (SF)	LDT2	Gas	STREX	PM2_5	0.00046722
2019	Annual	Marin (SF)	LDT2	Gas	STREX	ROG	0.1108858
2019	Annual	Marin (SF)	MDV	Gas	DIURN	ROG	0.01055051
2019	Annual	Marin (SF)	MDV	Gas	HOTSOAK	ROG	0.02361079
2019	Annual	Marin (SF)	MDV	Gas	RESTLOSS	ROG	0.01054609
2019	Annual	Marin (SF)	MDV	Gas	RUNEX	NOx	0.15827574
2019	Annual	Marin (SF)	MDV	Gas	RUNEX	PM10	0.00181356
2019	Annual	Marin (SF)	MDV	Gas	RUNEX	PM2_5	0.00166947
2019	Annual	Marin (SF)	MDV	Gas	RUNEX	ROG	0.03512694
2019	Annual	Marin (SF)	MDV	Gas	RUNLOSS	ROG	0.07708475
2019	Annual	Marin (SF)	MDV	Gas	STREX	NOx	0.06834171
2019	Annual	Marin (SF)	MDV	Gas	STREX	PM10	0.00034092
2019	Annual	Marin (SF)	MDV	Gas	STREX	PM2_5	0.00031404
2019	Annual	Marin (SF)	MDV	Gas	STREX	ROG	0.08243168
2019	Annual	Marin (SF)	HHDT	Gas	DIURN	ROG	5.1846E-08
2019	Annual	Marin (SF)	HHDT	Gas	HOTSOAK	ROG	1.8437E-06
2019	Annual	Marin (SF)	HHDT	Gas	RESTLOSS	ROG	2.5487E-08
2019	Annual	Marin (SF)	HHDT	Gas	RUNEX	NOx	0.00159879
2019	Annual	Marin (SF)	HHDT	Gas	RUNEX	PM10	2.3806E-07
2019	Annual	Marin (SF)	HHDT	Gas	RUNEX	PM2_5	2.1889E-07
2019	Annual	Marin (SF)	HHDT	Gas	RUNEX	ROG	0.00015092
2019	Annual	Marin (SF)	HHDT	Gas	RUNLOSS	ROG	8.725E-06
2019	Annual	Marin (SF)	HHDT	Gas	STREX	NOx	1.9722E-07
2019	Annual	Marin (SF)	HHDT	Gas	STREX	PM10	1.4896E-08
2019	Annual	Marin (SF)	HHDT	Gas	STREX	PM2_5	1.3696E-08
2019	Annual	Marin (SF)	HHDT	Gas	STREX	ROG	4.4025E-08
2019	Annual	Marin (SF)	LDT2	Dsl	RUNEX	NOx	0.00102039
2019	Annual	Marin (SF)	LDT2	Dsl	RUNEX	PM10	0.00010954
2019	Annual	Marin (SF)	LDT2	Dsl	RUNEX	PM2_5	0.0001048
2019	Annual	Marin (SF)	LDT2	Dsl	RUNEX	ROG	0.00031864
2019	Annual	Marin (SF)	MDV	Dsl	RUNEX	NOx	0.0027358
2019	Annual	Marin (SF)	MDV	Dsl	RUNEX	PM10	0.00024237
2019	Annual	Marin (SF)	MDV	Dsl	RUNEX	PM2_5	0.00023189
2019	Annual	Marin (SF)	MDV	Dsl	RUNEX	ROG	0.00056554
2019	Annual	Marin (SF)	HHDT	Dsl	RUNEX	NOx	0.48691435
2019	Annual	Marin (SF)	HHDT	Dsl	RUNEX	PM10	0.00803757
2019	Annual	Marin (SF)	HHDT	Dsl	RUNEX	PM2_5	0.00768987
2019	Annual	Marin (SF)	HHDT	Dsl	RUNEX	ROG	0.01888548
2019	Annual	Marin (SF)	HHDT	Dsl	STREX	NOx	0.01161369
2019	Annual	Marin (SF)	LDT2	Gas	RUNEX	CH4	0.23188701
2019	Annual	Marin (SF)	LDT2	Gas	RUNEX	CO2	698.212568
2019	Annual	Marin (SF)	LDT2	Gas	RUNEX	N2O	4.7936308
2019	Annual	Marin (SF)	LDT2	Gas	STREX	CH4	0.56687024
2019	Annual	Marin (SF)	LDT2	Gas	STREX	CO2	19.8063604
2019	Annual	Marin (SF)	LDT2	Gas	STREX	N2O	2.93695699

Aggregated VMT (miles/day)

calendar_year	sub_area	vehicle_class	fuel	vmt
2019	Marin (SF)	LDT2	Gas	1725363
2019	Marin (SF)	MDV	Gas	956427.24
2019	Marin (SF)	HHDT	Gas	319.05479
2019	Marin (SF)	LDT2	Dsl	19723.271
2019	Marin (SF)	MDV	Dsl	39118.344
2019	Marin (SF)	HHDT	Dsl	78085.182

Default_Marin_2019_Annual_v2_vmt

2019 Annual	Marin (SF)	MDV	Gas	RUNEX	CH4	0.18262312
2019 Annual	Marin (SF)	MDV	Gas	RUNEX	CO2	467.284799
2019 Annual	Marin (SF)	MDV	Gas	RUNEX	N2O	3.33890169
2019 Annual	Marin (SF)	MDV	Gas	STREX	CH4	0.39710943
2019 Annual	Marin (SF)	MDV	Gas	STREX	CO2	13.8055593
2019 Annual	Marin (SF)	MDV	Gas	STREX	N2O	1.8211462
2019 Annual	Marin (SF)	HHDT	Gas	RUNEX	CH4	0.00078838
2019 Annual	Marin (SF)	HHDT	Gas	RUNEX	CO2	0.79099762
2019 Annual	Marin (SF)	HHDT	Gas	RUNEX	N2O	0.01666297
2019 Annual	Marin (SF)	HHDT	Gas	STREX	CH4	2.1012E-07
2019 Annual	Marin (SF)	HHDT	Gas	STREX	CO2	0.00229609
2019 Annual	Marin (SF)	HHDT	Gas	STREX	N2O	2.8628E-06
2019 Annual	Marin (SF)	LDT2	Dsl	RUNEX	CH4	0.00037001
2019 Annual	Marin (SF)	LDT2	Dsl	RUNEX	CO2	6.96407073
2019 Annual	Marin (SF)	LDT2	Dsl	RUNEX	N2O	0.32620717
2019 Annual	Marin (SF)	MDV	Dsl	RUNEX	CH4	0.0006567
2019 Annual	Marin (SF)	MDV	Dsl	RUNEX	CO2	18.1943815
2019 Annual	Marin (SF)	MDV	Dsl	RUNEX	N2O	0.85225121
2019 Annual	Marin (SF)	HHDT	Dsl	RUNEX	CH4	0.02192954
2019 Annual	Marin (SF)	HHDT	Dsl	RUNEX	CO2	142.276698
2019 Annual	Marin (SF)	HHDT	Dsl	RUNEX	N2O	6.66444686

Default_Marin_2019_Annual_v2_emissions
Default_Marin_2019_Annual_v2_ghg

Calculated EFs (g/mi)

GHGs = CO2e

Vehicle Type	Fuel	Speed	VMT	ROG	NOX	PM10	PM2_5	CO2	CH4	N2O
LDT2	Gas	5	2585.05952	0.131283688	0.204875181	0.0105071	0.00966144	863.9026765	0.788117357	4.632279917
MDV	Dsl	5	58.6098394	0.214595696	0.17006181	0.0163309	0.01562442	965.7282131	0.249188998	45.23610991
HHDT	Dsl	5	1513.044123	1.821335883	18.67595324	0.2371024	0.22684548	3882.339841	2.114908362	181.8544279
LDT2	Gas	Aggregated	1725362.976	0.180680396	0.162826363	0.0018384	0.00169049	377.5298361	0.419981541	4.064694432
MDV	Dsl	Aggregated	39118.34374	0.013115287	0.063445409	0.0056208	0.00537764	421.941943	0.0152295	19.76437247
HHDT	Dsl	Aggregated	78085.18166	0.219409436	5.791843668	0.0933796	0.08934006	1652.954936	0.254775001	77.42680614

Change from original EFs

ROG	NOX	PM10	PM2_5	CO2	CH4	N2O
17%	11%	-5%	-5%	-30%	1662%	60270%
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
100%	-8%	360%	360%	-14%	-12%	122097%
11%	22%	-10%	-10%	-7%	4679%	73011%
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#N/A
44%	9%	243%	243%	-5%	199%	135676%

Onsite Truck Travel

Hours per Day of Truck Operation	Nursery	BB2	Nursery 6	Nursery 7
Pickups	10	10	10	10
Flatbed	10	8	10	10
Water Trucks	10	8	10	10
Haul Trucks	10	8	10	10
Other HD Trucks	10	8	10	10

Source: San Anselmo Flood Options 2, 6 and 7 Equip and Work Durations R6_BS and email from Gazaway, Constance/SJC on 4/12/18

Total Number of Trucks operating onsite

Source: San Anselmo Flood Options 2, 6 and 7 Equip and Work Durations R6_BS

Nursery Site Detention Basin — **Total Number of Trucks operating onsite**

Item	Operation	Pickups	Flatbed	Water Trucks	Haul Trucks	Other HD	Workdays	
1	Mobilization/Erosion Control	5	1		0	1	5	*7*
2	Demo Wood Framed Building	5	1		1	1	1	*8*
3	Demo Misc Structures	5	1		1	1	5	*8*
4	Clearing & Grubbing	5	1		0	1	3	*7*
5	Remove Trees	5	1		0	1	3	*7*
6	Remove septic tanks	5	1		0	1	1	*7*
7	Remove Fire Hydrant & Water Valves	5	1		0	1	1	*7*
8	Remove OH Electrical & Poles	5	1		0	2	2	*8*
9	Remove Fencing	5	1		0	1	1	*7*
10	Abandon Water Well	5	1		0	1	1	*7*
11	Top Soil Stripping/Stockpile	5	1	1	0	1	2	*8*
12	Excavation (Cut)	5	1	1	0	1	18	*8*
13	Over-excavation beneath berm	5	1	1	0	1	3	*8*
14	Over-excavation at spillway	5	1	1	0	1	3	*8*
15	Backfill Over-Excavated Areas	5	1	1	0	1	7	*8*
16	Off-Haul Trucks				29		13.61	*29*
17	Catch Basins, Manholes, Drainage Pi	5		1	0	1	15	*7*
18	Precast Box Culvert (6'x4' & 10'x5'), E	5		1	0	1	8	*7*
19	Construct Overflow Weir/Floodwall	5	1		0	2	20	*8*
20	Pour Concrete Overflow Weir/Floodv	5	1		0	3	3	*9*
21	Embankment (Berm)	5	1	1	0	1	6	*8*
22	Riprap	5	1		6	1	10	*13*
23	Riprap Trucks				0		0	*0*
24	Seepage cutoff wall 3' x 7'	5	1		0	2	13	*8*
25	Finish Grade Slopes/Seasonal Channe	5		1	0	1	2	*7*
26	Place Topsoil	5		1	0	1	1	*7*
27	Plantings	5	1		0	1	5	*7*
28	Hydroseeding	5		1	0	1	1	*7*
29	Fence	5	1		0	1	5	*7*
30	Demobilization	5	1		0	1	2	*7*
	Total	**140**	**23**	**11**	**37**	**33**	**160.612676**	***244***

Bridge Building #2 Demolition — **Total Number of Trucks operating onsite**

Item	Operation	Pickups	Flatbed	Water Trucks	Haul Trucks	Other HD	Workdays	
1	Mobilization/Er	5	1		0	1	5	*7*
2	Demo Wood Fr	5	1	1	2	1	2	*10*
3	Demo Concrete	5	1	1	2	1	15	*10*
4	Clearing & Grul	5	1	1	2	1	2	*10*
5	Top Soil Strippi	5	1	1	0	1	1	*8*
6	1/2 Ton Riprap.	5		1	7	1	10	*14*
7	Terrace Flood F	5		1	0	1	2	*7*
8	Flood Walls	5	1		0	2	9	*8*
9	Storm Drain	5	1	1	1	1	1	*9*
10	Bioengineered	5		1	0	1	14	*7*
11	Place Topsoil	5			0	1	1	*6*
12	Plantings	5	1		0	1	10	*7*
13	Guardrail	5	1		0	1	1	*7*
14	Demobilization	5	1		0	1	2	*7*
	Total	**70**	**10**	**8**	**14**	**15**		***117***

Nursery Site Detention Basin - Option 6 — **Total Number of Trucks operating onsite**

Item	Operation	Pickups	Flatbed	Water Trucks	Haul Trucks	Other HD	Workdays	
1	Mobilization/Erosion Control	5	1		0	1	5	*7*
2	Demo Wood Framed Building	5	1		1	1	1	*8*
3	Demo Misc Structures	5	1		1	1	5	*8*
4	Clearing & Grubbing	5	1		1	1	3	*8*
5	Remove Trees	5	1		1	1	3	*8*
6	Remove septic tanks	5	1		0	1	1	*7*
7	Remove Fire Hydrant & Water Valves	5	1		0	1	1	*7*
8	Remove OH Electrical & Poles	5	1		0	2	2	*8*
9	Remove Fencing	5	1		0	1	1	*7*
10	Abandon Water Well	5	1		0	1	1	*7*
11	Top Soil Stripping/Stockpile	5	1	1	0	1	2	*8*
12	Excavation (Cut)	5	1	1	0	1	23	*8*
13	Over-excavation beneath berm	5	1	1	0	1	3	*8*
14	Over-excvation at spillway	5	1	1	0	1	3	*8*
15	Backfill Over-Excavated Areas	5	1	1	0	1	7	*8*
16	Off-Haul Trucks				29		20.32	*29*
17	Catch Basins, Manholes, Drainage Pi	5		1	0	1	15	*7*
18	Precast Box Culvert (6'x4' & 10'x5'), E	5		1	0	1	8	*7*
19	Storm Water Lift Station	5		1	0	1	15	*7*
20	Construct Overflow Weir/Floodwall	5	1		0	2	20	*8*
21	Pour Concrete Overflow Weir/Floodv	5	1		0	3	3	*9*
22	Embankment (Berm)	5	1	1	0	1	4	*8*
23	Riprap	5	1		6	1	10	*13*
24	Riprap Trucks				0		0	*0*
25	Seepage cutoff wall 3' x 7'	5	1		0	2	13	*8*
26	Finish Grade Slopes/Seasonal Channe	5		1	0	1	2	*7*
27	Place Topsoil	5		1	0	1	1	*7*
28	Plantings	5	1		0	1	5	*7*
29	Hydroseeding	5		1	0	1	1	*7*
30	Fence	5	1		0	1	5	*7*
31	Demobilization	5	1		0	1	2	*7*
	Total	**145**	**23**	**12**	**39**	**34**	**185.323944**	***253***

Nursery Site Detention Basin - Total Number of Trucks operating onsite

Item	Operation	Pickups	Flatbed	Water Trucks	Haul Trucks	Other HD	Workdays	
1	Mobilization/Er	5	1		0	1	5	*7*
2	Demo Wood Fr	5	1		1	1	1	*8*
3	Demo Misc Stru	5	1		1	1	5	*8*
4	Clearing & Grul	5	1		1	1	2	*8*
5	Remove Trees	5	1		1	1	3	*8*
6	Remove septic	5	1		0	1	1	*7*
7	Remove Fire Hy	5	1		0	1	1	*7*
8	Remove OH Ele	5	1		0	2	2	*8*
9	Remove Fencin	5	1		0	1	1	*7*
10	Abandon Wate	5	1		0	1	1	*7*
11	Top Soil Strippi	5	1	1	0	1	1	*8*
12	Excavation (Cut	5	1	1	0	1	19	*8*
13	Over-excavatio	5	1	1	0	1	3	*8*
14	Backfill Over-Ex	5	1	1	0	1	4	*8*
15	Off-Haul Trucks				29		19.42	*29*
16	Catch Basins, M	5	1	1	0	1	15	*8*
17	Construct Over	5	1		0	2	20	*8*
18	Pour Concrete (	5	1		0	3	3	*9*
19	Embankment (E	5	1	1	0	1	1	*8*
20	Riprap	5			6	1	9	*12*
21	Riprap Trucks				0		0	*0*
22	Finish Grade Sl	5		1	0	1	2	*7*
23	Place Topsoil	5		1	0	1	1	*7*
24	Plantings	5	1		0	1	5	*7*
25	Hydroseeding	5		1	0	1	1	*7*
26	Fence	5	1		0	1	5	*7*
27	Demobilization	5	1		0	1	2	*7*
	Total	**125**	**21**	**9**	**39**	**29**	**132.42254**	***223***

Total Truck Days	Nursery	BB2	Nursery 6	Nursery 7	
Pickups	735	375	825	565	
Flatbed	120	48	123	100	
Water Trucks	66	47	84	47	
Haul Trucks	461	109	661	628	0.28
Other Trucks	188	84	206	141	
Total	**1,570**	**663**	**1,899**	**1,481**	

Total Miles traveled onsite (5 mph)	Nursery	BB2	Nursery 6	Nursery 7	
Pickups	7,350	3,750	8,250	5,650	*= total truck days * hrs/day * 5 mph * 25% moving time*
Flatbed	1,200	384	1,230	1,000	""
Water Trucks	660	376	840	470	""
Haul Trucks	4,608	872	6,614	6,283	""
Other Trucks	1,880	672	2,060	1,410	""

Total Trips	Nursery	BB2	Nursery 6	Nursery 7	
Pickups	735	375	825	565	
Flatbed	360	144	369	300	
Water Trucks	660	235	840	470	
Haul Trucks	2,245	418	3,210	3,041	
Other Trucks	499	84	563	464	
Total	**4,499**	**1,256**	**5,807**	**4,840**	
Total HD	**3,404**	**737**	**4,613**	**3,975**	
	2,879	**618**	**3,937**	**3,654**	
	3,104	646	4,142	3,805	*includes few other trucks not in truck trip table*

Source: San Anselmo Flood Options 2, 6 and 7 Equip and Work Durations R6_BS

Emissions

	General Information				Total Emissions (tons)				Average Daily Emissions (lbs/day)				Total Emissions (MTCO2e)		
	Vehicle Type	Fuel	Speed	Total miles	ROG	NOX	PM10 Exh	PM2.5 Exh	ROG	NOX	PM10 Exh	PM2.5 Exh	CO2	CH4	N2O
Nursery Site Detention Basin															
Pickups	LDT2	GAS	5	7,350	0.001063659	0.0016599	8.5128E-05	7.82769E-05	0.014471545	0.022583616	0.00115821	0.001064992	6.349684672	0.0057927	0.034047257
Flatbed	MDV	DSL	5	1,200	0.000283861	0.000225	2.1602E-05	2.06676E-05	0.00386206	0.003060588	0.000293906	0.000281191	1.158873856	0.000299	0.054283332
Water Trucks	HHDT	DSL	5	660	0.001325068	0.0135872	0.0001725	0.000165036	0.018028134	0.18486024	0.002346912	0.002245385	2.562344295	0.0013958	0.120023922
Haul Trucks	HHDT	DSL	5	4,608	0.009250732	0.0948569	0.00120427	0.001152169	0.125860306	1.290569854	0.016384558	0.015675769	17.88856433	0.0097448	0.837926293
Other Trucks	HHDT	DSL	5	1,880	0.003774436	0.038703	0.00049136	0.000470102	0.051352867	0.526571594	0.006685142	0.006395946	7.2987989	0.003976	0.341886325
Total					**0.015697756**	**0.149032**	**0.00197485**	**0.001886251**	**0.213574912**	**2.027645893**	**0.026868727**	**0.025663283**	**35.25826605**	**0.0212084**	**1.38816713**
Bridge Building #2 Demolition and Riparian Restoration															
Pickups	LDT2	GAS	5	3,750	0.000542683	0.0008469	4.3433E-05	3.99372E-05	0.014471545	0.022583616	0.00115821	0.001064992	3.239635037	0.0029554	0.01737105
Flatbed	MDV	DSL	5	384	9.08357E-05	7.199E-05	6.9127E-06	6.61362E-06	0.002422284	0.001919601	0.000184338	0.000176363	0.370839634	9.569E-05	0.017370666
Water Trucks	HHDT	DSL	5	376	0.000754887	0.0077406	9.8272E-05	9.40204E-05	0.020130324	0.206416065	0.002620576	0.002507211	1.45975978	0.0007952	0.068377265
Haul Trucks	HHDT	DSL	5	872	0.001750696	0.0179516	0.00022791	0.000218047	0.046685219	0.478709597	0.006077505	0.005814595	3.385400341	0.0018442	0.158577061
Other Trucks	HHDT	DSL	5	672	0.00134916	0.0138343	0.00017563	0.000168036	0.0359776	0.368913818	0.004683582	0.004480972	2.608932373	0.0014212	0.122206176
Total					**0.004488261**	**0.0404454**	**0.00055216**	**0.000526655**	**0.119686972**	**1.078542697**	**0.014724211**	**0.014044133**	**11.06456716**	**0.0071118**	**0.383902218**
Nursery Site Detention Basin - Option 6															
Pickups	LDT2	GAS	5	8,250	0.001193902	0.0018631	9.5552E-05	8.78618E-05	0.014471545	0.022583616	0.00115821	0.001064992	7.127197081	0.006502	0.038216309
Flatbed	MDV	DSL	5	1,230	0.000290958	0.0002306	2.2142E-05	2.11843E-05	0.003526763	0.002794873	0.000268389	0.000256779	1.187845702	0.0003065	0.055640415
Water Trucks	HHDT	DSL	5	840	0.00168645	0.0172928	0.00021954	0.000210046	0.020441818	0.209610124	0.002661126	0.002546007	3.261165466	0.0017765	0.152757719
Haul Trucks	HHDT	DSL	5	6,614	0.013278673	0.1361593	0.00172862	0.001653845	0.160953612	1.650416132	0.020953022	0.020046604	25.67757698	0.0139879	1.202774941
Other Trucks	HHDT	DSL	5	2,060	0.004135818	0.0424086	0.0005384	0.000515112	0.050131126	0.514043875	0.006526095	0.006243779	7.997620072	0.0043567	0.374620122
Total					**0.020585801**	**0.1979545**	**0.00260426**	**0.002488048**	**0.249524864**	**2.399448621**	**0.031566843**	**0.03015816**	**45.2514053**	**0.0269296**	**1.824009507**
Nursery Site Detention Basin - Option 7															
Pickups	LDT2	GAS	5	5,650	0.000817642	0.001276	6.5439E-05	6.0172E-05	0.014471545	0.022583616	0.00115821	0.001064992	4.881050122	0.0044529	0.026172382
Flatbed	MDV	DSL	5	1,000	0.000236551	0.0001875	1.8002E-05	1.7223E-05	0.004186747	0.003317894	0.000318614	0.000304831	0.965728213	0.0002492	0.04523611
Water Trucks	HHDT	DSL	5	470	0.000943609	0.0096758	0.00012284	0.000117526	0.016701043	0.171252266	0.00217415	0.002080097	1.824699725	0.000994	0.085471581
Haul Trucks	HHDT	DSL	5	6,283	0.012613311	0.1293367	0.00164201	0.001570975	0.223244448	2.289145516	0.029062075	0.027804862	24.39093675	0.013287	1.142506847
Other Trucks	HHDT	DSL	5	1,410	0.002830827	0.0290273	0.00036852	0.000352577	0.050103129	0.513756799	0.006522451	0.006240292	5.474099175	0.002982	0.256414743
Total					**0.017441941**	**0.1695032**	**0.00221681**	**0.002118472**	**0.308706912**	**3.000056091**	**0.0392355**	**0.037495075**	**37.53651399**	**0.0219651**	**1.555801663**
					ROG	*NOX*	*PM10*	*PM2_5*	0.333	3.106	0.042	0.040	*CO2*	*CH4*	*N2O*
									0.056	1.208	0.003	0.003			

Pickup Truck Travel - offsite

	Nursery	BB2	Nursery 6	Nursery 7
Total pickup loads	735	375	825	565
one-way trip distance (CalEEMod Vendor	7.3	7.3	7.3	7.3
Total miles	10,731	5,475	12,045	8,249

	General Information				Total Emissions (tons)				Average Daily Emissions (lbs/day)				Total Emissions (MTCO2e)		
	Vehicle Type	Fuel	Speed	Total miles	ROG	NOX	PM10 Exh	PM2.5 Exh	ROG	NOX	PM10 Exh	PM2.5 Exh	CO2	CH4	N2O
Nursery Site Detention Basin	LDT2	GAS	Aggregated	10,731	0.00213725	0.0019261	2.1746E-05	1.99967E-05	0.029078234	0.026204852	0.000295862	0.000272064	4.051272671	0.0045068	0.043618236
Bridge Building #2 Demolition and Ripari	LDT2	GAS	Aggregated	5,475	0.001090434	0.0009827	1.1095E-05	1.02024E-05	0.029078234	0.026204852	0.000295862	0.000272064	2.066975853	0.0022994	0.022254202
Nursery Site Detention Basin - Option 6	LDT2	GAS	Aggregated	12,045	0.002398954	0.0021619	2.4409E-05	2.24453E-05	0.029078234	0.026204852	0.000295862	0.000272064	4.547346876	0.0050587	0.048959244
Nursery Site Detention Basin - Option 7	LDT2	GAS	Aggregated	8,249	0.00164292	0.0014806	1.6716E-05	1.53716E-05	0.029078234	0.026204852	0.000295862	0.000272064	3.114243618	0.0034644	0.033529664

Idling

Annual Hours Idling	**Nursery**	**BB2**	**Nursery 6**	**Nursery 7**	***Equation***
Water Trucks	99	56	126	71	*= total truck days * hrs/day * 15% idling time*
Haul Trucks	561	105	803	760	*= total trips * 15 min per trip * 1/60 hrs per min*
Other Trucks	125	21	141	116	*= total trips * 15 min per trip * 1/60 hrs per min*

EMFAC2014 Idling Emissions Inventory - NOT USED

calendar_year	season_month	sub_area	vehicle_class	fuel	process	pollutant	emission
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	CH4	0.0001012
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	CO2	8.5811021
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	Fuel	0.7722992
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	NOx	0.0502548
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	PM10	9.126E-05
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	PM2_5	8.732E-05
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	ROG	0.0015049

Default_Marin_2019_Annual_emission_20171010102613

EMFAC2017 Idling Emission Rates (g/hr-veh)

GHGs = CO2e

calendar_year	season_month	sub_area	vehicle_class	Fuel	process	pollutant	emission_rat	Change from original EFs
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	NOx	40.6292045	8%
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	ROG	2.49832886	125%
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	CO2	6271.59682	-3%
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	CH4	0.1160409	54%
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	PM10	0.06610876	6%
2019	Annual	Marin (SF)	HHDT	Dsl	IDLEX	PM2_5	0.06324892	6%

PL_Marin_2019_Annual_Idling

Emissions

N2O separate calc

	General Information			Total Emissions (tons)				Average Daily Emissions (lbs/day)				Total Emissions (MTCO2e)		
	Vehicle Type	Fuel	Annual Hours Idling	ROG	NOX	PM10 Exh	PM2.5 Exh	ROG	NOX	PM10 Exh	PM2.5 Exh	CO2	CH4	N2O
Nursery Site Detention Basin														
Water Trucks	HHDT	D	99	0.00027264	0.004433816	7.214E-06	6.9023E-06	0.003709382	0.060324025	9.81547E-05	9.39085E-05	0.620888085	1.1488E-05	0.0290833
Haul Trucks	HHDT	D	561	0.001545646	0.025136153	4.09E-05	3.913E-05	0.0210292	0.341988477	0.000556458	0.000532386	3.519933714	6.5128E-05	0.1648788
Other Trucks	HHDT	D	125	0.000343553	0.005587056	9.091E-06	8.6976E-06	0.004674196	0.076014365	0.000123685	0.000118334	0.782381703	1.44761E-05	0.0366479
Total				**0.002161839**	**0.035157025**	**5.72E-05**	**5.473E-05**	**0.029412779**	**0.478326868**	**0.000778297**	**0.000744628**	**4.923203501**	**9.10921E-05**	**0.23061**
Bridge Building #2 Demolition and Riparian Restoration														
Water Trucks	HHDT	D	56	0.000155322	0.002525931	4.11E-06	3.9322E-06	0.004141919	0.067358172	0.0001096	0.000104859	0.35371806	6.54471E-06	0.0165687
Haul Trucks	HHDT	D	105	0.000287786	0.004680139	7.615E-06	7.2857E-06	0.0076743	0.124803706	0.000203071	0.000194286	0.655381867	1.21263E-05	0.030699
Other Trucks	HHDT	D	21	5.78326E-05	0.000940506	1.53E-06	1.4641E-06	0.001542204	0.025080171	4.08085E-05	3.90432E-05	0.131703533	2.43686E-06	0.0061692
Total				**0.000500941**	**0.008146577**	**1.326E-05**	**1.2682E-05**	**0.013358422**	**0.217242049**	**0.00035348**	**0.000338188**	**1.140803461**	**2.11078E-05**	**0.0534369**
Nursery Site Detention Basin - Option 6														
Water Trucks	HHDT	D	126	0.000346996	0.005643038	9.182E-06	8.7847E-06	0.00420601	0.068400465	0.000111296	0.000106481	0.790221199	1.46212E-05	0.0370151
Haul Trucks	HHDT	D	803	0.002210033	0.03594078	5.848E-05	5.595E-05	0.02678828	0.435645819	0.00070885	0.000678185	5.032956446	9.31228E-05	0.235751
Other Trucks	HHDT	D	141	0.000387616	0.006303632	1.026E-05	9.8131E-06	0.004698381	0.076407662	0.000124325	0.000118947	0.882727252	1.63328E-05	0.0413482
Total				**0.002944645**	**0.047887451**	**7.792E-05**	**7.4548E-05**	**0.035692671**	**0.580453947**	**0.000944471**	**0.000903613**	**6.705904897**	**0.000124077**	**0.3141143**
Nursery Site Detention Basin - Option 7														
Water Trucks	HHDT	D	71	0.000194152	0.003157414	5.138E-06	4.9153E-06	0.003436326	0.055883439	9.09293E-05	8.69957E-05	0.442147576	8.18088E-06	0.0207108
Haul Trucks	HHDT	D	760	0.002093679	0.034048571	5.54E-05	5.3005E-05	0.037056272	0.602629572	0.000980553	0.000938135	4.76798148	8.82201E-05	0.2233392
Other Trucks	HHDT	D	116	0.000319457	0.005195178	8.453E-06	8.0875E-06	0.005654097	0.091950056	0.000149614	0.000143142	0.727505231	1.34607E-05	0.0340774
Total				**0.002607288**	**0.042401163**	**6.899E-05**	**6.6007E-05**	**0.046146696**	**0.750463068**	**0.001221097**	**0.001168272**	**5.937634287**	**0.000109862**	**0.2781274**
				ROG	*NOx*	*PM10*	*PM2_5*					*CO2*	*CH4*	
								0.04	0.70	0.00	0.00			
								0.17	5.95	0.01	0.01			

Water Trucks
Haul Trucks
Other Trucks

B-8 CalEEMod Output Summary

CalEEMod Outputs

updated: 4/16/2018

Paste from CalEEMod: see *OutputSummary_v2_ops.xlsx*

Operation

					Annual Emissions (tons or MT per year for GHG)												
Site	**Year**	**Category 1**	**Category 2**	**Mit / Unmit**	**ROG**	**NOX**	**CO**	**SOX**	**PM10 Exh**	**PM10 Dst**	**PM10 T**	**PM2.5 Ex**	**PM2.5 Dst**	**PM2.5 T**	**CO2**	**CH4**	**N2O**
Nursery	2019	Fugitive Dust	Offroad Equipment	Unmitigated	-	-	-	-	-	-	-	-	-	-	-	-	-
Nursery	2019	Off-Road	Offroad Equipment	Unmitigated	0.001	0.012	0.007	0.000	0.000	-	0.000	0.000	-	0.000	2.919	-	-
Nursery	2019	Paving	Offroad Equipment	Unmitigated	-	-	-	-	-	-	-	-	-	-	-	-	-
Nursery	2019	Archit. Coating	Offroad Equipment	Unmitigated	-	-	-	-	-	-	-	-	-	-	-	-	-
Nursery	2019	Hauling	Onroad Truck Travel	Unmitigated	0.001	0.029	0.008	0.000	0.000	0.000	0.001	0.000	0.000	0.000	7.027	-	-
Nursery	2019	Vendor	Onroad Truck Travel	Unmitigated	-	-	-	-	-	-	-	-	-	-	-	-	-
Nursery	2019	Worker	Worker Commute	Unmitigated	0.000	0.000	0.002	-	-	0.000	0.000	-	0.000	0.000	0.435	-	-

B-9 Health Risk Assessment

HRA - Screening

Updated: 4/5/2018

Since AERSCREEN calculates maximum 1-hr concentration based on continuous emissions (which is then converted to annual), the 1-hr emission rate should be based on the emission rate during the entire construction period (24 hrs/day, 7 days per week).

HRA Notes:

Concentrations modeled using AERSCREEN worst-case 1-hr, scaled to annual

BAAQMD recommends short-term projects "use of actual emission rates over a minimum 3-year duration for cancer risk assessments involving projects lasting 3 years or less." This was not done to be conservative.

Since AERSCREEN calculates maximum 1-hr concentration based on continuous emissions (which is then converted to annual), the 1-hr emission rate should be based on the emission rate during the entire construction period (24 hrs/day, 7 days per week).

Normally, we use a worker adjustment factor to estimate risk for school and daycare receptors, but this is used if AERMOD models sources using a non-continuous emissions schedule (e.g. work hours). However, because we use AERSCREEN, which assumes a continuous emission rate based on the actual construction schedule of 5 days per week and 8 hrs/day (and estimates maximum 1-hr concentrations), concentrations are based on continuous emissions, and we don't need the adjustment factor.

To estimate annual average PM2.5 concentrations, divided PM2.5 exhaust emissions by the full 24hrs/day and 7 days/week when construction is occurring. This is still conservative because emissions would not occur for 6-7 months of the year. Could divide by the full 365 days/year for the entire year to be less conservative, but did not do this.

DPM Emissions (lbs)

	34.60	6.56	18.03	5.61	42.00	8.76	21.86	5.86	<- Cancer		
	0.47	0.10	0.82	0.28	0.48	0.11	0.45	0.13	<- PM2.5		
DPM Emissions (lbs)	**Nursery Unmitigated**	**Nursery Mitigated**	**BB2 Unmitigated**	**BB2 Mitigated**	**Nursery6 Unmitigated**	**Nursery6 Mitigated**	**Nursery7 Unmitigated**	**Nursery7 Mitigated**	**NOTES**		
Off-Road	71.27	9.92	21.01	4.91	82.44	13.08	48.57	8.27		-86%	-77%
Hauling	28.03	28.03	11.90	11.90	33.84	33.84	42.58	42.58			
Onsite Trucks	4.06	4.06	2.22	2.22	4.78	4.78	5.95	5.95			
Total	103.36	42.02	35.12	19.02	121.06	51.70	97.10	56.80			
Scaling Factor for HD trucks	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	haul trip = 20 mile one-way trip; assume 0.25 mile onsite segment (once incom		
DPM lbs - Scaled	75.68	14.34	23.38	7.27	87.64	18.28	55.05	14.75			
DPM lbs/hr	0.0155	0.0029	0.0094	0.0029	0.0159	0.0033	0.0147	0.0039	based on 7 days/week, 24 hrs/day; see note above		
DPM g/s	**0.0019**	**0.0004**	**0.0012**	**0.0004**	**0.0020**	**0.0004**	**0.0019**	**0.0005**	NOTE: original HRA based on 5 days/week, 10 hrs/day; see note above		
	0.0065	*0.0012*	*0.0039*	*0.0012*	*0.0067*	*0.0014*	*0.0061*	*0.0016*	*based on 5 days/week, 10 hrs/day; see note above*		
	3.33	*3.33*	*3.33*	*3.33*	*3.35*	*3.35*	*3.31*	*3.31*	*ratio*		

PM2.5 Exhaust Emissions (lbs)

DPM Emissions (lbs)	Nursery Unmitigated	Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Unmitigated	Nursery6 Mitigated	Nursery7 Unmitigated	Nursery7 Mitigated	NOTES
Off-Road	66.43	9.92	19.68	4.91	77.10	13.08	45.53	8.27	
Hauling	26.82	26.82	11.38	11.38	32.38	32.38	40.74	40.74	
Onsite Trucks	3.88	3.88	2.11	2.11	4.57	4.57	5.68	5.68	
Total	97.13	40.62	33.17	18.40	114.04	50.02	91.96	54.69	
Scaling Factor for HD trucks	*0.013*	*0.013*	*0.013*	*0.013*	*0.013*	*0.013*	*0.013*	*0.013*	haul trip = 20 mile one-way trip; assume 0.25 mile onsite segment (once incoming, once outgoing)
PM2.5 lbs - Scaled	70.64	14.14	21.93	7.16	82.07	18.05	51.73	14.46	
PM2.5 lbs/hr	0.0144	0.0029	0.0088	0.0029	0.0149	0.0033	0.0138	0.0039	based on 7 days/week, 24 hrs/day; see note above
PM2.5 g/s	**0.0018**	**0.0004**	**0.0011**	**0.0004**	**0.0019**	**0.0004**	**0.0017**	**0.0005**	

1.5

AERSCREEN Inputs - DPM

	Nursery	BB2	Notes
Title	Nursery	BB2	
Units	M	M	
Source Type	A	A	
DPM emission rate (g/s)	1	1	
Release Height above ground (meters)	3.89	3.89	Release height for off-road construction equipment and on-road operational mobile sources from the CRRP-HRA (BAAQMD, SF DPH & SF Planning, 2012).
Maximum horizontal dimension of area source (meters)	185	50	
Minimum horizontal dimension of area source (meters)	150	40	
Initial Vertical Dimension (meters)	1.4	1.4	Initial vertical dimension for off-road construction equipment and on-road operational mobile sources from the CRRP-HRA (BAAQMD, SF DPH & SF Planning, 2012).
rural/urban	rural	urban	
population of urban area	-	12,599	https://www.census.gov/quickfacts/fact/table/sananselmotowncalifornia,sanfranciscocountycalifornia,US/PST045216
min distance to ambient air (meters)	default	default	
NO2 chemistry	1	1	
max distance to probe	default	default	
include discrete receptors	no	no	
use flagpole receptors	yes	yes	
flagpole receptor height (meters)	1.5	1.5	BAAQMD 2012, Recommended Methods for Screening and Modeling Local Risks and Hazards
source elevation	default	default	
min ambient temperature (F)	*41*	*41*	http://www.intellicast.com/Local/History.aspx?location=USCA0976
max ambient temperature (F)	*85*	*85*	http://www.intellicast.com/Local/History.aspx?location=USCA0976
min ambient temperature (K)	278	278	
max ambient temperature (K)	303	303	
min wind speed (m/s)	default	default	
anemometer height (m)	default	default	
surface characteristics	2	2	
Dominant surface profile	7	7	
dominant climate profile	1	1	
adjust	no	no	
debug	no	no	
Output file name	Nursery.out	BB2.out	

DPM Concentrations - Maximum 1-hr (ug/m3)

Distance (m) Nursery		Nursery Unmitigated	Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Unmitigated	Nursery6 Mitigated	Nursery7 Unmitigated	Nursery7 Mitigated	Distance (m) BB2
	1	**1452.3**	*1452.30*	**4880.90**	*4880.90*	*1452.30*	*1452.30*	*1452.30*	*1452.30*	1
	25	**1756.4**	1756.40	**7808.50**	*7808.50*	*1756.40*	*1756.40*	*1756.40*	*1756.40*	25
	50	**2061.1**	2061.10	**7899.80**	*7899.80*	*2061.10*	*2061.10*	*2061.10*	*2061.10*	26
	75	**2352.7**	2352.70	**5096.70**	*5096.70*	*2352.70*	*2352.70*	*2352.70*	*2352.70*	50
	100	**2630.9**	2630.90	**3009.90**	*3009.90*	*2630.90*	*2630.90*	*2630.90*	*2630.90*	75
	117	**2761.4**	2761.40	**2075.10**	*2075.10*	*2761.40*	*2761.40*	*2761.40*	*2761.40*	100
	125	**2743.7**	2743.70	**1544.60**	*1544.60*	*2743.70*	*2743.70*	*2743.70*	*2743.70*	125
	150	**2603.3**	2603.30	**1210.60**	*1210.60*	*2603.30*	*2603.30*	*2603.30*	*2603.30*	150
	175	**2359.1**	2359.10	**983.80**	*983.80*	*2359.10*	*2359.10*	*2359.10*	*2359.10*	175
	200	**2125.9**	2125.90	**821.26**	*821.26*	*2125.90*	*2125.90*	*2125.90*	*2125.90*	200
	225	**1924.9**	1924.90	**700.24**	*700.24*	*1924.90*	*1924.90*	*1924.90*	*1924.90*	225
	250	**1753.7**	1753.70	**607.01**	*607.01*	*1753.70*	*1753.70*	*1753.70*	*1753.70*	250
	275	**1609.3**	1609.30	**533.30**	*533.30*	*1609.30*	*1609.30*	*1609.30*	*1609.30*	275
	300	**1484**	1484.00	**473.54**	*473.54*	*1484.00*	*1484.00*	*1484.00*	*1484.00*	300
Concentrations - Maximum 1-hr (ug/m3)										
Residential		2761.40	2761.40	7899.80	7899.80	2761.40	2761.40	2761.40	2761.40	
Daycare		0.00	0.00	473.54	473.54	0.00	0.00	0.00	0.00	
School		2125.90	2125.90	607.01	607.01	2125.90	2125.90	2125.90	2125.90	
Concentrations - Average Annual (ug/m3)										
Residential		276.14	276.14	789.98	789.98	276.14	276.14	276.14	276.14	
Daycare		0.00	0.00	47.35	47.35	0.00	0.00	0.00	0.00	
School		212.59	212.59	60.70	60.70	212.59	212.59	212.59	212.59	
SCALED Concentrations - Average Annual (ug/m3)										
Residential		0.54	0.10	0.93	0.29	0.55	0.12	0.51	0.14	
Daycare		0.00	0.00	0.06	0.02	0.00	0.00	0.00	0.00	
School		0.41	0.08	0.07	0.02	0.43	0.09	0.39	0.11	

ESTIMATED PM2.5 Concentrations - Maximum 1-hr (ug/m3)

Distance (m) Nursery		Nursery Unmitigated	Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Unmitigated	Nursery6 Mitigated	Nursery7 Unmitigated	Nursery7 Mitigated	Distance (m) BB2
	1	*1355.64*	*1432.31*	*4579.08*	*4807.98*	*1359.92*	*1433.92*	*1364.68*	*1424.08*	1
	25	*1639.51*	*1732.23*	*7325.65*	*7691.85*	*1644.68*	*1734.17*	*1650.43*	*1722.27*	25
	50	*1923.93*	*2032.74*	*7411.30*	*7781.78*	*1930.00*	*2035.01*	*1936.75*	*2021.05*	26
	75	*2196.12*	*2320.32*	*4781.54*	*5020.56*	*2203.05*	*2322.92*	*2210.76*	*2306.98*	50
	100	*2455.80*	*2594.69*	*2823.78*	*2964.93*	*2463.56*	*2597.60*	*2472.17*	*2579.78*	75
	117	*2577.62*	*2723.40*	*1946.78*	*2044.10*	*2585.76*	*2726.45*	*2594.80*	*2707.74*	100
	125	*2561.10*	*2705.94*	*1449.09*	*1521.52*	*2569.18*	*2708.97*	*2578.17*	*2690.38*	125
	150	*2430.04*	*2567.47*	*1135.74*	*1192.51*	*2437.71*	*2570.35*	*2446.24*	*2552.71*	150
	175	*2202.09*	*2326.64*	*922.96*	*969.10*	*2209.05*	*2329.24*	*2216.77*	*2313.26*	175
	200	*1984.41*	*2096.64*	*770.48*	*808.99*	*1990.68*	*2098.99*	*1997.64*	*2084.59*	200
	225	*1796.79*	*1898.41*	*656.94*	*689.78*	*1802.46*	*1900.54*	*1808.77*	*1887.49*	225
	250	*1636.99*	*1729.57*	*569.47*	*597.94*	*1642.15*	*1731.50*	*1647.90*	*1719.62*	250
	275	*1502.20*	*1587.15*	*500.32*	*525.33*	*1506.94*	*1588.93*	*1512.21*	*1578.03*	275
	300	*1385.23*	*1463.58*	*444.26*	*466.47*	*1389.61*	*1465.22*	*1394.47*	*1455.16*	300
Concentrations - Maximum 1-hr (ug/m3)										
Residential		2577.62	2723.40	7411.30	7781.78	2585.76	2726.45	2594.80	2707.74	
Daycare		0.00	0.00	444.26	466.47	0.00	0.00	0.00	0.00	
School		1984.41	2096.64	569.47	597.94	1990.68	2098.99	1997.64	2084.59	
Concentrations - Average Annual (ug/m3)										
Residential		257.76	272.34	741.13	778.18	258.58	272.64	259.48	270.77	
Daycare		0.00	0.00	44.43	46.65	0.00	0.00	0.00	0.00	
School		198.44	209.66	56.95	59.79	199.07	209.90	199.76	208.46	
SCALED Concentrations - Average Annual (ug/m3)										
Residential		0.47	0.10	0.82	0.28	0.48	0.11	0.45	0.13	Green = used in results table
Daycare		0.00	0.00	0.05	0.02	0.00	0.00	0.00	0.00	
School		0.36	0.08	0.06	0.02	0.37	0.09	0.35	0.10	

Dose Calculation

	Nursery Unmitigated	Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Unmitigated	Nursery6 Mitigated	Nursery7 Unmitigated	Nursery7 Mitigated	
Dose Factors									
Daily Breathing Rate (DBR) [L/kg-day or L/kg-8hrs]									
Residential									
3rd Trimester	361	*361*	*361*	*361*	*361*	*361*	*361*	*361*	Table 5.6, 95th percentile
Age 0<2 Years	1090	*1090*	*1090*	*1090*	*1090*	*1090*	*1090*	*1090*	Table 5.6, 95th percentile
Daycare									
Age 0<2 Years	1200	*1200*	*1200*	*1200*	*1200*	*1200*	*1200*	*1200*	Table 5.8, moderate intensity, 95th
School									
Age 2<9 Years	640	*640*	*640*	*640*	*640*	*640*	*640*	*640*	Table 5.8, moderate intensity, 95th
Inhalation Absorption Factor (A)	1	*1*	*1*	*1*	*1*	*1*	*1*	*1*	
Exposure Frequency (EF) [days/365 days]									
Residential	0.96	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*	
Daycare	0.68	*0.68*	*0.68*	*0.68*	*0.68*	*0.68*	*0.68*	*0.68*	
School	0.49	*0.49*	*0.49*	*0.49*	*0.49*	*0.49*	*0.49*	*0.49*	
Conversion	0.000001	*0.000001*	*0.000001*	*0.000001*	*0.000001*	*0.000001*	*0.000001*	*0.000001*	
Dose Calculation									
Residential									
3rd Trimester	0.000186173	3.52704E-05	0.000322721	0.000100398	0.000191225	3.98882E-05	0.000177082	4.74505E-05	
Age 0<2 Years	0.000562128	0.000106495	0.000974419	0.000303142	0.000577382	0.000120438	0.000534679	0.000143272	
Total	0.0007483	0.000141765	0.00129714	0.00040354	0.000768607	0.000160326	0.000711761	0.000190722	
Daycare									
Age 0<2 Years	0	0	4.59318E-05	1.42894E-05	0	0	0	0	
Total	0	0	4.59318E-05	1.42894E-05	0	0	0	0	
School									
Age 2<9 Years	0.000130679	2.47572E-05	2.26091E-05	7.03369E-06	0.000134225	2.79985E-05	0.000124298	3.33067E-05	
Total	0.000130679	2.47572E-05	2.26091E-05	7.03369E-06	0.000134225	2.79985E-05	0.000124298	3.33067E-05	

Risk Calculation

	Nursery Unmitigated	Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Unmitigated	Nursery6 Mitigated	Nursery7 Unmitigated	Nursery7 Mitigated		
Risk Factors										
Inhalation Cancer Potency Factor (CPF)	1.1	*1.1*	*1.1*	*1.1*	*1.1*	*1.1*	*1.1*	*1.1*		
Age Sensitivity Factor (ASF) [unitless]										
3rd Trimester	10	*10*	*10*	*10*	*10*	*10*	*10*	*10*		
Age 0<2 Years	10	*10*	*10*	*10*	*10*	*10*	*10*	*10*		
Age 2<9 Years	3	*3*	*3*	*3*	*3*	*3*	*3*	*3*		
Exposure Duration (ED) [years]										
Residential										
3rd Trimester	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25		
Age 0<2 Years	0.31	0.31	0.03	0.03	0.38	0.38	0.18	0.18		
Daycare										
Age 0<2 Years	0.56	0.56	0.28	0.28	0.63	0.63	0.43	0.43		
School										
Age 2<9 Years	0.56	0.56	0.28	0.28	0.63	0.63	0.43	0.43		
Averaging Time (AT) [years]	70	70	70	70	70	70	70	70		
Fraction of Time at Home (FAH) [unitless]										
3rd Trimester	1	1	1	1	1	1	1	1	1	Fraction of time at home is set to 1.
Age 0<2 Years	1	1	1	1	1	1	1	1	1	
Age 2<9 Years	1	1	1	1	1	1	1	1	1	
Model Adjustment Factor (MAF) [unitless] - NOT USED - see note at top of page										
Residential	1	1	1	1	1	1	1	1		
Chances per Million	1,000,000	*1,000,000*	*1,000,000*	*1,000,000*	*1,000,000*	*1,000,000*	*1,000,000*	*1,000,000*		
Risk Calculation										
Residential										
3rd Trimester	7.31	1.39	12.68	3.94	7.51	1.57	6.96	1.86		
Age 0<2 Years	27.29	5.17	5.35	1.66	34.49	7.19	14.91	3.99		
Total	**34.60**	**6.56**	**18.03**	**5.61**	**42.00**	**8.76**	**21.86**	**5.86**	Green = used in results table	
Daycare										
Age 0<2 Years	0.00	0.00	2.06	0.64	0.00	0.00	0.00	0.00		
Total	**0.00**	**0.00**	**2.06**	**0.64**	**0.00**	**0.00**	**0.00**	**0.00**	**2.69**	
School										
Age 2<9 Years	3.44	0.65	0.30	0.09	3.99	0.83	2.50	0.67		
Total	**3.44**	**0.65**	**0.30**	**0.09**	**3.99**	**0.83**	**2.50**	**0.67**		
		-81%			-69%					
	#DIV/0!				-69%					
San Anselmo Wind Rose (see below):		-81%			-69%					

https://www.meteoblue.com/en/weather/forecast/modelclimate/san-anselmo_united-states-of-america_5391615

an one in a million.

Chronic Hazard Index

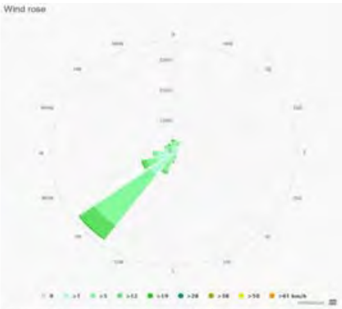
Chronic REL (µg/m3) 5.0

California Air Resources Board, "Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values" and "OEHHA/ARB Approved Chronic Reference Exposure Levels and Target Organs," http://www.arb.ca.gov/toxics/healthval/healthval.htm.

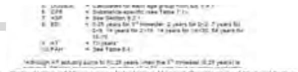
Table last updated: February 23, 2017. Downloaded 10/9/17

Chronic Hazard Index	Nursery Unmitigated	Nursery Mitigated	BB2 Unmitigated	BB2 Mitigated	Nursery6 Unmitigated	Nursery6 Mitigated	Nursery7 Unmitigated	Nursery7 Mitigated
Residential	0.11	0.02	0.19	0.06	0.11	0.02	0.10	0.03
Daycare	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
School	0.08	0.02	0.01	0.00	0.09	0.02	0.08	0.02

Green = used in results table



The wind rose for San Antonio shows how many hours per year the wind blows from the indicated direction. Example SW: Wind is blowing from South-West (SW) to North-East (NE). Cape Horn, the southernmost land point of South America, has a characteristic strong west-wind, which makes crossings from East to West very difficult especially for sailing boats.



8.3.1 Calculation of Noncancer Inhalation Hazard Quotient and Hazard Index

To calculate the acute HQ, the maximum 1-hour ground level concentration (in µg/m³) of a substance at a receptor is divided by the acute 1-hour REL (in µg/m³) for the substance:

$$\text{Acute Hazard Quotient} = \frac{\text{1-hour Max. Concentration (µg/m}^3\text{)}}{\text{Acute REL (µg/m}^3\text{)}}$$

To calculate the chronic HQ, the annual average ground level concentration of a substance is divided by the chronic REL for the substance:

$$\text{Chronic Hazard Quotient} = \frac{\text{Annual Average Concentration (µg/m}^3\text{)}}{\text{Chronic REL (µg/m}^3\text{)}}$$

To calculate the 8-hour HQ, the adjusted annual average ground level concentration of a substance (represented as "Adjusted C_{air}" in EQ 5.4.1.4.A) is divided by the 8-hour REL for the substance:

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B-10 Constants

Constants

Updated:	4/11/2018	
grams per ton	907185	
grams per MT	1000000	
grams per kg	1000	
lbs per ton	2000	
lbs per MT	2204.62	
hrs/day	24	
work hrs/day	10	*San Anselmo Flood Equipment & Work Durations R1*
seconds/hr	3600	
grams per lb	453.592	
kWh per MWh	1000	
1hr to annual concentration	0.1	https://www3.epa.gov/ttn/scram/models/screen/aerscreen_userguide.pdf
Days per year	365	

Renewable Diesel % reductions	Fuel, engine type RD, On-Road, FTP	B20 Soy, off-road	B100 Soy, off-road	**Source**
PM	-34.2%	-23.3%	-55.9%	On-Road: SF RD memo (Sachiko Tanikawa 2015) and Table ES-6: https://www.arb.ca.gov/fuels/diesel/altdiesel/20111013_CARB%20Final%20Biodiesel%20Report.pd
THC	-3.4%	-5.2%	-27.5%	Off-Road: Table ES-7: https://www.arb.ca.gov/fuels/diesel/altdiesel/20111013_CARB%20Final%20Biodiesel%20Report.pd
NOX	-9.9%	2.8%	13.8%	
CO2	-3.4%	1.2%	2.1%	
				SF RD memo for John Deere engine (Sachiko Tanikawa 2015) and https://www.arb.ca.gov/fuels/diesel/altdiesel/20111013_CARB%20Final%20Biodiesel%20Report.pdf, and https://www.arb.ca.gov/fuels/multimedia/meetings/RenewableDieselStaffReport_Nov2013.pc
Percent reduction for low-VOC Arch	0.1			

GWPs

CH4	28	IPCC AR4
N2O	265	IPCC AR4

`

GHG EFs from Climate Registry for Off-road equipment

CH4 (g/gal)	0.58	Table 13.7 , Construction/Mining Equipment - https://www.theclimateregistry.org/wp-content/uploads/2017/05/2017-Climate-Registry-Default-Emission-Factors.pd
N2O (g/gal)	0.26	Table 13.7 , Construction/Mining Equipment - https://www.theclimateregistry.org/wp-content/uploads/2017/05/2017-Climate-Registry-Default-Emission-Factors.pd
Ratio: CH4:CO2	0.00006	
Ratio: N2O:CO2	0.00003	
CO2 (kg/gal) - Diesel	10.21	Table 13.1 - https://www.theclimateregistry.org/wp-content/uploads/2017/05/2017-Climate-Registry-Default-Emission-Factors.pd
CO2 (kg/gal) - Biodiesel (B100)	9.45	Table 13.1 - https://www.theclimateregistry.org/wp-content/uploads/2017/05/2017-Climate-Registry-Default-Emission-Factors.pd
percent reduction biodiesel	7.4%	

CH4 and N2O from EMFAC

Gasoline - N2O per Nox	4.16%	https://www.arb.ca.gov/msei/emfac2011-faq.htm#emfac2011_web_db_qstn07
Diesel - gN2O per gallon	0.3316	https://www.arb.ca.gov/msei/emfac2011-faq.htm#emfac2011_web_db_qstn07

B-11 CalEEMod Output – Operational Emissions

San Anselmo Flood Control - Operational

Marin County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Office Building	10.00	1000sqft	0.23	10,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	69
Climate Zone	5			**Operational Year**	2021
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - project modeling

Land Use -

Construction Phase - See AQ-GHG_calcs.xls. Assume all phases grading for simplicity.

Off-road Equipment - See AQ-GHG_calcs_v2.xls

Off-road Equipment - Information from PD and CH2M

Trips and VMT - Based on 10 workers (20 one-way trips per day) and 182 truck loads

On-road Fugitive Dust - See AQ-GHG_calcs_v2.xls

Grading - Information from PD and CH2M

Construction Off-road Equipment Mitigation - Assume all Tier 4 interim, per BAAQMD recommendations

Table Name	Column Name	Default Value	New Value
tblAreaCoating	Area_Nonresidential_Exterior	5000	500
tblAreaCoating	Area_Nonresidential_Interior	15000	1500
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstructionPhase	NumDays	2.00	6.00
tblEnergyUse	LightingElect	3.58	3.67
tblEnergyUse	T24E	4.10	4.30
tblEnergyUse	T24NG	18.32	18.41
tblGrading	MaterialExported	0.00	1,600.00
tblOffRoadEquipment	HorsePower	212.00	245.00
tblOffRoadEquipment	HorsePower	158.00	266.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	PhaseName		Sediment Removal
tblOffRoadEquipment	PhaseName		Sediment Removal
tblOnRoadDust	RoadSiltLoading	0.10	0.04
tblSolidWaste	SolidWasteGenerationRate	9.30	0.93
tblTripsAndVMT	HaulingTripNumber	158.00	182.00
tblTripsAndVMT	WorkerTripNumber	3.00	20.00
tblWater	IndoorWaterUseRate	1,777,337.48	177,733.75
tblWater	OutdoorWaterUseRate	1,089,335.87	108,933.59

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	2.2000e-003	0.0405	0.0175	1.1000e-004	4.5000e-004	5.1000e-004	9.5000e-004	3.3000e-004	4.7000e-004	8.0000e-004	0.0000	10.3809	10.3809	1.3500e-003	0.0000	10.4145
Maximum	**2.2000e-003**	**0.0405**	**0.0175**	**1.1000e-004**	**4.5000e-004**	**5.1000e-004**	**9.5000e-004**	**3.3000e-004**	**4.7000e-004**	**8.0000e-004**	**0.0000**	**10.3809**	**10.3809**	**1.3500e-003**	**0.0000**	**10.4145**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	1.6500e-003	0.0373	0.0274	1.1000e-004	1.1200e-003	1.7000e-004	1.3000e-003	3.3000e-004	1.7000e-004	5.0000e-004	0.0000	10.3809	10.3809	1.3500e-003	0.0000	10.4145
Maximum	**1.6500e-003**	**0.0373**	**0.0274**	**1.1000e-004**	**1.1200e-003**	**1.7000e-004**	**1.3000e-003**	**3.3000e-004**	**1.7000e-004**	**5.0000e-004**	**0.0000**	**10.3809**	**10.3809**	**1.3500e-003**	**0.0000**	**10.4145**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**25.00**	**8.07**	**-56.87**	**0.00**	**-148.89**	**66.67**	**-36.84**	**0.00**	**63.83**	**37.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	**Start Date**	**End Date**	**Maximum Unmitigated ROG + NOX (tons/quarter)**	**Maximum Mitigated ROG + NOX (tons/quarter)**
1	**1-1-2019**	**3-31-2019**	0.0409	0.0372
		Highest	0.0409	0.0372

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0396	0.0000	9.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.8000e-004	1.8000e-004	0.0000	0.0000	1.9000e-004
Energy	1.0500e-003	9.5200e-003	8.0000e-003	6.0000e-005		7.2000e-004	7.2000e-004		7.2000e-004	7.2000e-004	0.0000	47.5127	47.5127	1.8800e-003	5.4000e-004	47.7198
Mobile	0.0224	0.0750	0.2502	8.2000e-004	0.0742	8.6000e-004	0.0750	0.0199	8.1000e-004	0.0207	0.0000	74.7320	74.7320	2.5800e-003	0.0000	74.7966
Waste						0.0000	0.0000		0.0000	0.0000	0.1888	0.0000	0.1888	0.0112	0.0000	0.4677
Water						0.0000	0.0000		0.0000	0.0000	0.0564	0.3907	0.4471	5.8100e-003	1.4000e-004	0.6341
Total	**0.0630**	**0.0845**	**0.2583**	**8.8000e-004**	**0.0742**	**1.5800e-003**	**0.0757**	**0.0199**	**1.5300e-003**	**0.0214**	**0.2452**	**122.6355**	**122.8807**	**0.0214**	**6.8000e-004**	**123.6185**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0396	0.0000	9.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.8000e-004	1.8000e-004	0.0000	0.0000	1.9000e-004
Energy	1.0500e-003	9.5200e-003	8.0000e-003	6.0000e-005		7.2000e-004	7.2000e-004		7.2000e-004	7.2000e-004	0.0000	47.5127	47.5127	1.8800e-003	5.4000e-004	47.7198
Mobile	0.0224	0.0750	0.2502	8.2000e-004	0.0742	8.6000e-004	0.0750	0.0199	8.1000e-004	0.0207	0.0000	74.7320	74.7320	2.5800e-003	0.0000	74.7966
Waste						0.0000	0.0000		0.0000	0.0000	0.1888	0.0000	0.1888	0.0112	0.0000	0.4677
Water						0.0000	0.0000		0.0000	0.0000	0.0564	0.3907	0.4471	5.8100e-003	1.4000e-004	0.6341
Total	**0.0630**	**0.0845**	**0.2583**	**8.8000e-004**	**0.0742**	**1.5800e-003**	**0.0757**	**0.0199**	**1.5300e-003**	**0.0214**	**0.2452**	**122.6355**	**122.8807**	**0.0214**	**6.8000e-004**	**123.6185**

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

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Sediment Removal	Grading	1/1/2019	1/8/2019	5	6	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Sediment Removal	Concrete/Industrial Saws	0	8.00	81	0.73
Sediment Removal	Crawler Tractors	0	10.00	245	0.43
Sediment Removal	Excavators	1	10.00	266	0.38
Sediment Removal	Rubber Tired Dozers	0	1.00	247	0.40
Sediment Removal	Tractors/Loaders/Backhoes	0	6.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Sediment Removal	1	20.00	0.00	182.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

3.2 Sediment Removal - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.0800e-003	0.0119	7.4400e-003	3.0000e-005		3.9000e-004	3.9000e-004		3.6000e-004	3.6000e-004	0.0000	2.9186	2.9186	9.2000e-004	0.0000	2.9417
Total	**1.0800e-003**	**0.0119**	**7.4400e-003**	**3.0000e-005**	**0.0000**	**3.9000e-004**	**3.9000e-004**	**0.0000**	**3.6000e-004**	**3.6000e-004**	**0.0000**	**2.9186**	**2.9186**	**9.2000e-004**	**0.0000**	**2.9417**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	8.9000e-004	0.0285	8.4300e-003	7.0000e-005	3.8000e-004	1.2000e-004	5.0000e-004	2.6000e-004	1.1000e-004	3.7000e-004	0.0000	7.0271	7.0271	4.1000e-004	0.0000	7.0374
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.3000e-004	1.6000e-004	1.5800e-003	0.0000	6.0000e-005	0.0000	7.0000e-005	7.0000e-005	0.0000	7.0000e-005	0.0000	0.4352	0.4352	1.0000e-005	0.0000	0.4355
Total	**1.1200e-003**	**0.0286**	**0.0100**	**7.0000e-005**	**4.4000e-004**	**1.2000e-004**	**5.7000e-004**	**3.3000e-004**	**1.1000e-004**	**4.4000e-004**	**0.0000**	**7.4623**	**7.4623**	**4.2000e-004**	**0.0000**	**7.4729**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.3000e-004	8.6200e-003	0.0174	3.0000e-005		5.0000e-005	5.0000e-005		5.0000e-005	5.0000e-005	0.0000	2.9186	2.9186	9.2000e-004	0.0000	2.9417
Total	**5.3000e-004**	**8.6200e-003**	**0.0174**	**3.0000e-005**	**0.0000**	**5.0000e-005**	**5.0000e-005**	**0.0000**	**5.0000e-005**	**5.0000e-005**	**0.0000**	**2.9186**	**2.9186**	**9.2000e-004**	**0.0000**	**2.9417**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	8.9000e-004	0.0285	8.4300e-003	7.0000e-005	8.8000e-004	1.2000e-004	1.0000e-003	2.6000e-004	1.1000e-004	3.7000e-004	0.0000	7.0271	7.0271	4.1000e-004	0.0000	7.0374
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.3000e-004	1.6000e-004	1.5800e-003	0.0000	2.4000e-004	0.0000	2.5000e-004	7.0000e-005	0.0000	7.0000e-005	0.0000	0.4352	0.4352	1.0000e-005	0.0000	0.4355
Total	**1.1200e-003**	**0.0286**	**0.0100**	**7.0000e-005**	**1.1200e-003**	**1.2000e-004**	**1.2500e-003**	**3.3000e-004**	**1.1000e-004**	**4.4000e-004**	**0.0000**	**7.4623**	**7.4623**	**4.2000e-004**	**0.0000**	**7.4729**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0224	0.0750	0.2502	8.2000e-004	0.0742	8.6000e-004	0.0750	0.0199	8.1000e-004	0.0207	0.0000	74.7320	74.7320	2.5800e-003	0.0000	74.7966
Unmitigated	0.0224	0.0750	0.2502	8.2000e-004	0.0742	8.6000e-004	0.0750	0.0199	8.1000e-004	0.0207	0.0000	74.7320	74.7320	2.5800e-003	0.0000	74.7966

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Office Building	110.30	24.60	10.50	200,261	200,261
Total	110.30	24.60	10.50	200,261	200,261

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Office Building	9.50	7.30	7.30	33.00	48.00	19.00	77	19	4

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Office Building	0.589733	0.041719	0.200019	0.112200	0.017267	0.005142	0.010289	0.010866	0.002023	0.003460	0.005838	0.000685	0.000758

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	37.1494	37.1494	1.6800e-003	3.5000e-004	37.2950
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	37.1494	37.1494	1.6800e-003	3.5000e-004	37.2950
NaturalGas Mitigated	1.0500e-003	9.5200e-003	8.0000e-003	6.0000e-005		7.2000e-004	7.2000e-004		7.2000e-004	7.2000e-004	0.0000	10.3633	10.3633	2.0000e-004	1.9000e-004	10.4248
NaturalGas Unmitigated	1.0500e-003	9.5200e-003	8.0000e-003	6.0000e-005		7.2000e-004	7.2000e-004		7.2000e-004	7.2000e-004	0.0000	10.3633	10.3633	2.0000e-004	1.9000e-004	10.4248

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Office Building	194200	1.0500e-003	9.5200e-003	8.0000e-003	6.0000e-005		7.2000e-004	7.2000e-004		7.2000e-004	7.2000e-004	0.0000	10.3633	10.3633	2.0000e-004	1.9000e-004	10.4248
Total		**1.0500e-003**	**9.5200e-003**	**8.0000e-003**	**6.0000e-005**		**7.2000e-004**	**7.2000e-004**		**7.2000e-004**	**7.2000e-004**	**0.0000**	**10.3633**	**10.3633**	**2.0000e-004**	**1.9000e-004**	**10.4248**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Office Building	194200	1.0500e-003	9.5200e-003	8.0000e-003	6.0000e-005		7.2000e-004	7.2000e-004		7.2000e-004	7.2000e-004	0.0000	10.3633	10.3633	2.0000e-004	1.9000e-004	10.4248

Total		**1.0500e-003**	**9.5200e-003**	**8.0000e-003**	**6.0000e-005**		**7.2000e-004**	**7.2000e-004**		**7.2000e-004**	**7.2000e-004**	**0.0000**	**10.3633**	**10.3633**	**2.0000e-004**	**1.9000e-004**	**10.4248**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Office Building	127700	37.1494	1.6800e-003	3.5000e-004	37.2950
Total		**37.1494**	**1.6800e-003**	**3.5000e-004**	**37.2950**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Office Building	127700	37.1494	1.6800e-003	3.5000e-004	37.2950
Total		**37.1494**	**1.6800e-003**	**3.5000e-004**	**37.2950**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0396	0.0000	9.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.8000e-004	1.8000e-004	0.0000	0.0000	1.9000e-004
Unmitigated	0.0396	0.0000	9.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.8000e-004	1.8000e-004	0.0000	0.0000	1.9000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	5.2000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0391					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	9.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.8000e-004	1.8000e-004	0.0000	0.0000	1.9000e-004
Total	**0.0396**	**0.0000**	**9.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.8000e-004**	**1.8000e-004**	**0.0000**	**0.0000**	**1.9000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	5.2000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0391					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	9.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.8000e-004	1.8000e-004	0.0000	0.0000	1.9000e-004
Total	**0.0396**	**0.0000**	**9.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.8000e-004**	**1.8000e-004**	**0.0000**	**0.0000**	**1.9000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.4471	5.8100e-003	1.4000e-004	0.6341
Unmitigated	0.4471	5.8100e-003	1.4000e-004	0.6341

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e

Land Use	Mgal	MT/yr			
General Office Building	0.177734 / 0.108934	0.4471	5.8100e-003	1.4000e-004	0.6341
Total		**0.4471**	**5.8100e-003**	**1.4000e-004**	**0.6341**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Office Building	0.177734 / 0.108934	0.4471	5.8100e-003	1.4000e-004	0.6341
Total		**0.4471**	**5.8100e-003**	**1.4000e-004**	**0.6341**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.1888	0.0112	0.0000	0.4677

Unmitigated	0.1888	0.0112	0.0000	0.4677

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Office Building	0.93	0.1888	0.0112	0.0000	0.4677
Total		**0.1888**	**0.0112**	**0.0000**	**0.4677**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Office Building	0.93	0.1888	0.0112	0.0000	0.4677
Total		**0.1888**	**0.0112**	**0.0000**	**0.4677**

9.0 Operational Offroad

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

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

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

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

B-12 AERSCREEN Inputs – Sunnyside Nursery Site Basin

```
Start date and time  04/04/18 14:01:38
                             AERSCREEN 16216

BB2

            BB2


         -----------------  DATA ENTRY VALIDATION  -----------------
                        METRIC              ENGLISH
 ** AREADATA **  ---------------     ----------------

 Emission Rate:       1.0000 g/s            7.937 lb/hr
 Area Height:           3.89 meters          12.76 feet
 Area Source Length:  185.00 meters         606.96 feet
 Area Source Width:   150.00 meters         492.13 feet
 Vertical Dimension:    1.40 meters           4.59 feet
 Model Mode:           RURAL
 Dist to Ambient Air:           1.0 meters            3. feet


 ** BUILDING DATA **

 No Building Downwash Parameters


 ** TERRAIN DATA **

 No Terrain Elevations
 Source Base Elevation:   0.0 meters        0.0  feet

 Probe distance:   5000. meters       16404. feet
 Flagpole Receptor Height:      1.5 meters            5. feet

 No discrete receptors used


 ** FUMIGATION DATA **

 No fumigation requested


 ** METEOROLOGY DATA **

 Min/Max Temperature:  278.0 / 303.0 K   40.7 /  85.7 Deg F

 Minimum Wind Speed:     0.5 m/s

 Anemometer Height:   10.000 meters

 Dominant Surface Profile: Urban
 Dominant Climate Type:    Average Moisture

 Surface friction velocity (u*): not adjusted

DEBUG OPTION OFF


 AERSCREEN output file:
 Nursery.Out


 *** AERSCREEN Run is Ready to Begin


 No terrain used, AERMAP will not be run
**************************************************
```

```
SURFACE CHARACTERISTICS & MAKEMET
Obtaining surface characteristics...

Using AERMET seasonal surface characteristics for Urban with Average Moisture
Season            Albedo     Bo       zo
Winter             0.35     1.50     1.000
Spring             0.14     1.00     1.000
Summer             0.16     2.00     1.000
Autumn             0.18     2.00     1.000

Creating met files aerscreen_01_01.sfc & aerscreen_01_01.pfl

Creating met files aerscreen_02_01.sfc & aerscreen_02_01.pfl

Creating met files aerscreen_03_01.sfc & aerscreen_03_01.pfl

Creating met files aerscreen_04_01.sfc & aerscreen_04_01.pfl

Buildings and/or terrain present or rectangular area source, skipping probe

FLOWSECTOR   started 04/04/18 14:04:00
 *******************************************

  Running AERMOD
 Processing Winter

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
```

```
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  30

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  35

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   9

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  40

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 ********************************************

  Running AERMOD
 Processing Spring

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
```

```
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  30

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  35

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   9

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  40

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 ********************************************

  Running AERMOD
 Processing Summer

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
```

```
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  30

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  35

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   9

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  40

    ********   WARNING MESSAGES   ********
               ***  NONE  ***
 ********************************************

  Running AERMOD
 Processing Autumn

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   5

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
```

```
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  10

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  15

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  20

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  25

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  30

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  35

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

*****************************************************
Processing wind flow sector   9

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  40

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

FLOWSECTOR   ended 04/04/18 14:04:41

REFINE       started 04/04/18 14:04:41

 AERMOD Finishes Successfully for REFINE stage 3 Winter sector   0

    ********   WARNING MESSAGES   ********
               ***  NONE  ***

REFINE       ended 04/04/18 14:04:44

 *********************************************
 AERSCREEN Finished Successfully
 With no errors or warnings
 Check log file for details
```

****

Ending date and time 04/04/18 14:04:45

B-13 AERSCREEN Inputs – Downtown San Anselmo Site

```
Start date and time  04/04/18 14:11:57
                             AERSCREEN 16216

BB2

            BB2


         -----------------  DATA ENTRY VALIDATION  -----------------
                       METRIC              ENGLISH
 ** AREADATA **  ---------------     ----------------

 Emission Rate:       1.0000 g/s             7.937 lb/hr
 Area Height:           3.89 meters          12.76 feet
 Area Source Length:   50.00 meters         164.04 feet
 Area Source Width:    40.00 meters         131.23 feet
 Vertical Dimension:    1.40 meters           4.59 feet
 Model Mode:           URBAN
 Population:           12599
 Dist to Ambient Air:           1.0 meters             3. feet


 ** BUILDING DATA **

 No Building Downwash Parameters


 ** TERRAIN DATA **

 No Terrain Elevations
 Source Base Elevation:   0.0 meters        0.0  feet

 Probe distance:   5000. meters       16404. feet
 Flagpole Receptor Height:      1.5 meters             5. feet

 No discrete receptors used


 ** FUMIGATION DATA **

 No fumigation requested


 ** METEOROLOGY DATA **

 Min/Max Temperature:  278.0 / 303.0 K   40.7 /  85.7 Deg F

 Minimum Wind Speed:     0.5 m/s

 Anemometer Height:   10.000 meters

 Dominant Surface Profile: Urban
 Dominant Climate Type:    Average Moisture

 Surface friction velocity (u*): not adjusted

DEBUG OPTION OFF


 AERSCREEN output file:
 BB2.out


 *** AERSCREEN Run is Ready to Begin



 No terrain used, AERMAP will not be run
```

```
**************************************************

SURFACE CHARACTERISTICS & MAKEMET
Obtaining surface characteristics...

Using AERMET seasonal surface characteristics for Urban with Average Moisture
Season            Albedo     Bo       zo
Winter             0.35     1.50     1.000
Spring             0.14     1.00     1.000
Summer             0.16     2.00     1.000
Autumn             0.18     2.00     1.000

Creating met files aerscreen_01_01.sfc & aerscreen_01_01.pfl

Creating met files aerscreen_02_01.sfc & aerscreen_02_01.pfl

Creating met files aerscreen_03_01.sfc & aerscreen_03_01.pfl

Creating met files aerscreen_04_01.sfc & aerscreen_04_01.pfl

Buildings and/or terrain present or rectangular area source, skipping probe

FLOWSECTOR   started 04/04/18 14:12:42
 *******************************************

  Running AERMOD
 Processing Winter

Processing surface roughness sector  1

*****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector   0

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter       URB-POP

*****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector   5

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter       URB-POP

*****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  10

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter       URB-POP

*****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  15

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter       URB-POP

*****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  20

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter       URB-POP
```

```
****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  25

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  30

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  35

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   9

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector  40

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP
 ********************************************

  Running AERMOD
 Processing Spring

Processing surface roughness sector  1

****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   0

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector   5

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  10

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  15

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP
```

```
****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  20

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  25

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  30

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  35

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   9

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector  40

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP
 ********************************************

  Running AERMOD
 Processing Summer

Processing surface roughness sector  1

****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   0

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector   5

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  10

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP
```

```
****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  15

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  20

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  25

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  30

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  35

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   9

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector  40

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP
 ********************************************

  Running AERMOD
 Processing Autumn

Processing surface roughness sector  1

****************************************************
Processing wind flow sector   1

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   0

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   2

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector   5

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP
```

```
****************************************************
Processing wind flow sector   3

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  10

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   4

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  15

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   5

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  20

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   6

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  25

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   7

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  30

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   8

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  35

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

****************************************************
Processing wind flow sector   9

 AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector  40

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

FLOWSECTOR   ended 04/04/18 14:13:02

REFINE       started 04/04/18 14:13:02

 AERMOD Finishes Successfully for REFINE stage 3 Winter sector   0

    ********   WARNING MESSAGES   ********
 CO W320      36       URBOPT: Input Parameter May Be Out-of-Range for Parameter      URB-POP

REFINE       ended 04/04/18 14:13:04

 **********************************************
 AERSCREEN Finished Successfully
 But with Warnings
```

Check log file for details
****

Ending date and time 04/04/18 14:13:05

B-14 AERSCREEN Outputs – Sunnyside Nursery Site Basin

Nursery_max_conc_distance

Concentration	Distance	Elevation	Diag	Season/Month	Zo sector	Date	H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS	HT	REF TA	HT
0.14523E+04	1.00	0.00	35.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.17564E+04	25.00	0.00	35.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.20611E+04	50.00	0.00	30.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.23527E+04	75.00	0.00	20.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.26309E+04	100.00	0.00	20.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
* 0.27614E+04	117.00	0.00	35.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.27437E+04	125.00	0.00	35.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.26033E+04	150.00	0.00	35.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.23591E+04	175.00	0.00	35.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.21259E+04	200.00	0.00	35.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.19249E+04	225.00	0.00	35.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.17537E+04	250.00	0.00	30.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.16093E+04	275.00	0.00	30.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.14840E+04	300.00	0.00	25.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.13764E+04	325.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.12818E+04	350.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11965E+04	375.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11198E+04	400.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.10511E+04	425.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.98814E+03	450.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.93174E+03	475.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.88028E+03	500.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.83333E+03	525.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.79022E+03	550.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.75075E+03	575.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.71502E+03	600.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.68129E+03	625.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.65060E+03	650.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.62182E+03	675.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.59553E+03	700.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.57093E+03	725.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.54786E+03	750.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.52639E+03	775.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.50634E+03	800.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.48760E+03	825.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.47009E+03	850.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.45347E+03	875.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.43789E+03	900.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.42327E+03	925.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.40938E+03	950.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.39625E+03	975.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.38386E+03	1000.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.37216E+03	1025.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.36101E+03	1050.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.35035E+03	1075.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.34031E+03	1100.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.33071E+03	1125.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.32155E+03	1150.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.31285E+03	1175.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.30459E+03	1200.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.29671E+03	1225.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.28911E+03	1250.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.28186E+03	1275.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.27492E+03	1300.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.26828E+03	1325.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.26187E+03	1350.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.25570E+03	1375.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.24979E+03	1400.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.24415E+03	1425.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.23871E+03	1450.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.23347E+03	1475.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.22843E+03	1500.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.22359E+03	1525.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.21891E+03	1550.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.21439E+03	1575.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.21004E+03	1600.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.20586E+03	1625.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.20183E+03	1650.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.19793E+03	1675.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.19417E+03	1700.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.19050E+03	1725.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.18695E+03	1750.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.18351E+03	1775.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.18019E+03	1800.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.17694E+03	1825.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.17379E+03	1850.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.17073E+03	1875.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.16776E+03	1900.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.16489E+03	1924.99	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.16211E+03	1950.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.15940E+03	1975.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.15679E+03	2000.01	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.15425E+03	2025.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.15179E+03	2050.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.14939E+03	2075.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.14703E+03	2100.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.14474E+03	2125.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.14252E+03	2150.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.14035E+03	2175.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.13824E+03	2200.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.13618E+03	2225.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.13417E+03	2250.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.13222E+03	2275.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.13033E+03	2300.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.12848E+03	2325.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.12668E+03	2350.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.12491E+03	2375.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.12319E+03	2400.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.12151E+03	2425.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11987E+03	2450.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11828E+03	2475.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11672E+03	2500.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11519E+03	2525.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11370E+03	2550.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11225E+03	2575.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.11082E+03	2600.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.10942E+03	2625.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.10806E+03	2650.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.10671E+03	2675.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0

0.10540E+03	2700.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.10411E+03	2725.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.10285E+03	2750.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.10161E+03	2775.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.10040E+03	2800.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.99214E+02	2825.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.98051E+02	2850.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.96915E+02	2875.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.95803E+02	2900.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.94712E+02	2925.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.93640E+02	2950.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.92589E+02	2975.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.91558E+02	3000.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.90554E+02	3025.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.89567E+02	3050.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.88599E+02	3075.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.87648E+02	3100.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.86714E+02	3125.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.85798E+02	3150.00	0.00	15.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.84903E+02	3175.00	0.00	15.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.84024E+02	3200.00	0.00	15.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.83159E+02	3225.00	0.00	15.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.82308E+02	3250.00	0.00	15.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.81470E+02	3275.00	0.00	15.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.80645E+02	3300.00	0.00	15.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.79834E+02	3325.00	0.00	15.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.79037E+02	3350.00	0.00	15.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.78254E+02	3375.00	0.00	15.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.77484E+02	3400.00	0.00	15.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.76726E+02	3425.01	0.00	15.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.75981E+02	3450.00	0.00	15.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.75248E+02	3475.00	0.00	15.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.74527E+02	3500.00	0.00	15.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.73818E+02	3525.00	0.00	15.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.73122E+02	3550.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.72439E+02	3575.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.71768E+02	3600.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.71106E+02	3625.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.70456E+02	3650.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.69816E+02	3675.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.69186E+02	3700.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.68566E+02	3725.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.67956E+02	3750.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.67353E+02	3775.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.66760E+02	3800.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.66176E+02	3825.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.65601E+02	3850.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.65034E+02	3875.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.64476E+02	3900.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.63924E+02	3925.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.63381E+02	3950.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.62846E+02	3975.00	0.00	10.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.62321E+02	4000.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.61804E+02	4025.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.61295E+02	4050.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.60793E+02	4075.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.60298E+02	4100.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.60303E+02	4125.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.59812E+02	4150.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.59328E+02	4175.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.58851E+02	4200.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.58381E+02	4225.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.57916E+02	4250.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.57459E+02	4275.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.57007E+02	4300.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.56562E+02	4325.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.56123E+02	4350.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.55689E+02	4375.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.55261E+02	4400.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.54839E+02	4425.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.54423E+02	4450.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.54012E+02	4475.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.53606E+02	4500.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.53206E+02	4525.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.52811E+02	4550.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.52421E+02	4575.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.52035E+02	4600.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.51655E+02	4625.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.51280E+02	4650.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.50909E+02	4675.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.50543E+02	4700.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.50181E+02	4725.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.49824E+02	4750.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.49471E+02	4775.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.49123E+02	4800.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.48779E+02	4825.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.48439E+02	4850.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.48103E+02	4875.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.47771E+02	4900.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.47443E+02	4925.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.47119E+02	4950.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.46799E+02	4975.00	0.00	0.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0
0.46482E+02	5000.00	0.00	5.0	Winter	0-360	10010101	-1.23	0.043	-9.000	0.020	-999.	21.	5.7	1.000	1.50	0.35	0.50	10.0	278.0	2.0

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B-15 AERSCREEN Outputs – Downtown San Anselmo Site

Concentration	Distance	Elevation	Diag	Season/Month	Zo sector	Date	H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS	HT	REF TA	HT
0.48809E+04	1.00	0.00	30.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.78085E+04	25.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
* 0.78998E+04	26.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.50967E+04	50.00	0.00	35.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.30099E+04	75.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.20751E+04	100.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15446E+04	125.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.12106E+04	150.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.98380E+03	175.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.82126E+03	200.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.70024E+03	225.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.60701E+03	250.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.53330E+03	275.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.47354E+03	300.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.42461E+03	325.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.38374E+03	350.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.34935E+03	375.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.31998E+03	400.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.29455E+03	425.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.27238E+03	450.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.25300E+03	475.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.23592E+03	500.00	0.00	15.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.22069E+03	525.00	0.00	15.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.20709E+03	550.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.19490E+03	575.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.18388E+03	600.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.17393E+03	625.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.16488E+03	650.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15663E+03	675.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14996E+03	700.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14290E+03	725.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13639E+03	750.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13038E+03	775.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.12482E+03	800.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.11965E+03	825.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.11484E+03	850.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.11036E+03	875.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.10617E+03	900.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.10225E+03	925.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.98577E+02	950.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.95124E+02	975.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.91876E+02	1000.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.88815E+02	1025.00	0.00	20.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.85927E+02	1050.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.83197E+02	1075.00	0.00	25.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.80614E+02	1100.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.78167E+02	1125.00	0.00	20.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.75846E+02	1149.99	0.00	15.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.73641E+02	1175.00	0.00	35.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.71546E+02	1200.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.69551E+02	1224.99	0.00	40.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.67651E+02	1249.99	0.00	25.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.65839E+02	1275.00	0.00	30.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.64110E+02	1300.00	0.00	15.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.62457E+02	1325.00	0.00	30.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.60878E+02	1350.00	0.00	30.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.59366E+02	1375.00	0.00	25.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.57918E+02	1400.00	0.00	40.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.56530E+02	1425.00	0.00	15.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.55199E+02	1450.00	0.00	40.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.53921E+02	1475.00	0.00	25.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.52693E+02	1500.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.51513E+02	1525.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.50378E+02	1550.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.49286E+02	1574.99	0.00	25.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.48234E+02	1600.00	0.00	35.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.47221E+02	1625.00	0.00	35.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.46244E+02	1650.00	0.00	20.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.45301E+02	1675.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.44391E+02	1700.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.43512E+02	1725.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.42663E+02	1750.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.41842E+02	1775.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.41049E+02	1800.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.40281E+02	1824.99	0.00	15.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.39537E+02	1850.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.38817E+02	1875.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.38120E+02	1900.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.37444E+02	1924.99	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.36788E+02	1950.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.36152E+02	1975.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.35535E+02	2000.00	0.00	35.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.34936E+02	2025.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.34354E+02	2050.00	0.00	30.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.33788E+02	2075.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.33239E+02	2100.00	0.00	15.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.32705E+02	2125.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.32186E+02	2150.00	0.00	25.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.31680E+02	2175.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.31189E+02	2200.00	0.00	20.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.30710E+02	2225.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.30244E+02	2250.00	0.00	15.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.29790E+02	2275.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.29348E+02	2300.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.28917E+02	2325.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.28497E+02	2350.00	0.00	25.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.28087E+02	2375.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.27688E+02	2399.99	0.00	35.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.27298E+02	2425.00	0.00	35.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.26917E+02	2450.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.26546E+02	2475.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.26184E+02	2500.00	0.00	15.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.25829E+02	2525.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.25484E+02	2550.00	0.00	25.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.25146E+02	2575.00	0.00	25.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.24816E+02	2600.00	0.00	20.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.24493E+02	2625.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.24177E+02	2650.00	0.00	15.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.23869E+02	2675.00	0.00	15.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0

0.23567E+02	2700.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.23271E+02	2725.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.22983E+02	2750.00	0.00	20.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.22700E+02	2775.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.22423E+02	2800.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.22152E+02	2825.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.21887E+02	2850.00	0.00	35.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.21627E+02	2875.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.21372E+02	2900.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.21123E+02	2925.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.20878E+02	2950.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.20639E+02	2975.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.20404E+02	3000.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.20174E+02	3025.00	0.00	40.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.19948E+02	3050.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.19726E+02	3075.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.19509E+02	3100.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.19296E+02	3125.00	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.19087E+02	3150.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.18881E+02	3175.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.18680E+02	3199.99	0.00	10.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.18482E+02	3225.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.18288E+02	3249.99	0.00	35.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.18097E+02	3275.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.17910E+02	3300.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.17726E+02	3325.00	0.00	15.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.17546E+02	3350.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.17368E+02	3375.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.17194E+02	3400.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.17022E+02	3425.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.16854E+02	3450.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.16688E+02	3475.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.16525E+02	3500.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.16365E+02	3525.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.16208E+02	3550.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.16053E+02	3575.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15901E+02	3600.00	0.00	15.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15751E+02	3625.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15604E+02	3650.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15459E+02	3675.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15316E+02	3700.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15176E+02	3725.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.15038E+02	3750.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14902E+02	3775.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14768E+02	3800.00	0.00	40.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14636E+02	3825.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14506E+02	3849.99	0.00	15.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14379E+02	3875.00	0.00	5.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14253E+02	3900.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14129E+02	3925.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.14007E+02	3950.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13886E+02	3975.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13768E+02	4000.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13651E+02	4025.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13536E+02	4050.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13423E+02	4074.99	0.00	35.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13311E+02	4100.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13201E+02	4125.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.13092E+02	4150.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.12985E+02	4175.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.12879E+02	4200.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.12775E+02	4225.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.12673E+02	4250.00	0.00	0.0	Winter	0-360	10011001	-1.28	0.043	-9.000	0.020	-999.	21.	5.9	1.000	1.50	0.35	0.50	10.0	303.0	2.0
0.12595E+02	4275.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12543E+02	4300.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12492E+02	4325.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12442E+02	4350.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12392E+02	4375.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12342E+02	4400.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12293E+02	4425.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12245E+02	4450.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12197E+02	4475.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12149E+02	4500.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12102E+02	4525.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12055E+02	4550.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.12009E+02	4575.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11963E+02	4600.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11918E+02	4625.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11873E+02	4650.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11828E+02	4675.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11784E+02	4700.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11740E+02	4725.00	0.00	25.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11697E+02	4750.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11654E+02	4775.00	0.00	30.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11611E+02	4800.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11569E+02	4825.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11527E+02	4850.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11486E+02	4875.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11445E+02	4900.00	0.00	5.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11404E+02	4925.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11363E+02	4950.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11323E+02	4975.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0
0.11283E+02	5000.00	0.00	0.0	Summer	0-360	10010312	8.25	0.121	0.300	0.020	117.	96.	-19.0	1.000	2.00	0.16	0.50	10.0	290.5	2.0

APPENDIX C
Hazards and Hazardous Materials Supporting Documentation

Hazardous Building Materials Survey

630, 634, and 636 San Anselmo Avenue
San Anselmo, California

County of Marin

3501 Civic Center Drive, Room 304 |San Rafael, California 94903

November 16, 2017 | Project No. 403163001

Geotechnical | Environmental | Construction Inspection & Testing | Forensic Engineering & Expert Witness

Geophysics | Engineering Geology | Laboratory Testing | Industrial Hygiene | Occupational Safety | Air Quality | GIS

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

Hazardous Building Materials Survey

630, 634, and 636 San Anselmo Avenue
San Anselmo, California

Mr. Russell Eberwein, Senior Civil Engineer
Marin County Department of Public Works
3501 Civic Center Drive, Room 304 |San Rafael, California 94903

November 16, 2017 | Project No. 403163001

David Blair Bridges, CAC 14-5173
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Distribution: (1) Addressee (via e-mail)

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C – Lead-Containing Material Laboratory Analytical Report and Chain-of-Custody Records

D – CDPH Form 8552 - Lead Hazard Evaluation Report

1 INTRODUCTION

Ninyo & Moore was retained by the County of Marin to conduct hazardous building materials surveys (HBMSs) at 630, 634, and 636 San Anselmo Avenue, located in San Anselmo, California (Figure 1). Our services included the performance of asbestos-containing materials (ACM) surveys, lead-containing materials (LCM) surveys, and a review and quantification of miscellaneous hazardous building materials (potential mercury-containing thermostats/switches, poly chlorinated biphenyl (PCB)-containing items [transformers, light ballasts, etc.], fluorescent light tubes, exit signs, air conditioning units, and Freon™-containing refrigeration systems) at the three site buildings. For the purposes of this assessment, LCM refers to both lead-based paint (LBP), as defined by the California Department of Public Health (CDPH) and U.S. Department of Housing and Urban Development (HUD) and other potential LCMs (including ceramic tile).

The survey was performed in accordance with established guidelines for the assessment of ACM and LCM, and is based upon conditions of the site buildings at the time of the surveying/assessment activities. Our objective and scope of work for the survey are presented below.

1.1 Involved Parties

Mr. Blair Bridges of Ninyo & Moore conducted the HBMS sampling activities on November 2, 2017. Mr. Bridges is a State of California Division of Occupational Safety and Health (DOSH)-Certified Asbestos Consultant (No. 14-5173) and California Department of Public Health (DPH) Lead-related Construction Services Inspector/Assessor (No. 24052). Mr. Duane Blamer of Ninyo & Moore provided quality assurance and principal-level management for this project. Professional certifications are presented in Appendix A.

1.2 User Reliance

This report may be relied upon and is intended exclusively for use by the County of Marin. Any use or re-use of the findings, conclusions, and/or recommendations of this report by parties other than the Client is undertaken at said parties' sole risk.

2 OBJECTIVE AND SCOPE OF SERVICES

The purpose of this study is to provide information regarding the current site conditions to assist the County of Marin in implementing proposed site building demolition activities. Ninyo & Moore personnel performed the following services:

- Conducted a visual reconnaissance of the site buildings to document homogeneous areas of hazardous building materials and locate suspect ACM and LCMs.
- Collected 54 bulk samples of suspect ACMs and submitted them to a certified, independent laboratory for analysis of asbestos content.
- Collected 18 suspect LCM samples and submitted these samples to a certified, independent laboratory for analysis of lead content.
- Visually assessed and quantified potential mercury-containing thermostats/switches, PCB-containing items, fluorescent light tubes, exit signs, smoke detectors, air conditioning units, and FreonTM-containing refrigeration systems.
- Prepared this HBMS report, which presents our data and summarizes the assessed building materials. The report includes a site description, laboratory testing information, findings, conclusions, and recommendations, sample location maps, tables summarizing the building materials assessed, and the estimated quantities of identified materials.

3 SITE DESCRIPTION

The three buildings are located in the City of San Anselmo and are indicated on Figures 1 and 2. Descriptions of each of the site buildings are provided below.

636 San Anselmo Avenue: this building is an approximately 1,600 square-foot building with a kitchen, a dining area, storage rooms, and bathrooms. Building finishes include gypsum wallboard walls, vinyl floor sheeting (VFS), ceramic tile and painted concrete floors, and wood exterior walls.

634 San Anselmo Avenue: this building is an approximately 1,500 square-foot building including a real estate office (and bathroom), an optometrists office (and bathroom), and a barber shop. Building finishes include gypsum wallboard walls, ceramic tile floors, carpeted and wood floors, and exterior wood walls.

630 San Anselmo Avenue: this building is an approximately 140 square-foot building with CMU interior/exterior walls and a painted concrete floor.

4 PHYSICAL LIMITATIONS

No physical limitations were encountered during the site visit.

Underground utilities, such as suspect cementitious water lines or suspect insulated/coated gas or electrical lines were not assessed during these survey activities. If additional suspect materials and/or surfaces are encountered during the site building demolitions that have not been assessed, they should be assumed to be asbestos and/or lead-containing and handled accordingly, or should be sampled and analyzed to assess whether they are asbestos and/or lead-containing. As-built diagrams of the site buildings were not provided for review.

5 SAMPLE COLLECTION AND ANALYSES

On November 2, 2017, the site buildings were assessed for the presence of ACMs, LCMs, and miscellaneous hazardous building materials. The ACM and LCM surveys followed United States Environmental Protection Agency (EPA) guidelines, or industry standards, within the limitations of the scope of this assessment. Survey activities are discussed below.

5.1 Asbestos Survey

A preliminary visual assessment and bulk sampling survey of suspect ACMs were performed by a State of California Certified Asbestos Consultant. Representative samples of suspect ACMs were collected after identification of homogeneous sampling areas (areas in which the materials are consistent in color, texture, construction or application date, and general appearance). Each homogeneous area was observed for material type, location, condition, and friability. Representative samples were collected from each area (except from areas that were inaccessible). Samples were collected using USEPA-recommended sampling procedures.

A total of 54 bulk suspect asbestos samples were collected and analyzed. Building materials that were sampled and analyzed for the presence of asbestos are presented in Table 1.

After collection, the suspect ACM samples were transferred to EMSL Analytical, Inc., (EMSL) of San Leandro, California for analysis. EMSL is a laboratory accredited in the National Voluntary Laboratory Accreditation Program (NVLAP) for bulk asbestos fiber analysis. The samples were analyzed for the presence and quantification of asbestos fibers, using polarized light microscopy with dispersion staining (PLM/ds), in general accordance with USEPA Method 600/R-93/116. The lower limit of reliable detection for asbestos using the PLM method is approximately 1 percent by volume. Currently, the EPA and the State of California stipulate that materials containing more than 1% asbestos constitute an ACM and the State of California stipulates that a material containing greater than 0.1% asbestos constitutes an asbestos-containing construction material (ACCM). Building materials that were sampled and analyzed for the presence of asbestos are presented in the attached Table 1, and the locations from which bulk asbestos samples were collected are shown on Figures 3 and 4. Materials in which no asbestos was detected are defined in Table 1 as “ND” (for “None Detected”) in the “Asbestos Detected” column. Copies of the laboratory analytical reports and chain-of-custody records for suspect ACMs are presented in Appendix B. ACMs reported in the Ninyo & Moore survey are listed in Section 6.1 below.

5.2 Lead-Containing Materials Survey

After collection, the suspect LCM samples were also transferred to EMSL for analysis of total lead content by Flame Atomic Absorption Spectrometry (Flame AAS/SW 846 3050B/7000B).

EMSL is an American Industrial Hygiene Association accredited Environmental Lead Laboratory (AIHA ELLA). Currently, the USEPA stipulates what concentrations of lead in non-volatile components of surface coatings or materials indicate whether a material is considered to be lead-containing. The USEPA stipulates that paint containing an amount equal to or in excess of 1 milligram per square centimeter (1.0 mg/cm^2), or more than half of one percent (0.5%) by weight (or 5,000 milligrams per kilogram [mg/kg]), constitute a lead-based paint (LBP). Coatings with any detectable amount of reported lead would be considered lead-containing paint (LCP).

Paint that is chipping or peeling, or that may be readily removed from surfaces, and has a lead content equal to or more than 1,000 mg/kg, would require handling as a California Title 22 hazardous waste. The analytical results associated with paint chip samples collected from the building are summarized in Table 2 and copies of the laboratory analytical report and chain-of-custody record are presented in Appendix C.

5.3 Miscellaneous Hazardous Building Materials Survey

Confirmation of miscellaneous hazardous building materials, via analytical testing, was not performed for this survey. Potentially hazardous miscellaneous building materials observed and quantified at the site buildings are presented in Table 3.

A visual assessment and quantification was performed of potential mercury-containing thermostats/switches, PCB-containing items (transformers, light ballasts, etc.), fluorescent light tubes, exit signs, smoke detectors, air conditioning units, and Freon™-containing refrigeration systems.

6 FINDINGS

HBMSs were performed at the site buildings to evaluate if potential hazards associated with the building materials, paint or other suspect LCMs, and/or other miscellaneous hazardous building materials (potential mercury-containing thermostats, potential PCB-containing items, fluorescent light tubes, exit signs with radioactive sources, and Freon™-containing refrigeration systems) may exist.

Based upon the analytical results of bulk samples collected, and observations made, during this survey, ACMs and/or ACCMs are not located at the site buildings; LCMs are located at 630 and 634 San Anselmo Avenue; and miscellaneous hazardous building materials are located at 634 and 636 San Anselmo Avenue. These materials are discussed below.

6.1 Asbestos-Containing Materials

No materials were found to be asbestos-containing through Ninyo & Moore's sampling activities.

6.2 Lead-Containing Materials

A total of 18 suspect lead-containing samples were collected for analysis of lead content. This included 12 paint chip samples and six ceramic tile samples. One of the paint chip samples contained lead at a reported concentration greater than 5,000 mg/kg (or 0.5% by weight). This lead concentration was 2.0% by weight (or 20,000 mg/kg) for a sample collected on the upper ceiling of 634 San Anselmo Avenue (LBP-01). This paint sample is considered LBP. The lead concentrations associated with 10 of the paint chip samples and all of the six ceramic tile samples were reported by the analytical laboratory EMSL to be less than their associated reporting limit of 0.010% by weight (100 mg/kg). The reported lead concentration of the remaining paint chip sample was 0.020% by weight (or 200 mg/kg), collected on the exterior wall of 630 San Anselmo Avenue. This paint sample is considered LCP. Occupational Health and Safety Administration (OSHA) regulations apply whenever materials with any detectable amounts of lead are disturbed.

Copies of the CDPH form 8552 “Lead Hazard Evaluation Report” for the site buildings are included in Appendix D.

6.3 Miscellaneous Hazardous Building Material Survey

Miscellaneous hazardous building materials observed at the site buildings included potential PCB-containing light ballasts; fluorescent light tubes; exit signs (potential low-level radioactive sources); refrigerators, air conditioning units, and smoke detectors. No attempt was made to disassemble or sample any of the observed miscellaneous hazardous building materials.

7 RECOMMENDATIONS

Since LCMs and miscellaneous hazardous building materials have been reported at the site buildings, the following recommendations and precautions are provided:

The LCMs reported at the site building should be incorporated into building-specific O&M Plans and should not be disturbed. Any LCMs found in a damaged or non-intact condition should be abated and/or stabilized. Prior to renovation or demolition work that would disturb the identified LCMs a licensed lead abatement removal contractor should stabilize and/or remove the identified LCMs in compliance with the most recent applicable federal, state, and local laws, regulations, standards, and/or codes governing abatement, transport, and disposal of LCMs. All lead waste must be properly characterized prior to disposal to determine waste classification, packaging, transportation, and disposal requirements. ***While Ninyo & Moore provided an estimate of the quantity of LCMs present at the site buildings (Table 2), it is the responsibility of abatement contractors to assess the actual LCM quantities present.***

Prior to demolition or renovation activities, potential mercury-containing thermostats/switches, PCB-containing items (light ballasts, transformers, etc.), fluorescent light tubes, smoke detectors, exit signs, air conditioning units, and FreonTM-containing refrigeration systems should be removed and recycled or disposed of by a licensed contractor according to applicable federal, state, and local laws/regulations. All light fixtures should be visually inspected, prior to disposal, to assess if they contain PCBs (checked for “No PCBs” or “PCB free” stickers). ***While Ninyo & Moore provided an estimate of the quantity of miscellaneous hazardous building materials present at the site buildings (Table 3), it is the abatement contractor’s responsibility to assess the actual quantities of items present.***

There is a possibility that additional suspect ACMs/ACCMs, LCMs, or other miscellaneous hazardous building materials may be discovered during building renovation and/or demolition activities. Therefore, Ninyo & Moore recommends that, should additional suspect materials not sampled or assessed in this report be uncovered during demolition/renovation activities, (a) samples of suspect materials should be collected for laboratory analysis and activities that may impact the materials should cease until laboratory analytical results are reviewed or (b) the materials should be assumed to be hazardous and handled as such.

8 LIMITATIONS

Ninyo & Moore's opinions and recommendations regarding environmental conditions, as presented in this report, are based on limited sampling and chemical analysis. Further assessment of potential adverse environmental impacts may be accomplished by conducting a more comprehensive assessment. The samples collected and used for testing, and the observations made, are believed to be representative of the areas evaluated. However, if additional suspect hazardous building materials are encountered during renovation/demolition activities, these materials should be sampled by qualified personnel, and analyzed for content prior to further disturbance. ***In addition, please note that quantities of impacted hazardous building materials are approximate. It is the contractor’s responsibility to assess the actual quantities of hazardous building materials present.***

The environmental services described in this report have been conducted in general accordance with current regulatory guidelines and the standard of care exercised by environmental consultants performing similar work in the project area. No warranty, expressed or implied, is made regarding the professional opinions presented in this report. Variations in site conditions may exist and conditions not observed or described in this report may be encountered during subsequent activities.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires any additional information, or has questions regarding content, interpretations presented, or completeness of this document.

The environmental interpretations and opinions contained in this report are based on the results of laboratory tests and analyses intended to detect the presence and concentration of specific chemical or physical constituents in samples collected from the subject site. The testing and analyses have been conducted by an independent laboratory that is certified by the State of California to conduct such tests. Ninyo & Moore has no involvement in, or control over, such testing and analysis. Ninyo & Moore, therefore, disclaims responsibility for any inaccuracy in such laboratory results.

Our findings, opinions, and recommendations are based on an analysis of the observed site conditions. It should be understood that the conditions of a site can change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no control.

Table 1 - Bulk Asbestos Sampling Results

Sample I.D.	Building	Material Location	Sample Description	Friable Y/N	Quantity	Condition	Asbestos Content
ASB-01	636 San Anselmo Ave	Restaurant - Storage Area	Wallboard/Joint Compound	NA	NA	NA	ND
ASB-02	636 San Anselmo Ave	Restaurant - Storage Area	Wallboard/Joint Compound	NA	NA	NA	ND
ASB-03	636 San Anselmo Ave	Restaurant - Bathroom	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-04	636 San Anselmo Ave	Restaurant - Bathroom	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-05	636 San Anselmo Ave	Restaurant - Bathroom	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-06	634 San Anselmo Ave	Real Estate Office - Bathroom	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-07	634 San Anselmo Ave	Real Estate Office - Bathroom	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-08	634 San Anselmo Ave	Real Estate Office - Back Wall	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-09	634 San Anselmo Ave	Real Estate Office - Conference Room	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-10	634 San Anselmo Ave	Real Estate Office - Conference Room	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-11	634 San Anselmo Ave	Real Estate Office - Bathroom Floor	12-inch by 12-inch Beige Ceramic Tile (CT) with Mortar & Grout	NA	NA	NA	ND
ASB-12	634 San Anselmo Ave	Real Estate Office - Entryway	12-inch by 12-inch Black CT with Mortar & Grout	NA	NA	NA	ND
ASB-13	634 San Anselmo Ave	Optometrist - Bathroom Floor	12-inch by 12-inch Beige CT with Mortar & Grout	NA	NA	NA	ND
ASB-14	634 San Anselmo Ave	Optometrist - Bathroom Wall	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-15	634 San Anselmo Ave	Optometrist - Bathroom Wall	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-16	634 San Anselmo Ave	Optometrist - Exam Room	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-17	634 San Anselmo Ave	Optometrist - Main Room	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-18	634 San Anselmo Ave	Optometrist - Main Room	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-19	634 San Anselmo Ave	Barber - Southwest Corner	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-20	634 San Anselmo Ave	Barber - Northwest Corner	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-21	634 San Anselmo Ave	Barber - Southeast Corner	Wallboard/Joint Compound with Texture	NA	NA	NA	ND
ASB-22	634 San Anselmo Ave	Barber - Floor	12-inch by 12-inch White CT with Mortar & Grout	NA	NA	NA	ND
ASB-23	634 San Anselmo Ave	Roof (Lower)	Rolled Roof Assembly	NA	NA	NA	ND
ASB-24	634 San Anselmo Ave	Roof (Upper)	Rolled Roof Assembly	NA	NA	NA	ND

Table 1 - Bulk Asbestos Sampling Results							
Sample I.D.	Building	Material Location	Sample Description	Friable Y/N	Quantity	Condition	Asbestos Content
ASB-25	634 San Anselmo Ave	Roof (Barber Shop)	Rolled Roof Assembly	NA	NA	NA	ND
ASB-26	636 San Anselmo Ave	Roof (Upper)	Rolled Roof Assembly	NA	NA	NA	ND
ASB-27	636 San Anselmo Ave	Roof (Lower)	Rolled Roof Assembly	NA	NA	NA	ND
ASB-28	636 San Anselmo Ave	Roof - Vent on Lower Roof	Black Penetration Mastic	NA	NA	NA	ND
ASB-29	636 San Anselmo Ave	Roof - on Horizontal Pipe on Lower Roof	Black Mastic	NA	NA	NA	ND
ASB-30	636 San Anselmo Ave	Roof - at Base of Air Handler	Black Patch Material	NA	NA	NA	ND
ASB-31	636 San Anselmo Ave	Roof - on Air Handler Duct	Gray Alligatored Sealant	NA	NA	NA	ND
ASB-32	634 San Anselmo Ave	Real Estate Office Roof - on Vent	Black Penetration Mastic	NA	NA	NA	ND
ASB-33	634 San Anselmo Ave	Optometry Roof - on Horizontal Pipe	Black Mastic	NA	NA	NA	ND
ASB-34	634 San Anselmo Ave	Optometry Roof - on Large Green Duct	Gray Mastic	NA	NA	NA	ND
ASB-35	634 San Anselmo Ave	Lower Roof - on Vent	Gray Mastic (painted green)	NA	NA	NA	ND
ASB-36	634 San Anselmo Ave	Barber Roof - on Vent	Black Penetration Mastic	NA	NA	NA	ND
ASB-37	630 San Anselmo Ave	Exterior Wall	Cinder Block & Mortar	NA	NA	NA	ND
ASB-38	630 San Anselmo Ave	Exterior Wall	Mortar	NA	NA	NA	ND
ASB-39	630 San Anselmo Ave	Exterior Wall	Mortar	NA	NA	NA	ND
ASB-40	630 San Anselmo Ave	Exterior Window	Window Putty	NA	NA	NA	ND
ASB-41	630 San Anselmo Ave	Roof	Brown Asphaltic Tile	NA	NA	NA	ND
ASB-42	634 San Anselmo Ave	Optometrist - Brick Wall	Brick & Mortar	NA	NA	NA	ND
ASB-43	634 San Anselmo Ave	Optometrist - Brick Wall	Mortar	NA	NA	NA	ND

Table 1 - Bulk Asbestos Sampling Results

Sample I.D.	Building	Material Location	Sample Description	Friable Y/N	Quantity	Condition	Asbestos Content
ASB-44	634 San Anselmo Ave	Optometrist - Brick Wall	Mortar	NA	NA	NA	ND
ASB-45	636 San Anselmo Ave	Kitchen Floor	5-inch by 5-inch Brownish-Red CT with Mortar & Grout	NA	NA	NA	ND
ASB-46	636 San Anselmo Ave	Bar Floor	5-inch by 5-inch Gray CT with Mortar & Grout	NA	NA	NA	ND
ASB-47	636 San Anselmo Ave	Kitchen Wall Base	White Sealant	NA	NA	NA	ND
ASB-48	636 San Anselmo Ave	Bathroom	Gray Mottled Vinyl Floor Sheeting (VFS) with Gray Flooring Beneath	NA	NA	NA	ND
ASB-49	636 San Anselmo Ave	Bathroom	Gray 3-inch Covebase with White Mastic	NA	NA	NA	ND
ASB-50	636 San Anselmo Ave	Dining Area Wall	Red Brick with Gray Sealant	NA	NA	NA	ND
ASB-51	636 San Anselmo Ave	Exterior Front Patio	2-foot by 2-foot Concrete Tile with Grout	NA	NA	NA	ND
ASB-52	636 San Anselmo Ave	Kitchen Wall	Cinder Block & Mortar	NA	NA	NA	ND
ASB-53	636 San Anselmo Ave	Kitchen Wall	Mortar	NA	NA	NA	ND
ASB-54	636 San Anselmo Ave	Kitchen Wall	Mortar	NA	NA	NA	ND

NOTES:

Analysis by Polarized Light Microscopy (EPA 600/R-93/116 Method).

NA = Not Applicable

ND = None Detected

Table 2 - Lead-Containing Material Sampling Results

Sample I.D.	Building	Sample Location	Lead-Containing Surface (LCS) (e.g., door, wall, frame)	Sample Description (Color / # of Layers / Substrate)	Condition	Estimate of Surface Area	Total Lead	
							Weight Percent	Parts per Million (or mg/kg)
LBP-01	634 San Anselmo Avenue	Real Estate Office - Above Ceiling on Upper Ceiling	Ceiling	White/2/Metal	Non-Intact	1,100 SF	2.0	20,000
LBP-02	634 San Anselmo Avenue	Real Estate Office - Bathroom Floor	Floor	Beige 12-inch by 12-inch Ceramic Tile (CT)	Intact	30 SF	<0.010	<100
LBP-03	634 San Anselmo Avenue	Real Estate Office - Entryway	Floor	Black 12-inch by 12-inch CT	Intact	15 SF	<0.010	<100
LBP-04	634 San Anselmo Avenue	Real Estate Office - Bathroom	Wall	Olive-Green/2/Wallboard	Intact	900 SF	<0.010	<100
LBP-05	634 San Anselmo Avenue	Optometry - Bathroom	Floor	Beige 12-inch by 12-inch CT	Intact	70 SF	<0.010	<100
LBP-06	634 San Anselmo Avenue	Optometry - Examination Room Door	Door Frame	White/2/Wood	Intact	1,500 SF	<0.010	<100
LBP-07	634 San Anselmo Avenue	Barber	Floor	White 12-inch by 12-inch CT	Intact	180 SF	<0.010	<100
LBP-08	634 San Anselmo Avenue	Barber	Wall	Brownish-Red/2/Wallboard	Intact	300 SF	<0.010	<100
LBP-09	634 San Anselmo Avenue	Optometry - Exterior Rear	Pipe	Dark-Green/2/Metal	Intact	1,000 SF	<0.010	<100
LBP-10	636 San Anselmo Avenue	Exterior Rear	Pipe	Dark-Green/2/Metal	Intact	1,200 SF	<0.010	<100
LBP-11	630 San Anselmo Avenue	Exterior Wall	Wall	Dark-Green/2/Concrete	Intact	320 SF	0.020	200*
LBP-12	634 San Anselmo Avenue	Optometry - Bathroom Wall	Wall	Cream/2/Wallboard	Intact	400 SF	<0.010	<100
LBP-13	636 San Anselmo Avenue	Kitchen	Floor	Brownish-Red 5-inch by 5-inch CT	Intact	450 SF	<0.010	<100
LBP-14	636 San Anselmo Avenue	Bar	Floor	Gray 5-inch by 5-inch CT	Intact	25 SF	<0.010	<100
LBP-15	636 San Anselmo Avenue	Kitchen Door	Door Frame	White/2/Wood	Intact	1,700 SF	<0.010	<100
LBP-16	636 San Anselmo Avenue	Wine Storage Area	Wall	Light-Brownish Yellow/2/Wallboard	Intact	700 SF	<0.010	<100
LBP-17	636 San Anselmo Avenue	Wine Storage Area	Floor	Gray/2/Concrete	Intact	600 SF	<0.010	<100
LBP-18	630 San Anselmo Avenue	Interior Wall	Wall	White/2/Concrete	Intact	400 SF	<0.010	<100

NOTES:
Total lead analyzed in accordance with EPA Test Method EPA SW-846 3050B/7000B.
mg/kg = Milligrams per kilogram
SF = Square feet
* indicates lead-containing paint
Estimated quantities are not intended for use in bidding calculations.

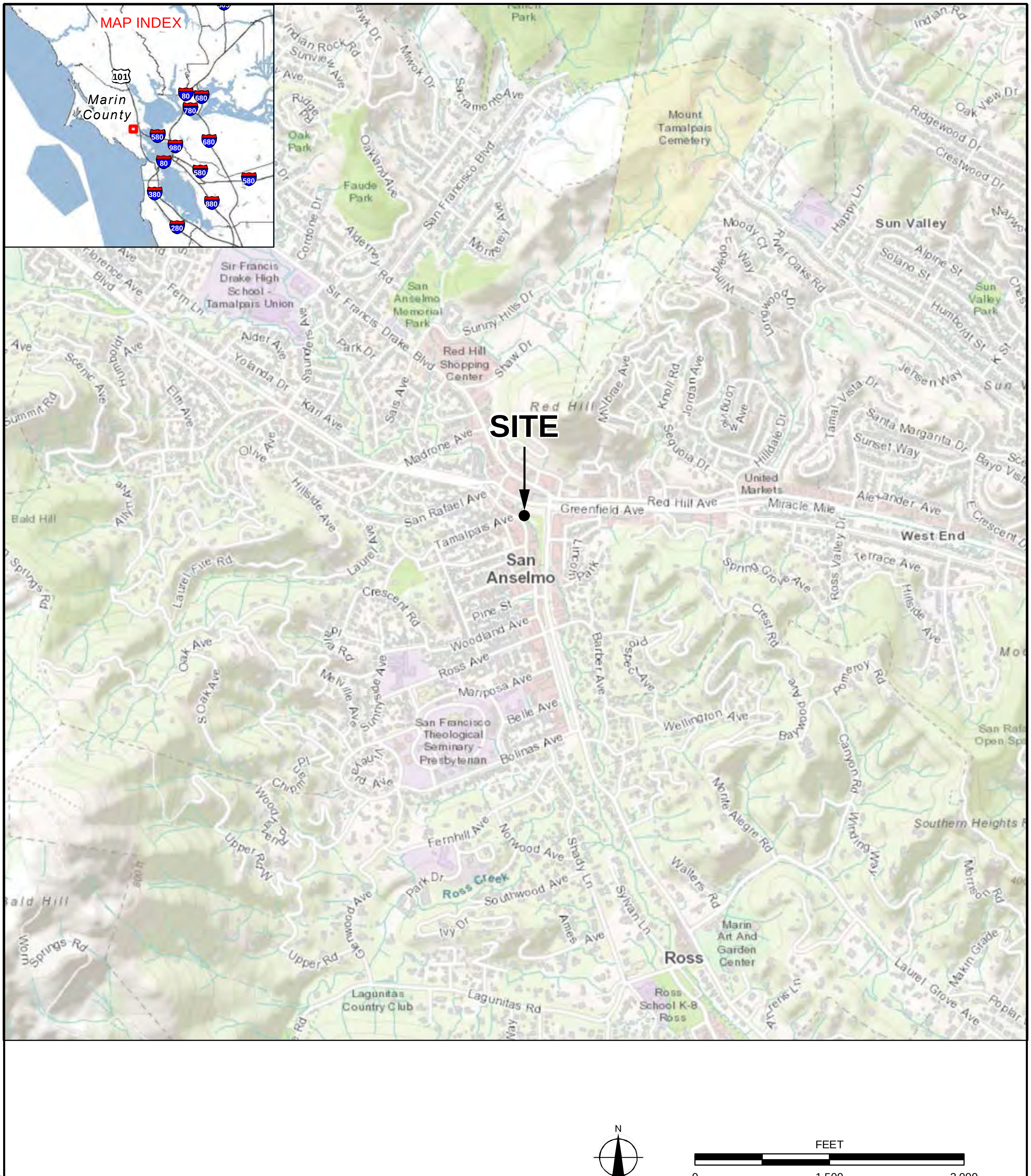
Table 3 - Miscellaneous Hazardous Building Materials Survey Results

Building	Number of Transformers	Number of Light Ballasts	Number of Mercury Thermostats	Number of A/C Units	No. of Fluorescent Light Tubes	Number of Smoke Detectors	Number of Exit Signs	No. of Freon Refrigerator Systems
636 San Anselmo Avenue	0	8	0	1	16	4	1	2
634 San Anselmo Avenue	0	0	0	0	0	5	0	0
630 San Anselmo Avenue	0	0	0	0	0	0	0	0

NOTES:

A/C = Air Conditioning

FIGURES



NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE. | SOURCE: ESRI WORLD TOPO, 2017

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FIGURE 1

SITE LOCATION

630, 634, AND 636 SAN ANSELMO AVENUE
SAN ANSELMO, CALIFORNIA

403163001 | 11/17

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

2_403163001_SP.mxd 11/10/2017 AOB

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE. | SOURCE: GOOGLE EARTH, 2017

N

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0 30 60

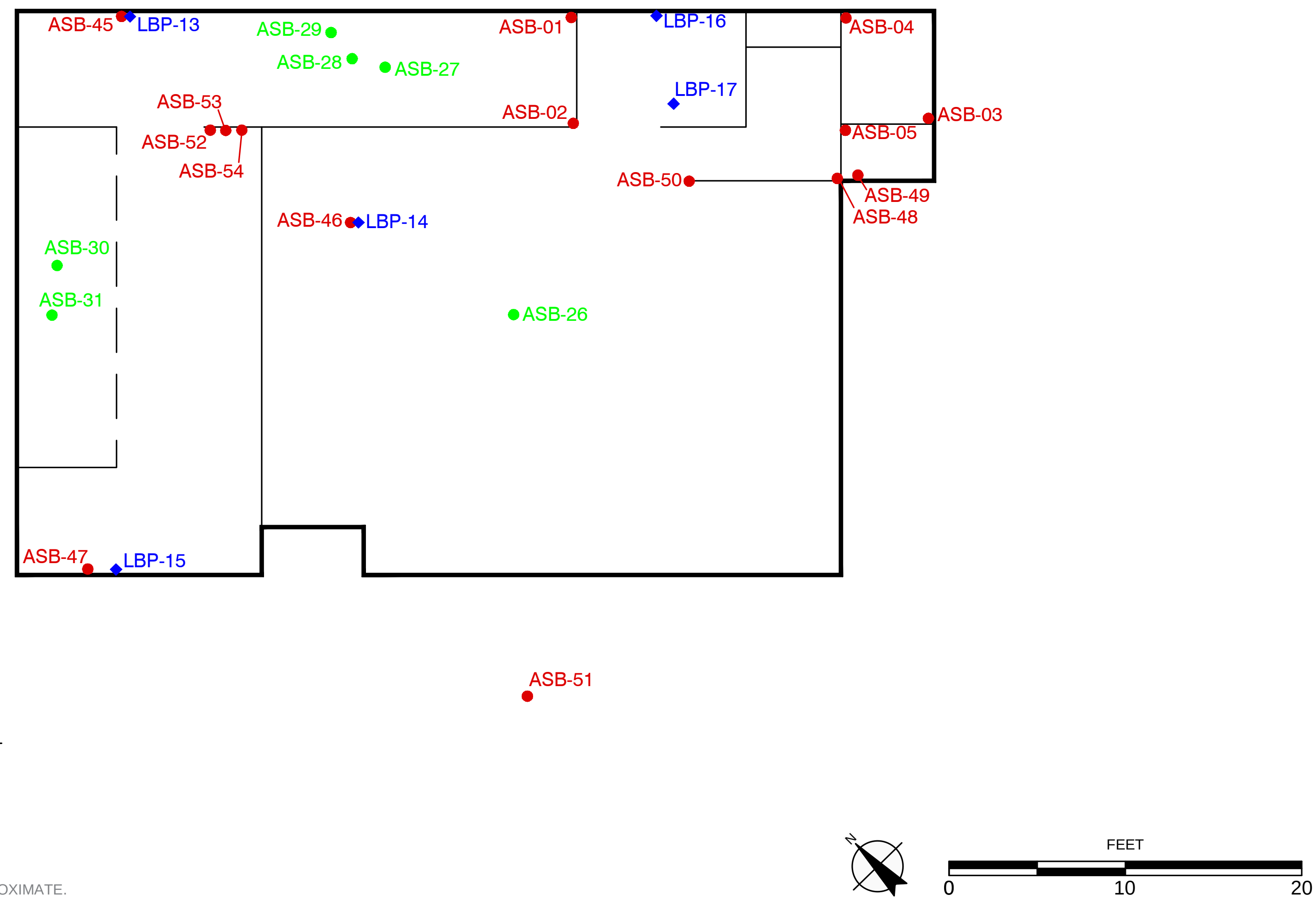
FIGURE 2

SITE PLAN

630, 634, AND 636 SAN ANSELMO AVENUE
SAN ANSELMO, CALIFORNIA

403163001 | 11/17

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants



LEGEND

ASB-51 ● SUSPECT ASBESTOS SAMPLE

ASB-31 ● SUSPECT ASBESTOS ROOF SAMPLE

LBP-17 ◆ SUSPECT LEAD PAINT CHIP SAMPLE

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

3 403163001 SPL 636.DWG

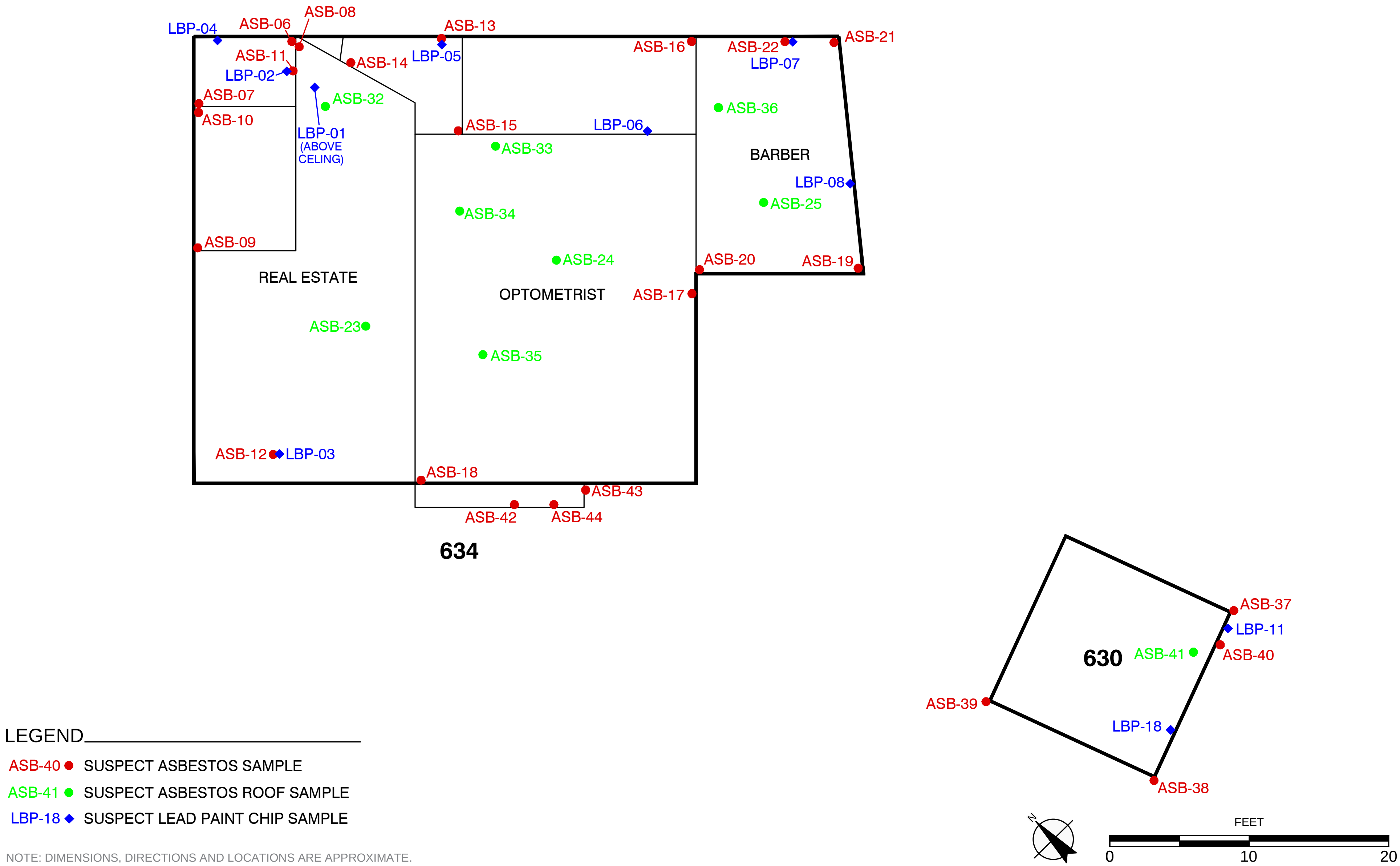
FIGURE 3

SAMPLE LOCATIONS, 636 SAN ANSELMO AVENUE

630, 634, AND 636 SAN ANSELMO AVENUE
SAN ANSELMO, CALIFORNIA

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

403163001 I 11/17



4 403163001 SPL 630 634.DWG

FIGURE 4

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

SAMPLE LOCATIONS, 630 AND 634 SAN ANSELMO AVENUE

630, 634, AND 636 SAN ANSELMO AVENUE
SAN ANSELMO, CALIFORNIA

403163001 I 11/17

APPENDIX A

Certifications

State of California
Division of Occupational Safety and Health
Certified Asbestos Consultant

David B Bridges
Name

Certification No. **14-5173**

Expires on **02/12/18**

This certification was issued by the Division of Occupational Safety and Health as authorized by Sections 7180 et seq. of the Business and Professions Code.

State of California Department of Public Health

Lead-Related Construction Certificate

Certificate Type	Expiration Date
Inspector/Assessor	10/11/2018

David B. Bridges ID #: 24052

Conditions of Certification

This individual meets the requirements of the State of California, Department of Public Health (CDPH), to perform lead-related construction. CDPH may suspend or revoke certification for:

1. any false statement in the application (for certification);
2. violations of relevant local, state or federal statutes or regulations;
3. misrepresentation, failure to disclose relevant facts, fraud, or issuance by mistake; or
4. failure to comply with any relevant regulation or order of the Department.

This certificate was issued by the Department of Public Health as authorized by 17 CCR 35001 et seq., and is non-transferable.

To verify authenticity call
(800) 597-LEAD or
510-620-5600

03164508

APPENDIX B

Asbestos Laboratory Analytical Report and Chain-of-Custody Records

EMSL Analytical, Inc.
464 McCormick Street San Leandro, CA 94577
Tel/Fax: (510) 895-3675 / (510) 895-3680
http://www.EMSL.com / sanleandrolab@emsl.com

EMSL Order: 091721313
Customer ID: NOMO22
Customer PO: 403163001
Project ID:

Attention: Blair Bridges
Ninyo & Moore
1956 Webster
Suite 400
Oakland, CA 94612
Project: 403163001 - San Anselmo

Phone: (510) 715-7224
Fax: (510) 633-5646
Received Date: 11/03/2017 11:15 AM
Analysis Date: 11/06/2017
Collected Date: 11/02/2017

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
ASB-01-Joint Compound *091721313-0001*	Building 636 - Storage Area - Wallboard/Joint Compound	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-01-Wallboard *091721313-0001A*	Building 636 - Storage Area - Wallboard/Joint Compound	White Non-Fibrous Homogeneous	2% Cellulose	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-02-Joint Compound *091721313-0002*	Building 636 - Storage Area - Wallboard/Joint Compound	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-02-Wallboard *091721313-0002A*	Building 636 - Storage Area - Wallboard/Joint Compound	White Non-Fibrous Homogeneous	2% Cellulose	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-03-Joint Compound *091721313-0003*	Building 636 - Men's Bathroom - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-03-Wallboard *091721313-0003A*	Building 636 - Men's Bathroom - Wallboard/Joint Compound w/ Texture	Beige Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-03-Texture *091721313-0003B*	Building 636 - Men's Bathroom - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-04-Joint Compound *091721313-0004*	Building 636 - Men's Bathroom - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-04-Wallboard *091721313-0004A*	Building 636 - Men's Bathroom - Wallboard/Joint Compound w/ Texture	Beige Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-04-Texture *091721313-0004B*	Building 636 - Men's Bathroom - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-05-Joint Compound *091721313-0005*	Building 636 - Women's Bathroom - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-05-Wallboard *091721313-0005A*	Building 636 - Women's Bathroom - Wallboard/Joint Compound w/ Texture	Beige Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected

Initial report from: 11/06/2017 15:41:38

EMSL Analytical, Inc.
464 McCormick Street San Leandro, CA 94577
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http://www.EMSL.com / sanleandrolab@emsl.com

EMSL Order:	091721313
Customer ID:	NOMO22
Customer PO:	403163001
Project ID:	

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
ASB-05-Texture 091721313-0005B	Building 636 - Women's Bathroom - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-06-Wallboard 091721313-0006	Building 634 - Bathroom (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-06-Joint Compound 091721313-0006A	Building 634 - Bathroom (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-06-Texture 091721313-0006B	Building 634 - Bathroom (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-07-Joint Compound 091721313-0007	Building 634 - Bathroom (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-07-Wallboard 091721313-0007A	Building 634 - Bathroom (RE) - Wallboard/Joint Compound w/ Texture	Beige Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-07-Texture 091721313-0007B	Building 634 - Bathroom (RE) - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-08-Joint Compound 091721313-0008	Building 634 - Back Wall (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-08-Wallboard 091721313-0008A	Building 634 - Back Wall (RE) - Wallboard/Joint Compound w/ Texture	Beige Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-08-Texture 091721313-0008B	Building 634 - Back Wall (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-09-Joint Compound 091721313-0009	Building 634 - Conference Room (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-09-Wallboard 091721313-0009A	Building 634 - Conference Room (RE) - Wallboard/Joint Compound w/ Texture	Beige Non-Fibrous Homogeneous	2% Cellulose 1% Glass	80% Gypsum 17% Non-fibrous (Other)	None Detected
ASB-09-Texture 091721313-0009B	Building 634 - Conference Room (RE) - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-10-Joint Compound 091721313-0010	Building 634 - Conference Room (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected

Initial report from: 11/06/2017 15:41:38

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http://www.EMSL.com / sanleandrolab@emsl.com

EMSL Order: 091721313
Customer ID: NOMO22
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Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
ASB-10-Wallboard 091721313-0010A	Building 634 - Conference Room (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous	2% Cellulose	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-10-Texture 091721313-0010B	Building 634 - Conference Room (RE) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-11-Ceramic Tile 091721313-0011	Building 634 - Bathroom Floor (RE) - Beige 12" CT w/ Grout & Mortar	Beige Non-Fibrous Homogeneous		15% Quartz 30% Gypsum 55% Non-fibrous (Other)	None Detected
ASB-11-Grout 091721313-0011A	Building 634 - Bathroom Floor (RE) - Beige 12" CT w/ Grout & Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 15% Gypsum 65% Non-fibrous (Other)	None Detected
ASB-11-Mortar 091721313-0011B	Building 634 - Bathroom Floor (RE) - Beige 12" CT w/ Grout & Mortar				Insufficient Material
ASB-12-Ceramic Tile 091721313-0012	Building 634 - Entryway (RE) - Black 12" CT w/ Grout & Mortar	Gray Non-Fibrous Homogeneous		15% Quartz 30% Gypsum 55% Non-fibrous (Other)	None Detected
ASB-12-Grout 091721313-0012A	Building 634 - Entryway (RE) - Black 12" CT w/ Grout & Mortar	Black Non-Fibrous Homogeneous		20% Quartz 15% Gypsum 65% Non-fibrous (Other)	None Detected
ASB-13-Ceramic Tile 091721313-0013	Building 634 - Bathroom Floor (Optometry) - Beige 12" CT w/ Grout & White Mortar	Brown Non-Fibrous Homogeneous		10% Quartz 30% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-13-Grout 091721313-0013A	Building 634 - Bathroom Floor (Optometry) - Beige 12" CT w/ Grout & White Mortar	Brown Non-Fibrous Homogeneous		20% Quartz 15% Gypsum 65% Non-fibrous (Other)	None Detected
ASB-13-Mortar 091721313-0013B	Building 634 - Bathroom Floor (Optometry) - Beige 12" CT w/ Grout & White Mortar	White Non-Fibrous Homogeneous		20% Quartz 70% Ca Carbonate 10% Non-fibrous (Other)	None Detected
ASB-14-Joint Compound 091721313-0014	Building 634 - Bathroom (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-14-Wallboard 091721313-0014A	Building 634 - Bathroom (Optometry) - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-14-Texture 091721313-0014B	Building 634 - Bathroom (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected

Initial report from: 11/06/2017 15:41:38

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Customer ID:	NOMO22
Customer PO:	403163001
Project ID:	

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
ASB-15-Wallboard *091721313-0015*	Building 634 - Bathroom (Optometry) - Wallboard/Joint Compound w/ Texture	Beige Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-15-Joint Compound *091721313-0015A*	Building 634 - Bathroom (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-15-Texture *091721313-0015B*	Building 634 - Bathroom (Optometry) - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-16-Joint Compound *091721313-0016*	Building 634 - Exam Room (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-16-Wallboard *091721313-0016A*	Building 634 - Exam Room (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous	2% Cellulose	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-16-Texture *091721313-0016B*	Building 634 - Exam Room (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-17-Wallboard *091721313-0017*	Building 634 - Main Room (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-17-Joint Compound *091721313-0017A*	Building 634 - Main Room (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-17-Texture *091721313-0017B*	Building 634 - Main Room (Optometry) - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-18-Wallboard *091721313-0018*	Building 634 - Main Room (Optometry) - Wallboard/Joint Compound w/ Texture	Beige Non-Fibrous Homogeneous	2% Glass	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-18-Joint Compound *091721313-0018A*	Building 634 - Main Room (Optometry) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-18-Texture *091721313-0018B*	Building 634 - Main Room (Optometry) - Wallboard/Joint Compound w/ Texture				Insufficient Material
ASB-19-Wallboard *091721313-0019*	Building 634 - SW Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous	2% Cellulose	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-19-Joint Compound *091721313-0019A*	Building 634 - SW Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected

Initial report from: 11/06/2017 15:41:38

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
ASB-19-Texture 091721313-0019B	Building 634 - SW Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-20-Joint Compound 091721313-0020	Building 634 - NW Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-20-Wallboard 091721313-0020A	Building 634 - NW Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous	2% Cellulose	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-20-Texture 091721313-0020B	Building 634 - NW Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-21-Wallboard 091721313-0021	Building 634 - SE Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous	2% Cellulose	80% Gypsum 18% Non-fibrous (Other)	None Detected
ASB-21-Joint Compound 091721313-0021A	Building 634 - SE Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-21-Texture 091721313-0021B	Building 634 - SE Corner (Barber) - Wallboard/Joint Compound w/ Texture	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ASB-22-Ceramic Tile 091721313-0022	Building 634 - Floor (Barber) - 12" White CT w/ Grout & Mortar	White Non-Fibrous Homogeneous		10% Quartz 30% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-22-Grout 091721313-0022A	Building 634 - Floor (Barber) - 12" White CT w/ Grout & Mortar	Tan Non-Fibrous Homogeneous		25% Quartz 75% Non-fibrous (Other)	None Detected
ASB-22-Mortar 091721313-0022B	Building 634 - Floor (Barber) - 12" White CT w/ Grout & Mortar				Insufficient Material
ASB-23 091721313-0023	Building 634 - Roof (lower) - Rolled Roof Assembly	White/Black Fibrous Homogeneous	10% Glass	10% Quartz 25% Ca Carbonate 40% Matrix 15% Non-fibrous (Other)	None Detected
ASB-24 091721313-0024	Building 634 - Roof (upper) - Rolled Roof Assembly	White/Black Fibrous Homogeneous	10% Glass	10% Quartz 25% Ca Carbonate 40% Matrix 15% Non-fibrous (Other)	None Detected
ASB-25 091721313-0025	Building 634 - Roof of Barber Shop - Rolled Roof Assembly	White/Black Non-Fibrous Homogeneous	10% Glass	10% Quartz 25% Ca Carbonate 40% Matrix 15% Non-fibrous (Other)	None Detected
ASB-26 091721313-0026	Building 636 - Roof of Restaurant (upper) - Rolled Roof Assembly	Black Non-Fibrous Homogeneous	15% Cellulose 10% Glass	10% Quartz 25% Ca Carbonate 40% Matrix	None Detected
ASB-27 091721313-0027	Building 636 - Restaurant Lower Roof - Rolled Roof Assembly	Black Non-Fibrous Homogeneous	15% Cellulose 10% Glass	10% Quartz 25% Ca Carbonate 40% Matrix	None Detected

Initial report from: 11/06/2017 15:41:38

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	Description	Appearance	% Fibrous	% Non-Fibrous	% Type
ASB-28 091721313-0028	Building 636 - Roof on Lower Roof Vent - Black Penetration Mastic	White/Black Non-Fibrous Homogeneous		5% Quartz 80% Matrix 15% Non-fibrous (Other)	None Detected
ASB-29 091721313-0029	Building 636 - Roof on Pipe Exterior on Lower Roof - Black Mastic	Black Non-Fibrous Homogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected
ASB-30 091721313-0030	Building 636 - Roof at Base of Air Handlers - Black Patch Material	Black Non-Fibrous Homogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected
ASB-31 091721313-0031	Building 636 - Roof on Air Handler Duct - Gray Alligatored Sealant	Gray Non-Fibrous Homogeneous		70% Matrix 30% Non-fibrous (Other)	None Detected
ASB-32 091721313-0032	Building 634 - Bank Roof on Vent - Black Penetration Mastic	Black Non-Fibrous Homogeneous	25% Cellulose	70% Matrix 5% Non-fibrous (Other)	None Detected
ASB-33 091721313-0033	Building 634 - Optometry Roof on Pipe Exterior - Black Mastic	Black Non-Fibrous Homogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected
ASB-34 091721313-0034	Building 634 - Optometry Roof on Large Green Duct - Gray Mastic (painted green)	Gray Non-Fibrous Homogeneous		70% Matrix 30% Non-fibrous (Other)	None Detected
ASB-35 091721313-0035	Building 634 - Lower Roof on Vent Penetration - Black (newer) Sealant/Mastic	Black Fibrous Homogeneous	10% Cellulose	5% Quartz 80% Matrix 5% Non-fibrous (Other)	None Detected
ASB-36 091721313-0036	Building 634 - Barber Roof on Vent - Black Penetration Mastic	Black Non-Fibrous Homogeneous	15% Cellulose	80% Matrix 5% Non-fibrous (Other)	None Detected
ASB-37 091721313-0037	Building 630 - Exterior Wall - Cinderblock & Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-38 091721313-0038	Building 630 - Exterior Wall - Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-39 091721313-0039	Building 630 - Exterior Wall - Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-40 091721313-0040	Building 630 - Exterior Window - Window Putty	Gray Non-Fibrous Homogeneous		70% Ca Carbonate 30% Non-fibrous (Other)	None Detected
ASB-41 091721313-0041	Building 630 - Roof - Tile (Brown)	Black Fibrous Homogeneous	5% Glass	35% Quartz 60% Matrix	None Detected
ASB-42-Brick 091721313-0042	Building 634 - Optometrists Front Garden Wall - Brick & Mortar	Brown Non-Fibrous Homogeneous		20% Quartz 25% Gypsum 55% Non-fibrous (Other)	None Detected
ASB-42-Mortar 091721313-0042A	Building 634 - Optometrists Front Garden Wall - Brick & Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected

Initial report from: 11/06/2017 15:41:38

EMSL Analytical, Inc.
464 McCormick Street San Leandro, CA 94577
Tel/Fax: (510) 895-3675 / (510) 895-3680
http://www.EMSL.com / sanleandrolab@emsl.com

EMSL Order:	091721313
Customer ID:	NOMO22
Customer PO:	403163001
Project ID:	

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	Description	Appearance	% Fibrous	% Non-Fibrous	% Type
ASB-43 091721313-0043	Building 634 - Optometrists Front Garden Wall - Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-44 091721313-0044	Building 634 - Optometrists Front Garden Wall - Mortar	Tan Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-45-Ceramic Tile 091721313-0045	Building 636 - Kitchen Floor - Brownish-Red CT w/ Grout & Mortar (5")	Brown Non-Fibrous Homogeneous		15% Quartz 30% Gypsum 55% Non-fibrous (Other)	None Detected
ASB-45-Grout 091721313-0045A	Building 636 - Kitchen Floor - Brownish-Red CT w/ Grout & Mortar (5")	Gray Non-Fibrous Homogeneous		25% Quartz 75% Non-fibrous (Other)	None Detected
ASB-45-Mortar 091721313-0045B	Building 636 - Kitchen Floor - Brownish-Red CT w/ Grout & Mortar (5")	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-46-Ceramic Tile 091721313-0046	Building 636 - Bar Floor - Gray 5" CT w/ Grout & Mortar	Gray Non-Fibrous Homogeneous		10% Quartz 25% Gypsum 65% Non-fibrous (Other)	None Detected
ASB-46-Grout 091721313-0046A	Building 636 - Bar Floor - Gray 5" CT w/ Grout & Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 80% Non-fibrous (Other)	None Detected
ASB-46-Mortar 091721313-0046B	Building 636 - Bar Floor - Gray 5" CT w/ Grout & Mortar				Insufficient Material
ASB-47 091721313-0047	Building 636 - Kitchen Base CT/Wall - White Sealant	White Non-Fibrous Homogeneous		70% Matrix 30% Non-fibrous (Other)	None Detected
ASB-48-Vinyl Sheet Flooring 091721313-0048	Building 636 - Bathroom - Gray Mottled VFS w/ Gray Flooring beneath	Gray Non-Fibrous Homogeneous		30% Ca Carbonate 70% Matrix	None Detected
ASB-48-Leverer 091721313-0048A	Building 636 - Bathroom - Gray Mottled VFS w/ Gray Flooring beneath	Gray Non-Fibrous Homogeneous		70% Ca Carbonate 30% Non-fibrous (Other)	None Detected
ASB-49-Cove Base 091721313-0049	Building 636 - Bathroom - 3" Gray Cove Base w/ Mastic	Gray Non-Fibrous Homogeneous		70% Matrix 30% Non-fibrous (Other)	None Detected
ASB-49-Mastic 091721313-0049A	Building 636 - Bathroom - 3" Gray Cove Base w/ Mastic	Tan Non-Fibrous Homogeneous		70% Matrix 30% Non-fibrous (Other)	None Detected
ASB-50-Brick 091721313-0050	Building 636 - Dining Area Wall - Brick w/ Gray Sealant	Red Non-Fibrous Homogeneous		15% Quartz 20% Gypsum 65% Non-fibrous (Other)	None Detected
ASB-50-Sealant 091721313-0050A	Building 636 - Dining Area Wall - Brick w/ Gray Sealant	Gray Non-Fibrous Homogeneous		20% Quartz 70% Matrix 10% Non-fibrous (Other)	None Detected
ASB-51-Concrete 091721313-0051	Building 636 - Exterior Front Patio - 2'x2' Concrete Tile w/ Grout	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-51-Grout 091721313-0051A	Building 636 - Exterior Front Patio - 2'x2' Concrete Tile w/ Grout	Gray Non-Fibrous Homogeneous		20% Quartz 80% Non-fibrous (Other)	None Detected

Initial report from: 11/06/2017 15:41:38

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http://www.EMSL.com / sanleandrolab@emsl.com

EMSL Order: 091721313
Customer ID: NOMO22
Customer PO: 403163001
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
ASB-52 091721313-0052	Building 636 - Kitchen Wall - Cinder Block w/ Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-53 091721313-0053	Building 636 - Kitchen Wall - Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected
ASB-54 091721313-0054	Building 636 - Kitchen Wall - Mortar	Gray Non-Fibrous Homogeneous		20% Quartz 20% Gypsum 60% Non-fibrous (Other)	None Detected

Analyst(s)
Jared Martin (92)

Matthew Batongbacal
or Other Approved Signatory

Initial report from: 11/06/2017 15:41:38

OrderID: 091721313

3 day TAT

ASBESTOS BULK SAMPLE DATA SHEET

Ninyo & Moore 1956 Webster Street Oakland, CA 94612 Tel: 510 343 3000	San Anselmo Project No.: 403163001 Site Address: San Anselmo	Sampled By: Blair Bridges Sampled By: Sampled By: Date Sampled: 11/2/17	**Laboratory:** EMSL

CHAIN OF CUSTODY INFORMATION:

Relinquished By: (sign/print)	Company	Date	Time(24 hr.)	Received By: (sign/print)	Laboratory
BBridges / Blair Bridges	Ninyo & Moore	11/3/17	1110	/	
/		11/3/17	11:15AM WI	theariel / TR	

LabID	Sample ID	Building	Sample Location	Sample Description	Quantity (SF/LF/EA)	Friable (Y/N)	Condition
	ASB-01	636	Storage Area	wallboard / Joint Compound		Y	Good
	ASB-02		" "	wallboard / Joint Compound			
	ASB-03		Men's Bathroom	" / " " w/texture			
	ASB-04		" "	" / " " " "			
	ASB-05		women's "	" / " " " "			
	ASB-06	634	Bathroom (~~Bank~~ LE)	" / " " " "	1500SF		
	ASB-07		" (")				
	ASB-08		Back Wall (")				
	ASB-09		conference Room (")				
	ASB-10		" " (")				
	ASB-11		Bathroom Floor (")	Beige 12" CT w/ grout & mortar	30SF	N	
	ASB-12		Entryway (")	Black " " " " " "	15SF		
	ASB-13		Bathroom Floor (optometry)	Beige 12" " " " " white "	70SF		

Ninyo & Moore

OrderID: 091721313

ASBESTOS BULK SAMPLE DATA SHEET

Ninyo & Moore 1956 Webster Street Oakland, CA 94612 Tel: 510 343 3000	San Anselmo Project No.: 403163001 Site Address: San Anselmo	Sampled By: Blair Bridges Sampled By: Sampled By: Date Sampled: 11/2/17	Laboratory: EMSL

CHAIN OF CUSTODY INFORMATION:

Relinquished By: (sign/print)	Company	Date	Time(24 hr.)	Received By: (sign/print)	Laboratory
B Bridges /Blair Bridges	Ninyo & Moore	11/3/17	1110	/	
/				/	

LabID	Sample ID	Building	Sample Location	Sample Description	Quantity (SF/LF/EA)	Friable (Y/N)	Condition
	ASB- 14	634	Bathroom (optometry)	Wallboard/Joint compound w/ texture	2600 SF	Y	Good
	ASB- 15		" (")				
	ASB- 16		Exam Room (")				
	ASB- 17		Main " (")				
	ASB- 18		" " (")				
	ASB- 19		SW corner (Barber)		700 SF		
	ASB- 20		NW " (")				
	ASB- 21		SE " (")				
	ASB- 22		Floor (")	12" white CT w/ grout + Mortar	180 SF	N	
	ASB- 23		Roof (lower)	Rolled Roof Assembly	420 SF		
	ASB- 24		" upper	" " "	800 SF		
	ASB- 25		" of Barber shop	" " "	200 SF		
	ASB- 26	636	" of Restaurant (upper)	" " "	850 SF		

OrderID: 091721313

ASBESTOS BULK SAMPLE DATA SHEET

Ninyo & Moore 1956 Webster Street Oakland, CA 94612 Tel: 510 343 3000	San Anselmo Project No.: 403163001 Site Address: San Anselmo	Sampled By: Blair Bridges Sampled By: Sampled By: Date Sampled: 11/2/17	Laboratory: EMSL

CHAIN OF CUSTODY INFORMATION:

Relinquished By: (sign/print)	Company	Date	Time(24 hr.)	Received By: (sign/print)	Laboratory
BBridges /Blair Bridges	Ninyo & Moore	11/3/17	1110	/	
/				/	

LabID	Sample ID	Building	Sample Location	Sample Description	Quantity (SF/LF/EA)	Friable (Y/N)	Condition
	ASB-27	636	Restaurant Lower Roof	Rolled Roof Assembly	360SF	N	Good
	ASB-28	↓	Roof on ~~Roof " " Mastic~~ " " vent	Black Penetration Mastic	16SF	↓	↓
	ASB-29		" on pipe ~~exterior~~ on lower roof	" " mastic	15SF		Poor
	ASB-30		" at base of air handler	Black Patch material	50 SF		Good
	ASB-31	↓	" on Air handler duct.	Gray Alligatored Sealant	8SF		↓
	ASB-32	634	Bank Roof on vent	Black Penetration mastic	25SF		
	ASB-33	↓	Optometry Roof on Pipe Exterior	" mastic	10SF		
	ASB-34		" " " large Green Duct	Gray mastic (painted Green)	30SF		
	ASB-35		Lower roof on vent Penetration	Black (newer) Sealant/mastic	15SF		
	ASB-36	↓	Barber Roof on vent	Black Penetration mastic	8SF		
	ASB-37	630	Exterior Wall	Cinderblock Mortar	120SF		
	ASB-38	↓	" "	mortar			
	ASB-39	↓	" "	mortar		↓	↓

Asbestos Bulk Sample Data Sheet 35509-ASB-COC

Ninyo & Moore

ASBESTOS BULK SAMPLE DATA SHEET

Ninyo & Moore 1956 Webster Street Oakland, CA 94612 Tel: 510 343 3000	San Anselmo Project No.: 403163001 Site Address: San Anselmo	Sampled By: Blair Bridges Sampled By: Sampled By: Date Sampled: 11/2/17	Laboratory: EMSL

CHAIN OF CUSTODY INFORMATION:

Relinquished By: (sign/print)	Company	Date	Time(24 hr.)	Received By: (sign/print)	Laboratory
BBridges /Blair Bridges	Ninyo & Moore	11/3/17	1110	/	
/				/	

LabID	Sample ID	Building	Sample Location	Sample Description	Quantity (SF/LF/EA)	Friable (Y/N)	Condition
	ASB-40	~~360~~ 636	Exterior Window	window putty	190 LF	N	Good
	ASB-41	↓	Roof	Tile (Brown)	200 SF	↓	
	ASB-42	634	optometrists Front Garden wall	Brick + Mortar	400 SF		
	ASB-43			Mortar			
	ASB-44		↓	"			
	ASB-45	636	Kitchen Floor	Brownish-Red CT w/ Grout + Mortar (5")	450 SF		
	ASB-46		Bar Floor	Gray 5" CT w/ Grout + Mortar	25 SF		
	ASB-47		Kitchen Base CT/wall	white Sealant	100 LF		
	ASB-48		Bathroom	Gray mottled VFS w/ Gray Flooring beneath	120 SF		
	ASB-49		"	3" Gray Cove base w/ mastic	60 LF		
	ASB-50	↓	Dining Area wall	Brick w/ Gray sealant	300 SF	↓	↓
	ASB-51		Exterior Front Patio	2'x2' Concrete Tile w/ Grout	700 SF		
	ASB-52		Kitchen wall	Cinder Block w/ mortar	100 SF		
	ASB-53		~~Kit~~ " "	Mortar			
	ASB-54	↓	" "	Mortar		↓	↓

Ninyo & Moore

APPENDIX C

Lead-Containing Material Laboratory Analytical Report and Chain-of-Custody Records

EMSL Analytical, Inc
464 McCormick Street, San Leandro, CA 94577
Phone/Fax: (510) 895-3675 / (510) 895-3680
http://www.EMSL.com sanleandrolab@emsl.com

EMSL Order:	091721244
CustomerID:	NOMO22
CustomerPO:	
ProjectID:	

Attn: **Blair Bridges**
Ninyo & Moore
1956 Webster
Suite 400
Oakland, CA 94612

Phone:	(510) 633-5640
Fax:	(510) 633-5646
Received:	11/03/17 11:15 AM
Collected:	11/2/2017

Project: **SAN ANSELMO**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client SampleDescription	*Collected*	*Analyzed*	*RDL*	*Lead Concentration*
LBP-01 *091721244-0001*	11/2/2017	11/4/2017 Site: ABOVE CEILING ON UPPER CEILING	0.20 % wt	2.0 % wt
LBP-02 *091721244-0002*	11/2/2017	11/4/2017 Site: BATHROOM FLOOR	0.010 % wt	<0.010 % wt
LBP-03 *091721244-0003*	11/2/2017	11/4/2017 Site: ENTRYWAY	0.010 % wt	<0.010 % wt
LBP-04 *091721244-0004*	11/2/2017	11/4/2017 Site: BATHROOM	0.010 % wt	<0.010 % wt
LBP-05 *091721244-0005*	11/2/2017	11/4/2017 Site: BATHROOM (OPTOMETRY)	0.010 % wt	<0.010 % wt
LBP-06 *091721244-0006*	11/2/2017	11/4/2017 Site: EXAM ROOM DOOR	0.010 % wt	<0.010 % wt
LBP-07 *091721244-0007*	11/2/2017	11/4/2017 Site: FLOOR (BARBER)	0.010 % wt	<0.010 % wt
LBP-08 *091721244-0008*	11/2/2017	11/4/2017 Site: WALL	0.010 % wt	<0.010 % wt
LBP-09 *091721244-0009*	11/2/2017	11/4/2017 Site: REAR OF OPTOMETRY ON PIPE	0.010 % wt	<0.010 % wt
LBP-10 *091721244-0010*	11/2/2017	11/4/2017 Site: EXTERIOR REAR PIPE	0.010 % wt	<0.010 % wt
LBP-11 *091721244-0011*	11/2/2017	11/4/2017 Site: EXTERIOR WALL	0.010 % wt	0.020 % wt

Julian Neagu, Lead Laboratory Manager
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request.

Samples analyzed by EMSL Analytical, Inc San Leandro, CA A2LA Accredited Environmental Testing Cert #2845.09

Initial report from 11/04/2017 17:48:59

EMSL Analytical, Inc
464 McCormick Street, San Leandro, CA 94577
Phone/Fax: (510) 895-3675 / (510) 895-3680
http://www.EMSL.com sanleandrolab@emsl.com

EMSL Order: 091721244
CustomerID: NOMO22
CustomerPO:
ProjectID:

Attn: **Blair Bridges**
Ninyo & Moore
1956 Webster
Suite 400
Oakland, CA 94612

Phone: (510) 633-5640
Fax: (510) 633-5646
Received: 11/03/17 11:15 AM
Collected: 11/2/2017

Project: **SAN ANSELMO**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client SampleDescription	*Collected*	*Analyzed*	*RDL*	*Lead Concentration*
LBP-12 *091721244-0012*	11/2/2017	11/4/2017 Site: OPTOMETRIST BATHROOM WALL	0.010 % wt	<0.010 % wt
LBP-13 *091721244-0013*	11/2/2017	11/4/2017 Site: KITCHEN	0.010 % wt	<0.010 % wt
LBP-14 *091721244-0014*	11/2/2017	11/4/2017 Site: BAR	0.010 % wt	<0.010 % wt
LBP-15 *091721244-0015*	11/2/2017	11/4/2017 Site: KITCHEN DOOR	0.010 % wt	<0.010 % wt
LBP-16 *091721244-0016*	11/2/2017	11/4/2017 Site: WINE AREA	0.010 % wt	<0.010 % wt
LBP-17 *091721244-0017*	11/2/2017	11/4/2017 Site: FLOOR IN WINE AREA	0.010 % wt	<0.010 % wt
LBP-18 *091721244-0018*	11/2/2017	11/4/2017 Site: INTERIOR WALL	0.010 % wt	<0.010 % wt

Julian Neagu, Lead Laboratory Manager
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request.

Samples analyzed by EMSL Analytical, Inc San Leandro, CA A2LA Accredited Environmental Testing Cert #2845.09

Initial report from 11/04/2017 17:48:59

OrderID: 091721244

LEAD BASED PAINT BULK SAMPLE DATA SHEET

3day TAT 091721244 Page 1 of 1

Ninyo & Moore 1956 Webster Street Oakland, CA 94612 Tel: 510 343 3000	San Anselmo Project No.: Project Manager: Blair Bridges/Bill Larkin Site Address: San Anselmo	Sampled By: Blair Bridges Sampled By: Sampled By: Date Sampled: 11/2/17	Laboratory: EMSL

CHAIN OF CUSTODY INFORMATION:

Relinquished By: (sign/print)	Company	Date	Time(24 hr.)	Received By: (sign/print)	Laboratory
BBridges /Blair Bridges	Ninyo&Moore	11/3/17	1110	/	
/		11/3/17	11:15AM WI	[illegible] / TR	

Sample ID	Building	Sample Location	Building Component	Sample Description (Color /# Layers /Substrate)	Estimated Surface Area	Condition
LBP-01	634	Above ceiling on upper ~~[illegible]~~ ceiling ~~[illegible]~~ (RE)	Ceiling	white/2/metal	600SF	Non-intact
LBP-02		Bathroom Floor ~~(Barb)~~ (RE)	Floor	Beige 12" CT	30SF	Intact
LBP-03		Entryway (")	"	Black 12" CT	15 SF	
LBP-04		Bathroom (")	wall	olive green/2/wallboard	900SF	
LBP-05		" (optometry)	Floor	12" Beige CT	70 SF	
LBP-06		Exam Room Door (")	Door Frame	white/2/wood	1500SF	
LBP-07		Floor (Barber)	Floor	12" white CT	180SF	
LBP-08		wall	wall	Brownish Red/2/wallboard	300SF	
LBP-09		Rear of optometry on Pipe	Pipe	Dark Green/2/metal		
LBP-10	636	Exterior Rear Pipe	Pipe			
LBP-11	630	" wall	wall	Dark Green/2/concrete		
LBP-12	634	Optometrist Bathroom Wall	"	cream/2/wallboard	400SF	
LBP-13	636	Kitchen	Floor	Brownish-Red 5" CT	450SF	
LBP-14		Bar	"	Gray 5" CT	25SF	
LBP-15		Kitchen Door	Door Frame	white/2/wood	1700SF	
LBP-16		Wine Area	wall	Brownish light Yellow/2/wallboard	700SF	
LBP-17	636	Floor in Wine Area	Floor	Gray/2/concrete	600 SF	
LBP-18	630	Interior Wall	wall	white/2/concrete	400SF	

Paint Chip Sample COC

APPENDIX D

CDPH Form 8552 – Lead Hazard Evaluation Report

LEAD HAZARD EVALUATION REPORT

Section 1 — Date of Lead Hazard Evaluation 11/2/2018

Section 2 — Type of Lead Hazard Evaluation (Check one box only)

☑ Lead Inspection ☐ Risk assessment ☐ Clearance Inspection ☐ Other (specify) ____________

Section 3 — Structure Where Lead Hazard Evaluation Was Conducted

Address [number, street, apartment (if applicable)]	City	County	Zip Code
634 San Anselmo Avenue	San Anselmo	Marin	94960

Construction date (year) of structure	Type of structure	Children living in structure?
	☑ Multi-unit building ☐ School or daycare ☐ Single family dwelling ☐ Other________	☐ Yes ☑ No ☐ Don't Know

Section 4 — Owner of Structure (if business/agency, list contact person)

Name	Telephone number
County of Marin	(415) 473-7579

Address [number, street, apartment (if applicable)]	City	State	Zip Code
3501 Civic Center Drive, Suite 304	San Rafael	CA	94903

Section 5 — Results of Lead Hazard Evaluation (check all that apply)

☐ No lead-based paint detected ☐ Intact lead-based paint detected ☑ Deteriorated lead-based paint detected

☐ No lead hazards detected ☐ Lead-contaminated dust found ☐ Lead-contaminated soil found ☐ Other____________

Section 6 — Individual Conducting Lead Hazard Evaluation

Name	Telephone number
David Blair Bridges	5107157224

Address [number, street, apartment (if applicable)]	City	State	Zip Code
1956 Webster St, #400	Oakland	CA	94612

CDPH certification number	Signature	Date
24052	B Bridges	11/8/2017

Name and CDPH certification number of any other individuals conducting sampling or testing (if applicable)

Section 7 — Attachments

A. A foundation diagram or sketch of the structure indicating the specifc locations of each lead hazard or presence of lead-based paint;
B. Each testing method, device, and sampling procedure used;
C. All data collected, including quality control data, laboratory results, including laboratory name, address, and phone number.

First copy and attachments retained by inspector

Second copy and attachments retained by owner

Third copy only (no attachments) mailed or faxed to:

California Department of Public Health
Childhood Lead Poisoning Prevention Branch Reports
850 Marina Bay Parkway, Building P, Third Floor
Richmond, CA 94804-6403
Fax: (510) 620-5656

LEAD HAZARD EVALUATION REPORT

Section 1 — Date of Lead Hazard Evaluation 11/2/2018

Section 2 — Type of Lead Hazard Evaluation (Check one box only)

[✓] Lead Inspection [ ] Risk assessment [ ] Clearance Inspection [ ] Other (specify) ____

Section 3 — Structure Where Lead Hazard Evaluation Was Conducted

Address [number, street, apartment (if applicable)]	City	County	Zip Code
630 San Anselmo Avenue	San Anselmo	Marin	94960

Construction date (year) of structure:

Type of structure: [ ] Multi-unit building [ ] School or daycare [ ] Single family dwelling [✓] Other Art Studio

Children living in structure? [ ] Yes [✓] No [ ] Don't Know

Section 4 — Owner of Structure (if business/agency, list contact person)

Name	Telephone number
County of Marin	(415) 473-7579

Address [number, street, apartment (if applicable)]	City	State	Zip Code
3501 Civic Center Drive, Suite 304	San Rafael	CA	94903

Section 5 — Results of Lead Hazard Evaluation (check all that apply)

[✓] No lead-based paint detected [ ] Intact lead-based paint detected [ ] Deteriorated lead-based paint detected

[ ] No lead hazards detected [ ] Lead-contaminated dust found [ ] Lead-contaminated soil found [ ] Other____

Section 6 — Individual Conducting Lead Hazard Evaluation

Name	Telephone number
David Blair Bridges	5107157224

Address [number, street, apartment (if applicable)]	City	State	Zip Code
1956 Webster St, #400	Oakland	CA	94612

CDPH certification number	Signature	Date
24052	B Bridges	11/8/2017

Name and CDPH certification number of any other individuals conducting sampling or testing (if applicable)

Section 7 — Attachments

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Section 3 — Structure Where Lead Hazard Evaluation Was Conducted

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636 San Anselmo Avenue	San Anselmo	Marin	94960

Construction date (year) of structure:

Type of structure: ☐ Multi-unit building ☐ School or daycare ☐ Single family dwelling ☑ Other Restaurant

Children living in structure? ☐ Yes ☑ No ☐ Don't Know

Section 4 — Owner of Structure (if business/agency, list contact person)

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Geotechnical & Environmental Sciences Consultants

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Former Nursery Detention Basin Project

Geotechnical Report

Fairfax, California

Submitted to:
Marin County Flood Control and Water Conservation District
3501 Civic Center Drive, Room 304
P.O. Box 4186
San Rafael, CA 94913

Submitted by:
GEI Consultants, Inc.
2868 Prospect Park Drive, Suite 400
Rancho Cordova, CA 95670
96-631-4500

March 2017

Project 1610277

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Senior Engineering Geologist

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1. Introduction

1.1 Program Overview

GEI Consultants Inc. (GEI) is assisting the Marin County Flood Control and Water Conservation District (District) in a preliminary geotechnical evaluation of the Former Nursery Detention Basin Project (Project) site located in Fairfax, CA (Figure 1-1). The overall goal of the Project is to provide temporary storage of floodwaters for peak flow attenuation on Fairfax Creek. The geotechnical evaluation described herein is based on site-specific information on the soil and groundwater conditions at the site.

1.2 Purpose and Scope

The preliminary plan for the detention basin includes excavation of the site to lower the ground elevation, and construction of an earthen dike on the downstream (eastern) boundary. A diversion structure and outlet structure would be constructed in Fairfax Creek to regulate and control stream flows. GEI has reviewed background documentation and completed geotechnical explorations within the former nursery as part of an assessment of the current conditions at the project site. The purpose of the explorations was to obtain information on environmental and geotechnical subsurface conditions and refine soil properties for engineering analyses. The results of the geotechnical explorations and environmental testing are documented in the *Field Investigation Report* (FIR), submitted as draft to the District in December 2016 (GEI, 2016).

This Geotechnical Report (GR) includes a review of geologic and geotechnical conditions, an assessment of project feasibility, and preliminary design recommendations and considerations for further project development. The assessment is based on the proposed flood detention basin design concept provided by the District on September 8, 2016. The GR contains:

- A summary of geotechnical conditions, geologic hazards, and groundwater conditions at the site,
- Soil characteristics for potential for reuse as embankment fill, including geotechnical properties, environmental constituents, and suitability,
- A preliminary evaluation of project fill requirements and borrow availability,
- Geotechnical analyses of the proposed basin concept, including seepage analysis, stability analyses for steady-state seepage, rapid drawdown, post-seismic, and pseudostatic conditions, and seismic deformation analyses.

2. Site Conditions

2.1 Project Location and Site Description

The Former Nursery Detention Basin site is a seven acre parcel previously used as a growing grounds for a retail landscaping nursery. Existing structures at the site include a 942 square foot (SF) sales office, 10,400 SF of shade structures, an 800 SF residence, 1,748 SF art gallery/studio, a well and water tank, a Marin Municipal Water District water service, and a septic tank system. Fairfax Creek flows from west to east in an incised natural channel at the southern boundary of the property (Figure 2-1). The center portion of the property is relatively flat, sloping gently from west to east. The northern portion of the parcel is a steep hillside. Typical ground surface elevations within the property range from about El. 238 ft on the western edge to 230 ft on the eastern edge. Fairfax Creek is incised an additional six to eight feet below the central portion of the property. The northern hillslope climbs steeply for several hundred feet. The site is accessed across a bridge over Fairfax Creek from Sir Francis Drake Blvd.

2.2 Site Geology

The project site is situated in the Coast Range province, along an east-west trending valley flanked to the north and south by relatively steep hillsides. According to Blake (2000), the hills are Franciscan Complex, and appear to consist of variably deformed Cretaceous sandstone and shale (see Photo 1) on the lower slope, with mélange and Serpentinite on the upper slope, as shown on Figure 2-2. The valley floor is filled with Quaternary alluvial and colluvial sediments of uncertain depths, which underlie the project site. The alluvial sediments thin and pinch out or merge with Quaternary hillside slope deposits at the edges of the valley.

Photo 1. Exposure of weathered Franciscan Complex from northern hillslope adjacent to Former Nursery site.

2.3 Subsurface Conditions

2.3.1 Soil Conditions

Subsurface conditions within the project extents are discussed below based on site reconnaissance and recent GEI explorations. Data collection details and methods are further discussed in Section 3 of the FIR (GEI, 2016). As described in the FIR, the recently performed exploration program consisted of six borings distributed across the site and on Sir Francis Drake Blvd (Figure 2-1). Three of the borings were converted to monitoring wells, which were outfitted with datalogging transducers to measure and record groundwater level measurements.

A geologic cross-section traversing the site was prepared based on existing conditions (Figure 2-3). The subsurface conditions within the site consist of interbedded layers of gravel, sand, silt, and clay sediments extending beyond the depths explored in the central portion of the site, but overlying bedrock near the flanks of the valley. As depicted on cross-section, the foundation generally consists of four zones – three alluvial deposits underlain by bedrock. The upper zone is about 5 ft thick consisting of loose to medium dense clayey and silty sand. The intermediate zone is very soft to very stiff lean clay, and varies from approximately 10 feet in the middle of the site to 20 feet on the east side of the site. The deeper alluvial zone is medium dense to very dense clayey sand and gravel. Claystone bedrock and clay with relic rock structure was encountered in the site investigations near the flanks of the valley. SPTs attempted in the claystone found it to be very hard (50 blows over a 4-inch drive and 50 blows over a 2-inch drive).

Although not encountered in the site investigations, it is likely that unconsolidated alluvial deposits are present in the Fairfax Creek channel. These deposits could range from clay to gravel, depending on the source material and depositional history. The conditions in Fairfax Creek should be further evaluated as part of detailed design.

2.3.2 Groundwater Conditions

Groundwater was not encountered during the field investigation program, which was performed in early-August 2016. However, as shown Figure 2-4, groundwater levels at the site increased through the fall and winter seasons, corresponding to significant increases in precipitation.

The monitoring wells were installed on August 4 & 5, 2016, with the bottom of the well screens at about 19.0 to 20.0 ft below ground surface (i.e. about El. 214 ft). No groundwater was present at the time of installation. The transducers were installed on November 23, 2016, at which time the groundwater was measured at about 8.5 to 9.0 ft below ground surface (i.e. about El. 224.5 to 225.5 ft). As shown on Figure 2-4, about 11 inches of precipitation had fallen in the area, which was followed by more substantial precipitation events. Consequently, groundwater levels have continued to increase in the monitoring wells. Since groundwater monitoring began in November 2016, levels have fluctuated between from a minimum of El. 224.3 ft at MW-3 located furthest downstream to a maximum of 233.6 ft at MW-1 located immediately adjacent to the northern hillside.

It is notable that the general groundwater flow regime during non-precipitation periods is different than during storm events. During non-precipitation periods, the highest values are observed in MW-2, which is closest to Fairfax Creek and furthest upstream indicating recharge from Fairfax Creek. However, during precipitation events, groundwater levels in MW-1 increase significantly rising to within a foot of the ground surface during the monitoring period, indicating recharge from the steep hills on the northern side of the property immediately adjacent to MW-1.

As described above, groundwater levels fluctuate at the site likely in response to precipitation, and that groundwater levels measured in the monitoring wells are at times above the floor of the proposed detention basin. However, based on review of site stratigraphy, it appears that the potentially water-bearing alluvial strata beneath the site is a unit of clayey sand and gravel, which is overlain by an intermediate lean clay layer. The floor of the detention basin would be positioned at El. 224 ft, which is mid-depth in the intermediate lean clay layer, thus providing a thickness of lean clay about five to eight feet thick below the bottom of the basin. Additionally, if water is shedding off of the adjacent northern slope during precipitation events, it is likely to be shallow baseflow through the Franciscan Complex bedrock which could connect with the surficial silty/clayey sand. The described soil types are unlikely to have hydraulic conductivities capable of producing quantities of water that would affect the performance of the basin. It is probable that seepage or surface runoff would enter the basin during the winter and spring months, but the quantity of water could likely be managed through surface contouring to promote drainage within the basin. Additional investigations and testing are recommended to better understand the deeper stratigraphy of the alluvial deposits and the properties of the adjacent hillslope to confirm this condition.

2.4 Geologic Hazards

Potential geological hazards such as landslides and fault rupture were assessed qualitatively using available information, and based on site reconnaissance performed on July 19, 2016, and will further discussed in the following sections. Analysis of additional geotechnical conditions, such as seepage, stability, liquefaction potential, and seismic deformation are discussed in Section 4.0 of this report.

2.4.1 Landslides

A landslide occurring on the slopes bordering the project site could impact the detention basin by damaging the earthen dikes, or if the basin contains water when a landslide occurs, by creating a wave that could overtop the downstream embankments. Landslide potential was assessed using the mapping developed Smith, Rice, and Strand titled *Geology of the Upper Ross Valley and the Western Part of the San Rafael Area, Marin County, California* (Smith et al, 1976), which has been annotated to make interpretation of the maps more readable for those features relevant to the detention basin site (Figure 2-5). The inventory summarizes evidence of historic landslide activity in terms of:

- Debris flow landslides, which are unconsolidated and unsorted soil and rock debris (colluvium) that has moved downslope by flow or creep processes.
- Block slump landslides, which are masses of bedrock [or soil] that have moved downslope by rotational or translational slip along a planar surface.
- Slopes exhibiting evidence of downslope creep.
- Small landslide deposits and debris avalanche scars too small to be delineated on the map.

The mapping and site reconnaissance demonstrates some evidence of slope creep on the hillslope bordering the northern side of the property, which is within areas underlain by Franciscan mélange. The movement could be due to either debris flow or surface creep, but large-scale rotational block landslides were not apparent. No significant cracking was observed during reconnaissance of the site, however, small-scale headscarps were noted adjacent to the access road. It is possible that saturated conditions along the hillside could trigger movement. Based on the observed landslide history in the site vicinity, the uncertain nature of Franciscan mélange deposits, and the significant amount of recharge that appears in MW-1 during storm events, there is moderate risk of slope instability.

2.4.2 Fault Rupture

Both the California Geological Survey and Caltrans fault mapping resources were used to determine if active faults pass through the site. Several major faults have been identified in the region, including the San Andreas, Hayward, and Rodgers Creek faults. However, no active faults are in the immediate project area (Figure 2-6). The California Division of Mines and Geology (CDMG) has prepared Alquist-Priolo Fault Zone and Seismic Hazard Maps to reduce losses from surface fault rupture on a statewide basis. The proposed detention basin site is not located within a Special Studies Zone. Therefore, the potential for fault surface rupture at the sites is remote.

The site will experience seismic ground shaking similar to other areas in the seismically active Bay Area. The fault likely to cause the greatest seismic activity is the San Andreas (North Coast) fault. This fault is approximately 10.8 km (6.7 miles) from the project site, and is believed to be capable of producing a magnitude 8.0 earthquake. The intensity of ground shaking will depend on the magnitude and duration of the earthquake. Potential geotechnical hazards such as liquefaction, seismic deformation, and seismic induced settlement will be further evaluated in Section 4.0 of this report.

2.5 Environmental Soil Testing

As part of the field investigation program documented in the FIR, GEI collected samples and assigned laboratory testing for contaminants within potential borrow materials. Soil samples collected at the site were tested for volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs), organochlorine pesticides, polychlorinated biphenyls (PCBs), and heavy metals. According to the results of laboratory testing, there were some low detections of VOCs, SVOCs, and organochlorine pesticide constituents at the site, but none exceeded the San Francisco Bay Regional Water Quality Control Board Environmental Screening Levels, rev. 3, February 2016 (ESLs). Metals concentrations were generally consistent across the site, with slightly elevated levels of arsenic, chromium, and nickel above the ESLs. However, these metals are common to the region and typical of background values. Therefore, the on-site soils does not appear to pose a hydrological hazard if used as embankment fill material. Based upon soil analytical results, constituent concentrations are less than the Total Limit Threshold Concentration (TTLC) values as defined in California Code of Regulations 22 §66261.24 Characteristics of Toxicity, and would therefore be considered non-hazardous. However, some of the metals concentrations are slightly elevated, such that off-site disposal of soil excavated at the site may require a Class II landfill accepting “designated” soils. This should be further evaluated based on supplemental environmental testing of borrow soil at the site.

3. Project Conceptual Layout

The conceptual layout of the Former Nursery Detention Basin is shown on Figure 3-1. The grading shown on the figure was based on the District's conceptual figure provided to GEI on September 8, 2016. The preliminary plan for the detention basin includes excavation in the central portion of the site to lower the ground to El. 224 ft, and construction of an earthen dike on the downstream (eastern) boundary with a crest elevation of 238 ft. The natural ground in the vicinity of the embankment is at approximately El. 230 ft, so the structure would be eight feet tall on the downstream side. Natural ground on the western (upstream) side of the basin, high ground on the northern side, and the right (south) bank of Fairfax Creek, which abuts Sir Francis Drake Blvd, complete the perimeter impoundment. A floodwall along the right bank of Fairfax Creek with a top elevation of 238 ft will be needed to maintain the basin crest elevation. A diversion structure and outlet structure would be constructed in Fairfax Creek to regulate and control stream flows. Fairfax Creek is incised down to an elevation of about 225 ft, so the diversion structure would have a height of 13 feet tall. The conceptual design includes a concrete spillway at El. 235 ft.

It is our understanding that the near-surface soils within the basin are being considered for potential use as borrow materials. For the proposed basin configuration, the estimated volume of soil to be excavated is 33,000 CY and the amount of fill required to construct the downstream berm is 11,500 CY. Assuming the upper 12 inches of existing soil will be removed and not considered for borrow due to organics and 30% shrinkage, the available borrow volume was calculated to be sufficient, but will need to be confirmed as design progresses.

4. Geotechnical Evaluation

Geotechnical analyses for evaluation of the proposed basin included:

- Seepage and stability analyses,
- Liquefaction susceptibility and triggering evaluations,
- Estimation of post-seismic reconsolidation settlements, and
- Seismic deformation analyses.

The analyses were performed at two analysis cross sections representing the maximum sections of the downstream dike and the dam/spillway section (Figures 4-1 and 4-2). The locations of the cross sections are shown on Figure 3-1. The analysis approach, analysis criteria, parameters, and design input ground motions are presented in the following sections.

4.1 Analysis Sections and Stratigraphy

Two cross sections were developed for analysis of the downstream berm of the proposed basin, as shown in Figures 4-1 and 4-2. Characterization of the subsurface conditions was performed by evaluating the site geology and the results of subsurface explorations and laboratory testing. Review of available information indicated the foundation generally consists of four zones:

- Zone 1: Upper zone consisting predominantly of silty to clayey sand, with some clayey gravel. This zone was encountered between El. 234 and El. 225 (NAVD 88) in explorations MW#1, MW#2, MW#3, SB#2, and SB#3. The fines contents measured from seven tests on samples from Zone 1 ranged from 15 to 38%, with an average of about 28%. The plasticity index (PI) measured from two tests on samples from Zone 1 were either non-plastic (NP) or 7. SPT energy-corrected blow counts (N_{60}) in Zone 1 ranged from 5 to 40, with an average of about 15.

- Zone 2: Intermediate zone consisting predominantly of lean clay, with limited intervals of high-plasticity clay and high-fines SC-SM (47% fines). This zone was encountered between El. 225 and El. 207 (NAVD 88) in explorations MW#1, MW#2, MW#3, SB#1, and SB#2. The fines contents measured from three tests on samples from Zone 2 ranged from 47 to 61%, with an average of about 55%. The plasticity index (PI) measured from seven tests on samples from Zone 2 ranged from 7 to 13, with an average of about 10. SPT energy-corrected blow counts (N_{60}) in Zone 2 ranged from 0 to 46, with an average of about 16. The higher blow counts were encountered near bottom of the unit in close proximity to the underlying bedrock.

- Zone 3: Deep zone consisting predominantly of clayey sand and clayey gravel. This zone was encountered between El. 218 and El. 201 (NAVD 88) in explorations MW#2, MW#3, and SB#1, which are closer to the middle of the valley. The borings near the edges of the valley (MW#1 and SB#2) did not encounter Zone 3 materials before encountering claystone bedrock or lean clay with rock structure. The fines contents measured from three tests on samples from Zone 3 ranged from 14 to 20%, with an average of about 17%. The plasticity index (PI) measured from three tests on samples from Zone 3 ranged from 9 to 26, with an average of about 16. SPT energy-corrected blow counts (N_{60}) in Zone 3 ranged from 15 to 21, with an average of about 19.

- Zone 4: Claystone bedrock encountered beginning at El. 217.5 in boring MW#1. Boring SB#2 encountered a sample of lean clay with rock structure at the bottom of the borehole, but did not encounter claystone. Two SPTs were attempted in claystone in boring MW#1; however, refusal was encountered on both attempts (50 blows over a 4-inch drive and 50 blows over a 2-inch drive).

The stratigraphy shown on Figures 4-1 and 4-2 is idealized based on the materials encountered during subsurface investigations superimposed on the basin conceptual layout (Figure 3-1). The finished topography shown on the concept plan was used for development of analysis cross sections. It is assumed that the upper portion of the foundation within the basin limits will be excavated and reused for embankment fill. As such, the material properties for the embankment are based on materials described above for Zone 1, but assumed to be reworked, homogenized, and placed under controlled conditions. The seepage and stability analyses described herein do not include Zone 1 or Zone 4, since Zone 1 does not appear to extend beneath the embankment (see boring SB-1), and Zone 4 is bedrock assumed to have little impact on the geotechnical performance of the embankment. Additional investigations are recommended beneath the footprint of the embankment to verify the subsurface conditions and better evaluate the extent of Zone 1 deposits at the site.

4.2 Criteria

The following table summarizes the design criteria for seepage and slope stability analyses for the proposed basin. These values were selected based on criteria from USACE EM 1110-2-1902 (2003) and DSOD, as published in “Strength of Materials for Embankment Dams” (USSD, 2007). As indicated in the table below, no safety factor criterion is applied to pseudostatic analysis as it is only used to estimate the yield acceleration for use in seismic deformation analyses.

Analysis Type	Criterion
Steady-State Seepage	Exit gradient, i = 0.50 at the downstream toe
Steady-State Stability	Factor of safety, FS = 1.5
Rapid Drawdown Stability	Factor of safety, FS = 1.3
Post-Seismic Stability	Factor of safety, FS = 1.1
Pseudostatic Stability	N/A

4.3 Seepage and Stability Analyses

4.3.1 Analysis Approach and Analysis Cases

Seepage and stability analyses were performed using software developed by GEO-SLOPE International, Ltd. SEEP/W is a two-dimensional finite element analysis computer program that was used to generate steady-state phreatic surfaces and pore water pressures within the embankment and foundation soils for the design water surface at El. 236 ft (NAVD 88). Stability analyses were performed with SLOPE/W, using the Spencer analysis method, which satisfies both moment and force equilibrium. Slip surfaces were defined using the entry-and-exit method. Stability analyses were performed on the same analysis cross sections evaluated for seepage.

For the steady-state stability case, it is assumed the proposed basin is filled to the design water surface elevation (El. 236 ft, NAVD 88) and the water surface elevation remains constant long enough to establish steady-state seepage conditions through the embankment, in accordance with USACE EM 1110-2-1902 guidelines. The phreatic surfaces and pore water pressures from our seepage analyses were used in the stability evaluations. Drained strengths were assigned to all soils in these analyses as steady-state seepage is a long-term condition.

For the rapid drawdown case, it is commonly assumed the embankment has been saturated for a sufficient length of time under the design water level to develop steady-state seepage conditions, followed by rapid drawdown of the basin. It is also assumed that excess pore pressures during drawdown would not develop in coarse-grained soils because these materials are relatively free-draining. Fine-grained soils were assumed to be non-free-draining and would generate excess pore pressures during loading.

The Improved Method for Rapid Drawdown was used as outlined in Appendix G of EM 1110-2-1902 (USACE, 2003) to evaluate the rapid drawdown case. This method of evaluating rapid-drawdown stability assumes that the water level drops instantaneously from the design water level to the bottom of the basin at El. 224 ft (NAVD 88), resulting in instantaneous excess pore pressure development in the embankment and foundation soils that is directly proportional to the assumed water level drop. In reality, the water level recedes gradually, and some pore pressure dissipation occurs as the water level drops. As a result, the rapid drawdown analysis is generally considered to be inherently conservative.

4.3.2 Seepage Analysis Parameters

Hydraulic conductivities for seepage analyses were selected for each soil type based on material index properties, laboratory and in-situ testing by DWR (2015), and review of relevant geotechnical references. Hydraulic conductivities were developed for each material type encountered within the basin. A summary table of horizontal and vertical hydraulic conductivities for each material type is provided below.

Material Type	k_v (cm/sec)	k_h/k_v	k_h (cm/sec)
SC (Embankment)	4.0E-06	4	1.6E-05
CL	2.5E-06	4	1.0E-05
SC (Foundation)	4.0E-05	4	1.6E-04

The hydraulic conductivity for the clayey sand (SC) embankment material was based on typical values for controlled placement of the excavated material to be used as berm fill. The clay (CL) in the foundation was assumed to not be intact due to possible penetrations during previous use of the site. Hydraulic conductivity for the clay was selected based on typical values for natural, damaged deposits. For the sandy (SC) foundation material below the clay, hydraulic conductivities selected were based on typical values for natural deposits with similar fines content.

4.3.3 Slope Stability Analysis Parameters

Soil strength parameters for slope stability analyses were selected for each layer. Strength parameters vary based on a number of factors such as material type, relative density, overconsolidation, and plasticity. Unit weights for each soil strata were selected based on blow counts and typical ranges for each soil type.

In selecting strength parameters, distinction was made between coarse-grained materials and fine-grained materials. Coarse-grained materials are defined as soils with fines contents less than 50%. Fine-grained soils are defined as soils with fines contents of 50% or more. The approaches for strength parameter selection are described below and illustrated on the plots included in Appendix A.

4.3.3.1 Coarse-Grained Soils

The drained friction angle (φ') for coarse-grained materials was estimated with the Hatanaka and Uchida (1996) relationship with normalized SPT blowcounts:

$$\varphi' = \sqrt{15.4 \times (N_1)_{60}} + 20°$$

The berm fill (Layer 1) will be placed using modern construction techniques and would be constructed with a high-level of compaction. Foundation layer 3 (SC) was also found to be dense based on SPT blowcounts in the layer. Based on the density of these layers, these materials are expected to dilate when sheared. Therefore, the undrained strengths of the coarse-grained soils were conservatively taken as the drained strengths.

4.3.3.2 Fine-Grained Soils

The maximum past pressure for fine-grained material was estimated using a relationship between SPT blowcounts (N_{60}) and maximum past pressure (σ'_p) by Kulhawy and Mayne (1990):

$$\sigma'_p = 0.47 N_{60} P_a,$$

where P_a is atmospheric pressure. Based on the range of σ'_p estimated using this relationship, a maximum past pressure of 4 ksf was selected for use in characterizing the fine-grained layer present in both analysis cross sections (Layer 2).

The drained cohesion (c') was calculated based on recommendations in the Urban Levee Evaluations Guidance Document for Geotechnical Analyses (DWR, 2015) for foundation CL soils:

$$c' = 0.015\sigma'_p.$$

Using this relationship with the estimated maximum past pressure of 4 ksf, a c' of 60 psf was calculated and rounded to the nearest 25 psf (c' = 50 psf was selected for Layer 2).

The drained friction angle for fine-grained materials was estimated using the relationship between φ' and PI by Terzaghi et al. (1996). A lower third φ' value of 30° was selected from the relationship using the average PI of the layer (average PI = 10 for Layer 2).

The undrained strength (s_u) of the fine-grained layer was estimated from SPT blowcounts using a correlation from Terzaghi et al. (1996) between undrained strength, N_{60}, and PI. For Layer 2 with an average PI of 10, the relationship can be written as:

$$s_u = 115 N_{60} \text{ (psf)}$$

Based on the SPT blowcounts in Layer 2, an undrained shear strength of 1000 psf was conservatively selected for analysis. Undrained strengths were also estimated from pocket penetrometer measurements performed during the field explorations. The undrained strength was estimated as the pocket penetrometer measurement divided by two per Blum (1997). Comparison of the undrained strengths estimated with the SPT correlation and the pocket penetrometer indicated the pocket penetrometer strengths were typically greater than or equal to the SPT-estimated strengths, with relatively few exceptions.

4.3.4 Results from Seepage and Stability Analyses

Seepage and slope stability analyses results are summarized in Table 4-1. Analysis result figures are presented in Appendix B. For each cross section, the seepage analysis results are illustrated by figures that show the seepage model with soil layering and parameters, and a total head plot for design water surface elevation. Likewise, for each cross section the stability analysis results are presented on figures that show soil stratigraphy, parameters, and the critical failure surfaces with corresponding factors of safety for each analysis case.

The results from the seepage and stability analyses indicate the proposed configuration for the downstream berm meets criteria for seepage and slope stability, as described in Section 4.2.

4.4 Seismic Stability and Deformation Analyses

4.4.1 Design Input Ground Motions

Deterministic ground motion acceleration response spectra (ARS) were calculated for the project site using the geometric average of all five NGA West2 Ground Motion Prediction Equations (GMPEs), where each GMPE was equally weighted. A site V_{s30} of 620 m/s was estimated using the USGS V_{s30} map server online (USGS, 2017). The Caltrans ARS Online tool (Caltrans, 2017) was used to characterize fault parameters and to calculate source-to-site distances.

The controlling seismic source was identified as the San Andreas fault – North Coast Section, which has a moment magnitude of 8.0 and is located approximately 11 km away from the site. The San Andreas fault has an estimated slip rate of 24 mm per year (Field et al. 2013), which is characterized as a very high slip rate (greater than 9.0 mm/year) per the Department of Water Resources' Division of Safety of Dams (DSOD) Consequence-Hazard Matrix (DSOD, 2002). The proposed basin as shown in the concept configuration would impound up to 11 ft of water in the creek channel, and would therefore be DSOD jurisdictional structure. The structure would not be classified as Low Consequence since it is located upstream of residential communities. Therefore, based on the DSOD Consequence Hazard Matrix, deterministic 84th percentile ARS will be required by DSOD. The deterministic 84th percentile PGA for the controlling seismic source was 0.69g. The deterministic 84th percentile ARS curves are provided in Appendix C. The controlling seismic source, fault parameters, source-to-site distance, and 84th percentile peak ground acceleration are also presented below.

Fault Parameters				Site Parameters	
Name	Fault Type	Dip (deg)	M_w	R_{RUP} (km)	84th Percentile PGA (g)
San Andreas (North Coast Fault)	SS	90	8.0	10.8	0.69

4.4.2 Liquefaction Susceptibility and Triggering

Liquefaction describes the loss of shear strength in saturated soils as a result of pore pressure increasing due to ground shaking. Liquefaction typically occurs in saturated near-surface soil layers consisting of poorly graded loose sands and gravels, non-plastic silts, and low plasticity clays. Liquefaction susceptibility of the foundation soils was evaluated using the Idriss and Boulanger (2008) criteria based on fines content and PI. According to their criteria, fine-grained soils (50% or more fines) with PI ≥ 7 are considered to behave clay-like and are not susceptible to liquefaction-related strength loss. Soils not meeting these criteria are classified as sand-like and require a liquefaction triggering evaluation to estimate the potential for liquefaction at the design seismic input ground motions. Results from the liquefaction susceptibility screening analysis are summarized below and in Table 4-2.

- Zone 1 fines contents and PIs indicate that the material will exhibit sand-like behavior as described in Section 3.2.2. However, this zone will be excavated and used as borrow for the proposed embankment. Therefore, this layer was not included in the seepage and stability models as a foundation material. If this material is encountered during design of the downstream berm, additional analyses should be performed to determine appropriate actions.

- Zone 2 fines contents and PIs indicate that the material will exhibit clay-like behavior, and is judged to not be susceptible to liquefaction triggering. Within this zone, a single sample had fines content slightly less than 50% (47%) and a PI of 7. Although the fines content of this sample falls just below the liquefaction susceptibility criteria by Idriss and Boulanger (2008), this material will likely exhibit clay-like behavior. Therefore, Zone 2 was judged to be not susceptible to liquefaction.

- Zone 3 fines contents and PIs indicate that the material will generally exhibit sand-like behavior, and is judged to be susceptible to liquefaction triggering during a seismic event.

Liquefaction triggering analyses were performed for all borings presented in the FIR. Liquefaction triggering evaluations were performed according to the methods recommended by Idriss and Boulanger (2008), with updates per Boulanger and Idriss (2014). The potential for liquefaction triggering is evaluated using SPT blow counts to estimate a cyclic resistance ratio (CRR), or cyclic strength, in sand-like soils. The cyclic loading due to the design input ground motions is characterized as a cyclic stress ratio (CSR). The potential for liquefaction is evaluated by calculating a factor of safety against liquefaction (FS_L) as the ratio of the CRR to the CSR.

As discussed in Section 4.4.1, the deterministic 84th percentile design seismic loading (PGA of 0.69g, magnitude 8.0) were used for the analyses. The analyses assumed the basin is filled to the design water surface elevation (El. 236) by specifying a depth to the water table at design of 0.0 feet in the analyses. A factor of safety against liquefaction triggering (FS_L) of 1.4 was used to identify materials where liquefaction was expected to occur. Intervals with FS_L greater than or equal to 1.4 would not be expected to trigger liquefaction due to the design earthquake loading, whereas intervals with FS_L less than 1.0 would be expected to trigger liquefaction for the design earthquake loading. Intervals with FS_L between 1.0 and 1.4 were not expected to trigger liquefaction, but may incur some build-up of excess pore pressures during cyclic loading. For the present feasibility-level analyses, intervals with FS_L less than 1.4 were considered to trigger liquefaction.

The liquefaction triggering evaluations indicate the factors of safety against liquefaction (FS_L) between 0.2 and 0.6 in Zone 3 and thus liquefaction triggering is expected in Zone 3 (Appendix D). These values are lower than the liquefaction threshold criteria (FS_L = 1.4) and therefore some liquefaction should be anticipated at the site for the design earthquake. However, the $(N_1)_{60cs}$ values are very high and indicate the materials are prone to cyclic mobility but not strength loss. Cyclic mobility, as described in Youd et al. (2001) and MSHA (2009), is a progressive softening of dense materials where increased cyclic shear strains may develop, but the tendency of these materials "to dilate during shear inhibits major strength loss and large ground deformations." Additionally, given the depth of Zone 3, it is unlikely to impact embankment stability.

Seismic induced settlement can occur with soils above the water table where looser zones are densified effectively decreasing void space between soil particles. Seismically induced settlement was evaluated by reviewing layer densities, thicknesses and continuity. During significant ground motions, expected settlements would likely be minimal and localized where thicker layers of sandy soil exist. Vertical reconsolidation settlement due to cyclic loading was calculated for all six borings using the procedures by Idriss and Boulanger (2008) (Appendix D). The vertical reconsolidation settlements were estimated to be negligible (0.3 ft or less). Based on the site-specific explorations by GEI, settlement caused by ground shaking does not pose a significant hazard to the site.

4.4.3 Seismic Deformation

Post-seismic stability analyses evaluate the potential for slope instabilities considering undrained strengths (where applicable) and potential strength loss in soils where liquefaction is estimated to trigger. Post-seismic stability was performed with undrained strengths from the pseudo-static analyses to account for potential strength loss due to excess pore pressure generation. Where applicable, residual undrained strengths were applied to materials where liquefaction-induced strength-loss was expected.

For the pseudostatic case, it is assumed that an earthquake causes an additional horizontal force in the direction of failure. This horizontal force is represented by a static force equal to the weight of the sliding soil mass multiplied by a seismic coefficient. The horizontal yield acceleration (k_y) represents the minimum horizontal acceleration required to produce a factor of safety equal to 1.0. The values of k_y for the berm slopes were computed using staged pseudostatic analysis in SLOPE/W, where undrained strengths are calculated using the same approach as described above for rapid drawdown. However for these analyses, the undrained strengths were reduced to 80% of the static undrained strengths used in rapid drawdown to account for development of excess pore pressures during cyclic loading (Duncan et al. 2014).

Seismic deformations were estimated by a simplified semi-empirical predictive relationship for estimating permanent displacements developed by Bray and Travasarou (2007). Bray and Travasarou analyzed 688 recorded strong-motion records from 41 earthquakes to estimate Newmark-type displacement. They chose earthquakes with a magnitude between 5.5 and 7.6, recorded at geotechnical sites B, C, or D (rock, soft rock, or deep stiff soil), and whose time histories in which the frequencies in the range of 0.25 to 10 Hz have not been filtered out.

Bray and Travasarou performed nonlinear coupled viscoelastic analyses with strain-dependent material properties to estimate the seismic displacements. From their analyses, Bray and Travasarou (2007) developed the following regression to estimate Newmark-type seismic deformations:

$$\begin{aligned} Ln(D) = {} & -1.10 - 2.83\ln(k_y) - 0.333(\ln(k_y))^2 + 0.566\ln(k_y)\ln(S_a(1.5T_s)) \\ & + 3.04\ln(S_a(1.5T_s)) - 0.244(\ln(S_a(1.5T_s)))^2 + 1.50T_s + 0.278(M-7) \\ & \pm \varepsilon \end{aligned}$$

where D is the displacement in centimeters, k_y is the yield acceleration, M is the magnitude of the earthquake, T_s is the fundamental period of the structure, and ε is a normally distributed random variable with zero mean and standard deviation of 0.66. The fundamental period was calculated as $2.6H/V_s$ where H is the height of the embankment and V_s is the shear wave velocity of the embankment fill. A V_s of 1,100 ft/sec was assumed for the embankment based on an anticipated high degree of compaction. For the present evaluation, median (50^{th} percentile) displacements are reported.

The results of the seismic deformation calculations are summarized in Table 4-2, with details included in Appendix E. Calculated seismic deformations for the two analysis sections were between 0.3 and 0.6 ft for both slopes of the maximum section and the upstream slope of the spillway section. The largest seismic deformation was calculated for the downstream slope at the spillway section and was 1.9 ft. For the 3:1 slopes at the site, the associated crest settlement would be approximately 0.6 ft. Given the design freeboard of 2 ft above the design WSE, these displacements are expected to be acceptable.

5. Project Feasibility and Recommendations

5.1 Detention Basin

Based on available information, preliminary site characterization, and analysis results, the construction of a floodwater detention basin at the Former Nursery site adjacent to Sir Francis Drake Boulevard is feasible. Explorations and analyses performed by GEI indicate the proposed berm will be able to withstand the design seismic event without major failure and proposed berm geometry meets slope stability design criteria.

Basin construction is expected to consist of a combination of excavation and fill placement. Estimations of excavation and fill needs to construct the downstream berm indicate there is sufficient borrow material on-site to construct the downstream detention berm. To be used in construction, the berm fill should meet the following guidelines:

1. Liquid Limit less than 45
2. Plasticity index between 8 and 30
3. 100% by weight passing the 3-inch sieve, and greater than/equal to 30% passing the No. 200 sieve
4. The material should be compacted to a relative compaction of 90% per ASTM D 1557 or higher with a water content between 1% dry-of-optimum and 2% wet-of-optimum.

If encountered, highly permeable or loose soils within the limits of embankment construction should be stripped and replaced with compacted fill meeting the guidelines above.

5.2 Floodwall/Gravity Wall

Based on available information from explorations, the construction of a gravity floodwall along Sir Francis Drake Boulevard is feasible. The exploration performed on the shoulder of Sir Francis Drake Boulevard suggest that the subsurface conditions are adequate for bearing capacity of a concrete gravity floodwall, and do not appear to contain materials susceptible to liquefaction triggering.

The concrete gravity floodwall would extend from the downstream edge of the access bridge to the Former Nursery site along Sir Francis Drake Boulevard to the crest of the proposed downstream berm with a length of approximately 400 ft. The top of the wall would remain constant at Elevation 238 ft. Based on the existing ground surface, the height of the wall would be up to 11 ft high in areas where the wall would extend the Fairfax Creek channel bottom, but on average 1 to 2 ft high.

5.3 Groundwater Control and Dewatering During Construction

If groundwater is encountered, dewatering will be necessary to perform temporary and permanent excavations. Based on groundwater level data collected from November 2016 through January 2017, the water table in the alluvial sediments can rise to elevations near the ground surface. No groundwater was encountered during investigations in early-August 2016, so it would also appear that groundwater levels fluctuate several feet annually likely in response to precipitation. If basin construction occurs during the summer months, dewatering may not be needed, except perhaps if performing deep excavations within Fairfax Creek. However, for the current conceptual configuration, groundwater infiltration into the basin during the winter months would be likely, since groundwater is observed to rise above the floor of the detention basin.

The recently completed investigation program terminated at a maximum depth of about 30 ft below ground surface, so the deeper stratigraphy within the alluvium is unknown. It is recommended that in-situ testing and additional deep investigations be performed at the site to evaluate the subsurface conditions related to groundwater.

5.4 Additional Explorations and Laboratory Testing

Additional explorations (borings and Cone Penetration Tests) and geophysical surveying are recommended at the site to further refine alternatives and develop detailed project designs. These explorations will improve the understanding of subsurface stratigraphy and laboratory testing will allow for the determination of strength and consolidation parameters to evaluate settlement and consolidation of the proposed earth structures.

Based on the interpretation of site conditions, it appears that the surficial granular soils (Zone 1) do not extend into the eastern portion of the site (based on SB-1) where the downstream berm would be constructed. Investigations (borings, cone penetration tests, or excavated test pits) are recommended within the footprint of the earthen dike to more accurately evaluate the foundation and assess liquefaction, seismically induced settlement, and consolidation potential. The effect of near-surface granular soils beneath the downstream berm may also have an impact on underseepage during periods of water storage. If encountered, these soils would either need to be removed or cutoff with a low permeability trench to prevent seepage from impacting nearby residences.

Although not encountered in the site investigations, it is likely that unconsolidated alluvial deposits are present in the Fairfax Creek channel. These deposits could range from clay to gravel, depending on the source material and depositional history. The conditions in Fairfax Creek within the embankment footprint should be further evaluated as part of detailed design.

We recommend excavated test pits be performed within the footprint of the basin for the purpose of borrow soil characterization. Samples should be collected from the test pits and submitted for environmental and geotechnical testing.

Based on the observed landslide history in the site vicinity, there is moderate risk of instability of the natural slope on the northern portion of the property, immediately adjacent to the proposed basin. Failure of this natural slope would not directly result in a loss of reservoir containment, but could impact basin capacity. A geotechnical investigation of the slope is recommended to evaluate the soil, rock, and groundwater conditions, and further assess impacts on the proposed basin configuration.

6. Limitations

This Geotechnical Report was prepared for the District for use in planning of the Former Nursery Detention Basin Project.

GEI prepared the conclusions, recommendations, and professional opinions of this report in accordance with the generally accepted geotechnical principles and practices at this time and location.

Soil and rock deposits can vary in type, strength, and other geotechnical properties between points of observations and explorations. The recommendations presented within this report are based on these projected explorations, and are subject to confirmation based on further exploration and testing at the site.

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Tables

Former Nursery Detention Basin Project
Fairfax, California
Table 4-1. Summary of Seepage, Stability, and Seismic Deformation Analysis Results

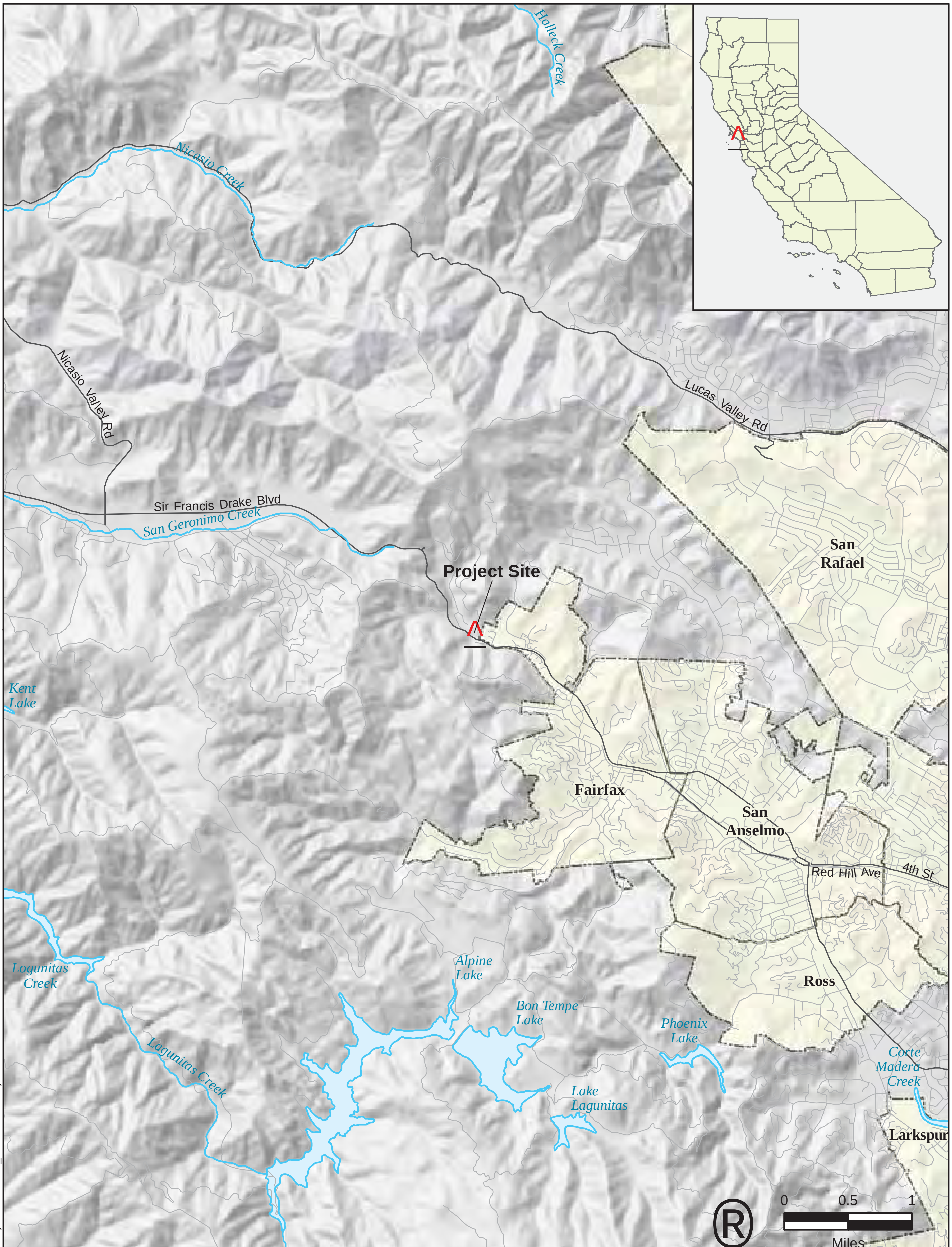
Analysis Section	Seepage		Stability					Seismic Deformation			
	Vertical Gradient at D/S Toe	Breakout Height above D/S Toe (ft)	Steady State Stability F.O.S.		Upstream Rapid Drawdown F.O.S.[1]	Post-Seismic Stability F.O.S.		Pseudo-Static k_y (g)		Deformation (ft)	
			D/S Slope	U/S Slope		D/S Slope	U/S Slope	D/S Slope	U/S Slope	D/S Slope	U/S Slope
Downstream Berm Maximum Section	0.14	2.0	1.79	2.81	2.13	1.79	2.81	0.24	0.31	0.6	0.3
Downstream Berm Spillway Section	0.28	4.9	1.50	3.05	2.15	1.50	3.05	0.16	0.31	1.9	0.5

Notes
F.O.S. = Factor of Safety
D/S = Downstream
U/S = Upstream
1. Rapid drawdown analyses were performed for drawdown from the maximum pool (EL. 236 ft, NAVD 88) to the bottom of the basin (EL. 224 ft, NAVD 88).

Former Nursery Detention Basin Project
Fairfax, California
Table 4-2. Liquefaction Susceptibility Screening for GEI Data

Material Zone	Exploration	Sample ID	Sample Depth (ft)	Sample Elevation (ft, NAVD 88)	Soil Classification	PI	% Fines	Clay-like Behavior
1	MW#2	S02A	2.5	232.1	SC	-	34	No
	MW#2	S04A	6	228.6	SM	NP	38	No
	MW#3	S03A	2.5	230.4	SC-SM	-	20	No
	MW#3	S04A	6	226.9	SC-SM	7	15	No
2	MW#1	S05A	7.5	226.4	CL	11	61	Yes
	MW#2	S07A	13.5	221.1	CL	12	-	Yes
	MW#3	S07A	13.5	219.4	CL	13	57	Yes
	SB#1	S02A	3.5	226.1	CL	10	-	Yes
	SB#1	S05A	11	218.6	CL	11	-	Yes
	SB#1	S06A	13.5	216.1	SC-SM	7	47	No
	SB#2	S06A	13.5	222.1	CL	9	-	Yes
3	MW#2	S10A	21	213.6	SC	-	17	No
	MW#3	S08A	16	216.9	GC	13	20	No
	SB#1	S10A	23.5	206.1	SC	9	17	No
	SB#1	S12A	28.5	201.1	SC	-	14	No
	SB#2	S12A	28.5	207.1	CL	26	-	Yes

Figures



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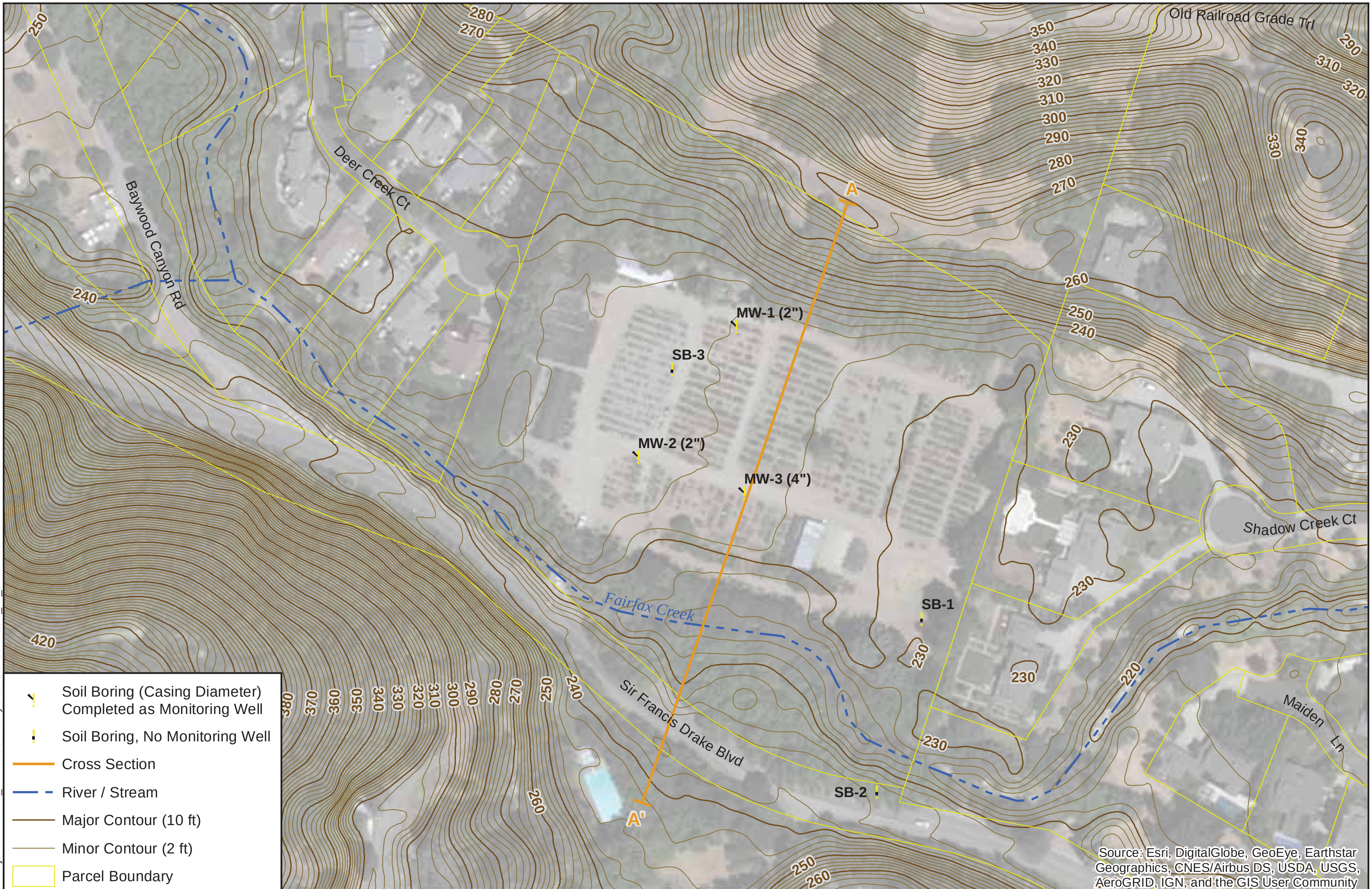
Former Nursery Detention Basin Fairfax, California	GEI Consultants	Site Vicinity
Marin County Flood Control and Water Conservation District		FEBRUARY 2017 FIGURE 1-1



Former Nursery Detention Basin Project
Fairfax, California

Marin County Flood Control and Water Conservation District

GEI Consultants

SITE PLAN

FEBRUARY 2017

FIGURE 2-1

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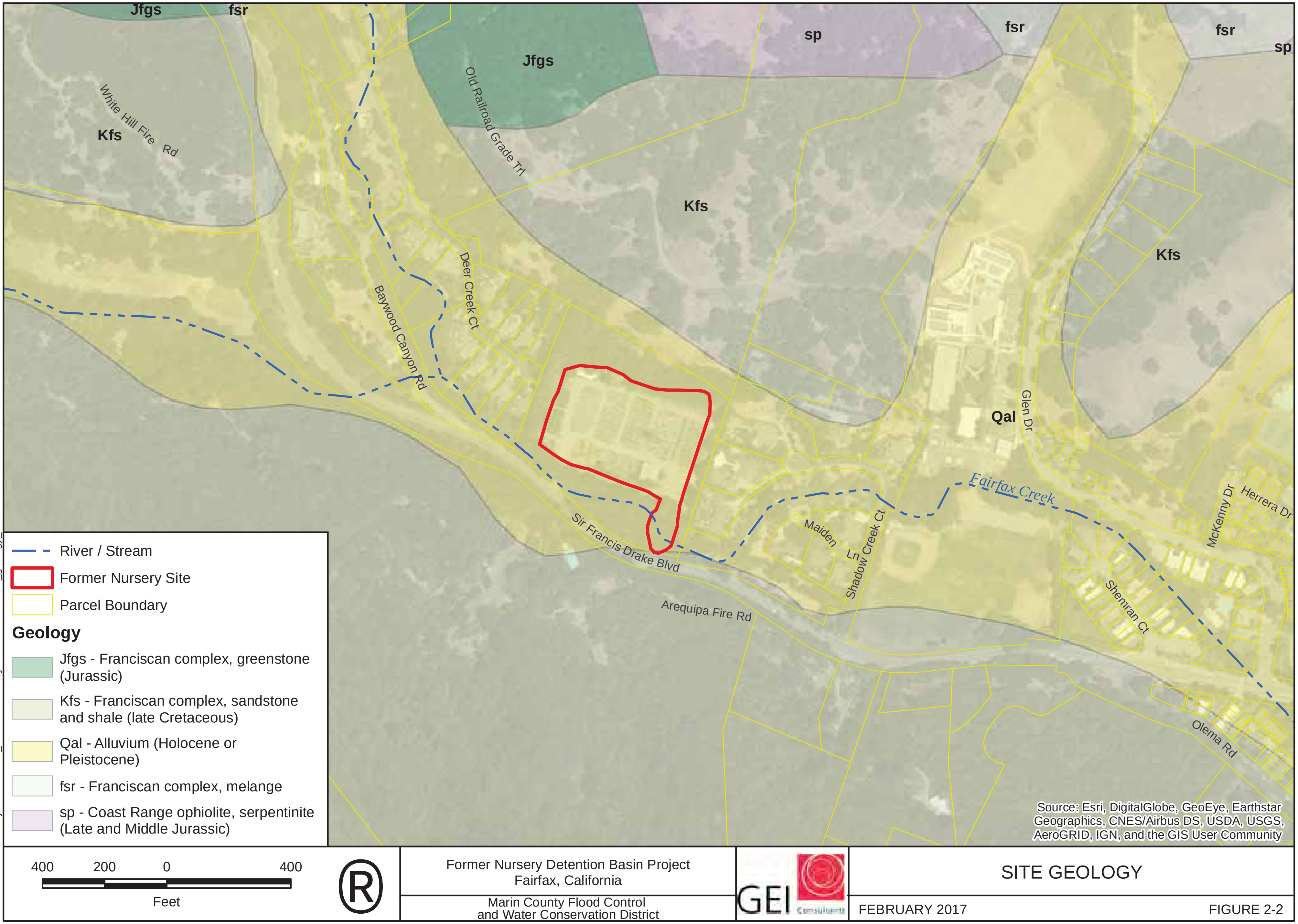

Former Nursery Detention Basin Project
Fairfax, California

Marin County Flood Control
and Water Conservation District

GEI Consultants

SITE GEOLOGY

FEBRUARY 2017

FIGURE 2-2

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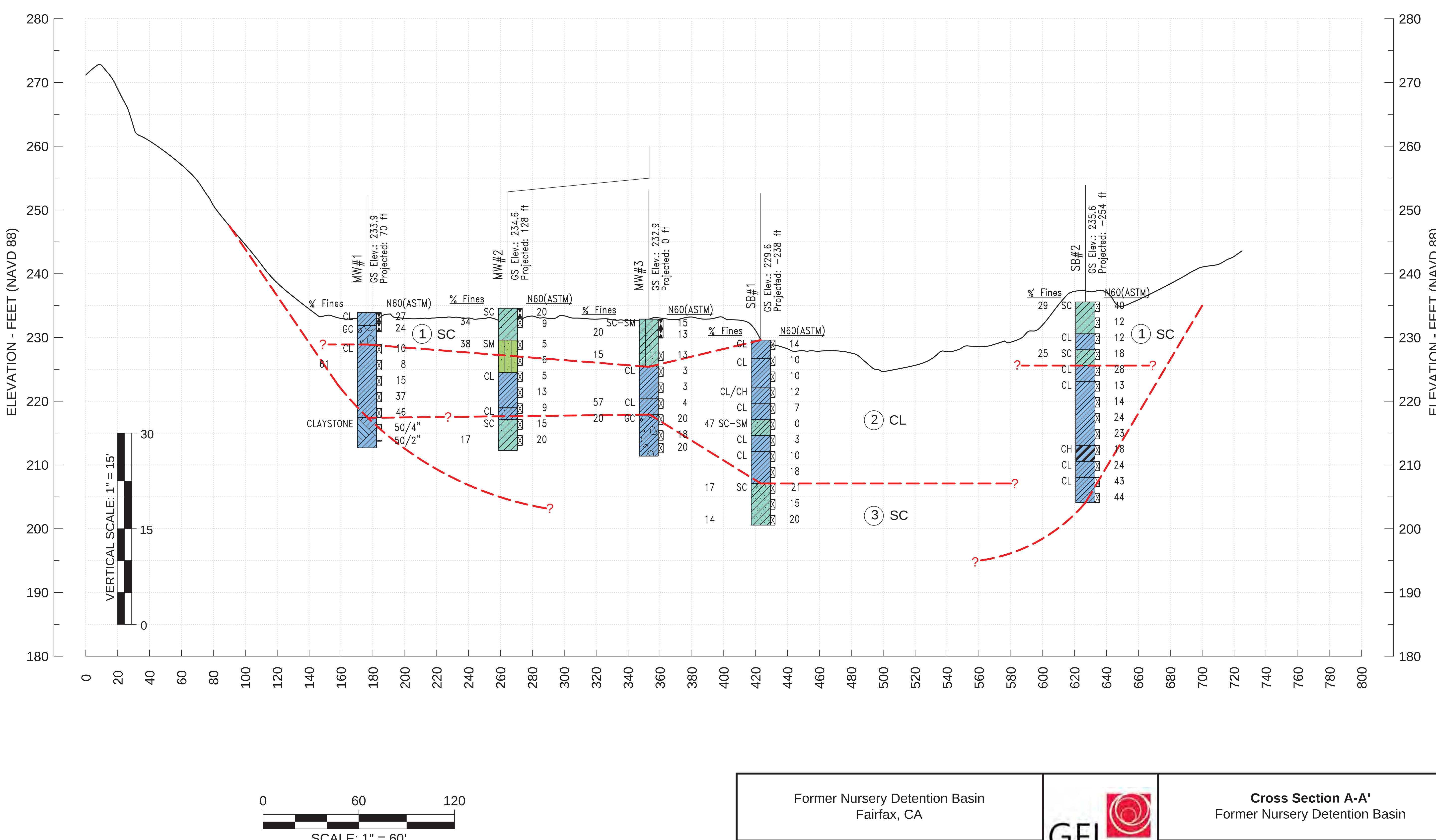
03-Feb-2017



Former Nursery Detention Basin
Fairfax, CA

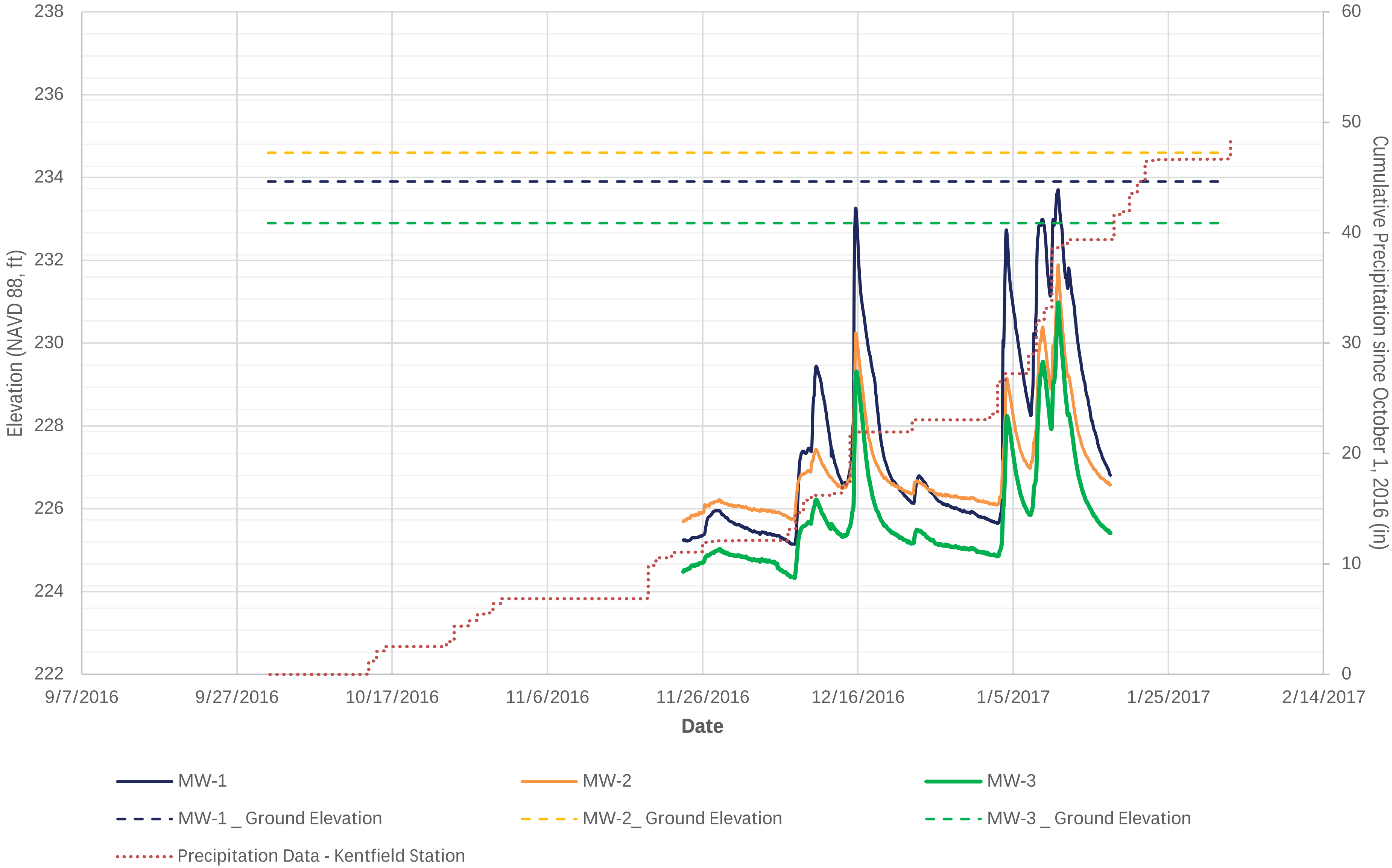
Marin County Flood Control and Water Conservation District

GEI Consultants

Cross Section A-A'
Former Nursery Detention Basin

February 2017

Figure 2-3



Former Nursery Detention Basin Marin County, California	GEI Consultants	Nursery Site Groundwater Levels and Precipitation	
Marin County Flood Control and Water Conservation District San Rafael, California	Project 1610277	February 2017	Figure 2-4

SYMBOLS

Contact between adjacent geologic units. Mostly approximately located except in rare well-exposed locations. Also contacts between all units within Franciscan melange, most all of which are faulted.

Fault, shown solid where fault traces are located with confidence, dashed where approximately located in bedrock areas, and dotted where assumed to be located but buried beneath Quaternary deposits. Queried where considerable doubt exists as to the location of the concealed trace. No evidence of recent faulting was found for any of the faults on this map, therefore all of the faults shown are presumed to be inactive.

Landslide deposits and debris avalanche scars that are too small to be delineated at this scale.

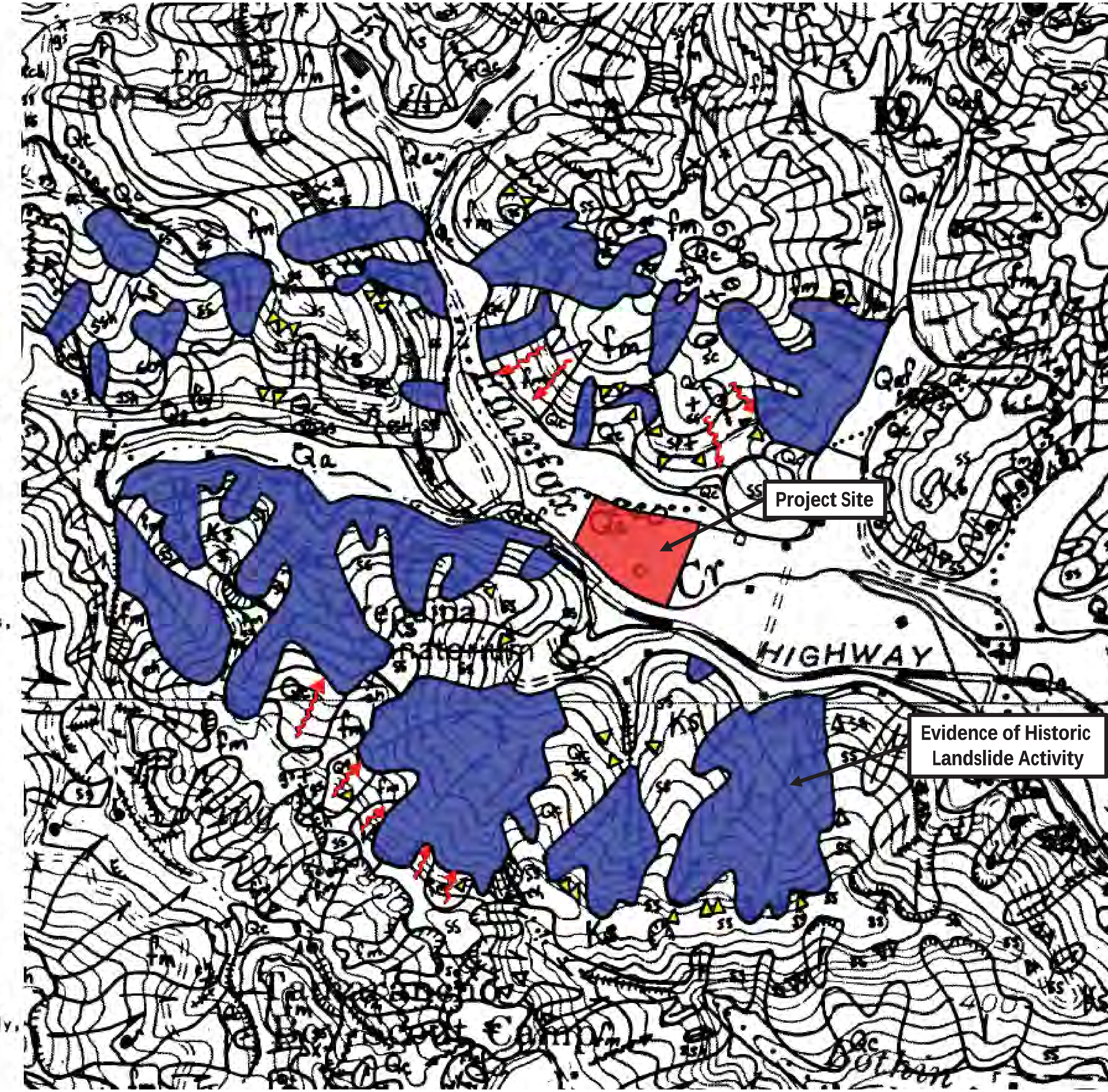
Slopes exhibiting evidence of continuous or intermittent downslope creep of surface zone. Boundaries of such zones commonly are obscure; however, attempts were made, where possible, to delineate the boundaries of the affected areas. Found principally within debris flow landslide deposits and within areas underlain by Franciscan melange. Evidence includes wrinkled topographic surfaces, leaning structures and trees that normally would be straight, tension cracks in soils, and cracked, sagged, or otherwise disrupted pavements and retaining walls.

Headwall scarps of block slump and debris flow landslides, and scars left at sources of soil and rock debris avalanches.

Gully; maximum depth given in feet.

DEBRIS FLOW LANDSLIDES. Predominantly deposits of unconsolidated and unsorted soil and rock debris (colluvium) that have moved downslope en masse or in increments by flow or creep processes. Slip surfaces in the base materials of these landslides are roughly planar and approximately parallel to the slope surface. Includes some soil and rock debris avalanche deposits that have accumulated outward from the base of slopes by rapid flow. Estimated maximum thickness in feet is indicated where such estimates could be made with reasonable confidence from surface observations.

BLOCK SLUMP LANDSLIDES. Masses of relatively intact to highly disrupted bedrock that have moved downslope by rotational slip along deep concave slip planes, or rarely, by translational slip along planar surfaces. Commonly flanked by, and succeeded downslope by, debris flow deposits.



Former Nursery Detention Basin Marin County, California	GEI Consultants	Site Landslide History
Marin County Flood Control and Water Conservation District San Rafael, California	Project 1610277	February 2017 Figure 2-5

Former Nursery Detention Basin Project

Field Investigation Report

Fairfax, California

Submitted to:

Marin County Flood Control and Water Conservation District
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February 2017
Project 1610277

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1. Introduction

1.1 Program Overview

GEI Consultants Inc. (GEI) is assisting the Marin County Flood Control and Water Conservation District (District) in a preliminary geotechnical evaluation of the Former Nursery Detention Basin Project (Project) site located in Fairfax, CA (Figure 1). The overall goal of the Project is to provide temporary storage of floodwaters for peak flow attenuation on Fairfax Creek. The investigation described herein provides site-specific information on the soil and groundwater conditions at the site to support preliminary geotechnical evaluations of project alternatives.

1.2 Purpose and Scope

The preliminary plan for the detention basin includes excavation of the site to lower the ground elevation by about 6 to 12 feet (to Elevation 224 ft NAVD88), and construction of an earthen dike on the downstream (eastern) boundary. Natural ground on the western side of the basin, and high ground on the northern and southern sides of the basin complete the perimeter impoundment. An earthen or concrete dam and outlet structure would be constructed in Fairfax Creek to regulate and control stream flows.

GEI has undertaken geotechnical explorations within the former nursery as part of a comprehensive assessment of the current conditions at the project site. The purpose of the explorations was to obtain information on environmental and geotechnical subsurface conditions and refine soil properties for engineering analyses.

This Field Investigation Report (FIR) summarizes data collection, subsurface investigations, and laboratory testing performed as part of this project. This report includes boring logs, laboratory test results, piezometer as-builts, transducer installation records, and a site plan showing exploration locations.

The scope of this geotechnical exploration program included:

- Background review of existing data;
- Completion of the geotechnical explorations utilizing auger boring methods;
- Construction of monitoring wells;
- Documentation of exploration locations and elevations;

- Preparation of boring logs and monitoring well construction as-builts;
- Environmental and geotechnical laboratory testing; and
- Installation of water level monitoring transducers in the monitoring wells.

A Geotechnical Report will be prepared by GEI as a companion to this FIR, which will evaluate the results of the environmental testing and will include seepage and stability analysis. It should be noted that future additional design-level explorations and analyses may be required to assist in the final design phase and the development of construction plans and specifications for the project components.

2. Site Conditions

2.1 Site Description

The Former Nursery Detention Basin site is a seven acre parcel previously used as a growing grounds for a retail landscaping nursery. Existing structures at the site include a 942 square foot (SF) sales office, 10,400 SF of shade structures, an 800 SF residence, 1,748 SF art gallery/studio, a well and water tank, a MMWD water service, and a septic tank system. Fairfax Creek flows from west to east in a natural channel in the southern portion of the parcel. The center portion of the parcel is relatively flat and the northern portion of the parcel is a steep hillside. The site is accessed across a bridge over Fairfax Creek from Sir Francis Drake Blvd.

2.2 Subsurface Conditions

Subsurface conditions within the Project extents are discussed below based on review of historic geologic mapping, site reconnaissance, and recent GEI explorations. Data collection details and methods are further discussed in Section 3 of this FIR.
The site is situated in the Coast Range province, along an east-west trending valley flanked to the north and south by relatively steep hillsides. The hills are Franciscan Complex, and appear to consist of mélange on the north side of the site, and variably deformed Cretaceous sandstone and shale on the south side of the site, south of Sir Francis Drake Blvd (Blake, 2000). The valley floor is filled with Quaternary alluvial and colluvial sediments of uncertain depths, which underlie the project site. Based on the slope of the adjacent hillsides, the sediment accumulations could be as thick as 100 to 150 feet in the deepest section of the valley. The alluvial sediments thin and pinch out or merge with Quaternary hillside slope deposits at the edges of the valley.

The subsurface conditions within the site consist of interbedded layers of gravel, sand, silt, and clay sediments extending beyond the depths explored in the central portion of the site, but overlying weathered bedrock near the flanks of the valley. The upper soil is commonly sand and gravel material to depths of about 5 feet, which is underlain by clayey soils. The thickness of the clay layer varies from approximately 15 feet in the middle of the site to 22.5 feet on the east side of the site. Sandy, gravelly sediments underlie the clay layer in some portions of the site. Groundwater was not encountered during this field investigation program, which was performed in early-August 2016.

3. Field Exploration

3.1 General

The field exploration program summarized in this report was performed as described in the *Subsurface Exploration Work Plan, Former Nursery Detention Basin* (Work Plan), dated August 2016 (GEI, 2016). The work plan was reviewed and approved by the District. Table 1 summarizes the subsurface explorations performed as part of this investigation. Figure 2 shows an aerial image of the former nursery, investigation locations, and other site features. Borings logs, monitoring well as-builts, laboratory test results, and transducer installation documentation are provided as Appendices A through D, respectively.

Prior to the beginning field investigations, the goals and challenges of the exploration program were identified through discussion and site reconnaissance with District staff and exploration subcontractors. Other significant considerations of the exploration program included:

- Project goals and objectives;
- Project Health and Safety Plan;
- The scope of field investigations;
- Sampling procedures and sample requirements;
- Exploration depth targets;
- Site access and contact information;
- Utility clearance and permits;
- Site security and noise;
- Backfill requirements;
- Disposal of cuttings; and
- Applicable standards.

3.2 Health and Safety

A project-specific Health and Safety Plan (HASP) was developed for the field investigation. Field personnel were given a health and safety briefing by the Project Manager, and attended health and safety tailgate meetings. Field personnel were also provided with specific guidelines and information about emergency action protocols, including the location of the closest emergency medical facility. Field personnel had no reportable incidents during field investigations.

3.3 County Drilling Permits

A Marin County "test hole/soil boring" permit was issued by the Environmental Health Services Department. The permit is applicable for one year, beginning on July 22, 2016. The permit requires that field operations follow all Marin County rules, regulations, Codes, laws and statutes as per County well drilling procedures. Copies of the applicable permits were provided in the Work Plan, and are also available upon request.

3.4 Utility Clearance

The locations were visually observed for the presence of overhead and underground utilities and then outlined in white paint as required by Underground Service Alert (USA). USA was then contacted a minimum of 48 hours before subsurface investigation of the site. A USA ticket number as well as the clearance date, expiration date and extension date were obtained for the work area and documented in the project file.

Prior to performing exploration activities at each location, the presence of underground utilities was also evaluated by Subtronic Corporation of Concord, CA, a private utility locator. In general, no major utility conflicts were encountered and each exploration could be performed at, or very close to, the planned location.

3.5 Field Program Description

The exploration program consisted of six borings, with monitoring wells constructed within three borings. Exploration locations and depths are summarized in Table 1, and are shown in Figure 2.

3.5.1 Exploration Methods

Vertical borings were drilled by Gregg Drilling and Testing, Inc. (Gregg) on August 3 and 4, 2016 using a truck-mounted drill rig with hollow-stem augers. GEI personnel coordinated the drilling program, logged the borings, collected and transported the soil samples, and observed the monitoring well installations.

Sampling of the subsurface material was performed using SPT (Standard Penetration Test) samplers, for both environmental and geotechnical samples, and Modified California (MC) barrel samplers in accordance with the procedures described in ASTM D 1586-11. Environmental samples were collected within three feet of the ground surface at explorations within the operational area of the former nursery using SPT and MC samplers with stainless steel liners. After environmental samples were collected, SPT geotechnical samples were driven at 2.5-foot intervals to the bottom depth of each exploration for soil classification and index testing.

Both the environmental and geotechnical SPT samplers had a 2-inch outside diameter with a 1.375-inch inside diameter shoe, but the environmental SPT sampler had a 1.5-inch inside diameter for use with 6-inch long stainless steel liners. The SPT geotechnical sampler had an inner diameter of 1.375-inches without liners. The MC sampler has a 2.5-inch outside diameter and 2-inch inside diameter with a 1.875-inch inside diameter shoe; this sampler was advanced with 6-inch long stainless steel liners.

Drive samples were attached to either AWJ or NWJ rod, and were driven using a 140-pound automatic trip hammer with a free fall of 30 inches. Due to mechanical issues that occurred with Gregg's drill rig during the project, a second rig was used to complete the geotechnical investigations. The drill rigs and associated hammer efficiencies are as follows:

- Rig D-26 (Mobile B-53) = 76% per testing on October 29, 2014; used for MW#1 and MW#3.

- Rig D-12 (Mobile B-61) = 69% per testing on March 2, 2016; used for MW#2, SB#1, SB#2, and SB#3.

The densities of coarse-grained soils were described in the field using the number of measured blow counts to drive an SPT sampler. Consistencies of fine-grained soils were based on pocket penetrometer measures, and evaluated qualitatively from measured blow counts.

3.5.2 Boring Logs

A field boring log was completed by the field logger for each boring drilled. Logs are included in Appendix A. The procedures for logging are described in detail in the Work Plan. Subsurface conditions observed in soil samples and drill cuttings or perceived through the performance of the drill rig (for example, ease/difficulty of drilling, rig chatter in gravel) were described in the "Remarks" column on the log. Besides descriptions of individual soil samples, boring logs indicate the tops and bottoms of soil layers. Descriptions were included for each soil layer, with horizontal lines drawn to separate subjacent layers.

3.5.3 Monitoring Wells

Three of the geotechnical borings were converted to open standpipe monitoring wells. Well locations are summarized on Table 1 and as-built details are included in Appendix B.

MW-1 and MW-2 were installed in 8-inch diameter borings with 2-inch diameter Schedule 40 polyvinyl chloride (PVC) blank casing and screen. MW-3 was installed in a 10-inch diameter boring with 4-inch diameter PVC blank casing and screen. The piezometers included a 15 to 16-foot well screen consisting of mill-slot (0.020 inch) PVC screen. Piezometer screens were surrounded by a 2 x 12 sand pack, extending from just below the transition seal to the bottom of the borehole. The sand was tremied in place through the hollow-stem augers, with a measuring tape in the hole to ensure bridging was not occurring, and tamped once in the hole. A 1-foot thick bentonite transition seal was placed above the sand pack, to prevent grout from infiltrating the sand pack. Bentonite chips were hydrated for at least 30 minutes prior to installation of the transition seal. Neat cement grout containing five percent powdered bentonite was installed above the transition seal, extending to within about one foot of the ground surface. Groundwater was not present at the time of installation, so the wells were not developed. However, because the wells were installed using hollow stem auger methods with no introduction of bentonite or other drilling fluids, the well screens are expected to be clean and free of significant sediment accumulation. A flush-mounted well vault was installed at the ground surface with sufficient rise to shed water and prevent ponding. The piezometers are protected with locking vault covers.

3.5.4 Exploration Completion and Site Restoration

For those soils borings not converted to monitoring wells, the drilling contractor sealed the borehole with a neat cement grout in accordance with Marin County Environmental Health standards and State Department of Water Resources Bulletin 74-81 and 74-90. All grout was mixed in batches using 55-gallon drums. The grout was placed in the boreholes through the augers, with the augers extending to the bottom of the boreholes. Grout levels were monitored during equipment tear-down at the work sites and any loss of grout was noted and grout was replaced.

Drill sites were cleaned and restored as closely as practicable to pre-drilling conditions. At the completion of drilling, all equipment and materials, tools and unused materials were removed and trash was disposed offsite.

3.6 Description and Classification of Soils

Soils were described in general accordance with ASTM D2487 and D2488 procedures and as outlined in the Work Plan. Soil descriptions are presented on the boring logs included in Appendix A.

3.7 Documentation of Exploration Locations

Field personnel used a handheld GPS unit to record boring and monitoring well locations in the field. GPS coordinates and spatial references in the field were used to position the exploration locations in a geographic information system (GIS). Topographic data for the site provided by the District was then used to estimate the ground surface elevations at these locations. The District provided LiDAR data was mostly assembled from surveys flown in April/May 2010 by the Golden Gate LiDAR project; the complete file for the County was initially assembled in 2011 and revised in 2013 (Version 6, dated December 18, 2013). Coordinates are provided in Table 1 and on the exploration logs in Appendix A. The locations are reported in feet using NAD83 California State Plane Zone II for the horizontal locations and NAVD88 for the elevations.

4. Laboratory Testing

4.1 Soil Testing

Laboratory tests were performed on selected soil samples from boreholes to obtain information about the environmental and geotechnical characteristics of subsurface soil. The laboratory testing program was developed based on the purpose of the project and review of information generated during subsurface investigations.

Environmental and geotechnical laboratory testing was performed by Curtis & Tompkins in Berkeley, California and Cooper Testing Laboratory in Palo Alto, California, respectively. Environmental testing results were used to assess the presence and distribution of naturally – occurring and manmade constituents in soils at the site. Geotechnical testing results were used to refine soils descriptions and material classifications. Laboratory test results are discussed below and summarized in Tables 2 and 3. The laboratory testing reports are provided in Appendix C. Geotechnical test results are also included on the boring logs in Appendix A.

4.1.1 Environmental Testing

Environmental laboratory testing of soil samples included the following tests.

- Total Organic Carbon, SM 5310C
- Metals, EPA 6010B
- Volatile Organic Compounds, EPA 8260
- Semivolatile Organic Compounds, EPA 8270
- Polychlorinated Biphenyls, EPA 8082
- Organochlorine Pesticides, EPA 8081A

According to the results of laboratory testing, there were some low detections of VOCs, SVOCs, and organochlorine pesticide constituents at the site, but none exceeded the San Francisco Bay Regional Water Quality Control Board (SFRWQCB) Environmental Screening Levels (ESLs), rev. 3, February 2016. Metals concentrations were generally consistent across the site, with slightly elevated levels of arsenic, chromium, and nickel above the ESLs. However, these metals are common to the region and typical of background values.

As discussed in Section 10.2 of the *ESL User's Guide*, arsenic concentrations in site soils typically exceed risk-based screening levels by one or more orders of magnitude. In many situations, this is due to naturally occurring background concentrations. Duvergé (2011) conducted a study of regional background concentrations of arsenic in undifferentiated urbanized flatland soils and proposed an upper estimate for background arsenic (99th percentile) of 11 mg/kg in the San Francisco Bay Area. This value can be used, as appropriate, in consultation with the overseeing regulatory agency.

Similar to Arsenic, other metals such as chromium and nickel can also be present in regional soils at background levels exceeding the ESLs. SFRWQCB's *Draft Technical Reference Document, Characterization and Reuse of Soil from Multiple Sources for Maintenance of Levees Adjacent to Aquatic Environment*, dated August 1, 2006, provides recommendations for reuse of local soil for levee projects. Including in the recommendations are screening thresholds for various analytes which are generally based on ambient values statistically derived from locally-collected data. The recommend ambient concentrations for arsenic, chromium, and nickel are higher than those listed in the ESLs (Arsenic = 15.3 mg/kg, Chromium = 112 mg/kg, Nickel = 112 mg/kg), and are consistent with concentrations encountered at the site.

4.1.2 Geotechnical Testing

Geotechnical laboratory testing of soil samples included the following index tests.

- Sieve analysis, ASTM D 422
- Atterberg Limits, ASTM D 4318

Index testing of soil samples collected from the Former Nursery site indicate fines content (i.e. silt and clay content) ranges from 14% to 61%, but field classification of samples in some areas indicate soils with higher fines content may also be present. Gravel content ranged from 0% to 48.6% and sand content ranged from 31% to 63%. The maximum particle size of gravel was approximately 1-inch. Plasticity indices ranged from 7 to 26 and liquid limits ranged from 23 to 47, indicating a mixture of silty and clayey fines.

An evaluation of site soils for reuse as borrow will be presented in the forthcoming Geotechnical Report.

5. Quality Assurance and Quality Control

Quality Assurance/Quality Control (QA/QC) was performed on all work products (deliverables) at the project and task level. QA/QC procedures were performed under the direction of the Project Manager. QA/QC was also performed on all subcontractor deliverables.

5.1 Hammer Energy Measurement

To ensure the consistency of data collected from SPTs, which are critical to liquefaction evaluation, the drilling subcontractor performed SPT energy measurements on SPT hammers to evaluate the energy that each hammer delivered. Hammer calibrations for the two drilling rigs equipped with automatic trip hammers utilized for this project were conducted in accordance with ASTM D 4633. The drill rigs and associated hammer efficiencies are as follows:

- Rig D-26 (Mobile B-53) = 76% per testing on October 29, 2014; used for MW#1 and MW#3.
- Rig D-12 (Mobile B-61) = 69% per testing on March 2, 2016; used for MW#2, SB#1, SB#2, and SB#3.

5.2 Boring Logs

Borings were logged in the field by engineers in general accordance with ASTM and California State guidelines. Boring logs for this project were created by carrying out the following QC steps:

- Entering field sampling details and soil descriptions on boring logs.
- The Project Manager and other geotechnical staff performing QC checks on field logs.
- Preparing draft gINT (Version 8) logs based on checked field logs.
- Engineering staff reviewing laboratory test results to gauge conformance with field boring logs.
- Refining boring log soil classifications and descriptions where appropriate based on laboratory test results.
- Geotechnical staff reviewing updated gINT boring logs

All gINT work was carried out by the project team's staff engineers and geologists. The gINT logs were taken through various levels of checks by the field loggers, the project team's engineers/geologists responsible for the gINT input, and the Project Manager.

5.3 Laboratory Testing and Test Results

While the laboratory testing was in progress, results were reviewed as they became available, maintained regular coordination with the laboratory representatives, addressed questions posed by laboratory representatives and provided additional instructions as necessary.

Laboratory index test results were reviewed by project team to gauge conformance with field boring logs. If laboratory results were in conflict with the field boring log information, the matter was typically resolved through a visual check and classification of a sample of the soil in question by the Project Manager and Field Logger.

5.4 Report

QA was performed on all deliverables and consisted of independent technical review (ITR), audits, documentation, and reporting. QC was also performed on all deliverables and included tasks, such as detail checking, computer program documentation, and nonconformance and corrective action documentation. QC was performed under the direction of the Project Manager.

6. Limitations

This geotechnical report, associated data collection and preparation have been performed in accordance with the standard of care commonly used as the state-of-practice in the engineering profession. Standard of care is defined as the ordinary diligence exercised by fellow practitioners in this area performing the same services under similar circumstances during the same period.

Discussions of subsurface conditions summarized in this report are based on subsurface soil and groundwater conditions at limited exploration locations. Variations in subsurface conditions may exist between exploration locations, and the project team may not be able identify all adverse conditions in the levee and/or its foundation.

No warranty, either expressed or implied, is made in the furnishing of this report. The project team makes no warranty that actual encountered site and subsurface conditions will exactly conform to the conditions described herein, nor that this report's interpretations and recommendations will be sufficient for all construction planning aspects of the work. The design engineer and/or contractor should perform a sufficient number of independent explorations and tests as they believe necessary to verify subsurface conditions rather than relying solely on the information presented in this report.

Data presented in this report are time-sensitive in that they apply only to locations and conditions existing at the time of the exploration and preparation of this report. Data should not be applied to any other projects in or near the area of this study nor should they be applied at a future time without appropriate verification.

This report is for the use and benefit of Marin County Flood Control and Water Conservation District. Use by any other party is at their own discretion and risk.

This report is one of multiple documents describing work completed. It will be supplemented with other reports presenting evaluations of this information.

7. References

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ASTM. 2010. *D 4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.* ASTM International.

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ASTM. 2007. *D 422 – 63, Standard Test Method for Particle-Size Analysis of Soils.* ASTM International.

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SFBRWQCB, 2016. *User's Guide: Derivation and Application of Environmental Screening Levels (ESLs).* San Francisco Bay Regional Water Quality Control Board. Interim Final 2016. February 2016.

State of California, Department of Water Resources, Division of Flood Management. 2006. *Soil and Rock Logging, Classification, Description, and Presentation Manual*. December 6, and revised February 2008 (September 2009).

Tables

Table 1 - Subsurface Exploration Summary
Former Nursery Detention Basin Project, Marin County Flood Control and Water Conservation District

Boring ID	Description	Date Started	Date Completed	Latitude	Longitude	Existing Ground Elev. (feet)[1]	Boring Depth (feet)	Screen Interval Length (feet)
MW#1	8” auger boring with 2" well	8/3/2016	8/3/2016	38.002706	-122.610379	233.9	21.2	15
MW#2	8” auger boring with 2" well	8/4/2016	8/4/2016	38.002290	-122.610757	234.6	22.3	16
MW#3	8” auger boring reamed to 10” and 4" well	8/3/2016	8/4/2016	38.002185	-122.610332	232.9	21.5	15
SB#1	6” auger boring	8/4/2016	8/4/2016	38.001803	-122.609618	229.6	29	--
SB#2	6” auger boring	8/4/2016	8/4/2016	38.001257	-122.60978	235.6	31.5	--
SB#3	2” to 2.5” driven samplers	8/4/2016	8/4/2016	38.002569	-122.61063	234.9	3	--

Notes:

[1]Existing Ground Elevations (ft) obtained from MCFCWD LiDAR assembled in 2011 and revised in 2013 (6th edition, dated 12/18/2013)

Table 2. Summary of Analytical Soil Testing Results, Former Nursery Detention Basin

Marin County Flood Control and Water Conservation District

Analyte	San Francisco Bay Regional Water Quality Control Board Environmental Screening Levels (1)		Test Result (2)			
	Direct Exposure Human Health Risk Level - Res: Shallow Soil Exposure	Tier 1 ESL (3)	MW #1	MW #2	MW #3	SB #3
Volitile Organic Compounds (µg/kg)						
Toluene	970,000	2,900	0.9	ND	ND	ND
Semivolitile Organic Compounds (µg/kg)						
2-Methylnaphthalene	240,000	250	ND	ND	ND	12
Phenanthrene	--	11,000	13	11	14	28
bis(2-Ethylhexyl)phthalate	39,000	39,000	67	11	39	68
Organochlorine Pesticides (µg/kg)						
Heptachlor epoxide	67	0.42	7.3	ND	ND	ND
4,4'-DDE	1,900	1,900	58	ND	ND	ND
4,4'-DDD	2,700	2,700	6	ND	ND	ND
4,4'-DDT	1,900	1,900	110	ND	ND	ND
alpha-Chlordane	480 (4)	480 (4)	33	ND	ND	ND
gamma-Chlordane			33	ND	ND	ND
Metals (mg/kg)						
Antimony	31	31	0.21	0.23	0.20	0.13
Arsenic	0.07	0.07	8.1	7.8	7.6	5.8
Barium	15,000	3,000	210	200	440	170
Beryllium	150	42	0.55	0.55	0.59	0.55
Cadmium	39	39	0.130	0.090	0.057	0.080
Chromium	0.3 (5)	0.3 (5)	100	110	95	68
Cobalt	23	23	20	19	22	17
Copper	3,100	3,100	39	28	39	29
Lead	80	80	15	9.5	11	10
Mercury	13	13	ND	0.17	0.25	0.66
Molybdenum	390	390	0.35	0.21	0.79	0.44
Nickel	820	86	140	120	130	89
Selenium	390	390	0.20	0.19	0.19	0.14
Silver	390	390	0.050	0.050	0.040	0.063
Thallium	1	1	0.066	0.055	0.070	0.057
Vanadium	390	390	54	54	59	44
Zinc	23,000	23,000	85	72	80	62
Total Organic Carbon (%)						
Total Organic Carbon	--	--	1.00	0.86	0.42	0.43

(1) *Environmental Screening Levels, San Francisco Bay Regional Water Quality Contol Board,* February 2016 (Rev. 3)

(2) ND = Not Detected

(3) Tier 1 ESLs are used for protecting sites with unrestricted land and water use, shallow soil contamination, shallow groundwater, and permeable soil per *ESL Users Guide, SFRWQCB, February 22, 2016*

(4) sum Chlordane concentration

(5) ESL for Chromium VI

Table 3 - Summary of Geotechnical Soil Testing Results
Former Nursery Detention Basin Project, Marin County Flood Control and Water Conservation District

Boring ID	Depth (ft)	Sample No.	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	% Gravel	% Sand	% Fines
MW#1	1.5	Composite[1]				9.5	7.5	36.9	55.6
	7.5	S05A	30	19	11	19	7.5	31.2	61.3
MW#2	1.5	Composite[2]				19	18.4	47.4	34.2
	5.0	S04A	24	0	24	4.75	0	61.7	38.3
	12.5	S07A	32	20	12				
	20.0	S10A				25	34.7	48.3	17
MW#3	1.5	Composite[3]				25	29.3	51	19.7
	5.0	S04A	23	16	7	25	42.1	42.9	15
	12.5	S07A	32	19	13	9.5	0.4	42.4	57.2
	15.0	S08A	31	18	13	25	48.6	31.8	19.6
SB#1	5.0	S03A	29	19	10				
	10.0	S05A	31	20	11				
	12.5	S06A	25	18	7	2	0	53.3	46.7
	22.5	S10A	27	18	9	25	34.2	49.2	16.6
	27.5	S12A				25	36.2	49.8	14
SB#2	0.0	S01A	26	18	8	19	19.5	51.1	29.4
	7.5	S04A				19	12.6	62.7	24.7
	12.5	S06A	27	18	9				
	27.5	S12A	47	21	26				
SB#3	1.5	Composite[4]				19	27.5	39.6	32.9

Notes:

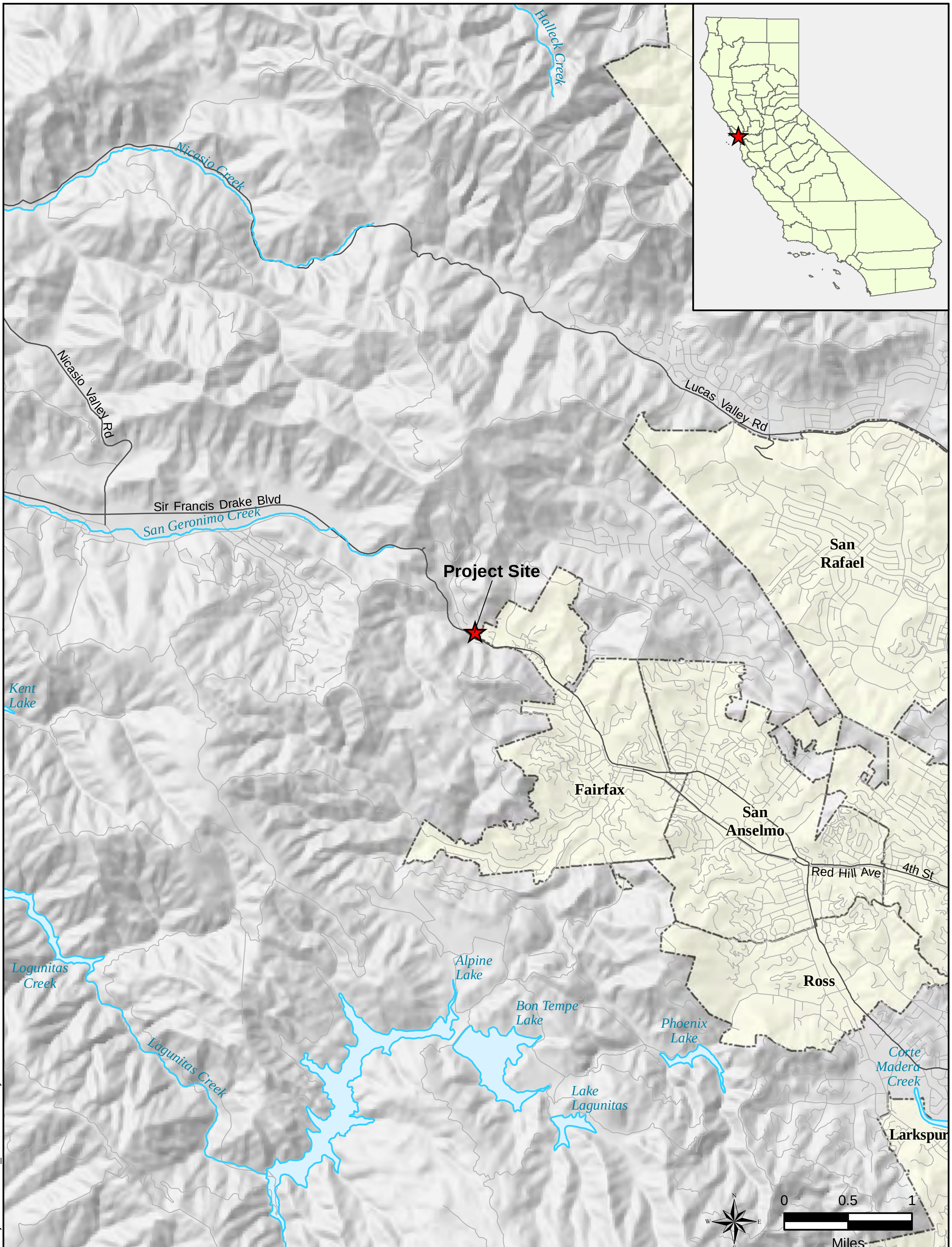
[1]Lab testing on combined sample (S01B, S01A, S02B, S02A, S03B, and S03A)

[2]Lab testing on combined sample (S01B, S01A, S02B, S02A, S03B, and S03A)

[3]Lab testing on combined sample (S01B, S01A, S02A, S03C, S03B, and S03A)

[4]Lab testing on combined sample (S01C, S01B, S01A, S02B, S02A, and S03A)

Figures



Former Nursery Detention Basin Fairfax, California	GEI Consultants	Site Vicinity	
County of Marin Flood Control and Water Conservation District		FEBRUARY 2017	FIGURE 1

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Former Nursery Detention Basin Project
Fairfax, California

County of Marin Flood Control and Water Conservation District

GEI Consultants

SITE PLAN

FEBRUARY 2017

FIGURE 2

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Appendix A

Boring Logs

BORING LOG LEGEND

SOIL DESCRIPTION

- CA - CHEMICAL ANALYSIS (CORROSIVITY)
- CD - CONSOLIDATED DRAINED TRIAXIAL
- CN - CONSOLIDATION
- CU - CONSOLIDATED UNDRAINED TRIAXIAL
- DS - DIRECT SHEAR
- PP - Q_p FROM POCKET PENETROMETER
- TV - S_u FROM TORVANE
- RV - R-VALUE

PENETRATION RESISTANCE
(RECORDED AS BLOWS / 0.5 FT)

SAND & GRAVEL		SILT & CLAY		
RELATIVE DENSITY	BLOWS/FOOT*	CONSISTENCY	BLOWS/FOOT*	COMPRESSIVE STRENGTH (TSF)
VERY LOOSE	0 - 4	VERY SOFT	0 - 2	0 - 0.25
LOOSE	4 - 10	SOFT	2 - 4	0.25 - 0.50
MEDIUM DENSE	10 - 30	FIRM	4 - 8	0.50 - 1.0
DENSE	30 - 50	STIFF	8 - 15	1.0 - 2.0
VERY DENSE	OVER 50	VERY STIFF	15 - 30	2.0 - 4.0
		HARD	OVER 30	OVER 4.0

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

SAMPLE TYPES

- Auger Cutting
- Grab Sample
- California Sample
- Modified California Sample
- 2.5" Modified California Sample
- Core Sample
- Split Spoon Sample
- Direct Push Sample
- Sonic Sample
- Undisturbed Sample
- Field Vane Shear
- Punch Core Sample

ADDITIONAL TESTS

- CA - CHEMICAL ANALYSIS (CORROSIVITY)
- CD - CONSOLIDATED DRAINED TRIAXIAL
- CN - CONSOLIDATION
- CU - CONSOLIDATED UNDRAINED TRIAXIAL
- DS - DIRECT SHEAR
- PP - POCKET PENETROMETER (TSF)
- (3.0) - (WITH SHEAR STRENGTH IN KSF)
- RV - R-VALUE
- SA - SIEVE ANALYSIS: % PASSING #200 SIEVE
- ▽ - WATER LEVEL (WITH DATE OF) MEASUREMENT
- (200) - (WITH % PASSING NO. 200 SIEVE
- SW - SWELL TEST
- TC - CYCLIC TRIAXIAL
- TV - TORVANE SHEAR
- UC - UNCONFINED COMPRESSION
- (1.5) - (WITH SHEAR STRENGTH IN KSF)
- UU - UNCONSOLIDATED UNDRAINED TRIAXIAL
- WA - WASH ANALYSIS
- (200%) - (WITH % PASSING NO. 200 SIEVE)

UNIFIED SOIL CLASSIFICATION (ASTM D-2487-98)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES			GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	Cu>4 AND 1<Cc<3	GW	WELL-GRADED GRAVEL
			Cu>4 AND 1>Cc>3	GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR CL	GM	SILTY GRAVEL
			FINES CLASSIFY AS CL OR CH	GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	Cu>6 AND 1<Cc<3	SW	WELL-GRADED SAND
			Cu>6 AND 1>Cc>3	SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	FINES CLASSIFY AS ML OR CL	SM	SILTY SAND
			FINES CLASSIFY AS CL OR CH	SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	PI>7 AND PLOTS>"A" LINE	CL	LEAN CLAY
			PI>4 AND PLOTS<"A" LINE	ML	SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	PI PLOTS >"A" LINE	CH	FAT CLAY
			PI PLOTS <"A" LINE	MH	ELASTIC SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR		PT	PEAT

CLIENT: Marin County Flood Control & Water Conservation District
PROJECT NAME: Former Nursery Detention Basin
CITY/STATE: Fairfax, California
GEI PROJECT NUMBER: 1610277

GEI Consultants
GEI Consultants, Inc.
180 Grand Avenue Suite 1410
Oakland, CA 94612
(510) 350-2900

Boring Location

LATITUDE: 38.002706 **LONGITUDE:** -122.610379 **STATION:** - **OFFSET (FT):** -

HORIZONTAL DATUM: NAD 83 **STATION CENTERLINE:** -

VERTICAL DATUM: NAVD 88 **GROUND SURFACE ELEVATION (FT):** 233.9

LOCATION: Former Nursery Site

BORING

MW#1

PAGE 1 of 1

Drilling Information

DATE START / END: 8/3/2016 - 8/3/2016 **TOTAL DEPTH (FT):** 21.2

CONTRACTOR: Gregg Drilling & Testing **DRILLER:** E. Santellan **LOGGED BY:** T. Haynes

EQUIPMENT: Mobile B-53 (Gregg Rig No. D-26) **BORING METHOD:** Hollow Stem Auger

AUGER ID/OD: OD - 8-inch **CASING ID/OD:** N/A / N/A **DRILL ROD TYPE/SIZE:** Drill Rod Type - NWJ

HAMMER TYPE: Automatic Hammer **HAMMER WEIGHT (lbs):** 140 **HAMMER DROP (inch):** 30

WATER LEVEL DEPTHS (ft): Not Encountered **HAMMER ENERGY MEASUREMENT (%):** 76

GENERAL NOTES:

ABBREVIATIONS: ID = Inside Diameter; OD = Outside Diameter; Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot; S = Split Spoon; DP = Direct Push Sample; U = Undisturbed Tube Sample; C = Rock Core; V = Field Vane Shear; SC = Sonic Core; WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; OVM = Organic Vapor Meter; Q_P = Pocket Penetrometer Strength; S_v = Pocket Torvane Shear Strength; F_v = Field Vane Shear Strength; NA, NM = Not Applicable, Not Measured

Elev. (ft)	Depth (ft)	Type	Sample No.	Pen./ Rec. (in)	Blows per 6 in. [bpf] / {N60}	Field Test Data (tsf)	GRAPHIC LOG	Sample Description & Classification	Moisture Content (%)	Dry Density (pcf)	Fines % <#200	LL	PI	Remarks
			S01B, S01A	18/12	10 10 11 [21]/ {27}	Q_P=>4.5		Lean CLAY (CL); hard; light olive brown (2.5Y 5/3); dry to moist; >95% medium plasticity, high dry strength, no to slow dilatency, medium toughness fines; <5% fine sand; trace fine gravel.			56			Lab testing on combined sample (S01B, S01A, S02B, S02A, S03B, and S03A)
			S02B, S02A	18/12	6 9 10 [19]/ {24}			Clayey GRAVEL with Sand (GC); medium dense; olive brown (2.5Y 4/4); dry to moist; 40% fine, subangular gravel, max. size 1/2-in.; 30% fine to coarse sand; 30% low plasticity fines.						Additional sampler (Samples S03B and S03A) driven from 0.0 to 1.5 feet for environmental sample approx. 1 foot east of boring
230	5		S04A	18/7	2 3 5 [8]/ {10}			Sandy Lean CLAY (CL); medium stiff; very dark gray (7.5YR 3/1) mottled with orange; moist; 61% high dry strength, no dilatency, medium toughness fines; 31% fine to coarse sand; 8% fine gravel.						
			S05A	18/6	2 2 4 [6]/ {8}	Q_P=0.75					61	30	11	
225	10		S06A	18/7	4 5 7 [12]/ {15}	Q_P=0.75								
			S07B, S07A	18/6	6 11 18 [29]/ {37}	Q_P=2.75 Q_P=4.25		Below 13 feet: very stiff to hard.						
220	15		S08A	18/6	15 16 20 [36]/ {46}									
			S09A	9/7	40 50/4"			CLAYSTONE; light gray; intensely weathered to decomposed; very weak.						
215	20			2/0	50/2"									
210	25							End of Boring at 21.2 feet.						
205														

Strata lines represent the approximate boundaries between soil types. Actual transitions may be gradual. Water level readings have been made at times stated. Water levels may be different at other times.

CLIENT: Marin County Flood Control & Water Conservation District

PROJECT NAME: Former Nursery Detention Basin

CITY/STATE: Fairfax, California

GEI PROJECT NUMBER: 1610277

GEI Consultants

Boring Location		**BORING**
LATITUDE: 38.002290 **LONGITUDE:** -122.610757	**STATION:** - **OFFSET (FT):** -	**MW#2**
HORIZONTAL DATUM: NAD 83	**STATION CENTERLINE:** -	**PAGE 1 of 1**
VERTICAL DATUM: NAVD 88	**GROUND SURFACE ELEVATION (FT):** 234.6	
LOCATION: Former Nursery Site		

Drilling Information

DATE START / END: 8/4/2016 - 8/4/2016		**TOTAL DEPTH (FT):** 22.3
CONTRACTOR: Gregg Drilling & Testing	**DRILLER:** E. Santellan	**LOGGED BY:** T. Haynes
EQUIPMENT: Mobile B-61 (Gregg Rig No. D-12)		**BORING METHOD:** Hollow Stem Auger
AUGER ID/OD: OD - 8-inch	**CASING ID/OD:** N/A / N/A	**DRILL ROD TYPE/SIZE:** Drill Rod Type - AWJ
HAMMER TYPE: Automatic Hammer	**HAMMER WEIGHT (lbs):** 140	**HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): Not Encountered		**HAMMER ENERGY MEASUREMENT (%):** 69
GENERAL NOTES:		

ABBREVIATIONS:

ID = Inside Diameter	bpf = Blows per Foot	U = Undisturbed Tube Sample	WOR = Weight of Rods	Q_P = Pocket Penetrometer Strength
OD = Outside Diameter	mpf = Minute per Foot	C = Rock Core	WOH = Weight of Hammer	S_v = Pocket Torvane Shear Strength
Pen. = Penetration Length	S = Split Spoon	V = Field Vane Shear	RQD = Rock Quality Designation	F_v = Field Vane Shear Strength
Rec. = Recovery Length	DP = Direct Push Sample	SC = Sonic Core	OVM = Organic Vapor Meter	NA, NM = Not Applicable, Not Measured

Elev. (ft)	Depth (ft)	Type	Sample No.	Pen./ Rec. (in)	Blows per 6 in. [bpf] / {N60}	Field Test Data (tsf)	Sample Description & Classification	Moisture Content (%)	Dry Density (pcf)	Fines % <#200	LL	PI	Remarks
			S01B, S01A	18/14	18 10 7 [17]/ {20}		Clayey SAND with Gravel (SC); loose to medium dense; light olive brown (2.5Y 5/3); dry; 47% fine to coarse sand; 34% low plasticity fines; trace rootlets at surface; 18% fine, subangular gravel, max. size 3/4-in.						Lab testing on combined sample (S01B, S01A, S02B, S02A, S03B, and S03A) Additional sampler (Samples S03B and S03A) driven from 1.5 to 3.0 feet for environmental sample approx. 1 foot northwest of boring
			S02B, S02A	18/12	4 4 4 [8]/ {9}					34			
230	5		S04A	18/6	2 2 2 [4]/ {5}	Q_P=<0.5	Silty SAND (SM); loose; dark yellowish brown (10YR 3/6); moist; 62% fine sand; 38% slow dilatency, low to medium toughness fines.			38	24	NP	
			S05A	18/5	2 2 3 [5]/ {6}								
225	10		S06A	18/10	1 2 2 [4]/ {5}	Q_P=0.5	Lean CLAY (CL); soft; very dark grayish brown (2.5Y 3/2); moist; 95% medium to high dry strength, no dilatency, medium toughness fines; 5% fine sand; trace fine gravel/coarse sand.						
			S07A	18/10	2 4 7 [11]/ {13}	Q_P=1.25	Below 13 feet: stiff.				32	12	
220	15		S08B, S08A	18/10	2 3 5 [8]/ {9}		Sandy Lean CLAY (CL); dark grayish brown (2.5Y 4/2); moist; 60% low to medium plasticity, no to slow dilatency, medium toughness fines; 40% fine sand.						
			S09A	18/9	4 5 8 [13]/ {15}	Q_P=4.5	Clayey SAND with Gravel (SC); medium dense; dark yellowish brown (10YR 3/4); moist; 48% fine to coarse sand; 35% fine to coarse, subangular gravel; 17% low to medium plasticity fines.						
215	20		S10A	18/11	5 8 9 [17]/ {20}	Q_P=3				17			
							End of Boring at 22.3 feet.						
210	25												
205													

Strata lines represent the approximate boundaries between soil types. Actual transitions may be gradual. Water level readings have been made at times stated. Water levels may be different at other times.

CLIENT: Marin County Flood Control & Water Conservation District
PROJECT NAME: Former Nursery Detention Basin
CITY/STATE: Fairfax, California
GEI PROJECT NUMBER: 1610277

GEI Consultants

Boring Location

LATITUDE: 38.002185 **LONGITUDE:** -122.610332 **STATION:** - **OFFSET (FT):** -
HORIZONTAL DATUM: NAD 83 **STATION CENTERLINE:** -
VERTICAL DATUM: NAVD 88 **GROUND SURFACE ELEVATION (FT):** 232.9
LOCATION: Former Nursery Site

BORING

MW#3

Drilling Information

DATE START / END: 8/3/2016 - 8/4/2016 **TOTAL DEPTH (FT):** 21.5
CONTRACTOR: Gregg Drilling & Testing **DRILLER:** E. Santellan **LOGGED BY:** T. Haynes
EQUIPMENT: Mobile B-53 (Gregg Rig No. D-26) **BORING METHOD:** Hollow Stem Auger
AUGER ID/OD: OD - 8-inch, 10-inch **CASING ID/OD:** N/A / N/A **DRILL ROD TYPE/SIZE:** Drill Rod Type - NWJ
HAMMER TYPE: Automatic Hammer **HAMMER WEIGHT (lbs):** 140 **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): Not Encountered **HAMMER ENERGY MEASUREMENT (%):** 76
GENERAL NOTES:

ABBREVIATIONS:
ID = Inside Diameter; OD = Outside Diameter; Pen. = Penetration Length; Rec. = Recovery Length
bpf = Blows per Foot; mpf = Minute per Foot; S = Split Spoon; DP = Direct Push Sample
U = Undisturbed Tube Sample; C = Rock Core; V = Field Vane Shear; SC = Sonic Core
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; OVM = Organic Vapor Meter
Q_P = Pocket Penetrometer Strength; S_v = Pocket Torvane Shear Strength; F_v = Field Vane Shear Strength; NA, NM = Not Applicable, Not Measured

Elev. (ft)	Depth (ft)	Type	Sample No.	Pen./ Rec. (in)	Blows per 6 in. [bpf] / {N60}	Field Test Data (tsf)	GRAPHIC LOG	Sample Description & Classification	Moisture Content (%)	Dry Density (pcf)	Fines % <#200	LL	PI	Remarks
			S01B, S01A	18/12	16 4 8 [12]/ {15}			Silty, Clayey SAND with Gravel (SC-SM); loose to medium dense; dark brown (10YR 3/3); dry to moist; 51% fine to coarse sand; 29% fine to coarse, subangular gravel; 20% fines.			20			Lab testing on combined sample (S01B, S01A, S02A, S03C, S03B, and S03A) Additional sampler (Sample S02A) driven from 0.0 to 1.5 feet for environmental sample approx. 1 foot southeast of boring
230			S03C, S03B, S03A	18/18	4 5 5 [10]/ {13}			Below 2.7 feet: moist.						
	5		S04A	18/8	7 6 4 [10]/ {13}			Below 5 feet: 43% sand; 42% gravel; 15% fines.			15	23	7	
225			S05A	18/10	1 1 1 [2]/ {3}	Q_P=<0.5		Lean CLAY (CL); very soft to soft; very dark gray (7.5YR 3/1) mottled with orange; moist; 90% low to medium plasticity, medium to high dry strength, no dilatency, low to medium toughness fines; 10% fine sand.						
	10		S06A	18/5	0 1 1 [2]/ {3}	Q_P=<0.5								
220			S07A	18/12	0 1 2 [3]/ {4}	Q_P=<0.5		Sandy Lean CLAY (CL); very soft to soft; very dark gray (7.5YR 3/1) mottled with orange; moist; 57% no dilatency, low to medium toughness fines; 42% fine to coarse sand; 1% fine gravel.			57	32	13	
	15		S08A	18/8	5 7 9 [16]/ {20}	Q_P=3.5		Clayey GRAVEL with Sand (GC); medium dense; dark brown (10YR 3/3) mottled with red and orange; moist to wet; 49% fine to coarse, subangular gravel, max. size 1-in.; 32% fine to coarse sand; 20% medium toughness fines.			20	31	13	
215			S09A	18/6	4 7 7 [14]/ {18}									
	20		S10A	18/11	4 6 10 [16]/ {20}	Q_P=2.5								
210								End of Boring at 21.5 feet. Reemed borehole with 10-inch auger for well installation.						
	25													
205														

Strata lines represent the approximate boundaries between soil types. Actual transitions may be gradual. Water level readings have been made at times stated. Water levels may be different at other times.

CLIENT: Marin County Flood Control & Water Conservation District
PROJECT NAME: Former Nursery Detention Basin
CITY/STATE: Fairfax, California
GEI PROJECT NUMBER: 1610277

GEI Consultants

Boring Location

LATITUDE: 38.001803 LONGITUDE: -122.609618 STATION: - OFFSET (FT): -
HORIZONTAL DATUM: NAD 83 STATION CENTERLINE: -
VERTICAL DATUM: NAVD 88 GROUND SURFACE ELEVATION (FT): 229.6
LOCATION: Former Nursery Site

BORING **SB#1** PAGE 1 of 1

Drilling Information

DATE START / END: 8/4/2016 - 8/4/2016 TOTAL DEPTH (FT): 29.0
CONTRACTOR: Gregg Drilling & Testing DRILLER: E. Santellan LOGGED BY: T. Haynes
EQUIPMENT: Mobile B-61 (Gregg Rig No. D-12) BORING METHOD: Hollow Stem Auger
AUGER ID/OD: OD - 6-inch CASING ID/OD: N/A / N/A DRILL ROD TYPE/SIZE: Drill Rod Type - AWJ
HAMMER TYPE: Automatic Hammer HAMMER WEIGHT (lbs): 140 HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): Not Encountered HAMMER ENERGY MEASUREMENT (%): 69
GENERAL NOTES:

ABBREVIATIONS: ID = Inside Diameter; OD = Outside Diameter; Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot; S = Split Spoon; DP = Direct Push Sample; U = Undisturbed Tube Sample; C = Rock Core; V = Field Vane Shear; SC = Sonic Core; WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; OVM = Organic Vapor Meter; Q_P = Pocket Penetrometer Strength; S_v = Pocket Torvane Shear Strength; F_v = Field Vane Shear Strength; NA, NM = Not Applicable, Not Measured

Elev. (ft)	Depth (ft)	Type	Sample No.	Pen./ Rec. (in)	Blows per 6 in. [bpf] / {N60}	Field Test Data (tsf)	Sample Description & Classification	Moisture Content (%)	Dry Density (pcf)	Fines % <#200	LL	PI	Remarks
		X	S01A	18/11	11 7 5 [12]/ {14}		Lean CLAY (CL); stiff; dark brown (7.5YR 3/2); dry to moist; 90% low plasticity, no dilatency, medium toughness fines; 10% fine, trace coarse sand; trace rootlets/plant fibers.						
		X	S02B, S02A	18/7	6 5 4 [9]/ {10}		Lean CLAY (CL); stiff; dark yellowish brown (10YR 3/4) speckled with orange and red; moist; 95% no dilatency, medium toughness fines; 5% fine sand; trace organics.						
225	5	X	S03A	18/6	4 5 4 [9]/ {10}	Q_P=2.5	Below 5 feet: stiff to very stiff.				29	10	
		X	S04A	18/4	3 4 6 [10]/ {12}	Q_P=2	Lean CLAY (CL/CH); stiff to very stiff; dark olive brown (2.5Y 3/3); moist; >95% medium plasticity, no dilatency, medium to high toughness fines; <5% fine sand.						
220	10	X	S05A	18/8	3 3 3 [6]/ {7}	Q_P=0.75	Lean CLAY (CL); medium stiff; very dark grayish brown (2.5Y 3/2) mottled with orange; moist; >95% no dilatency, medium toughness fines; <5% fine sand.				31	11	
		X	S06A	18/10	0 0 0 [0]/ {0}		Silty, Clayey SAND (SC-SM); very loose; dark olive brown (2.5Y 3/3); moist; 53% fine sand; 47% slow dilatency, medium toughness fines.			47	25	7	
215	15	X	S07A	18/7	1 1 2 [3]/ {3}	Q_P=<0.5	Lean CLAY (CL); soft; very dark grayish brown (2.5Y 3/2) mottled with orange; moist; 95% low plasticity, no dilatency, low to medium toughness fines; 5% fine sand.						
		X	S08A	18/9	1 4 5 [9]/ {10}	Q_P=0.75	Lean CLAY (CL); medium stiff to stiff; dark olive brown (2.5Y 3/3); moist; 95% medium plasticity, no dilatency, medium toughness fines; 5% fine sand.						
210	20	X	S09A	18/9	4 6 10 [16]/ {18}	Q_P=1.5							
		X	S10A	18/11	3 6 12 [18]/ {21}		Clayey SAND with Gravel (SC); medium dense; olive brown (2.5Y 4/3); moist; 49% fine to coarse sand; 34% fine to coarse, subangular to angular gravel, max. size 1-in.; 17% fines.			17	27	9	
205	25	X	S11A	18/8	5 7 6 [13]/ {15}								
		X	S12A	18/10	6 8 9 [17]/ {20}		Below 27.5 feet: 50% sand, 36% gravel, 14% fines.			14			
200							End of Boring at 29 feet.						

Strata lines represent the approximate boundaries between soil types. Actual transitions may be gradual. Water level readings have been made at times stated. Water levels may be different at other times.

CLIENT: Marin County Flood Control & Water Conservation District
PROJECT NAME: Former Nursery Detention Basin
CITY/STATE: Fairfax, California
GEI PROJECT NUMBER: 1610277

GEI Consultants

Boring Location

LATITUDE: 38.001257 **LONGITUDE:** -122.609780 **STATION:** - **OFFSET (FT):** -
HORIZONTAL DATUM: NAD 83 **STATION CENTERLINE:** -
VERTICAL DATUM: NAVD 88 **GROUND SURFACE ELEVATION (FT):** 235.6
LOCATION: North Side of Sir Francis Drake Boulevard, 600 feet West of Shadow Creek Court

BORING

SB#2

Drilling Information

DATE START / END: 8/4/2016 - 8/4/2016 **TOTAL DEPTH (FT):** 31.5
CONTRACTOR: Gregg Drilling & Testing **DRILLER:** E. Santellan **LOGGED BY:** T. Haynes
EQUIPMENT: Mobile B-61 (Gregg Rig No. D-12) **BORING METHOD:** Hollow Stem Auger
AUGER ID/OD: OD - 6-inch **CASING ID/OD:** N/A / N/A **DRILL ROD TYPE/SIZE:** Drill Rod Type - AWJ
HAMMER TYPE: Automatic Hammer **HAMMER WEIGHT (lbs):** 140 **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): Not Encountered **HAMMER ENERGY MEASUREMENT (%):** 69
GENERAL NOTES:

ABBREVIATIONS: ID = Inside Diameter; OD = Outside Diameter; Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot; S = Split Spoon; DP = Direct Push Sample; U = Undisturbed Tube Sample; C = Rock Core; V = Field Vane Shear; SC = Sonic Core; WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; OVM = Organic Vapor Meter; Q_P = Pocket Penetrometer Strength; S_v = Pocket Torvane Shear Strength; F_v = Field Vane Shear Strength; NA, NM = Not Applicable, Not Measured

Elev. (ft)	Depth (ft)	Type	Sample No.	Pen./ Rec. (in)	Blows per 6 in. [bpf] / {N60}	Field Test Data (tsf)	Sample Description & Classification	Moisture Content (%)	Dry Density (pcf)	Fines % <#200	LL	PI	Remarks
235			S01A	18/8	19 17 18 [35]/ {40}	Q_P=>4.5	Clayey SAND with Gravel (SC); dense; olive brown (2.5Y 4/3); dry to moist; 51% fine to coarse sand; 29% no to slow dilatency, low to medium toughness fines; 13% fine gravel.			29	26	8	
			S02A	18/8	3 4 6 [10]/ {12}		Below 2.5 feet: medium dense						
230	5		S03A	18/8	3 6 4 [10]/ {12}	Q_P=>4.5	Lean CLAY with Sand (CL); hard; brown (10YR 4/3); moist; 85% low to medium plasticity, no dilatency, medium toughness fines; 15% fine to medium sand; trace rootlets.						
			S04A	18/9	4 7 9 [16]/ {18}		Clayey SAND (SC); medium dense; brown (10YR 4/3); moist; 63% fine to medium sand; 25% low to medium plasticity fines; 12% fine gravel; trace rootlets.			25			
225	10		S05A	18/9	6 11 13 [24]/ {28}		Lean CLAY (CL); very stiff; dark brown (10YR 3/3); moist; 90% medium plasticity, no dilatency, medium toughness fines; 10% fine sand. At 10.7 feet: 1" hard nodule.						
			S06A	18/8	3 4 7 [11]/ {13}	Q_P=2.5	Lean CLAY (CL); stiff to very stiff; very dark gray (2.5Y 3/1) mottled orange and red; moist; 90% no dilatency, medium toughness fines; 10% medium sand.				27	9	
220	15		S07A	18/8	4 5 7 [12]/ {14}	Q_P=2							
			S08A	18/9	6 9 12 [21]/ {24}	Q_P=3.5	Below 17.5 feet: increased plasticity, medium to high toughness fines.						
215	20		S09A	18/9	5 7 13 [20]/ {23}	Q_P=2.75							
			S10A	18/6	8 6 10 [16]/ {18}		Fat CLAY with Gravel (CH); very stiff; dark olive brown (2.5Y 5/3); moist; 80% high plasticity, no dilatency, high toughness fines; 20% fine gravel.						
210	25		S11A	18/6	7 9 12 [21]/ {24}	Q_P=3.5	Lean CLAY (CL); very stiff; dark olive gray (5Y 3/2); moist; 95% medium to high plasticity, no dilatency, medium to high toughness fines; 5% fine sand.						
			S12A	18/9	8 17 20 [37]/ {43}	Q_P=>4.5	Lean CLAY (CL); hard; very dark gray (5Y 3/1) mottled with light gray; moist; 95% no dilatency, medium to high toughness fines; 5% fine sand; shows rock structure.				47	26	

Strata lines represent the approximate boundaries between soil types. Actual transitions may be gradual. Water level readings have been made at times stated. Water levels may be different at other times.

CLIENT: Marin County Flood Control & Water Conservation District
PROJECT NAME: Former Nursery Detention Basin
CITY/STATE: Fairfax, California
GEI PROJECT NUMBER: 1610277

GEI Consultants

Boring Location	
LATITUDE: 38.001257 **LONGITUDE:** -122.609780 **STATION:** - **OFFSET (FT):** -	**BORING**
HORIZONTAL DATUM: NAD 83 **STATION CENTERLINE:** -	**SB#2**
VERTICAL DATUM: NAVD 88 **GROUND SURFACE ELEVATION (FT):** 235.6	**PAGE 2 of 2**
LOCATION: North Side of Sir Francis Drake Boulevard, 600 feet West of Shadow Creek Court	

Elev. (ft)	Depth (ft)	SAMPLE INFORMATION: Type	Sample No.	Pen./ Rec. (in)	Blows per 6 in. [bpf] / {N60}	Field Test Data (tsf)	GRAPHIC LOG	Sample Description & Classification	Moisture Content (%)	Dry Density (pcf)	Fines % <#200	LL	PI	Remarks
205			S13A	18/8	10 17 21 [38]/ {44}	Q_P=>4.5		Lean CLAY (CL) as above.						
								End of Boring at 31.5 feet.						
200	35													
195	40													
190	45													
185	50													
180	55													
175	60													
170	65													

Strata lines represent the approximate boundaries between soil types. Actual transitions may be gradual. Water level readings have been made at times stated. Water levels may be different at other times.

CLIENT: Marin County Flood Control & Water Conservation District
PROJECT NAME: Former Nursery Detention Basin
CITY/STATE: Fairfax, California
GEI PROJECT NUMBER: 1610277

GEI Consultants

Boring Location

LATITUDE: 38.002569 **LONGITUDE:** -122.610630 **STATION:** - **OFFSET (FT):** -

HORIZONTAL DATUM: NAD 83 **STATION CENTERLINE:** -

VERTICAL DATUM: NAVD 88 **GROUND SURFACE ELEVATION (FT):** 234.9

LOCATION: Former Nursery Site

BORING

SB#3

PAGE 1 of 1

Drilling Information

DATE START / END: 8/4/2016 - 8/4/2016 **TOTAL DEPTH (FT):** 3.0

CONTRACTOR: Gregg Drilling & Testing **DRILLER:** E. Santellan **LOGGED BY:** T. Haynes

EQUIPMENT: Mobile B-61 (Gregg Rig No. D-12) **BORING METHOD:** Hollow Stem Auger

AUGER ID/OD: OD - 6-inch **CASING ID/OD:** N/A / N/A **DRILL ROD TYPE/SIZE:** Drill Rod Type - AWJ

HAMMER TYPE: Automatic Hammer **HAMMER WEIGHT (lbs):** 140 **HAMMER DROP (inch):** 30

WATER LEVEL DEPTHS (ft): Not Encountered **HAMMER ENERGY MEASUREMENT (%):** 69

GENERAL NOTES:

ABBREVIATIONS: ID = Inside Diameter; OD = Outside Diameter; Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot; S = Split Spoon; DP = Direct Push Sample; U = Undisturbed Tube Sample; C = Rock Core; V = Field Vane Shear; SC = Sonic Core; WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; OVM = Organic Vapor Meter; Q_P = Pocket Penetrometer Strength; S_v = Pocket Torvane Shear Strength; F_v = Field Vane Shear Strength; NA, NM = Not Applicable, Not Measured

Elev. (ft)	Depth (ft)	Type	Sample No.	Pen./ Rec. (in)	Blows per 6 in. [bpf] / {N60}	Field Test Data (tsf)	GRAPHIC LOG	Sample Description & Classification	Moisture Content (%)	Dry Density (pcf)	Fines % <#200	LL	PI	Remarks
			S01C, S01B, S01A	18/18	32 21 14 [35]/ {40}			Clayey SAND with Gravel (SC); medium dense to dense; dark yellowish brown (10YR 3/4); dry to moist; 40% fine to coarse sand; 33% low to medium fines; 28% fine, subrounded to subangular gravel, max. size 3/4-in.			33			Lab testing on combined sample (S01C, S01B, S01A, S02B, S02A, and S03A)
			S02B, S02A	18/12	8 9 11 [20]/ {23}									
								End of Boring at 3 feet.						Additional sampler (Sample S03A) driven from 1.5 to 3.0 feet for environmental sample approx. 1 foot northeast of boring
230	5													
225	10													
220	15													
215	20													
210	25													

Strata lines represent the approximate boundaries between soil types. Actual transitions may be gradual. Water level readings have been made at times stated. Water levels may be different at other times.

CLIENT: Marin County Flood Control & Water Conservation District

PROJECT NAME: Former Nursery Detention Basin

CITY/STATE: Fairfax, California

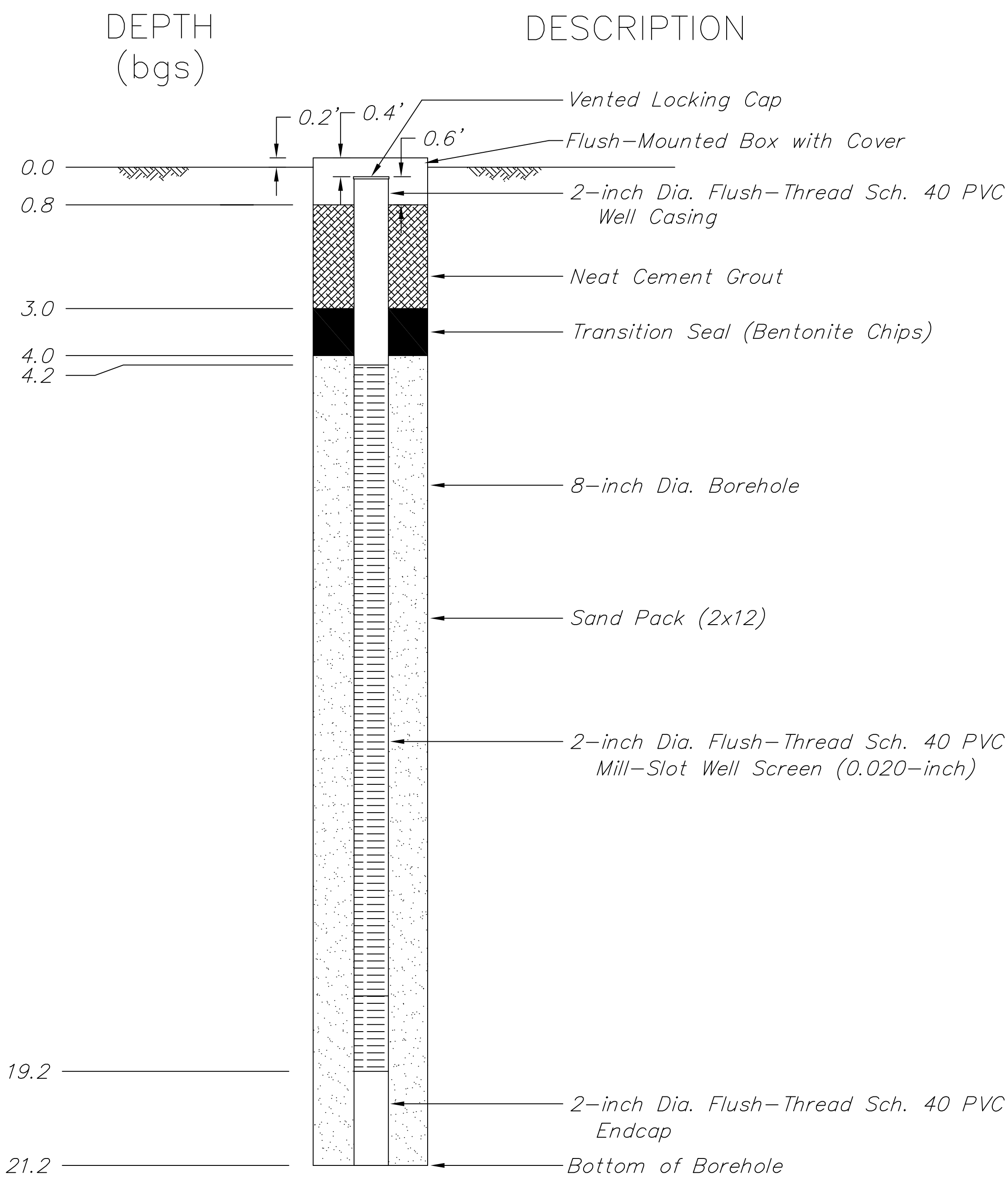
GEI PROJECT NUMBER: 1610277

GEI Consultants

Appendix B

Monitoring Well As-Builts

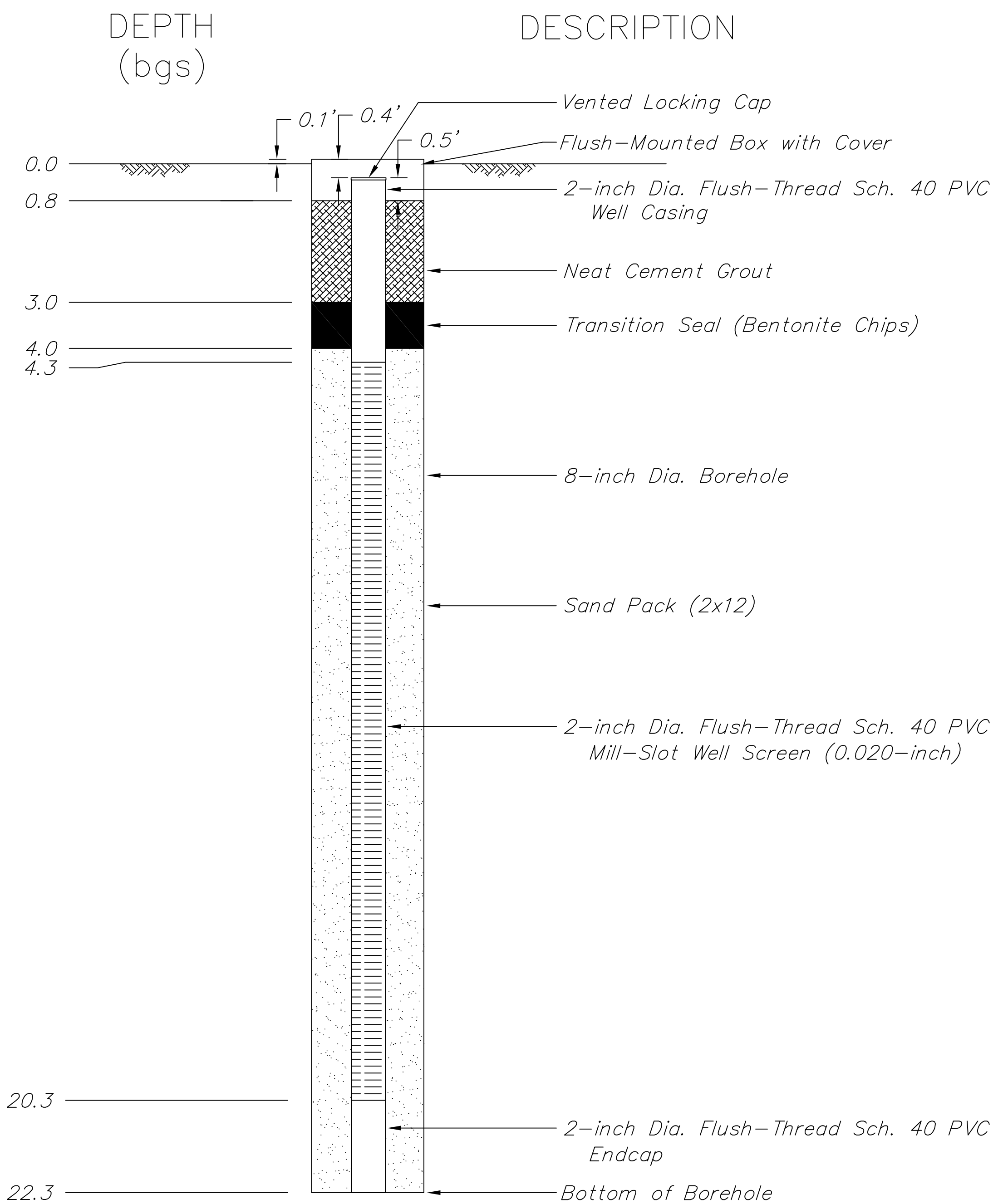
AS-BUILT CONSTRUCTION DETAILS
FOR MW-1



(HORIZONTAL: NOT TO SCALE)

Former Nursery Detention Basin Fairfax, California	GEI Consultants	MW-1 AS- BUILT DETAILS
County of Marin Flood Control and Water Conservation District	Project 1610277	December 2016 Figure B-1

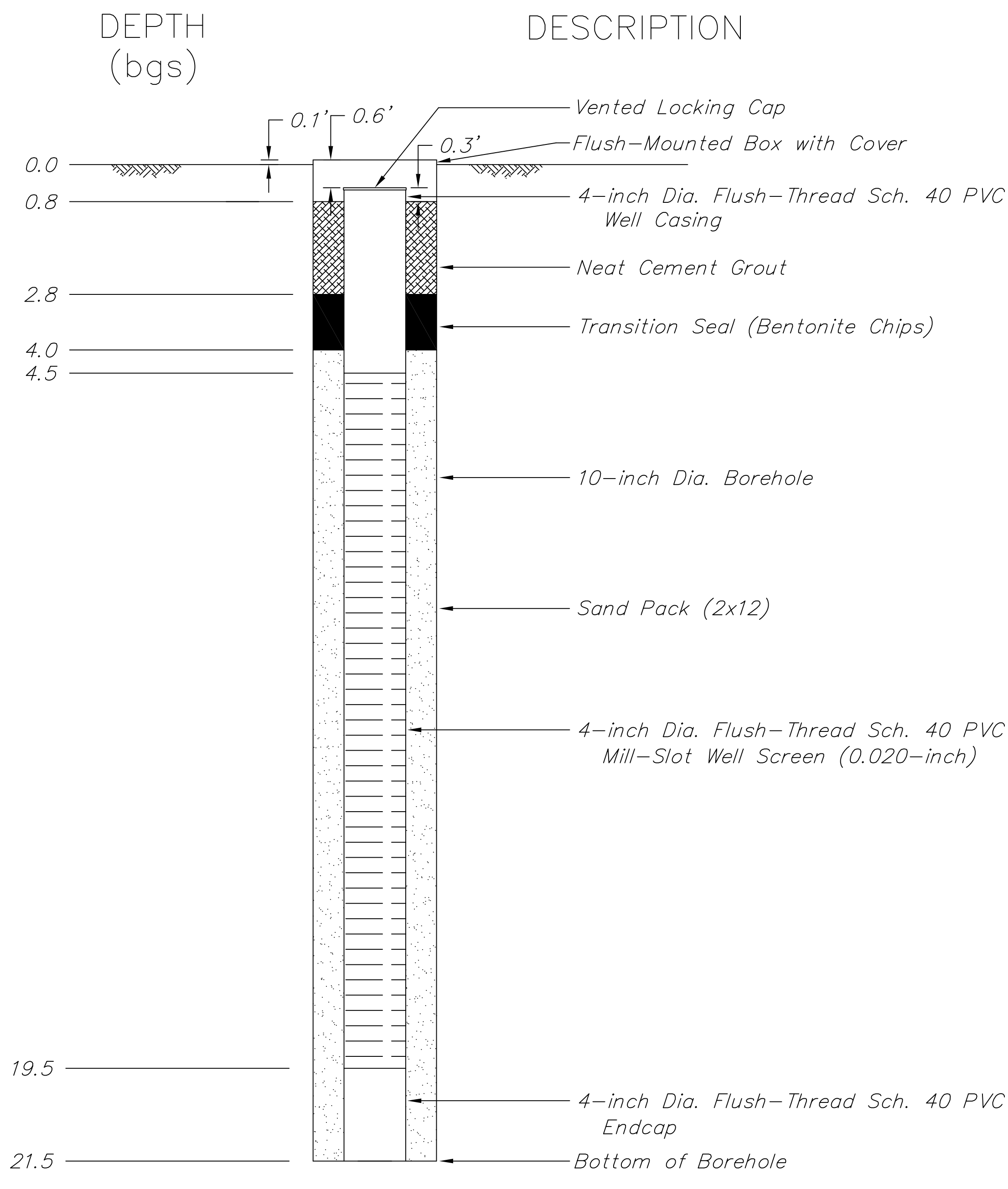
AS-BUILT CONSTRUCTION DETAILS
FOR MW-2



(HORIZONTAL: NOT TO SCALE)

Former Nursery Detention Basin Fairfax, California	GEI Consultants	MW-2 AS- BUILT DETAILS
County of Marin Flood Control and Water Conservation District	Project 1610277	December 2016 Figure B-2

AS-BUILT CONSTRUCTION DETAILS
FOR MW-3



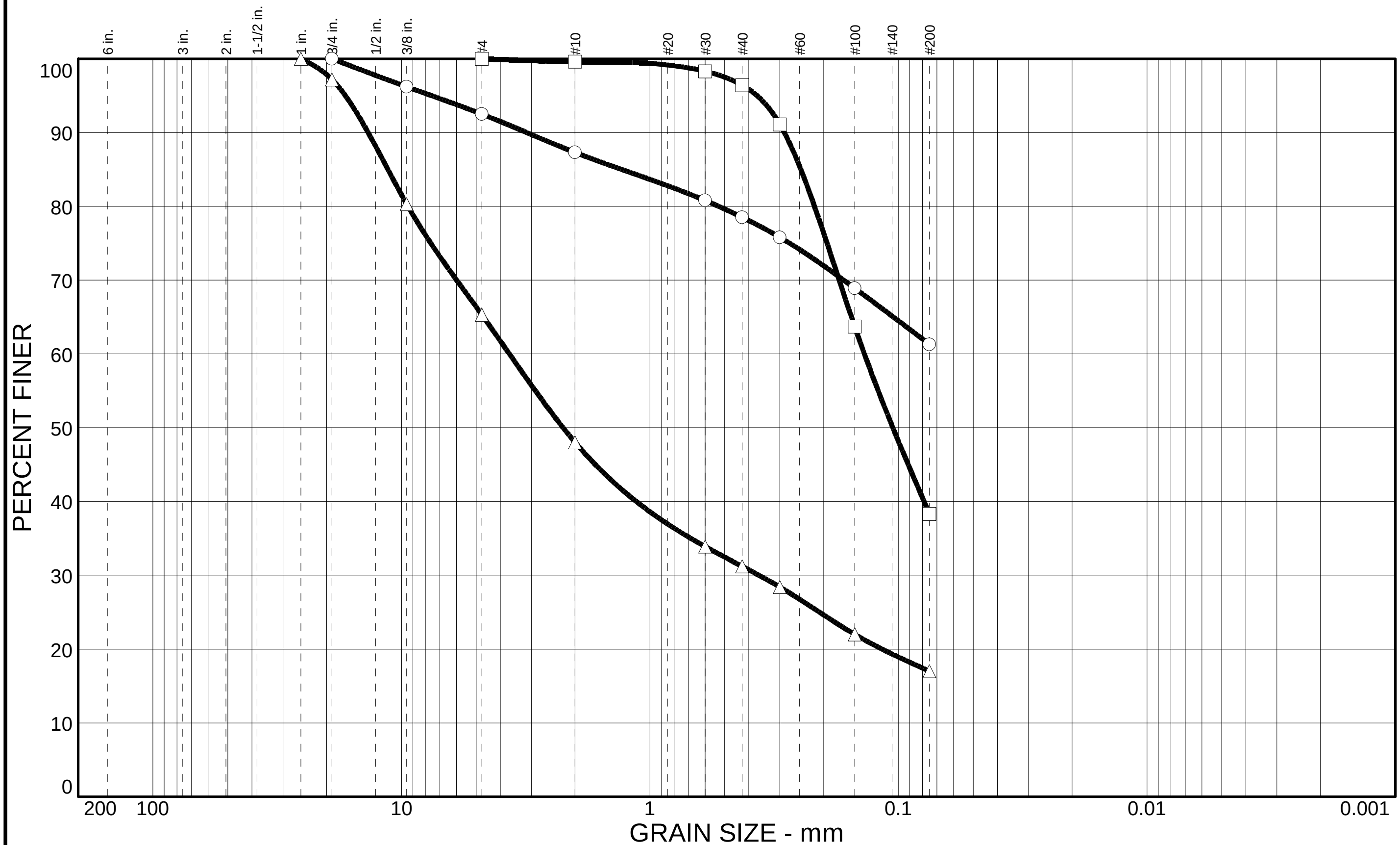
(HORIZONTAL: NOT TO SCALE)

Former Nursery Detention Basin Fairfax, California	GEI Consultants	MW-3 AS- BUILT DETAILS
County of Marin Flood Control and Water Conservation District	Project 1610277	December 2016 Figure B-3

Appendix C

Laboratory Test Results

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		7.5	31.2	61.3		CL		19	30
□			61.7	38.3		SM		26	24
△		34.7	48.3	17.0					

SIEVE inches size	PERCENT FINER ○	□	△
1"			100.0
3/4"	100.0		97.2
3/8"	96.2		80.3
GRAIN SIZE			
D_{60}		0.137	3.68
D_{30}			0.364
D_{10}			
COEFFICIENTS			
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	92.5	100.0	65.3
#10	87.3	99.6	48.0
#30	80.8	98.3	33.9
#40	78.5	96.4	31.2
#50	75.8	91.1	28.4
#100	68.9	63.7	22.0
#200	61.3	38.3	17.0

SOIL DESCRIPTION

○ Brown Sandy Lean CLAY

□ Brown Silty SAND

△ Brown Clayey SAND w/ Gravel

REMARKS:

○

□

△ Due to the small sample size, relative to the largest particle size, this data should be considered to be approximate.

○ Source: MW# 1 — Elev./Depth: 7.5'

□ Source: MW# 2 — Elev./Depth: 5.0'

△ Source: MW# 2 — Elev./Depth: 20'

COOPER TESTING LABORATORY

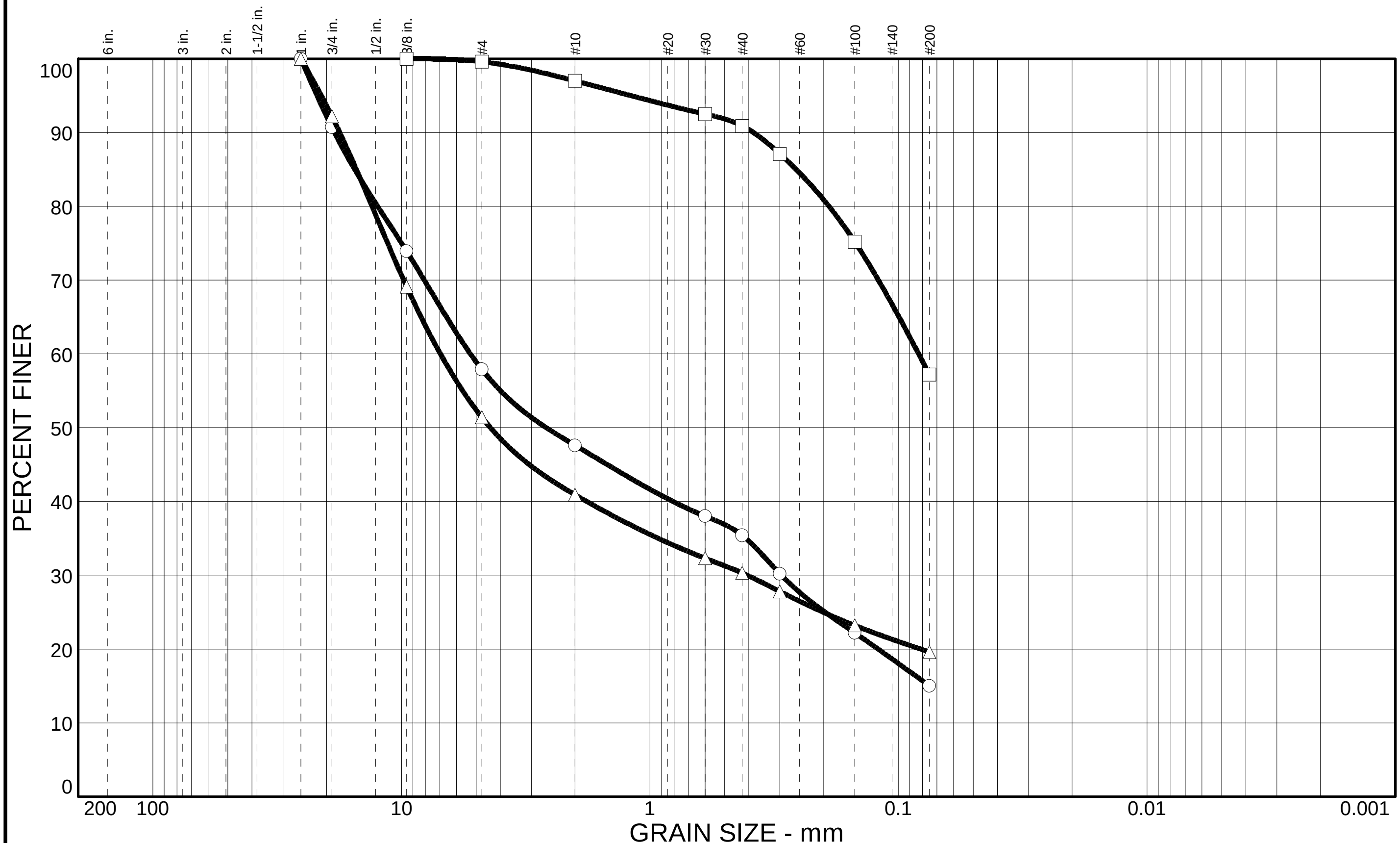
Client: GEI Consultants, Inc.

Project: Former Nursery Detention Basin - 1610277

Project No.: 250-066

Figure

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		42.1	42.9	15.0		SC-SM		16	23
□		0.4	42.4	57.2		CL		19	32
△		48.6	31.8	19.6		GC		18	31

SIEVE inches size	PERCENT FINER ○	□	△
1"	100.0		100.0
3/4"	90.7		92.2
3/8"	73.9	100.0	69.1
	GRAIN SIZE		
D_{60}	5.28	0.0829	6.97
D_{30}	0.296		0.406
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	57.9	99.6	51.4
#10	47.6	97.0	40.9
#30	38.0	92.5	32.3
#40	35.4	90.9	30.3
#50	30.2	87.1	27.8
#100	22.2	75.2	23.2
#200	15.0	57.2	19.6

SOIL DESCRIPTION

○ Brown Silty, Clayey SAND w/ Gravel

□ Brown Sandy Lean CLAY

△ Brown Lean Clayey GRAVEL w/ Sand

REMARKS:

○ Due to the small sample size, relative to the largest particle size, this data should be considered to be approximate.

□

△ Due to the small sample size, relative to the largest particle size, this data should be considered to be approximate.

○ Source: MW# 3 Elev./Depth: 5.0'

□ Source: MW# 3 Elev./Depth: 12.5'

△ Source: MW# 3 Elev./Depth: 15.0'

COOPER TESTING LABORATORY

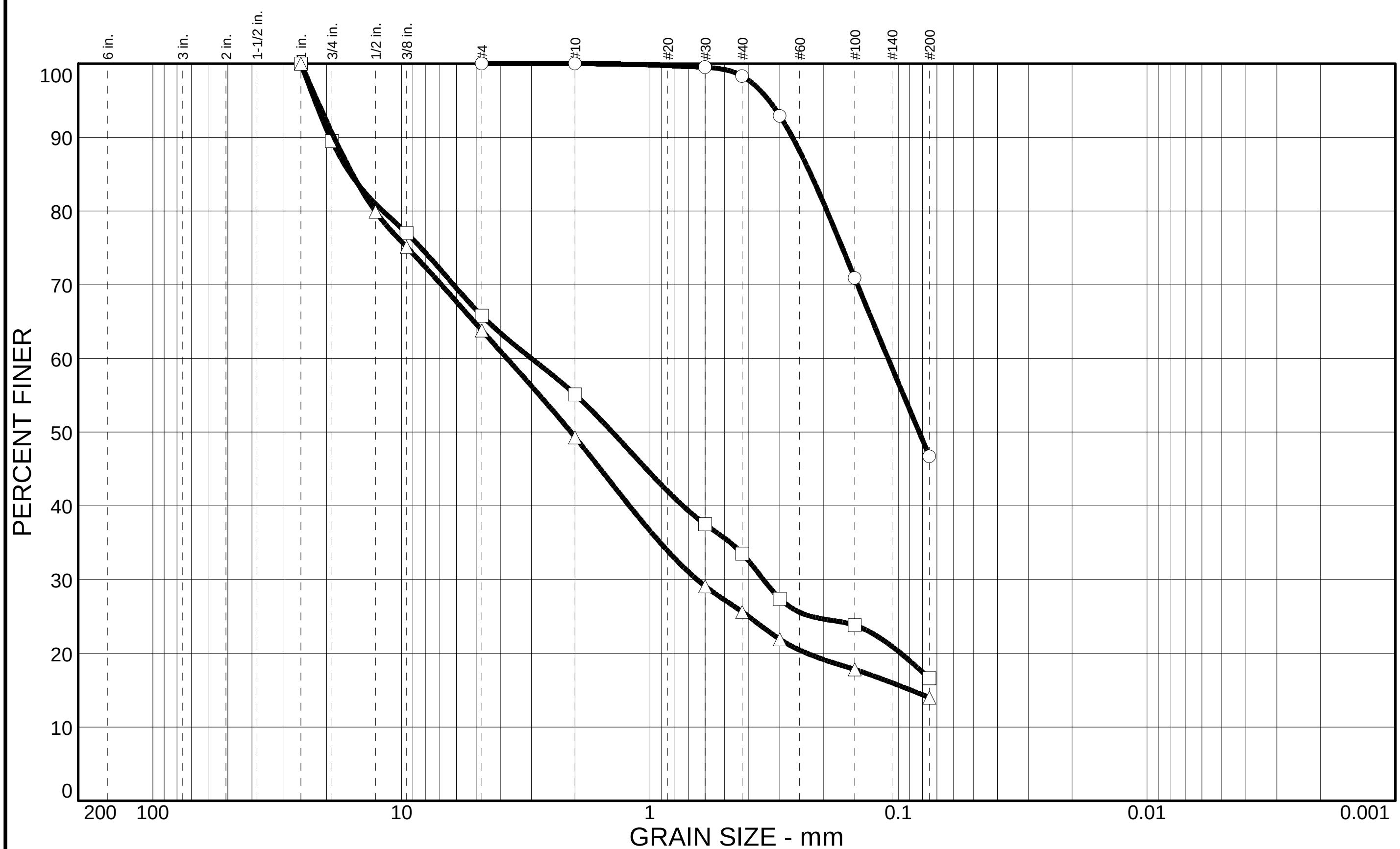
Client: GEI Consultants, Inc.

Project: Former Nursery Detention Basin - 1610277

Project No.: 250-066

Figure

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			53.3	46.7		SC-SM		18	25
□		34.2	49.2	16.6		SC		18	27
△		36.2	49.8	14.0					

SIEVE inches size	PERCENT FINER ○	□	△
1"		100.0	100.0
3/4"		89.5	
1/2"			79.9
3/8"		77.0	75.1
	GRAIN SIZE		
D_{60}	0.110	3.00	3.77
D_{30}		0.350	0.647
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	65.8	63.8
#10	100.0	55.1	49.3
#30	99.5	37.5	29.1
#40	98.3	33.5	25.6
#50	92.9	27.4	21.9
#100	70.9	23.8	17.8
#200	46.7	16.6	14.0

SOIL DESCRIPTION

○ Brown Silty, Clayey SAND

□ Brown Lean Clayey SAND w/ Gravel

△ Brown Clayey SAND w/ Gravel

REMARKS:

○

□ Due to the small sample size, relative to the largest particle size, this data should be considered to be approximate.

△ Due to the small sample size, relative to the largest particle size, this data should be considered to be approximate.

○ Source: SB# 1 Elev./Depth: 12.5'

□ Source: SB# 1 Elev./Depth: 22.5'

△ Source: SB# 1 Elev./Depth: 27.5'

COOPER TESTING LABORATORY

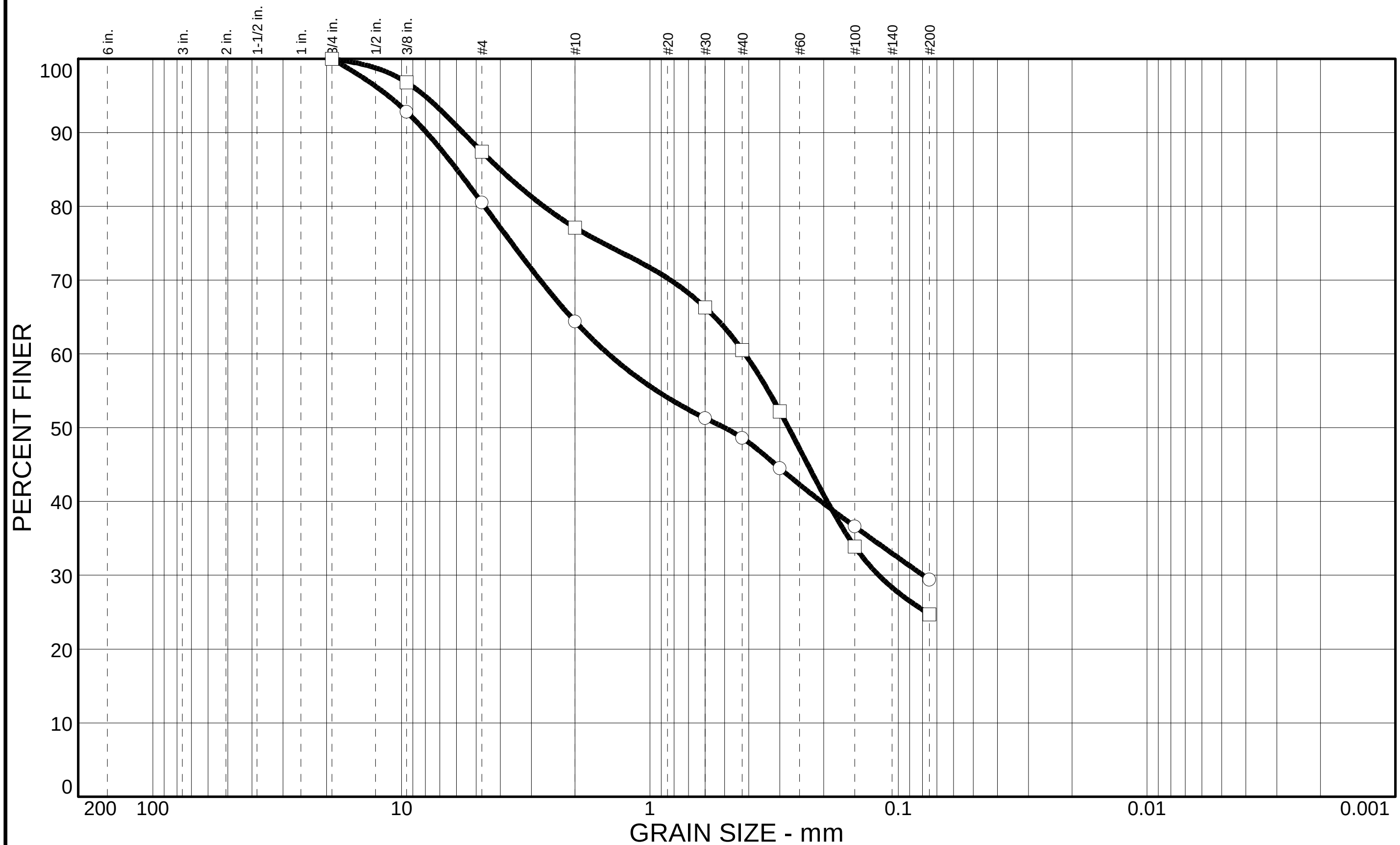
Client: GEI Consultants, Inc.

Project: Former Nursery Detention Basin - 1610277

Project No.: 250-066

Figure

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		19.5	51.1	29.4		SC		18	26
□		12.6	62.7	24.7					

SIEVE inches size	PERCENT FINER ○	□	
3/4"	100.0	100.0	
3/8"	92.8	96.8	
	GRAIN SIZE		
D_{60}	1.47	0.415	
D_{30}	0.0795	0.120	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	80.5	87.4	
#10	64.4	77.1	
#30	51.3	66.3	
#40	48.6	60.5	
#50	44.5	52.2	
#100	36.6	33.9	
#200	29.4	24.7	

SOIL DESCRIPTION

○ Olive Brown Lean Clayey SAND w/ Gravel

□ Olive Brown Silty SAND

REMARKS:

○

□

○ Source: SB# 2 Elev./Depth: 0'

□ Source: SB# 2 Elev./Depth: 7.5'

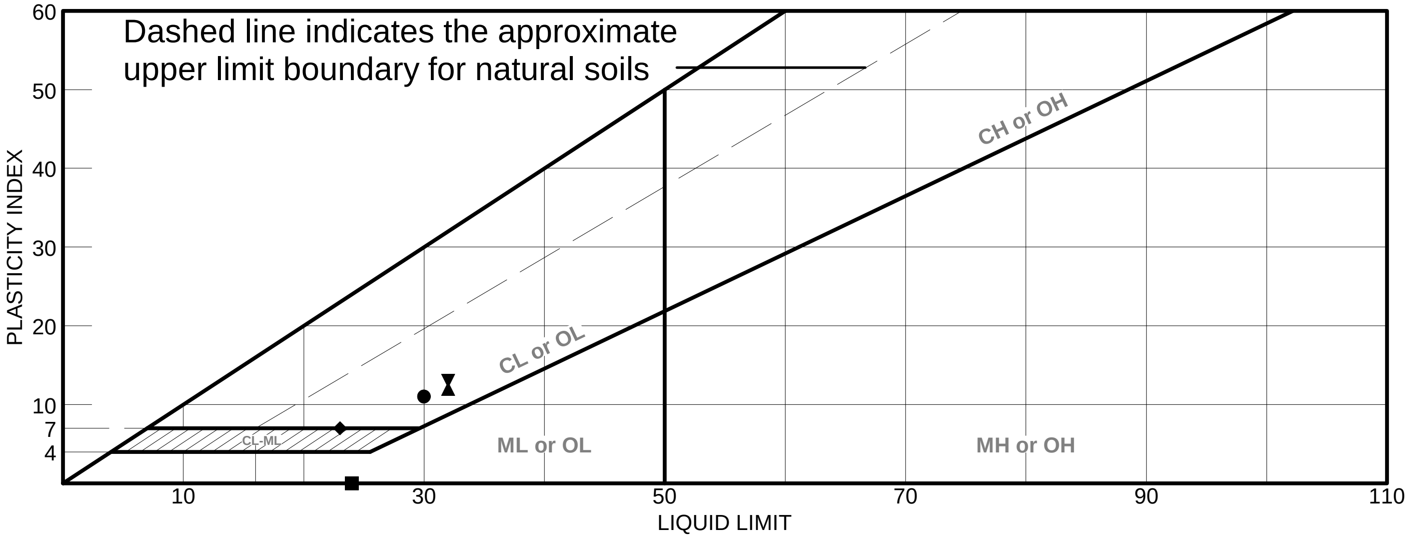
COOPER TESTING LABORATORY

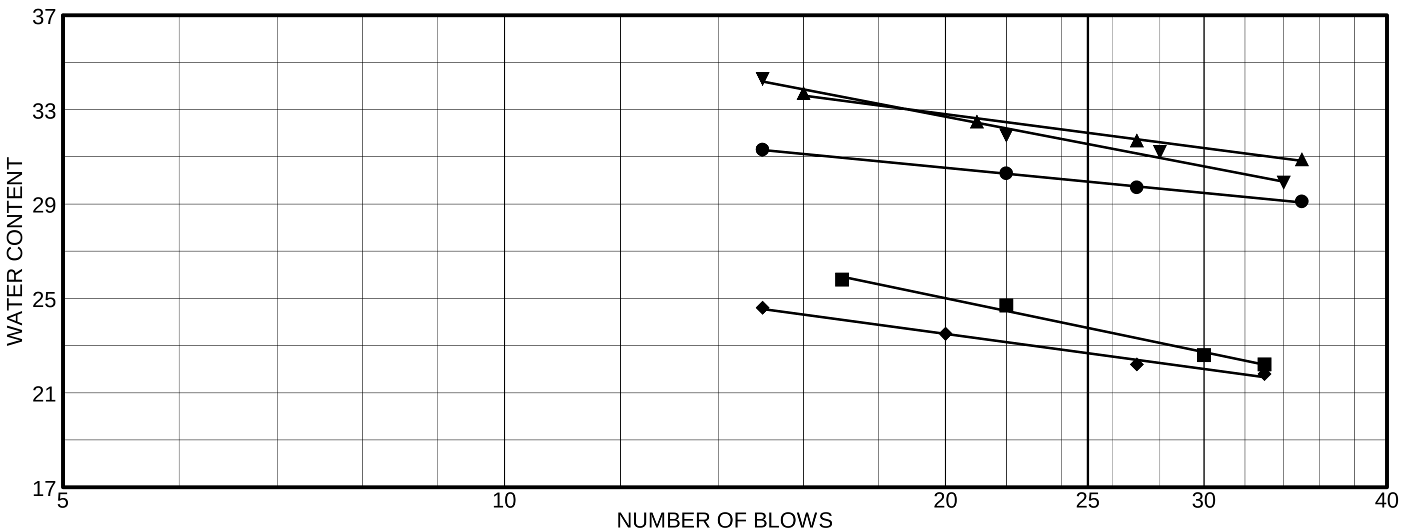
Client: GEI Consultants, Inc.

Project: Former Nursery Detention Basin - 1610277

Project No.: 250-066 Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Sandy Lean CLAY	30	19	11	78.5	61.3	CL
■	Brown Silty SAND	24	26	NP	96.4	38.3	SM
▲	Brown Sandy Lean CLAY	32	20	12			
◆	Brown Silty, Clayey SAND w/ Gravel	23	16	7	35.4	15.0	SC-SM
▼	Brown Sandy Lean CLAY	32	19	13	90.9	57.2	CL

Project No. 250-066 **Client:** GEI Consultants, Inc.

Project: Former Nursery Detention Basin - 1610277

● **Source:** MW# 1 **Elev./Depth:** 7.5'
■ **Source:** MW# 2 **Elev./Depth:** 5.0'
▲ **Source:** MW# 2 **Elev./Depth:** 12.5'
◆ **Source:** MW# 3 **Elev./Depth:** 5.0'
▼ **Source:** MW# 3 **Elev./Depth:** 12.5'

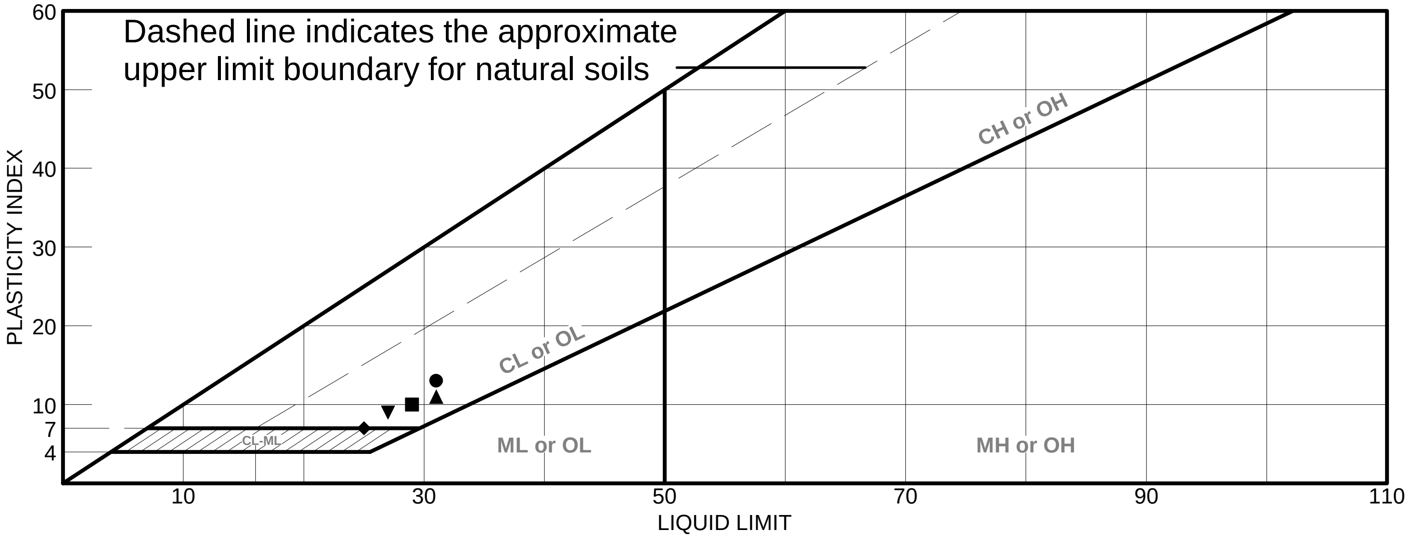
Remarks:
●
■ Could not roll out. Sample slides in bowl. Non-plastic.
▲
◆
▼

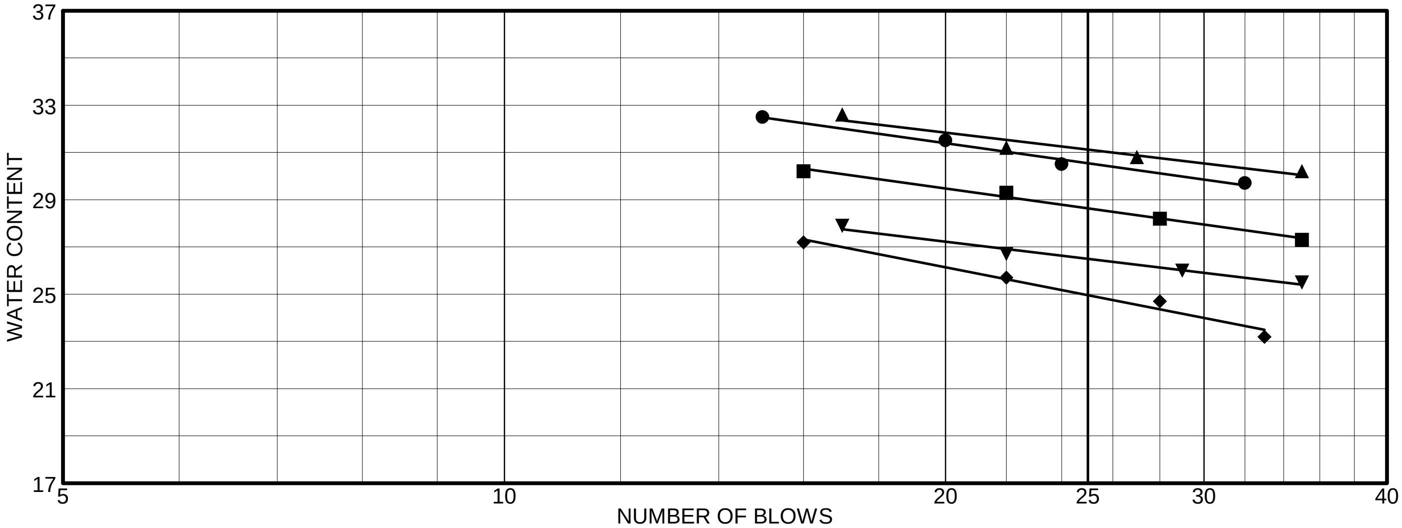
LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Lean Clayey GRAVEL w/ Sand	31	18	13	30.3	19.6	GC
■	Brown Lean Clayey SAND	29	19	10			
▲	Brown Sandy Lean CLAY	31	20	11			
◆	Brown Silty, Clayey SAND	25	18	7	98.3	46.7	SC-SM
▼	Brown Lean Clayey SAND w/ Gravel	27	18	9	33.5	16.6	SC

Project No. 250-066 **Client:** GEI Consultants, Inc.

Project: Former Nursery Detention Basin - 1610277

● **Source:** MW# 3 **Elev./Depth:** 15.0'
■ **Source:** SB# 1 **Elev./Depth:** 5.0'
▲ **Source:** SB# 1 **Elev./Depth:** 10'
◆ **Source:** SB# 1 **Elev./Depth:** 12.5'
▼ **Source:** SB# 1 **Elev./Depth:** 22.5'

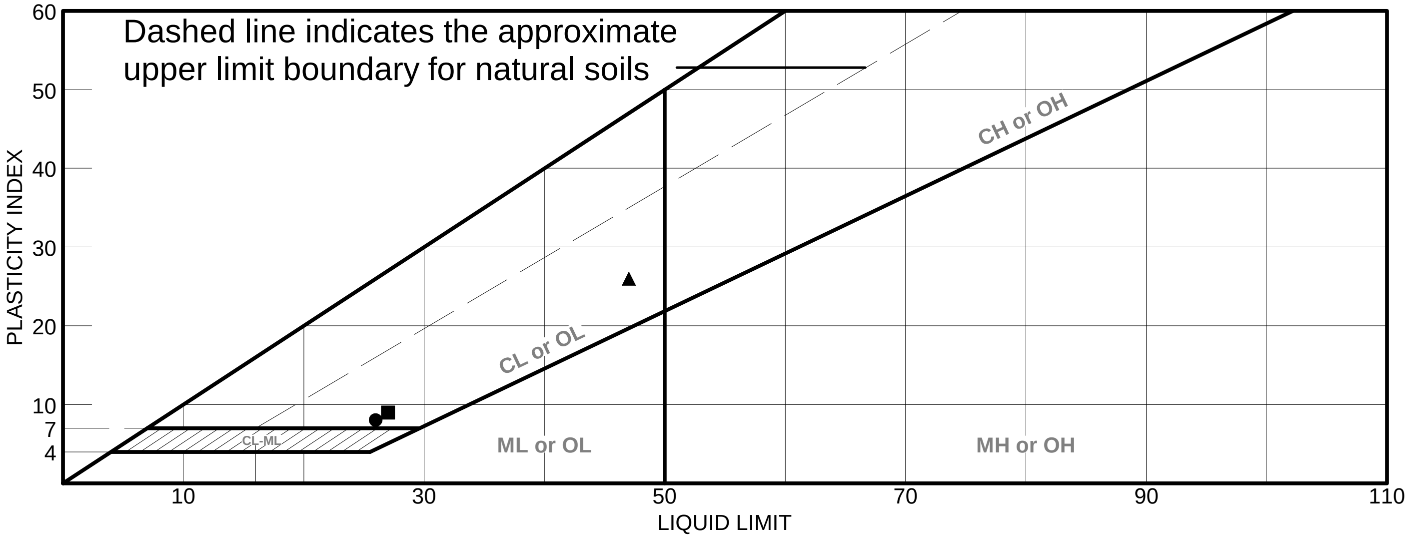
Remarks:
●
■
▲
◆
▼

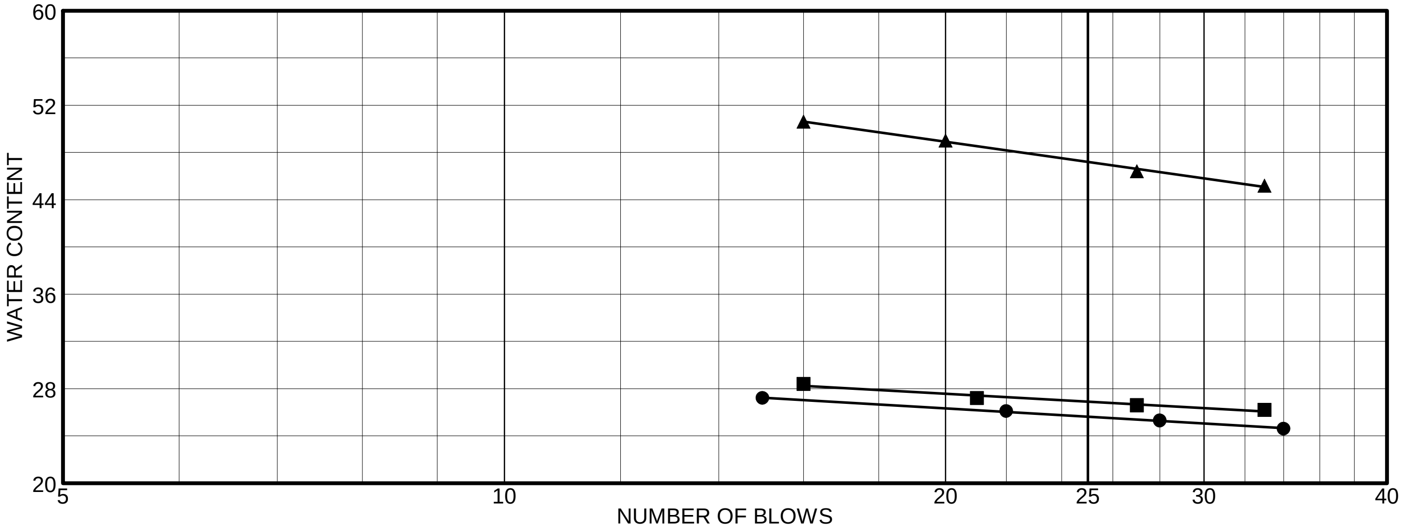
LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Olive Brown Lean Clayey SAND w/ Gravel	26	18	8	48.6	29.4	SC
■	Dark Brown Sandy Lean CLAY	27	18	9			
▲	Dark Brown Sandy Lean CLAY	47	21	26			

Project No. 250-066 **Client:** GEI Consultants, Inc.

Project: Former Nursery Detention Basin - 1610277

● **Source:** SB# 2 **Elev./Depth:** 0'

■ **Source:** SB# 2 **Elev./Depth:** 12.5'

▲ **Source:** SB# 2 **Elev./Depth:** 27.5'

Remarks:

●

■

▲

LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure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Analytical Laboratories, Since 1878

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 279328
ANALYTICAL REPORT

GEI Consultants, Inc. 180 Grand Avenue Oakland, CA 94612	Project : 1610277 Location : Former Nursery Detention Basin Level : II

Sample ID	Lab ID
MW #1	279328-001
MW #3	279328-002

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: Mikelle Chong

Date: 08/19/2016

Mikelle Chong
Project Manager
mikelle.chong@ctberk.com

CA ELAP# 2896, NELAP# 4044-001

Curtis & Tompkins, Ltd.

CASE NARRATIVE

Laboratory number:	**279328**
Client:	**GEI Consultants, Inc.**
Project:	**1610277**
Location:	**Former Nursery Detention Basin**
Request Date:	**08/03/16**
Samples Received:	**08/03/16**

This data package contains sample and QC results for two six-point soil composites, requested for the above referenced project on 08/03/16. The samples were received cold and intact.

Volatile Organics by GC/MS (EPA 8260B):
No analytical problems were encountered.

Semivolatile Organics by GC/MS (EPA 8270C):
Bis(2-ethylhexyl)phthalate was detected between the MDL and the RL in the method blank for batch 237734; this analyte was not detected in samples at or above the RL. No other analytical problems were encountered.

Pesticides (EPA 8081A):
All samples underwent sulfur cleanup using the copper option in EPA Method 3660B. All samples underwent florisil cleanup using EPA Method 3620C. Matrix spikes QC846055,QC846056 (batch 237742) were not reported because the parent sample required a dilution that would have diluted out the spikes. No other analytical problems were encountered.

PCBs (EPA 8082):
All samples underwent sulfuric acid cleanup using EPA Method 3665A. All samples underwent sulfur cleanup using the copper option in EPA Method 3660B. No analytical problems were encountered.

Metals (EPA 6020 and EPA 7471A):
Chromium was detected above the RL in the method blank for batch 237809; this analyte was detected in samples at a level at least 10 times that of the blank. Arsenic, vanadium, and zinc were detected between the MDL and the RL in the method blank for batch 237809; these analytes were detected in samples at a level at least 10 times that of the blank. Mercury was detected between the MDL and the RL in the method blank for batch 238064; this analyte was either not detected in samples at or above the RL, or detected at a level at least 10 times that of the blank. No other analytical problems were encountered.

Moisture (ASTM D2216/CLP):
No analytical problems were encountered.

Total Organic Carbon (TOC) (WALKLEY-BLACK):
No analytical problems were encountered.

Curtis & Tompkins, Ltd.

CASE NARRATIVE

Laboratory number:	**279328**
Client:	**GEI Consultants, Inc.**
Project:	**1610277**
Location:	**Former Nursery Detention Basin**
Request Date:	**08/03/16**
Samples Received:	**08/03/16**

Particle Size (ASTM):
Cooper Testing Labs in Palo Alto, CA performed the analysis (not NELAP certified). Please see the Cooper Testing Labs case narrative.

CHAIN OF CUSTODY

Curtis & Tompkins Laboratories
ENVIRONMENTAL ANALYTICAL TESTING LABORATORY
In Business Since 1878

2323 Fifth Street
Berkeley, CA 94710

Phone (510) 486-0900
Fax (510) 486-0532

Page ____ of ____

Chain of Custody # ________

C&T LOGIN # 279328

Project No: 1610277

Project Name: Former Nursery Detention Basin

Project P. O. No:

EDD Format: Report Level ☐ II ☐ III ☐ IV

Turnaround Time: ☐ RUSH ______ ☒ Standard

Sampler:

Report To: Graham Bradner

Company: GEI

Telephone: ~~XX~~ (916) 631-4577

Email: gbradner@geiconsultants.com

Lab No.	Sample ID.	SAMPLING: Date Collected	SAMPLING: Time Collected	MATRIX: Water	MATRIX: Solid	MATRIX	MATRIX	# of Containers	CHEMICAL PRESERVATIVE: HCl	H2SO4	HNO3	NaOH	None
	MW#1	8/3/16	1100		X			6					X
	MW#3	↓	1400		X			6					X

ANALYTICAL REQUEST

Sample ID.	TOC	Metals 6010B or 6020	VOCs 8260	SVOCs 8270	PCB Aroclors 8082	8081A	Sieve w/ 200 wash	~~TPH + Gas 8015~~ MG 08/04	TEHM 8015 + Silica Gel	~~[illegible]~~	COMP	Moisture				
MW#1	1	1	1	1	1	1	1	~~1~~	1		1	1				
MW#3	1	1	1	1	1	1	1	~~1~~	1		1	1				

Notes:
removed TPH analysis per Tim 08/04

SAMPLE RECEIPT
☐ Intact
☐ Cold
☐ On Ice
☐ Ambient

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
Tim Haynes	8/3/16	1835	dnguyen	8/3/16	18:35

COOLER RECEIPT CHECKLIST

Curtis & Tompkins, Ltd.

Login # 279328 Date Received 8/3/16 Number of coolers 1
Client GEI Project 1610277

Date Opened 8/3 By (print) CB (sign) [signature]
Date Logged in 8/4 By (print) SC (sign) [signature]
Date Labelled ↓ By (print) ↓ (sign) ↓

1. Did cooler come with a shipping slip (airbill, etc) YES **NO**
   Shipping info

2A. Were custody seals present? .... ☐ YES (circle) on cooler on samples ☒ NO
   How many ______ Name ______ Date ______
2B. Were custody seals intact upon arrival? YES NO **N/A**
3. Were custody papers dry and intact when received? **YES** NO
4. Were custody papers filled out properly (ink, signed, etc)? **YES** NO
5. Is the project identifiable from custody papers? (If so fill out top of form) **YES** NO
6. Indicate the packing in cooler: (if other, describe)

☐ Bubble Wrap ☐ Foam blocks ☒ Bags ☐ None
☐ Cloth material ☐ Cardboard ☐ Styrofoam ☐ Paper towels

7. Temperature documentation: * Notify PM if temperature exceeds 6°C

Type of ice used: ☒ Wet ☐ Blue/Gel ☐ None Temp(°C) 3.3

☐ Temperature blank(s) included? ☐ Thermometer# ______ ☒ IR Gun# B

☐ Samples received on ice directly from the field. Cooling process had begun

8. Were Method 5035 sampling containers present? YES **NO**
   If YES, what time were they transferred to freezer?
9. Did all bottles arrive unbroken/unopened? **YES** NO
10. Are there any missing / extra samples? YES **NO**
11. Are samples in the appropriate containers for indicated tests? **YES** NO
12. Are sample labels present, in good condition and complete? **YES** NO
13. Do the sample labels agree with custody papers? **YES** NO
14. Was sufficient amount of sample sent for tests requested? **YES** NO
15. Are the samples appropriately preserved? YES NO **N/A**
16. Did you check preservatives for all bottles for each sample? YES NO **N/A**
17. Did you document your preservative check? (pH strip lot# ______) YES NO **N/A**
18. Did you change the hold time in LIMS for unpreserved VOAs? YES NO **N/A**
19. Did you change the hold time in LIMS for preserved terracores? YES NO **N/A**
20. Are bubbles > 6mm absent in VOA samples? YES NO **N/A**
21. Was the client contacted concerning this sample delivery? YES **NO**
   If YES, Who was called? ______ By ______ Date: ______

COMMENTS

Curtis & Tompkins, Ltd.

Detections Summary for 279328

Results for any subcontracted analyses are not included in this summary.

Client : GEI Consultants, Inc.
Project : 1610277
Location : Former Nursery Detention Basin

Client Sample ID : MW #1 Laboratory Sample ID : 279328-001

Analyte	Result	Flags	RL	MDL	Units	Basis	IDF	Method	Prep Method
Toluene	0.9	J	5.4	0.8	ug/Kg	Dry	0.9921	EPA 8260B	EPA 5030B
Phenanthrene	13	J	73	10	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
bis(2-Ethylhexyl)phthalate	67	J	360	9.5	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
Heptachlor epoxide	7.3		1.9	0.27	ug/Kg	Dry	1.000	EPA 8081A	EPA 3550B
4,4'-DDE	58		3.6	0.48	ug/Kg	Dry	1.000	EPA 8081A	EPA 3550B
4,4'-DDD	6.0	C	3.6	0.52	ug/Kg	Dry	1.000	EPA 8081A	EPA 3550B
4,4'-DDT	110		3.6	0.48	ug/Kg	Dry	1.000	EPA 8081A	EPA 3550B
alpha-Chlordane	33		1.9	0.28	ug/Kg	Dry	1.000	EPA 8081A	EPA 3550B
gamma-Chlordane	33		1.9	0.40	ug/Kg	Dry	1.000	EPA 8081A	EPA 3550B
Antimony	0.21	J	2.2	0.086	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Arsenic	8.1		0.27	0.080	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Barium	210		0.27	0.059	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Beryllium	0.55		0.27	0.055	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Cadmium	0.13	J	0.27	0.032	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Chromium	100		0.27	0.084	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Cobalt	20		0.27	0.053	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Copper	39		0.35	0.12	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Lead	15		0.27	0.077	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Molybdenum	0.35		0.27	0.087	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Nickel	140		0.27	0.082	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Selenium	0.20	J	2.2	0.081	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Silver	0.050	J	0.27	0.032	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Thallium	0.066	J	0.27	0.058	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Vanadium	54		0.35	0.12	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Zinc	85		1.1	0.28	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Total Organic Carbon	1.0		0.05		%	Dry	1.000	WALKLEY-BLACK	METHOD

Curtis & Tompkins, Ltd.

Client Sample ID : MW #3 Laboratory Sample ID : 279328-002

Analyte	Result	Flags	RL	MDL	Units	Basis	IDF	Method	Prep Method
Phenanthrene	14	J	70	10	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
bis(2-Ethylhexyl)phthalate	39	J	350	9.2	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
Antimony	0.20	J	2.1	0.085	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Arsenic	7.6		0.26	0.079	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Barium	440		29	7.6	mg/Kg	Dry	2500	EPA 6020	EPA 3050B
Beryllium	0.59		0.26	0.054	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Cadmium	0.057	J	0.26	0.032	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Chromium	95		0.26	0.083	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Cobalt	22		0.26	0.052	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Copper	39		0.34	0.11	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Lead	11		0.26	0.076	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Mercury	0.25		0.017	0.0030	mg/Kg	Dry	1.000	EPA 7471A	METHOD
Molybdenum	0.79		0.26	0.086	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Nickel	130		0.26	0.081	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Selenium	0.19	J	2.1	0.080	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Silver	0.040	J	0.26	0.032	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Thallium	0.070	J	0.26	0.057	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Vanadium	59		0.34	0.11	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Zinc	80		1.1	0.28	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Total Organic Carbon	0.42		0.05		%	Dry	1.000	WALKLEY-BLACK	METHOD

C = Presence confirmed, but RPD between columns exceeds 40%

J = Estimated value

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	MW #1	Diln Fac:	0.9921
Lab ID:	279328-001	Batch#:	237945
Matrix:	Soil	Sampled:	08/03/16
Units:	ug/Kg	Received:	08/03/16
Basis:	dry	Analyzed:	08/11/16

Moisture: 8%

Analyte	Result	RL	MDL
Freon 12	ND	11	0.4
Chloromethane	ND	11	1.1
Vinyl Chloride	ND	11	1.0
Bromomethane	ND	11	1.3
Chloroethane	ND	11	0.5
Trichlorofluoromethane	ND	5.4	0.8
Acetone	ND	22	3.6
Freon 113	ND	5.4	0.5
1,1-Dichloroethene	ND	5.4	1.0
Methylene Chloride	ND	22	1.2
Carbon Disulfide	ND	5.4	0.9
MTBE	ND	5.4	1.1
trans-1,2-Dichloroethene	ND	5.4	0.9
Vinyl Acetate	ND	54	0.8
1,1-Dichloroethane	ND	5.4	1.2
2-Butanone	ND	11	1.4
cis-1,2-Dichloroethene	ND	5.4	0.9
2,2-Dichloropropane	ND	5.4	1.2
Chloroform	ND	5.4	1.4
Bromochloromethane	ND	5.4	1.0
1,1,1-Trichloroethane	ND	5.4	0.9
1,1-Dichloropropene	ND	5.4	0.7
Carbon Tetrachloride	ND	5.4	0.5
1,2-Dichloroethane	ND	5.4	1.0
Benzene	ND	5.4	1.0
Trichloroethene	ND	5.4	0.9
1,2-Dichloropropane	ND	5.4	0.8
Bromodichloromethane	ND	5.4	0.9
Dibromomethane	ND	5.4	0.8
4-Methyl-2-Pentanone	ND	11	1.1
cis-1,3-Dichloropropene	ND	5.4	0.7
Toluene	0.9 J	5.4	0.8
trans-1,3-Dichloropropene	ND	5.4	0.7
1,1,2-Trichloroethane	ND	5.4	0.7
2-Hexanone	ND	11	0.9
1,3-Dichloropropane	ND	5.4	0.9
Tetrachloroethene	ND	5.4	0.6
Dibromochloromethane	ND	5.4	0.6
1,2-Dibromoethane	ND	5.4	0.7
Chlorobenzene	ND	5.4	0.7
1,1,1,2-Tetrachloroethane	ND	5.4	0.7
Ethylbenzene	ND	5.4	0.7
m,p-Xylenes	ND	5.4	1.3
o-Xylene	ND	5.4	0.7
Styrene	ND	5.4	0.6
Bromoform	ND	5.4	0.4
Isopropylbenzene	ND	5.4	0.5
1,1,2,2-Tetrachloroethane	ND	5.4	0.4
1,2,3-Trichloropropane	ND	5.4	0.6
Propylbenzene	ND	5.4	0.5

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

18.0

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	MW #1	Diln Fac:	0.9921
Lab ID:	279328-001	Batch#:	237945
Matrix:	Soil	Sampled:	08/03/16
Units:	ug/Kg	Received:	08/03/16
Basis:	dry	Analyzed:	08/11/16

Analyte	Result	RL	MDL
Bromobenzene	ND	5.4	0.6
1,3,5-Trimethylbenzene	ND	5.4	0.6
2-Chlorotoluene	ND	5.4	0.7
4-Chlorotoluene	ND	5.4	0.7
tert-Butylbenzene	ND	5.4	0.4
1,2,4-Trimethylbenzene	ND	5.4	0.6
sec-Butylbenzene	ND	5.4	0.5
para-Isopropyl Toluene	ND	5.4	0.5
1,3-Dichlorobenzene	ND	5.4	0.5
1,4-Dichlorobenzene	ND	5.4	0.6
n-Butylbenzene	ND	5.4	0.4
1,2-Dichlorobenzene	ND	5.4	0.6
1,2-Dibromo-3-Chloropropane	ND	5.4	1.0
1,2,4-Trichlorobenzene	ND	5.4	0.5
Hexachlorobutadiene	ND	5.4	0.3
Naphthalene	ND	5.4	1.1
1,2,3-Trichlorobenzene	ND	5.4	0.5

Surrogate	%REC	Limits
Dibromofluoromethane	97	78-134
1,2-Dichloroethane-d4	89	80-138
Toluene-d8	94	80-120
Bromofluorobenzene	109	78-123

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	MW #3	Diln Fac:	0.9671
Lab ID:	279328-002	Batch#:	237987
Matrix:	Soil	Sampled:	08/03/16
Units:	ug/Kg	Received:	08/03/16
Basis:	dry	Analyzed:	08/12/16

Moisture: 5%

Analyte	Result	RL	MDL
Freon 12	ND	10	0.4
Chloromethane	ND	10	1.1
Vinyl Chloride	ND	10	0.9
Bromomethane	ND	10	1.2
Chloroethane	ND	10	0.5
Trichlorofluoromethane	ND	5.1	0.7
Acetone	ND	20	3.4
Freon 113	ND	5.1	0.4
1,1-Dichloroethene	ND	5.1	1.0
Methylene Chloride	ND	20	1.1
Carbon Disulfide	ND	5.1	0.9
MTBE	ND	5.1	1.0
trans-1,2-Dichloroethene	ND	5.1	0.9
Vinyl Acetate	ND	51	0.7
1,1-Dichloroethane	ND	5.1	1.2
2-Butanone	ND	10	1.4
cis-1,2-Dichloroethene	ND	5.1	0.9
2,2-Dichloropropane	ND	5.1	1.1
Chloroform	ND	5.1	1.3
Bromochloromethane	ND	5.1	1.0
1,1,1-Trichloroethane	ND	5.1	0.8
1,1-Dichloropropene	ND	5.1	0.6
Carbon Tetrachloride	ND	5.1	0.5
1,2-Dichloroethane	ND	5.1	0.9
Benzene	ND	5.1	0.9
Trichloroethene	ND	5.1	0.9
1,2-Dichloropropane	ND	5.1	0.8
Bromodichloromethane	ND	5.1	0.9
Dibromomethane	ND	5.1	0.8
4-Methyl-2-Pentanone	ND	10	1.0
cis-1,3-Dichloropropene	ND	5.1	0.6
Toluene	ND	5.1	0.7
trans-1,3-Dichloropropene	ND	5.1	0.7
1,1,2-Trichloroethane	ND	5.1	0.6
2-Hexanone	ND	10	0.9
1,3-Dichloropropane	ND	5.1	0.9
Tetrachloroethene	ND	5.1	0.5
Dibromochloromethane	ND	5.1	0.5
1,2-Dibromoethane	ND	5.1	0.7
Chlorobenzene	ND	5.1	0.7
1,1,1,2-Tetrachloroethane	ND	5.1	0.6
Ethylbenzene	ND	5.1	0.7
m,p-Xylenes	ND	5.1	1.3
o-Xylene	ND	5.1	0.6
Styrene	ND	5.1	0.6
Bromoform	ND	5.1	0.4
Isopropylbenzene	ND	5.1	0.5
1,1,2,2-Tetrachloroethane	ND	5.1	0.4
1,2,3-Trichloropropane	ND	5.1	0.6
Propylbenzene	ND	5.1	0.5
Bromobenzene	ND	5.1	0.5

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	MW #3	Diln Fac:	0.9671
Lab ID:	279328-002	Batch#:	237987
Matrix:	Soil	Sampled:	08/03/16
Units:	ug/Kg	Received:	08/03/16
Basis:	dry	Analyzed:	08/12/16

Analyte	Result	RL	MDL
1,3,5-Trimethylbenzene	ND	5.1	0.6
2-Chlorotoluene	ND	5.1	0.7
4-Chlorotoluene	ND	5.1	0.7
tert-Butylbenzene	ND	5.1	0.4
1,2,4-Trimethylbenzene	ND	5.1	0.6
sec-Butylbenzene	ND	5.1	0.4
para-Isopropyl Toluene	ND	5.1	0.4
1,3-Dichlorobenzene	ND	5.1	0.4
1,4-Dichlorobenzene	ND	5.1	0.5
n-Butylbenzene	ND	5.1	0.4
1,2-Dichlorobenzene	ND	5.1	0.5
1,2-Dibromo-3-Chloropropane	ND	5.1	1.0
1,2,4-Trichlorobenzene	ND	5.1	0.4
Hexachlorobutadiene	ND	5.1	0.3
Naphthalene	ND	5.1	1.0
1,2,3-Trichlorobenzene	ND	5.1	0.4

Surrogate	%REC	Limits
Dibromofluoromethane	95	78-134
1,2-Dichloroethane-d4	93	80-138
Toluene-d8	96	80-120
Bromofluorobenzene	105	78-123

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Matrix:	Soil	Batch#:	237945
Units:	ug/Kg	Analyzed:	08/11/16
Diln Fac:	1.000		

Type: BS Lab ID: QC846870

Analyte	Spiked	Result	%REC	Limits
1,1-Dichloroethene	25.00	27.21	109	70-134
Benzene	25.00	24.33	97	80-123
Trichloroethene	25.00	25.74	103	80-128
Toluene	25.00	23.96	96	80-120
Chlorobenzene	25.00	24.26	97	80-123

Surrogate	%REC	Limits
Dibromofluoromethane	107	78-134
1,2-Dichloroethane-d4	112	80-138
Toluene-d8	98	80-120
Bromofluorobenzene	102	78-123

Type: BSD Lab ID: QC846871

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
1,1-Dichloroethene	25.00	22.86	91	70-134	17	22
Benzene	25.00	22.09	88	80-123	10	21
Trichloroethene	25.00	22.71	91	80-128	13	23
Toluene	25.00	20.88	84	80-120	14	20
Chlorobenzene	25.00	21.82	87	80-123	11	20

Surrogate	%REC	Limits
Dibromofluoromethane	105	78-134
1,2-Dichloroethane-d4	112	80-138
Toluene-d8	96	80-120
Bromofluorobenzene	100	78-123

RPD= Relative Percent Difference

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846872	Batch#:	237945
Matrix:	Soil	Analyzed:	08/11/16
Units:	ug/Kg		

Analyte	Result	RL	MDL
Freon 12	ND	10	0.4
Chloromethane	ND	10	1.0
Vinyl Chloride	ND	10	0.9
Bromomethane	ND	10	1.2
Chloroethane	ND	10	0.5
Trichlorofluoromethane	ND	5.0	0.7
Acetone	ND	20	3.3
Freon 113	ND	5.0	0.4
1,1-Dichloroethene	ND	5.0	0.9
Methylene Chloride	ND	20	1.1
Carbon Disulfide	ND	5.0	0.9
MTBE	ND	5.0	1.0
trans-1,2-Dichloroethene	ND	5.0	0.8
Vinyl Acetate	ND	50	0.7
1,1-Dichloroethane	ND	5.0	1.2
2-Butanone	ND	10	1.3
cis-1,2-Dichloroethene	ND	5.0	0.9
2,2-Dichloropropane	ND	5.0	1.1
Chloroform	ND	5.0	1.3
Bromochloromethane	ND	5.0	0.9
1,1,1-Trichloroethane	ND	5.0	0.8
1,1-Dichloropropene	ND	5.0	0.6
Carbon Tetrachloride	ND	5.0	0.5
1,2-Dichloroethane	ND	5.0	0.9
Benzene	ND	5.0	0.9
Trichloroethene	ND	5.0	0.8
1,2-Dichloropropane	ND	5.0	0.8
Bromodichloromethane	ND	5.0	0.8
Dibromomethane	ND	5.0	0.8
4-Methyl-2-Pentanone	ND	10	1.0
cis-1,3-Dichloropropene	ND	5.0	0.6
Toluene	ND	5.0	0.7
trans-1,3-Dichloropropene	ND	5.0	0.6
1,1,2-Trichloroethane	ND	5.0	0.6
2-Hexanone	ND	10	0.9
1,3-Dichloropropane	ND	5.0	0.8
Tetrachloroethene	ND	5.0	0.5
Dibromochloromethane	ND	5.0	0.5
1,2-Dibromoethane	ND	5.0	0.7
Chlorobenzene	ND	5.0	0.7
1,1,1,2-Tetrachloroethane	ND	5.0	0.6
Ethylbenzene	ND	5.0	0.7
m,p-Xylenes	ND	5.0	1.3
o-Xylene	ND	5.0	0.6
Styrene	ND	5.0	0.6
Bromoform	ND	5.0	0.4
Isopropylbenzene	ND	5.0	0.5
1,1,2,2-Tetrachloroethane	ND	5.0	0.4
1,2,3-Trichloropropane	ND	5.0	0.6
Propylbenzene	ND	5.0	0.4
Bromobenzene	ND	5.0	0.5
1,3,5-Trimethylbenzene	ND	5.0	0.6
2-Chlorotoluene	ND	5.0	0.7

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

24.0

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846872	Batch#:	237945
Matrix:	Soil	Analyzed:	08/11/16
Units:	ug/Kg		

Analyte	Result	RL	MDL
4-Chlorotoluene	ND	5.0	0.6
tert-Butylbenzene	ND	5.0	0.4
1,2,4-Trimethylbenzene	ND	5.0	0.6
sec-Butylbenzene	ND	5.0	0.4
para-Isopropyl Toluene	ND	5.0	0.4
1,3-Dichlorobenzene	ND	5.0	0.4
1,4-Dichlorobenzene	ND	5.0	0.5
n-Butylbenzene	ND	5.0	0.4
1,2-Dichlorobenzene	ND	5.0	0.5
1,2-Dibromo-3-Chloropropane	ND	5.0	0.9
1,2,4-Trichlorobenzene	ND	5.0	0.4
Hexachlorobutadiene	ND	5.0	0.3
Naphthalene	ND	5.0	1.0
1,2,3-Trichlorobenzene	ND	5.0	0.4

Surrogate	%REC	Limits
Dibromofluoromethane	108	78-134
1,2-Dichloroethane-d4	114	80-138
Toluene-d8	96	80-120
Bromofluorobenzene	107	78-123

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	MW #2	Batch#:	237945
MSS Lab ID:	279335-001	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Analyzed:	08/11/16
Basis:	dry		

Type: MS　　Moisture: 8%
Lab ID: QC846987　　Diln Fac: 0.9843

Analyte	MSS Result	Spiked	Result	%REC	Limits
1,1-Dichloroethene	<1.015	53.49	58.61	110	56-133
Benzene	<0.9749	53.49	51.33	96	57-120
Trichloroethene	<0.9024	53.49	51.54	96	49-145
Toluene	<0.7686	53.49	55.51	104	51-120
Chlorobenzene	<0.7413	53.49	51.41	96	47-120

Surrogate	%REC	Limits
Dibromofluoromethane	95	78-134
1,2-Dichloroethane-d4	90	80-138
Toluene-d8	107	80-120
Bromofluorobenzene	101	78-123

Type: MSD　　Moisture: 8%
Lab ID: QC846988　　Diln Fac: 0.9960

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
1,1-Dichloroethene	54.13	55.40	102	56-133	7	46
Benzene	54.13	48.64	90	57-120	7	44
Trichloroethene	54.13	47.74	88	49-145	9	46
Toluene	54.13	46.50	86	51-120	19	47
Chlorobenzene	54.13	44.70	83	47-120	15	50

Surrogate	%REC	Limits
Dibromofluoromethane	95	78-134
1,2-Dichloroethane-d4	89	80-138
Toluene-d8	95	80-120
Bromofluorobenzene	103	78-123

RPD= Relative Percent Difference

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC847044	Batch#:	237987
Matrix:	Soil	Analyzed:	08/12/16
Units:	ug/Kg		

Analyte	Spiked	Result	%REC	Limits
1,1-Dichloroethene	25.00	26.55	106	70-134
Benzene	25.00	23.97	96	80-123
Trichloroethene	25.00	25.63	103	80-128
Toluene	25.00	23.99	96	80-120
Chlorobenzene	25.00	25.21	101	80-123

Surrogate	%REC	Limits
Dibromofluoromethane	103	78-134
1,2-Dichloroethane-d4	102	80-138
Toluene-d8	97	80-120
Bromofluorobenzene	100	78-123

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC847046	Batch#:	237987
Matrix:	Soil	Analyzed:	08/12/16
Units:	ug/Kg		

Analyte	Result	RL	MDL
Freon 12	ND	10	0.4
Chloromethane	ND	10	1.0
Vinyl Chloride	ND	10	0.9
Bromomethane	ND	10	1.2
Chloroethane	ND	10	0.5
Trichlorofluoromethane	ND	5.0	0.7
Acetone	ND	20	3.3
Freon 113	ND	5.0	0.4
1,1-Dichloroethene	ND	5.0	0.9
Methylene Chloride	ND	20	1.1
Carbon Disulfide	ND	5.0	0.9
MTBE	ND	5.0	1.0
trans-1,2-Dichloroethene	ND	5.0	0.8
Vinyl Acetate	ND	50	0.7
1,1-Dichloroethane	ND	5.0	1.2
2-Butanone	ND	10	1.3
cis-1,2-Dichloroethene	ND	5.0	0.9
2,2-Dichloropropane	ND	5.0	1.1
Chloroform	ND	5.0	1.3
Bromochloromethane	ND	5.0	0.9
1,1,1-Trichloroethane	ND	5.0	0.8
1,1-Dichloropropene	ND	5.0	0.6
Carbon Tetrachloride	ND	5.0	0.5
1,2-Dichloroethane	ND	5.0	0.9
Benzene	ND	5.0	0.9
Trichloroethene	ND	5.0	0.8
1,2-Dichloropropane	ND	5.0	0.8
Bromodichloromethane	ND	5.0	0.8
Dibromomethane	ND	5.0	0.8
4-Methyl-2-Pentanone	ND	10	1.0
cis-1,3-Dichloropropene	ND	5.0	0.6
Toluene	ND	5.0	0.7
trans-1,3-Dichloropropene	ND	5.0	0.6
1,1,2-Trichloroethane	ND	5.0	0.6
2-Hexanone	ND	10	0.9
1,3-Dichloropropane	ND	5.0	0.8
Tetrachloroethene	ND	5.0	0.5
Dibromochloromethane	ND	5.0	0.5
1,2-Dibromoethane	ND	5.0	0.7
Chlorobenzene	ND	5.0	0.7
1,1,1,2-Tetrachloroethane	ND	5.0	0.6
Ethylbenzene	ND	5.0	0.7
m,p-Xylenes	ND	5.0	1.3
o-Xylene	ND	5.0	0.6
Styrene	ND	5.0	0.6
Bromoform	ND	5.0	0.4
Isopropylbenzene	ND	5.0	0.5
1,1,2,2-Tetrachloroethane	ND	5.0	0.4
1,2,3-Trichloropropane	ND	5.0	0.6
Propylbenzene	ND	5.0	0.4
Bromobenzene	ND	5.0	0.5
1,3,5-Trimethylbenzene	ND	5.0	0.6
2-Chlorotoluene	ND	5.0	0.7

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC847046	Batch#:	237987
Matrix:	Soil	Analyzed:	08/12/16
Units:	ug/Kg		

Analyte	Result	RL	MDL
4-Chlorotoluene	ND	5.0	0.6
tert-Butylbenzene	ND	5.0	0.4
1,2,4-Trimethylbenzene	ND	5.0	0.6
sec-Butylbenzene	ND	5.0	0.4
para-Isopropyl Toluene	ND	5.0	0.4
1,3-Dichlorobenzene	ND	5.0	0.4
1,4-Dichlorobenzene	ND	5.0	0.5
n-Butylbenzene	ND	5.0	0.4
1,2-Dichlorobenzene	ND	5.0	0.5
1,2-Dibromo-3-Chloropropane	ND	5.0	0.9
1,2,4-Trichlorobenzene	ND	5.0	0.4
Hexachlorobutadiene	ND	5.0	0.3
Naphthalene	ND	5.0	1.0
1,2,3-Trichlorobenzene	ND	5.0	0.4

Surrogate	%REC	Limits
Dibromofluoromethane	105	78-134
1,2-Dichloroethane-d4	106	80-138
Toluene-d8	110	80-120
Bromofluorobenzene	104	78-123

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Batch QC Report

Purgeable Organics by GC/MS			
Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	ZZZZZZZZZZ	Batch#:	237987
MSS Lab ID:	279653-014	Sampled:	08/11/16
Matrix:	Soil	Received:	08/11/16
Units:	ug/Kg	Analyzed:	08/12/16
Basis:	as received		

Type: MS   Diln Fac: 0.9653
Lab ID: QC847171

Analyte	MSS Result	Spiked	Result	%REC	Limits
1,1-Dichloroethene	<0.8465	48.26	51.56	107	56-133
Benzene	<0.8129	48.26	47.55	99	57-120
Trichloroethene	<0.7524	48.26	51.60	107	49-145
Toluene	<0.6408	48.26	45.51	94	51-120
Chlorobenzene	<0.6181	48.26	45.46	94	47-120

Surrogate	%REC	Limits
Dibromofluoromethane	109	78-134
1,2-Dichloroethane-d4	121	80-138
Toluene-d8	94	80-120
Bromofluorobenzene	98	78-123

Type: MSD   Diln Fac: 0.9242
Lab ID: QC847172

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
1,1-Dichloroethene	46.21	54.97	119	56-133	11	46
Benzene	46.21	48.39	105	57-120	6	44
Trichloroethene	46.21	50.82	110	49-145	3	46
Toluene	46.21	45.10	98	51-120	3	47
Chlorobenzene	46.21	45.80	99	47-120	5	50

Surrogate	%REC	Limits
Dibromofluoromethane	108	78-134
1,2-Dichloroethane-d4	115	80-138
Toluene-d8	93	80-120
Bromofluorobenzene	103	78-123

RPD= Relative Percent Difference

Semivolatile Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Field ID:	MW #1	Batch#:	237734
Lab ID:	279328-001	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	ug/Kg	Prepared:	08/05/16
Basis:	dry	Analyzed:	08/15/16
Diln Fac:	1.000		

Moisture: 8%

Analyte	Result	RL	MDL
N-Nitrosodimethylamine	ND	360	36
Phenol	ND	360	19
bis(2-Chloroethyl)ether	ND	360	14
2-Chlorophenol	ND	360	18
1,3-Dichlorobenzene	ND	360	13
1,4-Dichlorobenzene	ND	360	11
Benzyl alcohol	ND	360	17
1,2-Dichlorobenzene	ND	360	10
2-Methylphenol	ND	360	17
bis(2-Chloroisopropyl) ether	ND	360	20
4-Methylphenol	ND	360	19
N-Nitroso-di-n-propylamine	ND	360	36
Hexachloroethane	ND	360	13
Nitrobenzene	ND	360	13
Isophorone	ND	360	12
2-Nitrophenol	ND	730	11
2,4-Dimethylphenol	ND	360	15
Benzoic acid	ND	1,800	550
bis(2-Chloroethoxy)methane	ND	360	13
2,4-Dichlorophenol	ND	360	14
1,2,4-Trichlorobenzene	ND	360	11
Naphthalene	ND	73	9.6
4-Chloroaniline	ND	360	18
Hexachlorobutadiene	ND	360	66
4-Chloro-3-methylphenol	ND	360	16
2-Methylnaphthalene	ND	73	11
Hexachlorocyclopentadiene	ND	730	66
2,4,6-Trichlorophenol	ND	360	15
2,4,5-Trichlorophenol	ND	360	9.6
2-Chloronaphthalene	ND	360	60
2-Nitroaniline	ND	730	36
Dimethylphthalate	ND	360	10
Acenaphthylene	ND	73	9.3
2,6-Dinitrotoluene	ND	360	9.6
3-Nitroaniline	ND	730	36
Acenaphthene	ND	73	13
2,4-Dinitrophenol	ND	730	170
4-Nitrophenol	ND	730	75
Dibenzofuran	ND	360	9.6
2,4-Dinitrotoluene	ND	360	11
Diethylphthalate	ND	360	9.3
Fluorene	ND	73	9.7
4-Chlorophenyl-phenylether	ND	360	11
4-Nitroaniline	ND	730	36
4,6-Dinitro-2-methylphenol	ND	730	46
N-Nitrosodiphenylamine	ND	360	61
Azobenzene	ND	360	13
4-Bromophenyl-phenylether	ND	360	64
Hexachlorobenzene	ND	360	13

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Semivolatile Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C

Field ID:	MW #1	Batch#:	237734
Lab ID:	279328-001	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	ug/Kg	Prepared:	08/05/16
Basis:	dry	Analyzed:	08/15/16
Diln Fac:	1.000		

Analyte	Result	RL	MDL
Pentachlorophenol	ND	730	160
Phenanthrene	13 J	73	10
Anthracene	ND	73	13
Di-n-butylphthalate	ND	360	13
Fluoranthene	ND	73	9.4
Pyrene	ND	73	10
Butylbenzylphthalate	ND	360	13
3,3'-Dichlorobenzidine	ND	730	47
Benzo(a)anthracene	ND	73	9.4
Chrysene	ND	73	13
bis(2-Ethylhexyl)phthalate	67 J	360	9.5
Di-n-octylphthalate	ND	360	9.2
Benzo(b)fluoranthene	ND	73	13
Benzo(k)fluoranthene	ND	73	9.5
Benzo(a)pyrene	ND	73	9.5
Indeno(1,2,3-cd)pyrene	ND	73	13
Dibenz(a,h)anthracene	ND	73	13
Benzo(g,h,i)perylene	ND	73	9.4

Surrogate	%REC	Limits
2-Fluorophenol	99	25-120
Phenol-d5	99	36-120
2,4,6-Tribromophenol	66	27-120
Nitrobenzene-d5	62	44-120
2-Fluorobiphenyl	70	47-120
Terphenyl-d14	81	49-120

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Field ID:	MW #3	Batch#:	237734
Lab ID:	279328-002	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	ug/Kg	Prepared:	08/05/16
Basis:	dry	Analyzed:	08/15/16
Diln Fac:	1.000		

Moisture: 5%

Analyte	Result	RL	MDL
N-Nitrosodimethylamine	ND	350	35
Phenol	ND	350	18
bis(2-Chloroethyl)ether	ND	350	13
2-Chlorophenol	ND	350	17
1,3-Dichlorobenzene	ND	350	13
1,4-Dichlorobenzene	ND	350	11
Benzyl alcohol	ND	350	16
1,2-Dichlorobenzene	ND	350	10
2-Methylphenol	ND	350	16
bis(2-Chloroisopropyl) ether	ND	350	19
4-Methylphenol	ND	350	18
N-Nitroso-di-n-propylamine	ND	350	35
Hexachloroethane	ND	350	13
Nitrobenzene	ND	350	13
Isophorone	ND	350	11
2-Nitrophenol	ND	700	11
2,4-Dimethylphenol	ND	350	15
Benzoic acid	ND	1,800	530
bis(2-Chloroethoxy)methane	ND	350	12
2,4-Dichlorophenol	ND	350	13
1,2,4-Trichlorobenzene	ND	350	10
Naphthalene	ND	70	9.3
4-Chloroaniline	ND	350	17
Hexachlorobutadiene	ND	350	64
4-Chloro-3-methylphenol	ND	350	16
2-Methylnaphthalene	ND	70	10
Hexachlorocyclopentadiene	ND	700	64
2,4,6-Trichlorophenol	ND	350	15
2,4,5-Trichlorophenol	ND	350	9.3
2-Chloronaphthalene	ND	350	58
2-Nitroaniline	ND	700	35
Dimethylphthalate	ND	350	9.9
Acenaphthylene	ND	70	9.0
2,6-Dinitrotoluene	ND	350	9.3
3-Nitroaniline	ND	700	35
Acenaphthene	ND	70	13
2,4-Dinitrophenol	ND	700	170
4-Nitrophenol	ND	700	72
Dibenzofuran	ND	350	9.2
2,4-Dinitrotoluene	ND	350	10
Diethylphthalate	ND	350	9.0
Fluorene	ND	70	9.4
4-Chlorophenyl-phenylether	ND	350	10
4-Nitroaniline	ND	700	35
4,6-Dinitro-2-methylphenol	ND	700	44
N-Nitrosodiphenylamine	ND	350	59
Azobenzene	ND	350	13
4-Bromophenyl-phenylether	ND	350	62
Hexachlorobenzene	ND	350	13

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Field ID:	MW #3	Batch#:	237734
Lab ID:	279328-002	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	ug/Kg	Prepared:	08/05/16
Basis:	dry	Analyzed:	08/15/16
Diln Fac:	1.000		

Analyte	Result	RL	MDL
Pentachlorophenol	ND	700	160
Phenanthrene	14 J	70	10
Anthracene	ND	70	13
Di-n-butylphthalate	ND	350	13
Fluoranthene	ND	70	9.1
Pyrene	ND	70	9.9
Butylbenzylphthalate	ND	350	13
3,3'-Dichlorobenzidine	ND	700	45
Benzo(a)anthracene	ND	70	9.1
Chrysene	ND	70	13
bis(2-Ethylhexyl)phthalate	39 J	350	9.2
Di-n-octylphthalate	ND	350	8.9
Benzo(b)fluoranthene	ND	70	13
Benzo(k)fluoranthene	ND	70	9.1
Benzo(a)pyrene	ND	70	9.1
Indeno(1,2,3-cd)pyrene	ND	70	13
Dibenz(a,h)anthracene	ND	70	13
Benzo(g,h,i)perylene	ND	70	9.1

Surrogate	%REC	Limits
2-Fluorophenol	100	25-120
Phenol-d5	101	36-120
2,4,6-Tribromophenol	70	27-120
Nitrobenzene-d5	62	44-120
2-Fluorobiphenyl	69	47-120
Terphenyl-d14	83	49-120

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846023	Batch#:	237734
Matrix:	Soil	Prepared:	08/05/16
Units:	ug/Kg	Analyzed:	08/15/16

Analyte	Result	RL	MDL
N-Nitrosodimethylamine	ND	330	33
Phenol	ND	330	17
bis(2-Chloroethyl)ether	ND	330	12
2-Chlorophenol	ND	330	16
1,3-Dichlorobenzene	ND	330	12
1,4-Dichlorobenzene	ND	330	10
Benzyl alcohol	ND	330	15
1,2-Dichlorobenzene	ND	330	9.4
2-Methylphenol	ND	330	15
bis(2-Chloroisopropyl) ether	ND	330	18
4-Methylphenol	ND	330	17
N-Nitroso-di-n-propylamine	ND	330	33
Hexachloroethane	ND	330	12
Nitrobenzene	ND	330	12
Isophorone	ND	330	11
2-Nitrophenol	ND	660	10
2,4-Dimethylphenol	ND	330	14
Benzoic acid	ND	1,700	500
bis(2-Chloroethoxy)methane	ND	330	11
2,4-Dichlorophenol	ND	330	13
1,2,4-Trichlorobenzene	ND	330	9.6
Naphthalene	ND	66	8.7
4-Chloroaniline	ND	330	16
Hexachlorobutadiene	ND	330	60
4-Chloro-3-methylphenol	ND	330	15
2-Methylnaphthalene	ND	66	9.8
Hexachlorocyclopentadiene	ND	660	60
2,4,6-Trichlorophenol	ND	330	14
2,4,5-Trichlorophenol	ND	330	8.7
2-Chloronaphthalene	ND	330	55
2-Nitroaniline	ND	660	33
Dimethylphthalate	ND	330	9.3
Acenaphthylene	ND	66	8.5
2,6-Dinitrotoluene	ND	330	8.8
3-Nitroaniline	ND	660	33
Acenaphthene	ND	66	12
2,4-Dinitrophenol	ND	660	160
4-Nitrophenol	ND	660	68
Dibenzofuran	ND	330	8.7
2,4-Dinitrotoluene	ND	330	9.6
Diethylphthalate	ND	330	8.5
Fluorene	ND	66	8.9
4-Chlorophenyl-phenylether	ND	330	9.7
4-Nitroaniline	ND	660	33
4,6-Dinitro-2-methylphenol	ND	660	42
N-Nitrosodiphenylamine	ND	330	56
Azobenzene	ND	330	12
4-Bromophenyl-phenylether	ND	330	58
Hexachlorobenzene	ND	330	12
Pentachlorophenol	ND	660	150
Phenanthrene	ND	66	9.6
Anthracene	ND	66	12

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

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Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846023	Batch#:	237734
Matrix:	Soil	Prepared:	08/05/16
Units:	ug/Kg	Analyzed:	08/15/16

Analyte	Result	RL	MDL
Di-n-butylphthalate	ND	330	12
Fluoranthene	ND	66	8.6
Pyrene	ND	66	9.3
Butylbenzylphthalate	ND	330	12
3,3'-Dichlorobenzidine	ND	660	43
Benzo(a)anthracene	ND	66	8.6
Chrysene	ND	66	12
bis(2-Ethylhexyl)phthalate	13 J	330	8.7
Di-n-octylphthalate	ND	330	8.4
Benzo(b)fluoranthene	ND	66	12
Benzo(k)fluoranthene	ND	66	8.6
Benzo(a)pyrene	ND	66	8.6
Indeno(1,2,3-cd)pyrene	ND	66	12
Dibenz(a,h)anthracene	ND	66	12
Benzo(g,h,i)perylene	ND	66	8.6

Surrogate	%REC	Limits
2-Fluorophenol	111	25-120
Phenol-d5	106	36-120
2,4,6-Tribromophenol	71	27-120
Nitrobenzene-d5	72	44-120
2-Fluorobiphenyl	81	47-120
Terphenyl-d14	85	49-120

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC846024	Batch#:	237734
Matrix:	Soil	Prepared:	08/05/16
Units:	ug/Kg	Analyzed:	08/15/16

Analyte	Spiked	Result	%REC	Limits
Phenol	2,694	1,490	55	42-120
2-Chlorophenol	2,694	1,801	67	45-120
1,4-Dichlorobenzene	2,694	1,754	65	48-120
N-Nitroso-di-n-propylamine	2,694	1,607	60	27-123
1,2,4-Trichlorobenzene	2,694	2,149	80	50-120
4-Chloro-3-methylphenol	2,694	2,563	95	59-120
Acenaphthene	1,010	740.4	73	53-120
4-Nitrophenol	2,694	2,119	79	47-120
2,4-Dinitrotoluene	2,694	2,276	85	55-120
Pentachlorophenol	2,694	1,388	52	32-120
Pyrene	1,010	826.8	82	52-120

Surrogate	%REC	Limits
2-Fluorophenol	74	25-120
Phenol-d5	59	36-120
2,4,6-Tribromophenol	86	27-120
Nitrobenzene-d5	75	44-120
2-Fluorobiphenyl	75	47-120
Terphenyl-d14	88	49-120

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8081A
Field ID:	MW #1	Batch#:	237742
Lab ID:	279328-001	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	ug/Kg	Prepared:	08/05/16
Basis:	dry	Analyzed:	08/08/16
Diln Fac:	1.000		

Moisture: 8%

Analyte	Result	RL	MDL
alpha-BHC	ND	1.9	0.27
beta-BHC	ND	1.9	0.44
gamma-BHC	ND	1.9	0.43
delta-BHC	ND	1.9	0.22
Heptachlor	ND	1.9	0.41
Aldrin	ND	1.9	0.46
Heptachlor epoxide	7.3	1.9	0.27
Endosulfan I	ND	1.9	0.35
Dieldrin	ND	1.9	0.51
4,4'-DDE	58	3.6	0.48
Endrin	ND	3.6	0.64
Endosulfan II	ND	3.6	0.53
Endosulfan sulfate	ND	3.6	0.53
4,4'-DDD	6.0 C	3.6	0.52
Endrin aldehyde	ND	3.6	0.43
4,4'-DDT	110	3.6	0.48
alpha-Chlordane	33	1.9	0.28
gamma-Chlordane	33	1.9	0.40
Methoxychlor	ND	19	2.9
Toxaphene	ND	66	16

Surrogate	%REC	Limits
TCMX	84	44-125
Decachlorobiphenyl	77	39-121

C= Presence confirmed, but RPD between columns exceeds 40%
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8081A
Field ID:	MW #3	Batch#:	237742
Lab ID:	279328-002	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	ug/Kg	Prepared:	08/05/16
Basis:	dry	Analyzed:	08/08/16
Diln Fac:	1.000		

Moisture: 5%

Analyte	Result	RL	MDL
alpha-BHC	ND	1.8	0.26
beta-BHC	ND	1.8	0.42
gamma-BHC	ND	1.8	0.42
delta-BHC	ND	1.8	0.22
Heptachlor	ND	1.8	0.39
Aldrin	ND	1.8	0.45
Heptachlor epoxide	ND	1.8	0.26
Endosulfan I	ND	1.8	0.34
Dieldrin	ND	1.8	0.50
4,4'-DDE	ND	3.5	0.47
Endrin	ND	3.5	0.62
Endosulfan II	ND	3.5	0.52
Endosulfan sulfate	ND	3.5	0.51
4,4'-DDD	ND	3.5	0.50
Endrin aldehyde	ND	3.5	0.42
4,4'-DDT	ND	3.5	0.46
alpha-Chlordane	ND	1.8	0.27
gamma-Chlordane	ND	1.8	0.38
Methoxychlor	ND	18	2.8
Toxaphene	ND	64	15

Surrogate	%REC	Limits
TCMX	96	44-125
Decachlorobiphenyl	97	39-121

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Batch QC Report

Organochlorine Pesticides

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8081A
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846053	Batch#:	237742
Matrix:	Soil	Prepared:	08/05/16
Units:	ug/Kg	Analyzed:	08/08/16

Analyte	Result	RL	MDL
alpha-BHC	ND	0.86	0.12
beta-BHC	ND	0.86	0.20
gamma-BHC	ND	0.86	0.20
delta-BHC	ND	0.86	0.10
Heptachlor	ND	0.86	0.19
Aldrin	ND	0.86	0.21
Heptachlor epoxide	ND	0.86	0.12
Endosulfan I	ND	0.86	0.16
Dieldrin	ND	0.86	0.23
4,4'-DDE	ND	1.7	0.22
Endrin	ND	1.7	0.29
Endosulfan II	ND	1.7	0.24
Endosulfan sulfate	ND	1.7	0.24
4,4'-DDD	ND	1.7	0.24
Endrin aldehyde	ND	1.7	0.20
4,4'-DDT	ND	1.7	0.22
alpha-Chlordane	ND	0.86	0.13
gamma-Chlordane	ND	0.86	0.18
Methoxychlor	ND	8.6	1.3
Toxaphene	ND	30	7.3

Surrogate	%REC	Limits
TCMX	86	44-125
Decachlorobiphenyl	76	39-121

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Organochlorine Pesticides

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8081A
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC846054	Batch#:	237742
Matrix:	Soil	Prepared:	08/05/16
Units:	ug/Kg	Analyzed:	08/08/16

Analyte	Spiked	Result	%REC	Limits
gamma-BHC	13.18	14.17	107	44-121
Heptachlor	13.18	14.18	108	45-129
Aldrin	13.18	14.15	107	45-120
Dieldrin	13.18	13.40 #	102	49-131
Endrin	13.18	12.12	92	43-135
4,4'-DDT	13.18	10.06	76	37-141

Surrogate	%REC	Limits
TCMX	108	44-125
Decachlorobiphenyl	87	39-121

#= CCV drift outside limits; average CCV drift within limits per method requirements

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8082
Matrix:	Soil	Sampled:	08/03/16
Units:	ug/Kg	Received:	08/03/16
Basis:	dry	Prepared:	08/08/16
Diln Fac:	1.000	Analyzed:	08/09/16
Batch#:	237812		

Field ID: MW #1 Lab ID: 279328-001
Type: SAMPLE Moisture: 8%

Analyte	Result	RL	MDL
Aroclor-1016	ND	13	3.2
Aroclor-1221	ND	26	8.6
Aroclor-1232	ND	13	4.2
Aroclor-1242	ND	13	3.9
Aroclor-1248	ND	13	4.1
Aroclor-1254	ND	13	3.3
Aroclor-1260	ND	13	2.1

Surrogate	%REC	Limits
Decachlorobiphenyl	81	25-135

Field ID: MW #3 Lab ID: 279328-002
Type: SAMPLE Moisture: 5%

Analyte	Result	RL	MDL
Aroclor-1016	ND	13	3.1
Aroclor-1221	ND	25	8.4
Aroclor-1232	ND	13	4.1
Aroclor-1242	ND	13	3.8
Aroclor-1248	ND	13	4.0
Aroclor-1254	ND	13	3.2
Aroclor-1260	ND	13	2.0

Surrogate	%REC	Limits
Decachlorobiphenyl	82	25-135

Type: BLANK Lab ID: QC846342

Analyte	Result	RL	MDL
Aroclor-1016	ND	4.8	1.2
Aroclor-1221	ND	9.6	3.2
Aroclor-1232	ND	4.8	1.5
Aroclor-1242	ND	4.8	1.4
Aroclor-1248	ND	4.8	1.5
Aroclor-1254	ND	4.8	1.2
Aroclor-1260	ND	4.8	0.77

Surrogate	%REC	Limits
Decachlorobiphenyl	107	25-135

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Batch QC Report

Polychlorinated Biphenyls (PCBs)

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8082
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC846343	Batch#:	237812
Matrix:	Soil	Prepared:	08/08/16
Units:	ug/Kg	Analyzed:	08/09/16

Analyte	Spiked	Result	%REC	Limits
Aroclor-1016	165.6	174.4	105	64-140
Aroclor-1260	165.6	155.8	94	65-146

Surrogate	%REC	Limits
Decachlorobiphenyl	92	25-135

Batch QC Report

Polychlorinated Biphenyls (PCBs)

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8082
Field ID:	ZZZZZZZZZZ	Batch#:	237812
MSS Lab ID:	279347-002	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Prepared:	08/08/16
Basis:	as received	Analyzed:	08/09/16
Diln Fac:	1.000		

Type: MS　　Lab ID: QC846344

Analyte	MSS Result	Spiked	Result	%REC	Limits
Aroclor-1016	<2.952	166.2	214.0	129	60-161
Aroclor-1260	38.23	166.2	248.9	127	42-166

Surrogate	%REC	Limits
Decachlorobiphenyl	91	25-135

Type: MSD　　Lab ID: QC846345

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Aroclor-1016	166.6	219.9	132	60-161	2	43
Aroclor-1260	166.6	269.4	139	42-166	8	51

Surrogate	%REC	Limits
Decachlorobiphenyl	90	25-135

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

California Title 22 Metals

Lab #:	279328	Project#:	1610277
Client:	GEI Consultants, Inc.	Location:	Former Nursery Detention Basin
Field ID:	MW #1	Basis:	dry
Lab ID:	279328-001	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	mg/Kg		

Moisture: 8%

Analyte	Result		RL	MDL	Diln Fac	Batch#	Prepared	Analyzed	Prep	Analysis
Antimony	0.21	J	2.2	0.086	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Arsenic	8.1		0.27	0.080	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Barium	210		0.27	0.059	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Beryllium	0.55		0.27	0.055	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Cadmium	0.13	J	0.27	0.032	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Chromium	100		0.27	0.084	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Cobalt	20		0.27	0.053	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Copper	39		0.35	0.12	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Lead	15		0.27	0.077	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Mercury	ND		0.018	0.0033	1.000	238064	08/15/16	08/16/16	METHOD	EPA 7471A
Molybdenum	0.35		0.27	0.087	25.00	237809	08/08/16	08/11/16	EPA 3050B	EPA 6020
Nickel	140		0.27	0.082	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Selenium	0.20	J	2.2	0.081	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Silver	0.050	J	0.27	0.032	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Thallium	0.066	J	0.27	0.058	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Vanadium	54		0.35	0.12	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Zinc	85		1.1	0.28	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

California Title 22 Metals

Lab #:	279328	Project#: 1610277	
Client:	GEI Consultants, Inc.	Location: Former Nursery Detention Basin	
Field ID:	MW #3	Basis:	dry
Lab ID:	279328-002	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	mg/Kg		

Moisture: 5%

Analyte	Result	RL	MDL	Diln Fac	Batch#	Prepared	Analyzed	Prep	Analysis
Antimony	0.20 J	2.1	0.085	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Arsenic	7.6	0.26	0.079	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Barium	440	29	7.6	2,500	237809	08/08/16	08/12/16	EPA 3050B	EPA 6020
Beryllium	0.59	0.26	0.054	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Cadmium	0.057 J	0.26	0.032	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Chromium	95	0.26	0.083	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Cobalt	22	0.26	0.052	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Copper	39	0.34	0.11	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Lead	11	0.26	0.076	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Mercury	0.25	0.017	0.0030	1.000	238064	08/15/16	08/16/16	METHOD	EPA 7471A
Molybdenum	0.79	0.26	0.086	25.00	237809	08/08/16	08/11/16	EPA 3050B	EPA 6020
Nickel	130	0.26	0.081	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Selenium	0.19 J	2.1	0.080	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Silver	0.040 J	0.26	0.032	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Thallium	0.070 J	0.26	0.057	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Vanadium	59	0.34	0.11	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020
Zinc	80	1.1	0.28	25.00	237809	08/08/16	08/09/16	EPA 3050B	EPA 6020

J= Estimated value
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

California Title 22 Metals

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3050B
Project#:	1610277	Analysis:	EPA 6020
Type:	BLANK	Diln Fac:	25.00
Lab ID:	QC846328	Batch#:	237809
Matrix:	Soil	Prepared:	08/08/16
Units:	mg/Kg	Analyzed:	08/08/16

Analyte	Result	RL	MDL
Antimony	ND	2.0	0.077
Arsenic	0.21 J	0.25	0.071
Barium	ND	0.25	0.052
Beryllium	ND	0.25	0.049
Cadmium	ND	0.25	0.029
Chromium	0.47 b	0.25	0.075
Cobalt	ND	0.25	0.047
Copper	ND	0.31	0.10
Lead	ND	0.25	0.069
Molybdenum	ND	0.25	0.077
Nickel	ND	0.25	0.073
Selenium	ND	2.0	0.072
Silver	ND	0.25	0.029
Thallium	ND	0.25	0.052
Vanadium	0.22 J	0.31	0.10
Zinc	0.47 J	1.0	0.25

J= Estimated value
b= See narrative
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

California Title 22 Metals

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3050B
Project#:	1610277	Analysis:	EPA 6020
Matrix:	Soil	Batch#:	237809
Units:	mg/Kg	Prepared:	08/08/16
Diln Fac:	25.00	Analyzed:	08/08/16

Type: BS Lab ID: QC846329

Analyte	Spiked	Result	%REC	Limits
Antimony	24.51	22.13	90	80-120
Arsenic	24.51	25.21	103	80-121
Barium	24.51	24.91	102	80-121
Beryllium	12.25	11.66	95	80-120
Cadmium	24.51	23.70	97	80-120
Chromium	24.51	25.38	104	80-131
Cobalt	24.51	25.45	104	80-132
Copper	24.51	23.11	94	80-137
Lead	24.51	24.62	100	80-125
Molybdenum	24.51	23.39	95	80-120
Nickel	24.51	25.00	102	77-141
Selenium	24.51	24.14	99	80-129
Silver	2.451	2.348	96	80-122
Thallium	24.51	24.19	99	80-120
Vanadium	24.51	24.40	100	80-128
Zinc	24.51	25.11	102	80-133

Type: BSD Lab ID: QC846330

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Antimony	24.27	22.79	94	80-120	4	20
Arsenic	24.27	26.12	108	80-121	5	21
Barium	24.27	25.73	106	80-121	4	20
Beryllium	12.14	11.93	98	80-120	3	20
Cadmium	24.27	24.82	102	80-120	6	20
Chromium	24.27	26.84	111	80-131	7	25
Cobalt	24.27	26.71	110	80-132	6	24
Copper	24.27	24.66	102	80-137	7	27
Lead	24.27	25.17	104	80-125	3	20
Molybdenum	24.27	22.62	93	80-120	2	20
Nickel	24.27	25.72	106	77-141	4	29
Selenium	24.27	25.69	106	80-129	7	22
Silver	2.427	2.499	103	80-122	7	20
Thallium	24.27	24.62	101	80-120	3	20
Vanadium	24.27	25.74	106	80-128	6	24
Zinc	24.27	25.78	106	80-133	4	23

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

California Title 22 Metals

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3050B
Project#:	1610277	Analysis:	EPA 6020
Field ID:	ZZZZZZZZZZ	Batch#:	237809
MSS Lab ID:	279117-003	Sampled:	07/26/16
Matrix:	Soil	Received:	07/28/16
Units:	mg/Kg	Prepared:	08/08/16
Basis:	as received	Analyzed:	08/08/16
Diln Fac:	25.00		

Type: MS   Lab ID: QC846331

Analyte	MSS Result	Spiked	Result	%REC	Limits
Antimony	0.1860	26.32	13.88	52	21-120
Arsenic	10.05	26.32	38.51	108	75-122
Barium	27.36	26.32	50.12	86	54-148
Beryllium	0.06667	13.16	12.77	97	80-120
Cadmium	<0.02565	26.32	26.46	101	80-120
Chromium	20.47	26.32	48.57	107	60-158
Cobalt	5.534	26.32	32.25	102	73-142
Copper	1.791	26.32	28.74	102	59-150
Lead	1.692	26.32	27.68	99	68-137
Molybdenum	0.4329	26.32	23.96	89	71-120
Nickel	23.53	26.32	49.80	100	57-161
Selenium	<0.06483	26.32	26.32	100	75-128
Silver	<0.02583	2.632	2.749	104	77-120
Thallium	<0.04630	26.32	25.93	99	76-120
Vanadium	18.18	26.32	44.03	98	65-150
Zinc	18.17	26.32	45.38	103	44-158

Type: MSD   Lab ID: QC846332

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Antimony	24.04	12.66	52	21-120	0	29
Arsenic	24.04	34.99	104	75-122	3	24
Barium	24.04	43.11	66	54-148	11	28
Beryllium	12.02	12.09	100	80-120	4	20
Cadmium	24.04	24.45	102	80-120	1	20
Chromium	24.04	45.97	106	60-158	0	36
Cobalt	24.04	30.18	103	73-142	1	34
Copper	24.04	30.44	119	59-150	14	52
Lead	24.04	25.97	101	68-137	2	32
Molybdenum	24.04	21.68	88	71-120	1	20
Nickel	24.04	48.65	105	57-161	2	47
Selenium	24.04	24.07	100	75-128	0	20
Silver	2.404	2.526	105	77-120	1	20
Thallium	24.04	23.74	99	76-120	0	20
Vanadium	24.04	42.55	101	65-150	2	28
Zinc	24.04	45.67	114	44-158	6	33

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

California Title 22 Metals			
Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	EPA 7471A
Analyte:	Mercury	Diln Fac:	1.000
Type:	BLANK	Batch#:	238064
Lab ID:	QC847358	Prepared:	08/15/16
Matrix:	Soil	Analyzed:	08/15/16
Units:	mg/Kg		

Result	RL	MDL
0.0058 J	0.016	0.0029

J= Estimated value
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

California Title 22 Metals

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	EPA 7471A
Analyte:	Mercury	Batch#:	238064
Matrix:	Soil	Prepared:	08/15/16
Units:	mg/Kg	Analyzed:	08/16/16
Diln Fac:	1.000		

Type	Lab ID	Spiked	Result	%REC	Limits	RPD	Lim
BS	QC847359	0.2083	0.1913	92	80-120		
BSD	QC847360	0.2049	0.1943	95	80-120	3	20

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

California Title 22 Metals

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	EPA 7471A
Analyte:	Mercury	Diln Fac:	1.000
Field ID:	ZZZZZZZZZZ	Batch#:	238064
MSS Lab ID:	279344-001	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	mg/Kg	Prepared:	08/15/16
Basis:	as received	Analyzed:	08/15/16

Type	Lab ID	MSS Result	Spiked	Result	%REC	Limits	RPD	Lim
MS	QC847361	0.2728	0.2016	0.4747	100	69-142		
MSD	QC847362		0.1953	0.4610	96	69-142	2	36

RPD= Relative Percent Difference

Total Organic Carbon (TOC)

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	WALKLEY-BLACK
Analyte:	Total Organic Carbon	Batch#:	237846
Matrix:	Soil	Sampled:	08/03/16
Units:	%	Received:	08/03/16
Basis:	dry	Analyzed:	08/08/16
Diln Fac:	1.000		

Field ID	Type	Lab ID	Result	RL	Moisture
MW #1	SAMPLE	279328-001	1.0	0.05	8%
MW #3	SAMPLE	279328-002	0.42	0.05	5%
	BLANK	QC846469	ND	0.01	

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

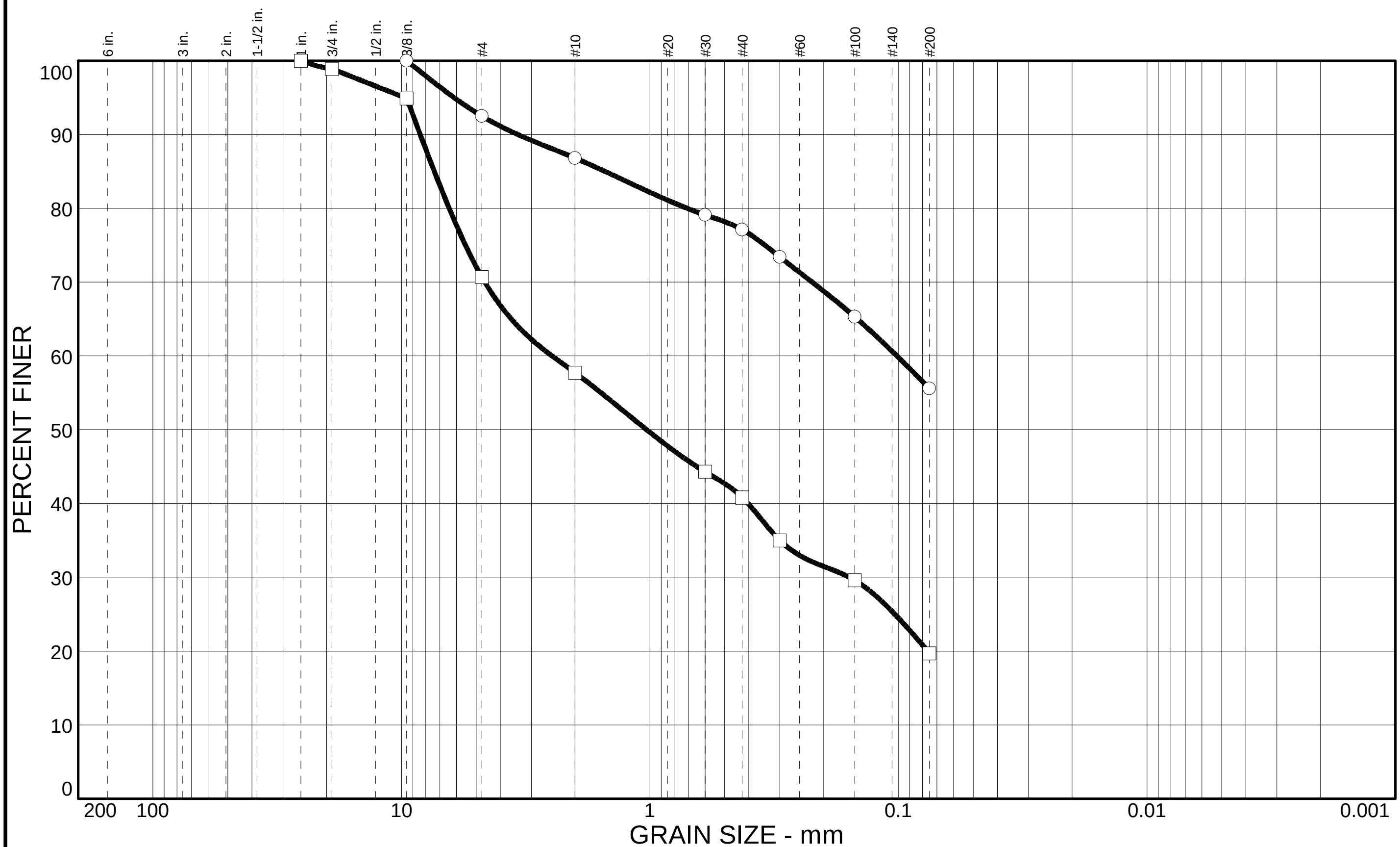
Total Organic Carbon (TOC)

Lab #:	279328	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	WALKLEY-BLACK
Analyte:	Total Organic Carbon	Diln Fac:	1.000
Field ID:	MW #1	Batch#:	237846
MSS Lab ID:	279328-001	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	%	Analyzed:	08/08/16
Basis:	dry		

Type	Lab ID	MSS Result	Spiked	Result	%REC	Limits	Moisture	RPD	Lim
LCS	QC846470		0.1300	0.1240	95	80-120			
MS	QC846471	1.020	0.7030	1.655	90	66-120	8%		
MSD	QC846472		0.6996	1.579	80	66-120	8%	5	20

RPD= Relative Percent Difference

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		7.5	36.9	55.6					
□		29.3	51.0	19.7					

SIEVE inches size	PERCENT FINER ○	□	
1"		100.0	
3/4"		98.9	
3/8	100.0	94.9	
	GRAIN SIZE		
D_{60}	0.102	2.48	
D_{30}		0.158	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	92.5	70.7	
#10	86.8	57.7	
#30	79.1	44.3	
#40	77.1	40.8	
#50	73.4	35.0	
#100	65.3	29.6	
#200	55.6	19.7	

SOIL DESCRIPTION

○ Olive Brown Sandy CLAY

□ Olive Brown Clayey SAND w/ Gravel

REMARKS:

○

□

○ Source: MW #1

□ Source: MW #3

COOPER TESTING LABORATORY

Client: Curtis & Tompkins, Ltd.

Project: Nursery Detention Basin - 279328

Project No.: 202-066

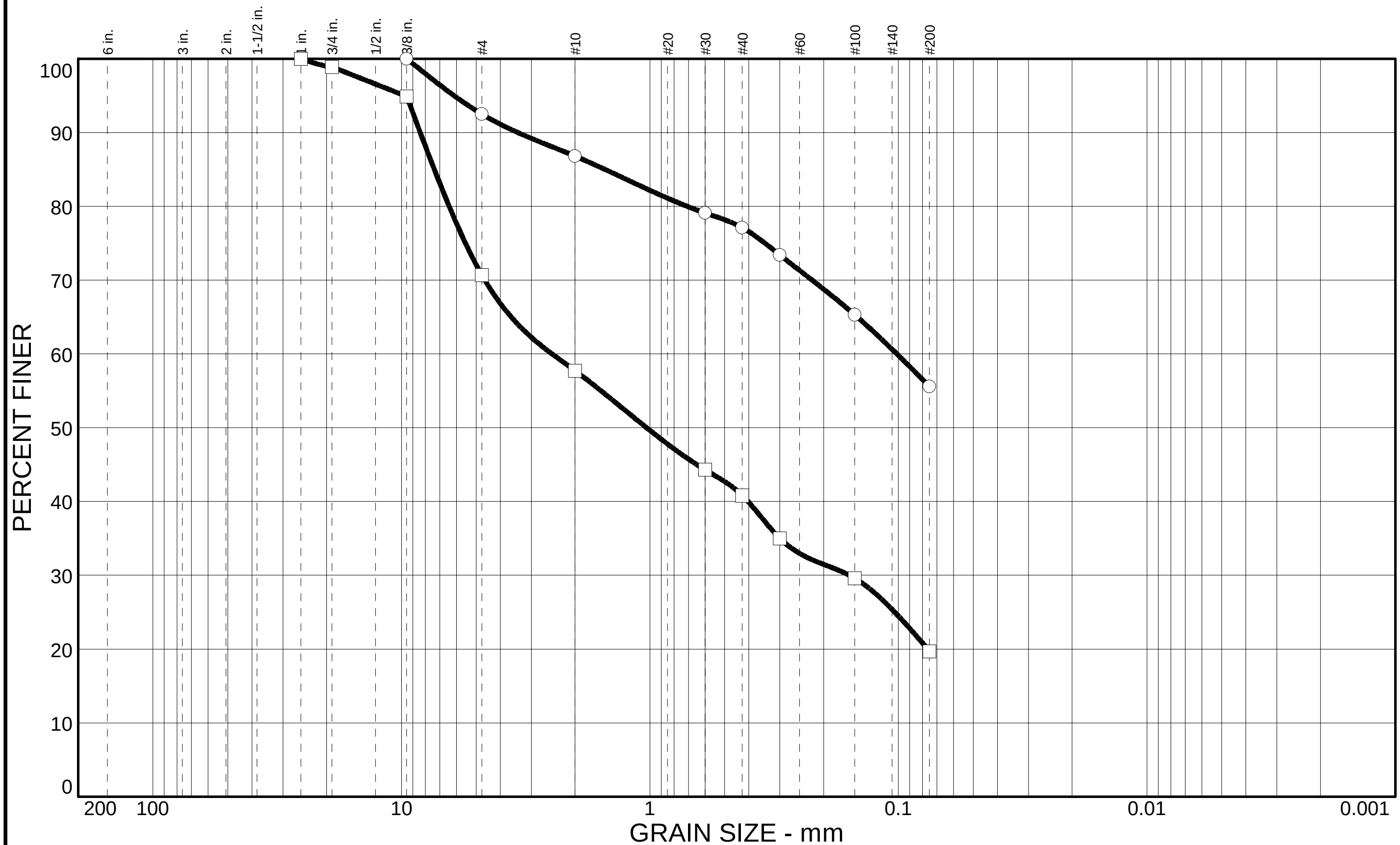
Figure

Laboratory Job Number 279328

Subcontracted Products

Cooper Testing Labs

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		7.5	36.9	55.6					
□		29.3	51.0	19.7					

SIEVE inches size	PERCENT FINER ○	□	
1"		100.0	
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3/8	100.0	94.9	
	GRAIN SIZE		
D_{60}	0.102	2.48	
D_{30}		0.158	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	92.5	70.7	
#10	86.8	57.7	
#30	79.1	44.3	
#40	77.1	40.8	
#50	73.4	35.0	
#100	65.3	29.6	
#200	55.6	19.7	

SOIL DESCRIPTION

○ Olive Brown Sandy CLAY

□ Olive Brown Clayey SAND w/ Gravel

REMARKS:

○

□

○ Source: MW #1

□ Source: MW #3

COOPER TESTING LABORATORY

Client: Curtis & Tompkins, Ltd.

Project: Nursery Detention Basin - 279328

Project No.: 202-066 Figure


Curtis & Tompkins, Ltd.
Analytical Laboratories, Since 1878

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 279335
ANALYTICAL REPORT

GEI Consultants, Inc.	Project : 1610277
180 Grand Avenue	Location : Former Nursery Detention Basin
Oakland, CA 94612	Level : II

Sample ID	Lab ID
MW #2	279335-001
SB #3	279335-002

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: ____________________ Date: 08/30/2016

Dina Ali
Project Manager
dina.ali@ctberk.com

CA ELAP# 2896, NELAP# 4044-001

Curtis & Tompkins, Ltd.

CASE NARRATIVE

Laboratory number:	**279335**
Client:	**GEI Consultants, Inc.**
Project:	**1610277**
Location:	**Former Nursery Detention Basin**
Request Date:	**08/04/16**
Samples Received:	**08/04/16**

This data package contains sample and QC results for two six-point soil composites, requested for the above referenced project on 08/04/16. The samples were received on ice and intact.

Volatile Organics by GC/MS (EPA 8260B):
No analytical problems were encountered.

Semivolatile Organics by GC/MS (EPA 8270C):
Matrix spikes QC846264,QC846265 (batch 237795) were not reported because the parent sample required a dilution that would have diluted out the spikes. 1,2,4-trichlorobenzene was detected between the MDL and the RL in the method blank for batch 237795; this analyte was not detected in samples at or above the RL. No other analytical problems were encountered.

Pesticides (EPA 8081A):
All samples underwent sulfur cleanup using the copper option in EPA Method 3660B. All samples underwent florisil cleanup using EPA Method 3620C. Matrix spikes QC846055,QC846056 (batch 237742) were not reported because the parent sample required a dilution that would have diluted out the spikes. No other analytical problems were encountered.

PCBs (EPA 8082):
All samples underwent sulfuric acid cleanup using EPA Method 3665A. All samples underwent sulfur cleanup using the copper option in EPA Method 3660B. No analytical problems were encountered.

Metals (EPA 6020 and EPA 7471A):
Mercury was detected between the MDL and the RL in the method blank for batch 238064; this analyte was detected in samples at a level at least 10 times that of the blank. Chromium was detected above the RL in the method blank for batch 237809; this analyte was detected in samples at a level at least 10 times that of the blank. Arsenic, vanadium, and zinc were detected between the MDL and the RL in the method blank for batch 237809; these analytes were detected in samples at a level at least 10 times that of the blank. No other analytical problems were encountered.

Moisture (ASTM D2216/CLP):
No analytical problems were encountered.

Total Organic Carbon (TOC) (WALKLEY-BLACK):
No analytical problems were encountered.

Curtis & Tompkins, Ltd.

CASE NARRATIVE

Laboratory number:	**279335**
Client:	**GEI Consultants, Inc.**
Project:	**1610277**
Location:	**Former Nursery Detention Basin**
Request Date:	**08/04/16**
Samples Received:	**08/04/16**

Particle Size (ASTM):

Cooper Testing Labs in Palo Alto, CA performed the analysis (not NELAP certified). Please see the Cooper Testing Labs case narrative.

CHAIN OF CUSTODY

Curtis & Tompkins Laboratories
ENVIRONMENTAL ANALYTICAL TESTING LABORATORY
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2323 Fifth Street
Berkeley, CA 94710

Phone (510) 486-0900
Fax (510) 486-0532

Page 1 of 1

Chain of Custody # ______

C&T LOGIN # 279335

Project No: 1610277

Project Name: Former Nursery Detention Basin

Project P. O. No:

EDD Format: Report Level ☐ II ☐ III ☐ IV

Turnaround Time: ☐ RUSH ☑ Standard

Sampler:

Report To: Graham Bradner

Company: GEI Consultants, Inc.

Telephone: ~~8~~ (916) 631-4577

Email: gbradner@geiconsultants.com

Lab No.	Sample ID.	SAMPLING: Date Collected	SAMPLING: Time Collected	MATRIX: Water	MATRIX: Solid	# of Containers	CHEMICAL PRESERVATIVE: HCl	H2SO4	HNO3	NaOH	None	ANALYTICAL REQUEST: TOC	Metals 6010B or 6020	VOCs 8260	SVOCs 8270	PCB Aroclors 8082	Organochlorine Pesticides 8081A	Sieve w/ 200 wash
	MW#2	8/4/16	8:00am									1	1	1	1	1	1	1
	SB#3											1	1	1	1	1	1	1

Notes:

SAMPLE RECEIPT
☐ Intact
☐ Cold
☑ On Ice
☐ Ambient

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
Maydel Uzcategui	8/4/16	13:29	Pat Hongah	8/4/16	13:29

COOLER RECEIPT CHECKLIST

Curtis & Tompkins, Ltd.

Login # 279335 Date Received 8/4/16 Number of coolers 1

Client GEI Project 1610277

Date Opened 8/4 By (print) CB (sign) [signature]

Date Logged in ↓ By (print) DTN (sign) dnguyen

Date Labelled ↓ By (print) CB (sign) [signature]

1. Did cooler come with a shipping slip (airbill, etc) YES **NO**
   Shipping info

2A. Were custody seals present? .... ☐ YES (circle) on cooler on samples ☒ NO
   How many Name Date

2B. Were custody seals intact upon arrival? YES NO **N/A**

3. Were custody papers dry and intact when received? **YES** NO

4. Were custody papers filled out properly (ink, signed, etc)? **YES** NO

5. Is the project identifiable from custody papers? (If so fill out top of form) **YES** NO

6. Indicate the packing in cooler: (if other, describe)

   ☐ Bubble Wrap ☐ Foam blocks ☒ Bags ☐ None
   ☐ Cloth material ☐ Cardboard ☐ Styrofoam ☐ Paper towels

7. Temperature documentation: * Notify PM if temperature exceeds 6°C

   Type of ice used: ☒ Wet ☐ Blue/Gel ☐ None Temp(°C) 4.1

   ☒ Temperature blank(s) included? ☒ Thermometer# 4 ☐ IR Gun#

   ☐ Samples received on ice directly from the field. Cooling process had begun

8. Were Method 5035 sampling containers present? YES **NO**
   If YES, what time were they transferred to freezer?

9. Did all bottles arrive unbroken/unopened? **YES** NO

10. Are there any missing / extra samples? YES **NO**

11. Are samples in the appropriate containers for indicated tests? **YES** NO

12. Are sample labels present, in good condition and complete? **YES** NO

13. Do the sample labels agree with custody papers? **YES** NO

14. Was sufficient amount of sample sent for tests requested? **YES** NO

15. Are the samples appropriately preserved? ~~YES NO~~ **N/A**

16. Did you check preservatives for all bottles for each sample? YES NO **N/A**

17. Did you document your preservative check? (pH strip lot#) YES NO **N/A**

18. Did you change the hold time in LIMS for unpreserved VOAs? YES NO **N/A**

19. Did you change the hold time in LIMS for preserved terracores? YES NO **N/A**

20. Are bubbles > 6mm absent in VOA samples? YES NO **N/A**

21. Was the client contacted concerning this sample delivery? YES **NO**
    If YES, Who was called? By Date:

COMMENTS

Detections Summary for 279335

Results for any subcontracted analyses are not included in this summary.

Client : GEI Consultants, Inc.
Project : 1610277
Location : Former Nursery Detention Basin

Client Sample ID : MW #2 Laboratory Sample ID : 279335-001

Analyte	Result	Flags	RL	MDL	Units	Basis	IDF	Method	Prep Method
Phenanthrene	11	J	73	10	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
bis(2-Ethylhexyl)phthalate	11	J	360	9.5	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
Antimony	0.23	J	2.2	0.081	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Arsenic	7.8		0.27	0.075	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Barium	200		0.27	0.055	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Beryllium	0.55		0.27	0.052	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Cadmium	0.090	J	0.27	0.030	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Chromium	110		0.27	0.079	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Cobalt	19		0.27	0.050	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Copper	28		0.68	0.11	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Lead	9.5		0.27	0.073	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Mercury	0.17		0.019	0.0034	mg/Kg	Dry	1.000	EPA 7471A	METHOD
Molybdenum	0.21	J	0.27	0.082	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Nickel	120		0.27	0.077	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Selenium	0.19	J	2.2	0.076	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Silver	0.050	J	0.27	0.030	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Thallium	0.055	J	0.27	0.054	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Vanadium	54		0.33	0.11	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Zinc	72		1.1	0.27	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Total Organic Carbon	0.86		0.05		%	Dry	1.000	WALKLEY-BLACK	METHOD

Curtis & Tompkins, Ltd.

Client Sample ID : SB #3 Laboratory Sample ID : 279335-002

Analyte	Result	Flags	RL	MDL	Units	Basis	IDF	Method	Prep Method
2-Methylnaphthalene	12	J	72	11	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
Phenanthrene	28	J	72	10	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
bis(2-Ethylhexyl)phthalate	68	J	360	9.4	ug/Kg	Dry	1.000	EPA 8270C	EPA 3550B
Antimony	0.13	J	2.2	0.082	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Arsenic	5.8		0.27	0.075	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Barium	170		0.27	0.056	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Beryllium	0.55		0.27	0.052	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Cadmium	0.080	J	0.27	0.030	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Chromium	68		0.27	0.080	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Cobalt	17		0.27	0.050	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Copper	29		0.33	0.11	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Lead	10		0.27	0.073	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Mercury	0.66		0.018	0.0033	mg/Kg	Dry	1.000	EPA 7471A	METHOD
Molybdenum	0.44		0.27	0.082	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Nickel	89		0.27	0.078	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Selenium	0.14	J	2.2	0.077	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Silver	0.063	J	0.27	0.031	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Thallium	0.057	J	0.27	0.055	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Vanadium	44		0.69	0.11	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Zinc	62		1.1	0.27	mg/Kg	Dry	25.00	EPA 6020	EPA 3050B
Total Organic Carbon	0.43		0.05		%	Dry	1.000	WALKLEY-BLACK	METHOD

J = Estimated value

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	MW #2	Diln Fac:	0.9940
Lab ID:	279335-001	Batch#:	237945
Matrix:	Soil	Sampled:	08/04/16
Units:	ug/Kg	Received:	08/04/16
Basis:	dry	Analyzed:	08/11/16

Moisture: 8%

Analyte	Result	RL	MDL
Freon 12	ND	11	0.4
Chloromethane	ND	11	1.1
Vinyl Chloride	ND	11	1.0
Bromomethane	ND	11	1.3
Chloroethane	ND	11	0.5
Trichlorofluoromethane	ND	5.4	0.8
Acetone	ND	22	3.6
Freon 113	ND	5.4	0.5
1,1-Dichloroethene	ND	5.4	1.0
Methylene Chloride	ND	22	1.2
Carbon Disulfide	ND	5.4	0.9
MTBE	ND	5.4	1.1
trans-1,2-Dichloroethene	ND	5.4	0.9
Vinyl Acetate	ND	54	0.8
1,1-Dichloroethane	ND	5.4	1.2
2-Butanone	ND	11	1.5
cis-1,2-Dichloroethene	ND	5.4	0.9
2,2-Dichloropropane	ND	5.4	1.2
Chloroform	ND	5.4	1.4
Bromochloromethane	ND	5.4	1.0
1,1,1-Trichloroethane	ND	5.4	0.9
1,1-Dichloropropene	ND	5.4	0.7
Carbon Tetrachloride	ND	5.4	0.5
1,2-Dichloroethane	ND	5.4	1.0
Benzene	ND	5.4	1.0
Trichloroethene	ND	5.4	0.9
1,2-Dichloropropane	ND	5.4	0.8
Bromodichloromethane	ND	5.4	0.9
Dibromomethane	ND	5.4	0.8
4-Methyl-2-Pentanone	ND	11	1.1
cis-1,3-Dichloropropene	ND	5.4	0.7
Toluene	ND	5.4	0.8
trans-1,3-Dichloropropene	ND	5.4	0.7
1,1,2-Trichloroethane	ND	5.4	0.7
2-Hexanone	ND	11	0.9
1,3-Dichloropropane	ND	5.4	0.9
Tetrachloroethene	ND	5.4	0.6
Dibromochloromethane	ND	5.4	0.6
1,2-Dibromoethane	ND	5.4	0.7
Chlorobenzene	ND	5.4	0.7
1,1,1,2-Tetrachloroethane	ND	5.4	0.7
Ethylbenzene	ND	5.4	0.7
m,p-Xylenes	ND	5.4	1.4
o-Xylene	ND	5.4	0.7
Styrene	ND	5.4	0.6
Bromoform	ND	5.4	0.4
Isopropylbenzene	ND	5.4	0.5
1,1,2,2-Tetrachloroethane	ND	5.4	0.4
1,2,3-Trichloropropane	ND	5.4	0.6
Propylbenzene	ND	5.4	0.5
Bromobenzene	ND	5.4	0.6

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	MW #2	Diln Fac:	0.9940
Lab ID:	279335-001	Batch#:	237945
Matrix:	Soil	Sampled:	08/04/16
Units:	ug/Kg	Received:	08/04/16
Basis:	dry	Analyzed:	08/11/16

Analyte	Result	RL	MDL
1,3,5-Trimethylbenzene	ND	5.4	0.6
2-Chlorotoluene	ND	5.4	0.7
4-Chlorotoluene	ND	5.4	0.7
tert-Butylbenzene	ND	5.4	0.4
1,2,4-Trimethylbenzene	ND	5.4	0.6
sec-Butylbenzene	ND	5.4	0.5
para-Isopropyl Toluene	ND	5.4	0.5
1,3-Dichlorobenzene	ND	5.4	0.5
1,4-Dichlorobenzene	ND	5.4	0.6
n-Butylbenzene	ND	5.4	0.4
1,2-Dichlorobenzene	ND	5.4	0.6
1,2-Dibromo-3-Chloropropane	ND	5.4	1.0
1,2,4-Trichlorobenzene	ND	5.4	0.5
Hexachlorobutadiene	ND	5.4	0.3
Naphthalene	ND	5.4	1.1
1,2,3-Trichlorobenzene	ND	5.4	0.5

Surrogate	%REC	Limits
Dibromofluoromethane	95	78-134
1,2-Dichloroethane-d4	88	80-138
Toluene-d8	94	80-120
Bromofluorobenzene	104	78-123

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Purgeable Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	SB #3	Diln Fac:	0.9560
Lab ID:	279335-002	Batch#:	237945
Matrix:	Soil	Sampled:	08/04/16
Units:	ug/Kg	Received:	08/04/16
Basis:	dry	Analyzed:	08/11/16

Moisture: 7%

Analyte	Result	RL	MDL
Freon 12	ND	10	0.4
Chloromethane	ND	10	1.1
Vinyl Chloride	ND	10	1.0
Bromomethane	ND	10	1.2
Chloroethane	ND	10	0.5
Trichlorofluoromethane	ND	5.1	0.7
Acetone	ND	21	3.4
Freon 113	ND	5.1	0.5
1,1-Dichloroethene	ND	5.1	1.0
Methylene Chloride	ND	21	1.1
Carbon Disulfide	ND	5.1	0.9
MTBE	ND	5.1	1.0
trans-1,2-Dichloroethene	ND	5.1	0.9
Vinyl Acetate	ND	51	0.7
1,1-Dichloroethane	ND	5.1	1.2
2-Butanone	ND	10	1.4
cis-1,2-Dichloroethene	ND	5.1	0.9
2,2-Dichloropropane	ND	5.1	1.1
Chloroform	ND	5.1	1.3
Bromochloromethane	ND	5.1	1.0
1,1,1-Trichloroethane	ND	5.1	0.8
1,1-Dichloropropene	ND	5.1	0.6
Carbon Tetrachloride	ND	5.1	0.5
1,2-Dichloroethane	ND	5.1	1.0
Benzene	ND	5.1	0.9
Trichloroethene	ND	5.1	0.9
1,2-Dichloropropane	ND	5.1	0.8
Bromodichloromethane	ND	5.1	0.9
Dibromomethane	ND	5.1	0.8
4-Methyl-2-Pentanone	ND	10	1.0
cis-1,3-Dichloropropene	ND	5.1	0.6
Toluene	ND	5.1	0.7
trans-1,3-Dichloropropene	ND	5.1	0.7
1,1,2-Trichloroethane	ND	5.1	0.6
2-Hexanone	ND	10	0.9
1,3-Dichloropropane	ND	5.1	0.9
Tetrachloroethene	ND	5.1	0.5
Dibromochloromethane	ND	5.1	0.5
1,2-Dibromoethane	ND	5.1	0.7
Chlorobenzene	ND	5.1	0.7
1,1,1,2-Tetrachloroethane	ND	5.1	0.6
Ethylbenzene	ND	5.1	0.7
m,p-Xylenes	ND	5.1	1.3
o-Xylene	ND	5.1	0.6
Styrene	ND	5.1	0.6
Bromoform	ND	5.1	0.4
Isopropylbenzene	ND	5.1	0.5
1,1,2,2-Tetrachloroethane	ND	5.1	0.4
1,2,3-Trichloropropane	ND	5.1	0.6
Propylbenzene	ND	5.1	0.5
Bromobenzene	ND	5.1	0.5

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

15.0

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	SB #3	Diln Fac:	0.9560
Lab ID:	279335-002	Batch#:	237945
Matrix:	Soil	Sampled:	08/04/16
Units:	ug/Kg	Received:	08/04/16
Basis:	dry	Analyzed:	08/11/16

Analyte	Result	RL	MDL
1,3,5-Trimethylbenzene	ND	5.1	0.6
2-Chlorotoluene	ND	5.1	0.7
4-Chlorotoluene	ND	5.1	0.7
tert-Butylbenzene	ND	5.1	0.4
1,2,4-Trimethylbenzene	ND	5.1	0.6
sec-Butylbenzene	ND	5.1	0.4
para-Isopropyl Toluene	ND	5.1	0.4
1,3-Dichlorobenzene	ND	5.1	0.5
1,4-Dichlorobenzene	ND	5.1	0.6
n-Butylbenzene	ND	5.1	0.4
1,2-Dichlorobenzene	ND	5.1	0.5
1,2-Dibromo-3-Chloropropane	ND	5.1	1.0
1,2,4-Trichlorobenzene	ND	5.1	0.4
Hexachlorobutadiene	ND	5.1	0.3
Naphthalene	ND	5.1	1.0
1,2,3-Trichlorobenzene	ND	5.1	0.4

Surrogate	%REC	Limits
Dibromofluoromethane	97	78-134
1,2-Dichloroethane-d4	92	80-138
Toluene-d8	95	80-120
Bromofluorobenzene	104	78-123

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Matrix:	Soil	Batch#:	237945
Units:	ug/Kg	Analyzed:	08/11/16
Diln Fac:	1.000		

Type: BS   Lab ID: QC846870

Analyte	Spiked	Result	%REC	Limits
1,1-Dichloroethene	25.00	27.21	109	70-134
Benzene	25.00	24.33	97	80-123
Trichloroethene	25.00	25.74	103	80-128
Toluene	25.00	23.96	96	80-120
Chlorobenzene	25.00	24.26	97	80-123

Surrogate	%REC	Limits
Dibromofluoromethane	107	78-134
1,2-Dichloroethane-d4	112	80-138
Toluene-d8	98	80-120
Bromofluorobenzene	102	78-123

Type: BSD   Lab ID: QC846871

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
1,1-Dichloroethene	25.00	22.86	91	70-134	17	22
Benzene	25.00	22.09	88	80-123	10	21
Trichloroethene	25.00	22.71	91	80-128	13	23
Toluene	25.00	20.88	84	80-120	14	20
Chlorobenzene	25.00	21.82	87	80-123	11	20

Surrogate	%REC	Limits
Dibromofluoromethane	105	78-134
1,2-Dichloroethane-d4	112	80-138
Toluene-d8	96	80-120
Bromofluorobenzene	100	78-123

RPD= Relative Percent Difference

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846872	Batch#:	237945
Matrix:	Soil	Analyzed:	08/11/16
Units:	ug/Kg		

Analyte	Result	RL	MDL
Freon 12	ND	10	0.4
Chloromethane	ND	10	1.0
Vinyl Chloride	ND	10	0.9
Bromomethane	ND	10	1.2
Chloroethane	ND	10	0.5
Trichlorofluoromethane	ND	5.0	0.7
Acetone	ND	20	3.3
Freon 113	ND	5.0	0.4
1,1-Dichloroethene	ND	5.0	0.9
Methylene Chloride	ND	20	1.1
Carbon Disulfide	ND	5.0	0.9
MTBE	ND	5.0	1.0
trans-1,2-Dichloroethene	ND	5.0	0.8
Vinyl Acetate	ND	50	0.7
1,1-Dichloroethane	ND	5.0	1.2
2-Butanone	ND	10	1.3
cis-1,2-Dichloroethene	ND	5.0	0.9
2,2-Dichloropropane	ND	5.0	1.1
Chloroform	ND	5.0	1.3
Bromochloromethane	ND	5.0	0.9
1,1,1-Trichloroethane	ND	5.0	0.8
1,1-Dichloropropene	ND	5.0	0.6
Carbon Tetrachloride	ND	5.0	0.5
1,2-Dichloroethane	ND	5.0	0.9
Benzene	ND	5.0	0.9
Trichloroethene	ND	5.0	0.8
1,2-Dichloropropane	ND	5.0	0.8
Bromodichloromethane	ND	5.0	0.8
Dibromomethane	ND	5.0	0.8
4-Methyl-2-Pentanone	ND	10	1.0
cis-1,3-Dichloropropene	ND	5.0	0.6
Toluene	ND	5.0	0.7
trans-1,3-Dichloropropene	ND	5.0	0.6
1,1,2-Trichloroethane	ND	5.0	0.6
2-Hexanone	ND	10	0.9
1,3-Dichloropropane	ND	5.0	0.8
Tetrachloroethene	ND	5.0	0.5
Dibromochloromethane	ND	5.0	0.5
1,2-Dibromoethane	ND	5.0	0.7
Chlorobenzene	ND	5.0	0.7
1,1,1,2-Tetrachloroethane	ND	5.0	0.6
Ethylbenzene	ND	5.0	0.7
m,p-Xylenes	ND	5.0	1.3
o-Xylene	ND	5.0	0.6
Styrene	ND	5.0	0.6
Bromoform	ND	5.0	0.4
Isopropylbenzene	ND	5.0	0.5
1,1,2,2-Tetrachloroethane	ND	5.0	0.4
1,2,3-Trichloropropane	ND	5.0	0.6
Propylbenzene	ND	5.0	0.4
Bromobenzene	ND	5.0	0.5
1,3,5-Trimethylbenzene	ND	5.0	0.6
2-Chlorotoluene	ND	5.0	0.7

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846872	Batch#:	237945
Matrix:	Soil	Analyzed:	08/11/16
Units:	ug/Kg		

Analyte	Result	RL	MDL
4-Chlorotoluene	ND	5.0	0.6
tert-Butylbenzene	ND	5.0	0.4
1,2,4-Trimethylbenzene	ND	5.0	0.6
sec-Butylbenzene	ND	5.0	0.4
para-Isopropyl Toluene	ND	5.0	0.4
1,3-Dichlorobenzene	ND	5.0	0.4
1,4-Dichlorobenzene	ND	5.0	0.5
n-Butylbenzene	ND	5.0	0.4
1,2-Dichlorobenzene	ND	5.0	0.5
1,2-Dibromo-3-Chloropropane	ND	5.0	0.9
1,2,4-Trichlorobenzene	ND	5.0	0.4
Hexachlorobutadiene	ND	5.0	0.3
Naphthalene	ND	5.0	1.0
1,2,3-Trichlorobenzene	ND	5.0	0.4

Surrogate	%REC	Limits
Dibromofluoromethane	108	78-134
1,2-Dichloroethane-d4	114	80-138
Toluene-d8	96	80-120
Bromofluorobenzene	107	78-123

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 5030B
Project#:	1610277	Analysis:	EPA 8260B
Field ID:	MW #2	Batch#:	237945
MSS Lab ID:	279335-001	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Analyzed:	08/11/16
Basis:	dry		

Type: MS Moisture: 8%
Lab ID: QC846987 Diln Fac: 0.9843

Analyte	MSS Result	Spiked	Result	%REC	Limits
1,1-Dichloroethene	<1.015	53.49	58.61	110	56-133
Benzene	<0.9749	53.49	51.33	96	57-120
Trichloroethene	<0.9024	53.49	51.54	96	49-145
Toluene	<0.7686	53.49	55.51	104	51-120
Chlorobenzene	<0.7413	53.49	51.41	96	47-120

Surrogate	%REC	Limits
Dibromofluoromethane	95	78-134
1,2-Dichloroethane-d4	90	80-138
Toluene-d8	107	80-120
Bromofluorobenzene	101	78-123

Type: MSD Moisture: 8%
Lab ID: QC846988 Diln Fac: 0.9960

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
1,1-Dichloroethene	54.13	55.40	102	56-133	7	46
Benzene	54.13	48.64	90	57-120	7	44
Trichloroethene	54.13	47.74	88	49-145	9	46
Toluene	54.13	46.50	86	51-120	19	47
Chlorobenzene	54.13	44.70	83	47-120	15	50

Surrogate	%REC	Limits
Dibromofluoromethane	95	78-134
1,2-Dichloroethane-d4	89	80-138
Toluene-d8	95	80-120
Bromofluorobenzene	103	78-123

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Field ID:	MW #2	Batch#:	237795
Lab ID:	279335-001	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Prepared:	08/08/16
Basis:	dry	Analyzed:	08/19/16
Diln Fac:	1.000		

Moisture: 8%

Analyte	Result	RL	MDL
N-Nitrosodimethylamine	ND	360	36
Phenol	ND	360	19
bis(2-Chloroethyl)ether	ND	360	14
2-Chlorophenol	ND	360	18
1,3-Dichlorobenzene	ND	360	13
1,4-Dichlorobenzene	ND	360	11
Benzyl alcohol	ND	360	17
1,2-Dichlorobenzene	ND	360	10
2-Methylphenol	ND	360	17
bis(2-Chloroisopropyl) ether	ND	360	20
4-Methylphenol	ND	360	19
N-Nitroso-di-n-propylamine	ND	360	36
Hexachloroethane	ND	360	13
Nitrobenzene	ND	360	13
Isophorone	ND	360	12
2-Nitrophenol	ND	730	11
2,4-Dimethylphenol	ND	360	15
Benzoic acid	ND	1,800	540
bis(2-Chloroethoxy)methane	ND	360	12
2,4-Dichlorophenol	ND	360	14
1,2,4-Trichlorobenzene	ND	360	11
Naphthalene	ND	73	9.5
4-Chloroaniline	ND	360	18
Hexachlorobutadiene	ND	360	66
4-Chloro-3-methylphenol	ND	360	16
2-Methylnaphthalene	ND	73	11
Hexachlorocyclopentadiene	ND	730	66
2,4,6-Trichlorophenol	ND	360	15
2,4,5-Trichlorophenol	ND	360	9.5
2-Chloronaphthalene	ND	360	60
2-Nitroaniline	ND	730	36
Dimethylphthalate	ND	360	10
Acenaphthylene	ND	73	9.3
2,6-Dinitrotoluene	ND	360	9.6
3-Nitroaniline	ND	730	36
Acenaphthene	ND	73	13
2,4-Dinitrophenol	ND	730	170
4-Nitrophenol	ND	730	75
Dibenzofuran	ND	360	9.5
2,4-Dinitrotoluene	ND	360	11
Diethylphthalate	ND	360	9.2
Fluorene	ND	73	9.7
4-Chlorophenyl-phenylether	ND	360	11
4-Nitroaniline	ND	730	36
4,6-Dinitro-2-methylphenol	ND	730	46
N-Nitrosodiphenylamine	ND	360	61
Azobenzene	ND	360	13
4-Bromophenyl-phenylether	ND	360	64
Hexachlorobenzene	ND	360	13

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Field ID:	MW #2	Batch#:	237795
Lab ID:	279335-001	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Prepared:	08/08/16
Basis:	dry	Analyzed:	08/19/16
Diln Fac:	1.000		

Analyte	Result	RL	MDL
Pentachlorophenol	ND	730	160
Phenanthrene	11 J	73	10
Anthracene	ND	73	13
Di-n-butylphthalate	ND	360	13
Fluoranthene	ND	73	9.4
Pyrene	ND	73	10
Butylbenzylphthalate	ND	360	13
3,3'-Dichlorobenzidine	ND	730	47
Benzo(a)anthracene	ND	73	9.4
Chrysene	ND	73	13
bis(2-Ethylhexyl)phthalate	11 J	360	9.5
Di-n-octylphthalate	ND	360	9.2
Benzo(b)fluoranthene	ND	73	13
Benzo(k)fluoranthene	ND	73	9.4
Benzo(a)pyrene	ND	73	9.4
Indeno(1,2,3-cd)pyrene	ND	73	13
Dibenz(a,h)anthracene	ND	73	13
Benzo(g,h,i)perylene	ND	73	9.4

Surrogate	%REC	Limits
2-Fluorophenol	114	25-120
Phenol-d5	108	36-120
2,4,6-Tribromophenol	77	27-120
Nitrobenzene-d5	83	44-120
2-Fluorobiphenyl	89	47-120
Terphenyl-d14	93	49-120

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Field ID:	SB #3	Batch#:	237795
Lab ID:	279335-002	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Prepared:	08/08/16
Basis:	dry	Analyzed:	08/19/16
Diln Fac:	1.000		

Moisture: 7%

Analyte	Result	RL	MDL
N-Nitrosodimethylamine	ND	360	36
Phenol	ND	360	19
bis(2-Chloroethyl)ether	ND	360	13
2-Chlorophenol	ND	360	18
1,3-Dichlorobenzene	ND	360	13
1,4-Dichlorobenzene	ND	360	11
Benzyl alcohol	ND	360	17
1,2-Dichlorobenzene	ND	360	10
2-Methylphenol	ND	360	17
bis(2-Chloroisopropyl) ether	ND	360	20
4-Methylphenol	ND	360	19
N-Nitroso-di-n-propylamine	ND	360	36
Hexachloroethane	ND	360	13
Nitrobenzene	ND	360	13
Isophorone	ND	360	12
2-Nitrophenol	ND	720	11
2,4-Dimethylphenol	ND	360	15
Benzoic acid	ND	1,800	540
bis(2-Chloroethoxy)methane	ND	360	12
2,4-Dichlorophenol	ND	360	14
1,2,4-Trichlorobenzene	ND	360	10
Naphthalene	ND	72	9.4
4-Chloroaniline	ND	360	18
Hexachlorobutadiene	ND	360	65
4-Chloro-3-methylphenol	ND	360	16
2-Methylnaphthalene	12 J	72	11
Hexachlorocyclopentadiene	ND	720	65
2,4,6-Trichlorophenol	ND	360	15
2,4,5-Trichlorophenol	ND	360	9.4
2-Chloronaphthalene	ND	360	59
2-Nitroaniline	ND	720	36
Dimethylphthalate	ND	360	10
Acenaphthylene	ND	72	9.2
2,6-Dinitrotoluene	ND	360	9.4
3-Nitroaniline	ND	720	36
Acenaphthene	ND	72	13
2,4-Dinitrophenol	ND	720	170
4-Nitrophenol	ND	720	74
Dibenzofuran	ND	360	9.4
2,4-Dinitrotoluene	ND	360	10
Diethylphthalate	ND	360	9.1
Fluorene	ND	72	9.6
4-Chlorophenyl-phenylether	ND	360	10
4-Nitroaniline	ND	720	36
4,6-Dinitro-2-methylphenol	ND	720	45
N-Nitrosodiphenylamine	ND	360	60
Azobenzene	ND	360	13
4-Bromophenyl-phenylether	ND	360	63
Hexachlorobenzene	ND	360	13

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Semivolatile Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Field ID:	SB #3	Batch#:	237795
Lab ID:	279335-002	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Prepared:	08/08/16
Basis:	dry	Analyzed:	08/19/16
Diln Fac:	1.000		

Analyte	Result	RL	MDL
Pentachlorophenol	ND	720	160
Phenanthrene	28 J	72	10
Anthracene	ND	72	13
Di-n-butylphthalate	ND	360	13
Fluoranthene	ND	72	9.3
Pyrene	ND	72	10
Butylbenzylphthalate	ND	360	13
3,3'-Dichlorobenzidine	ND	720	46
Benzo(a)anthracene	ND	72	9.3
Chrysene	ND	72	13
bis(2-Ethylhexyl)phthalate	68 J	360	9.4
Di-n-octylphthalate	ND	360	9.1
Benzo(b)fluoranthene	ND	72	13
Benzo(k)fluoranthene	ND	72	9.3
Benzo(a)pyrene	ND	72	9.3
Indeno(1,2,3-cd)pyrene	ND	72	13
Dibenz(a,h)anthracene	ND	72	13
Benzo(g,h,i)perylene	ND	72	9.3

Surrogate	%REC	Limits
2-Fluorophenol	115	25-120
Phenol-d5	106	36-120
2,4,6-Tribromophenol	74	27-120
Nitrobenzene-d5	87	44-120
2-Fluorobiphenyl	92	47-120
Terphenyl-d14	94	49-120

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

25.0

Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846262	Batch#:	237795
Matrix:	Soil	Prepared:	08/08/16
Units:	ug/Kg	Analyzed:	08/09/16

Analyte	Result	RL	MDL
N-Nitrosodimethylamine	ND	330	42
Phenol	ND	330	15
bis(2-Chloroethyl)ether	ND	330	22
2-Chlorophenol	ND	330	14
1,3-Dichlorobenzene	ND	330	42
1,4-Dichlorobenzene	ND	330	42
Benzyl alcohol	ND	330	16
1,2-Dichlorobenzene	ND	330	22
2-Methylphenol	ND	330	14
bis(2-Chloroisopropyl) ether	ND	330	16
4-Methylphenol	ND	330	16
N-Nitroso-di-n-propylamine	ND	330	15
Hexachloroethane	ND	330	42
Nitrobenzene	ND	330	22
Isophorone	ND	330	10
2-Nitrophenol	ND	670	39
2,4-Dimethylphenol	ND	330	19
Benzoic acid	ND	1,700	380
bis(2-Chloroethoxy)methane	ND	330	10
2,4-Dichlorophenol	ND	330	9.3
1,2,4-Trichlorobenzene	31 J	330	22
Naphthalene	ND	67	13
4-Chloroaniline	ND	330	13
Hexachlorobutadiene	ND	330	22
4-Chloro-3-methylphenol	ND	330	8.7
2-Methylnaphthalene	ND	67	9.9
Hexachlorocyclopentadiene	ND	670	76
2,4,6-Trichlorophenol	ND	330	11
2,4,5-Trichlorophenol	ND	330	9.2
2-Chloronaphthalene	ND	330	8.4
2-Nitroaniline	ND	670	34
Dimethylphthalate	ND	330	8.4
Acenaphthylene	ND	67	8.4
2,6-Dinitrotoluene	ND	330	34
3-Nitroaniline	ND	670	42
Acenaphthene	ND	67	8.4
2,4-Dinitrophenol	ND	670	150
4-Nitrophenol	ND	670	75
Dibenzofuran	ND	330	8.4
2,4-Dinitrotoluene	ND	330	8.3
Diethylphthalate	ND	330	8.4
Fluorene	ND	67	8.4
4-Chlorophenyl-phenylether	ND	330	8.4
4-Nitroaniline	ND	670	42
4,6-Dinitro-2-methylphenol	ND	670	42
N-Nitrosodiphenylamine	ND	330	8.4
Azobenzene	ND	330	8.4
4-Bromophenyl-phenylether	ND	330	8.4
Hexachlorobenzene	ND	330	8.4
Pentachlorophenol	ND	670	100
Phenanthrene	ND	67	8.4
Anthracene	ND	67	9.0

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846262	Batch#:	237795
Matrix:	Soil	Prepared:	08/08/16
Units:	ug/Kg	Analyzed:	08/09/16

Analyte	Result	RL	MDL
Di-n-butylphthalate	ND	330	9.5
Fluoranthene	ND	67	9.4
Pyrene	ND	67	8.4
Butylbenzylphthalate	ND	330	9.6
3,3'-Dichlorobenzidine	ND	670	79
Benzo(a)anthracene	ND	67	8.4
Chrysene	ND	67	8.4
bis(2-Ethylhexyl)phthalate	ND	330	8.5
Di-n-octylphthalate	ND	330	34
Benzo(b)fluoranthene	ND	67	8.4
Benzo(k)fluoranthene	ND	67	8.4
Benzo(a)pyrene	ND	67	8.4
Indeno(1,2,3-cd)pyrene	ND	67	8.4
Dibenz(a,h)anthracene	ND	67	8.4
Benzo(g,h,i)perylene	ND	67	8.4

Surrogate	%REC	Limits
2-Fluorophenol	70	25-120
Phenol-d5	72	36-120
2,4,6-Tribromophenol	32	27-120
Nitrobenzene-d5	54	44-120
2-Fluorobiphenyl	58	47-120
Terphenyl-d14	52	49-120

J= Estimated value
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Batch QC Report

Semivolatile Organics by GC/MS

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8270C
Type:	LCS	Diln Fac:	2.000
Lab ID:	QC846263	Batch#:	237795
Matrix:	Soil	Prepared:	08/08/16
Units:	ug/Kg	Analyzed:	08/09/16

Analyte	Spiked	Result	%REC	Limits
Phenol	2,661	2,043	77	42-120
2-Chlorophenol	2,661	2,089	78	45-120
1,4-Dichlorobenzene	2,661	2,281	86	48-120
N-Nitroso-di-n-propylamine	2,661	2,340	88	27-123
1,2,4-Trichlorobenzene	2,661	2,400	90	50-120
4-Chloro-3-methylphenol	2,661	2,126	80	59-120
Acenaphthene	998.0	739.2	74	53-120
4-Nitrophenol	2,661	1,965	74	47-120
2,4-Dinitrotoluene	2,661	2,245	84	55-120
Pentachlorophenol	2,661	1,291	48	32-120
Pyrene	998.0	764.1	77	52-120

Surrogate	%REC	Limits
2-Fluorophenol	63	25-120
Phenol-d5	66	36-120
2,4,6-Tribromophenol	70	27-120
Nitrobenzene-d5	53	44-120
2-Fluorobiphenyl	60	47-120
Terphenyl-d14	51	49-120

Curtis & Tompkins, Ltd.

Organochlorine Pesticides

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8081A
Field ID:	MW #2	Batch#:	237742
Lab ID:	279335-001	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Prepared:	08/05/16
Basis:	dry	Analyzed:	08/08/16
Diln Fac:	1.000		

Moisture: 8%

Analyte	Result	RL	MDL
alpha-BHC	ND	1.9	0.27
beta-BHC	ND	1.9	0.44
gamma-BHC	ND	1.9	0.43
delta-BHC	ND	1.9	0.22
Heptachlor	ND	1.9	0.41
Aldrin	ND	1.9	0.46
Heptachlor epoxide	ND	1.9	0.27
Endosulfan I	ND	1.9	0.35
Dieldrin	ND	1.9	0.51
4,4'-DDE	ND	3.6	0.48
Endrin	ND	3.6	0.64
Endosulfan II	ND	3.6	0.53
Endosulfan sulfate	ND	3.6	0.53
4,4'-DDD	ND	3.6	0.51
Endrin aldehyde	ND	3.6	0.43
4,4'-DDT	ND	3.6	0.48
alpha-Chlordane	ND	1.9	0.28
gamma-Chlordane	ND	1.9	0.40
Methoxychlor	ND	19	2.9
Toxaphene	ND	66	16

Surrogate	%REC	Limits
TCMX	110	44-125
Decachlorobiphenyl	95	39-121

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Organochlorine Pesticides

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8081A
Field ID:	SB #3	Batch#:	237742
Lab ID:	279335-002	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Prepared:	08/05/16
Basis:	dry	Analyzed:	08/08/16
Diln Fac:	1.000		

Moisture: 7%

Analyte	Result	RL	MDL
alpha-BHC	ND	1.8	0.26
beta-BHC	ND	1.8	0.42
gamma-BHC	ND	1.8	0.42
delta-BHC	ND	1.8	0.22
Heptachlor	ND	1.8	0.39
Aldrin	ND	1.8	0.44
Heptachlor epoxide	ND	1.8	0.26
Endosulfan I	ND	1.8	0.34
Dieldrin	ND	1.8	0.50
4,4'-DDE	ND	3.5	0.47
Endrin	ND	3.5	0.62
Endosulfan II	ND	3.5	0.52
Endosulfan sulfate	ND	3.5	0.51
4,4'-DDD	ND	3.5	0.50
Endrin aldehyde	ND	3.5	0.42
4,4'-DDT	ND	3.5	0.46
alpha-Chlordane	ND	1.8	0.27
gamma-Chlordane	ND	1.8	0.38
Methoxychlor	ND	18	2.8
Toxaphene	ND	64	15

Surrogate	%REC	Limits
TCMX	101	44-125
Decachlorobiphenyl	94	39-121

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Organochlorine Pesticides

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8081A
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC846053	Batch#:	237742
Matrix:	Soil	Prepared:	08/05/16
Units:	ug/Kg	Analyzed:	08/08/16

Analyte	Result	RL	MDL
alpha-BHC	ND	0.86	0.12
beta-BHC	ND	0.86	0.20
gamma-BHC	ND	0.86	0.20
delta-BHC	ND	0.86	0.10
Heptachlor	ND	0.86	0.19
Aldrin	ND	0.86	0.21
Heptachlor epoxide	ND	0.86	0.12
Endosulfan I	ND	0.86	0.16
Dieldrin	ND	0.86	0.23
4,4'-DDE	ND	1.7	0.22
Endrin	ND	1.7	0.29
Endosulfan II	ND	1.7	0.24
Endosulfan sulfate	ND	1.7	0.24
4,4'-DDD	ND	1.7	0.24
Endrin aldehyde	ND	1.7	0.20
4,4'-DDT	ND	1.7	0.22
alpha-Chlordane	ND	0.86	0.13
gamma-Chlordane	ND	0.86	0.18
Methoxychlor	ND	8.6	1.3
Toxaphene	ND	30	7.3

Surrogate	%REC	Limits
TCMX	86	44-125
Decachlorobiphenyl	76	39-121

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Organochlorine Pesticides

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8081A
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC846054	Batch#:	237742
Matrix:	Soil	Prepared:	08/05/16
Units:	ug/Kg	Analyzed:	08/08/16

Analyte	Spiked	Result	%REC	Limits
gamma-BHC	13.18	14.17	107	44-121
Heptachlor	13.18	14.18	108	45-129
Aldrin	13.18	14.15	107	45-120
Dieldrin	13.18	13.40 #	102	49-131
Endrin	13.18	12.12	92	43-135
4,4'-DDT	13.18	10.06	76	37-141

Surrogate	%REC	Limits
TCMX	108	44-125
Decachlorobiphenyl	87	39-121

#= CCV drift outside limits; average CCV drift within limits per method requirements

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8082
Matrix:	Soil	Sampled:	08/04/16
Units:	ug/Kg	Received:	08/04/16
Basis:	dry	Prepared:	08/08/16
Diln Fac:	1.000	Analyzed:	08/09/16
Batch#:	237812		

Field ID: MW #2 | Lab ID: 279335-001
Type: SAMPLE | Moisture: 8%

Analyte	Result	RL	MDL
Aroclor-1016	ND	13	3.2
Aroclor-1221	ND	26	8.6
Aroclor-1232	ND	13	4.2
Aroclor-1242	ND	13	3.9
Aroclor-1248	ND	13	4.1
Aroclor-1254	ND	13	3.3
Aroclor-1260	ND	13	2.1

Surrogate	%REC	Limits
Decachlorobiphenyl	94	25-135

Field ID: SB #3 | Lab ID: 279335-002
Type: SAMPLE | Moisture: 7%

Analyte	Result	RL	MDL
Aroclor-1016	ND	13	3.2
Aroclor-1221	ND	26	8.5
Aroclor-1232	ND	13	4.2
Aroclor-1242	ND	13	3.8
Aroclor-1248	ND	13	4.1
Aroclor-1254	ND	13	3.3
Aroclor-1260	ND	13	2.1

Surrogate	%REC	Limits
Decachlorobiphenyl	89	25-135

Type: BLANK | Lab ID: QC846342

Analyte	Result	RL	MDL
Aroclor-1016	ND	4.8	1.2
Aroclor-1221	ND	9.6	3.2
Aroclor-1232	ND	4.8	1.5
Aroclor-1242	ND	4.8	1.4
Aroclor-1248	ND	4.8	1.5
Aroclor-1254	ND	4.8	1.2
Aroclor-1260	ND	4.8	0.77

Surrogate	%REC	Limits
Decachlorobiphenyl	107	25-135

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Polychlorinated Biphenyls (PCBs)

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8082
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC846343	Batch#:	237812
Matrix:	Soil	Prepared:	08/08/16
Units:	ug/Kg	Analyzed:	08/09/16

Analyte	Spiked	Result	%REC	Limits
Aroclor-1016	165.6	174.4	105	64-140
Aroclor-1260	165.6	155.8	94	65-146

Surrogate	%REC	Limits
Decachlorobiphenyl	92	25-135

Curtis & Tompkins, Ltd.

Batch QC Report

Polychlorinated Biphenyls (PCBs)

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3550B
Project#:	1610277	Analysis:	EPA 8082
Field ID:	ZZZZZZZZZZ	Batch#:	237812
MSS Lab ID:	279347-002	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	ug/Kg	Prepared:	08/08/16
Basis:	as received	Analyzed:	08/09/16
Diln Fac:	1.000		

Type: MS   Lab ID: QC846344

Analyte	MSS Result	Spiked	Result	%REC	Limits
Aroclor-1016	<2.952	166.2	159.0	96	60-161
Aroclor-1260	38.23	166.2	248.9	127	42-166

Surrogate	%REC	Limits
Decachlorobiphenyl	91	25-135

Type: MSD   Lab ID: QC846345

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Aroclor-1016	166.6	158.4	95	60-161	1	43
Aroclor-1260	166.6	269.4	139	42-166	8	51

Surrogate	%REC	Limits
Decachlorobiphenyl	90	25-135

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

California Title 22 Metals

Lab #:	279335	Project#:	1610277
Client:	GEI Consultants, Inc.	Location:	Former Nursery Detention Basin
Field ID:	MW #2	Basis:	dry
Lab ID:	279335-001	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	mg/Kg		

Moisture: 8%

Analyte	Result	RL	MDL	Diln Fac	Batch#	Prepared	Analyzed	Prep	Analysis
Antimony	0.23 J	2.2	0.081	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Arsenic	7.8	0.27	0.075	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Barium	200	0.27	0.055	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Beryllium	0.55	0.27	0.052	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Cadmium	0.090 J	0.27	0.030	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Chromium	110	0.27	0.079	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Cobalt	19	0.27	0.050	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Copper	28	0.68	0.11	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Lead	9.5	0.27	0.073	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Mercury	0.17	0.019	0.0034	1.000	238064	08/15/16	08/16/16	METHOD	EPA 7471A
Molybdenum	0.21 J	0.27	0.082	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Nickel	120	0.27	0.077	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Selenium	0.19 J	2.2	0.076	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Silver	0.050 J	0.27	0.030	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Thallium	0.055 J	0.27	0.054	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Vanadium	54	0.33	0.11	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020
Zinc	72	1.1	0.27	25.00	237809	08/08/16	08/13/16	EPA 3050B	EPA 6020

J= Estimated value
RL= Reporting Limit
MDL= Method Detection Limit

California Title 22 Metals

Lab #:	279335	Project#:	1610277
Client:	GEI Consultants, Inc.	Location:	Former Nursery Detention Basin
Field ID:	SB #3	Basis:	dry
Lab ID:	279335-002	Sampled:	08/04/16
Matrix:	Soil	Received:	08/04/16
Units:	mg/Kg		

Moisture: 7%

Analyte	Result	RL	MDL	Diln Fac	Batch#	Prepared	Analyzed	Prep	Analysis
Antimony	0.13 J	2.2	0.082	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Arsenic	5.8	0.27	0.075	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Barium	170	0.27	0.056	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Beryllium	0.55	0.27	0.052	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Cadmium	0.080 J	0.27	0.030	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Chromium	68	0.27	0.080	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Cobalt	17	0.27	0.050	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Copper	29	0.33	0.11	25.00	237809	08/08/16	08/30/16	EPA 3050B	EPA 6020
Lead	10	0.27	0.073	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Mercury	0.66	0.018	0.0033	1.000	238064	08/15/16	08/16/16	METHOD	EPA 7471A
Molybdenum	0.44	0.27	0.082	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Nickel	89	0.27	0.078	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Selenium	0.14 J	2.2	0.077	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Silver	0.063 J	0.27	0.031	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Thallium	0.057 J	0.27	0.055	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Vanadium	44	0.69	0.11	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020
Zinc	62	1.1	0.27	25.00	237809	08/08/16	08/29/16	EPA 3050B	EPA 6020

J= Estimated value
RL= Reporting Limit
MDL= Method Detection Limit

Batch QC Report

California Title 22 Metals

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3050B
Project#:	1610277	Analysis:	EPA 6020
Type:	BLANK	Diln Fac:	25.00
Lab ID:	QC846328	Batch#:	237809
Matrix:	Soil	Prepared:	08/08/16
Units:	mg/Kg	Analyzed:	08/08/16

Analyte	Result	RL	MDL
Antimony	ND	2.0	0.077
Arsenic	0.21 J	0.25	0.071
Barium	ND	0.25	0.052
Beryllium	ND	0.25	0.049
Cadmium	ND	0.25	0.029
Chromium	0.47 b	0.25	0.075
Cobalt	ND	0.25	0.047
Copper	ND	0.31	0.10
Lead	ND	0.25	0.069
Molybdenum	ND	0.25	0.077
Nickel	ND	0.25	0.073
Selenium	ND	2.0	0.072
Silver	ND	0.25	0.029
Thallium	ND	0.25	0.052
Vanadium	0.17 J	0.31	0.10
Zinc	0.43 J	1.0	0.25

J= Estimated value
b= See narrative
ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

California Title 22 Metals

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3050B
Project#:	1610277	Analysis:	EPA 6020
Matrix:	Soil	Batch#:	237809
Units:	mg/Kg	Prepared:	08/08/16
Diln Fac:	25.00	Analyzed:	08/08/16

Type: BS   Lab ID: QC846329

Analyte	Spiked	Result	%REC	Limits
Antimony	24.51	22.22	91	80-120
Arsenic	24.51	24.33	99	80-121
Barium	24.51	25.17	103	80-121
Beryllium	12.25	11.87	97	80-120
Cadmium	24.51	23.24	95	80-120
Chromium	24.51	25.05	102	80-131
Cobalt	24.51	24.79	101	80-132
Copper	24.51	22.06	90	80-137
Lead	24.51	24.50	100	80-125
Molybdenum	24.51	23.39	95	80-120
Nickel	24.51	24.78	101	77-141
Selenium	24.51	23.84	97	80-129
Silver	2.451	2.456	100	80-122
Thallium	24.51	23.82	97	80-120
Vanadium	24.51	23.80	97	80-128
Zinc	24.51	24.60	100	80-133

Type: BSD   Lab ID: QC846330

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Antimony	24.27	21.29	88	80-120	3	20
Arsenic	24.27	23.51	97	80-121	2	21
Barium	24.27	23.99	99	80-121	4	20
Beryllium	12.14	11.12	92	80-120	6	20
Cadmium	24.27	22.66	93	80-120	2	20
Chromium	24.27	24.32	100	80-131	2	25
Cobalt	24.27	24.32	100	80-132	1	24
Copper	24.27	21.41	88	80-137	2	27
Lead	24.27	23.39	96	80-125	4	20
Molybdenum	24.27	22.62	93	80-120	2	20
Nickel	24.27	23.62	97	77-141	4	29
Selenium	24.27	23.26	96	80-129	1	22
Silver	2.427	2.250	93	80-122	8	20
Thallium	24.27	22.92	94	80-120	3	20
Vanadium	24.27	22.85	94	80-128	3	24
Zinc	24.27	23.52	97	80-133	3	23

RPD= Relative Percent Difference

30.0

Curtis & Tompkins, Ltd.

Batch QC Report

California Title 22 Metals

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	EPA 3050B
Project#:	1610277	Analysis:	EPA 6020
Field ID:	ZZZZZZZZZZ	Batch#:	237809
MSS Lab ID:	279117-003	Sampled:	07/26/16
Matrix:	Soil	Received:	07/28/16
Units:	mg/Kg	Prepared:	08/08/16
Basis:	as received	Analyzed:	08/08/16
Diln Fac:	25.00		

Type: MS Lab ID: QC846331

Analyte	MSS Result	Spiked	Result	%REC	Limits
Antimony	0.1860	26.32	13.79	52	21-120
Arsenic	10.05	26.32	36.50	101	75-122
Barium	27.36	26.32	49.12	83	54-148
Beryllium	0.06667	13.16	12.69	96	80-120
Cadmium	<0.02565	26.32	24.92	95	80-120
Chromium	20.47	26.32	47.05	101	60-158
Cobalt	5.534	26.32	31.29	98	73-142
Copper	1.791	26.32	27.46	98	59-150
Lead	1.692	26.32	26.70	95	68-137
Molybdenum	0.4329	26.32	23.96	89	71-120
Nickel	23.53	26.32	48.61	95	57-161
Selenium	<0.06483	26.32	24.70	94	75-128
Silver	<0.02583	2.632	2.547	97	77-120
Thallium	<0.04630	26.32	24.87	95	76-120
Vanadium	18.18	26.32	42.68	93	65-150
Zinc	18.17	26.32	44.64	101	44-158

Type: MSD Lab ID: QC846332

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Antimony	24.04	11.72	48	21-120	7	29
Arsenic	24.04	32.30	93	75-122	6	24
Barium	24.04	41.79	60	54-148	12	28
Beryllium	12.02	11.34	94	80-120	2	20
Cadmium	24.04	22.70	94	80-120	0	20
Chromium	24.04	43.55	96	60-158	3	36
Cobalt	24.04	29.05	98	73-142	0	34
Copper	24.04	37.09	147	59-150	38	52
Lead	24.04	26.13	102	68-137	6	32
Molybdenum	24.04	21.68	88	71-120	1	20
Nickel	24.04	46.41	95	57-161	0	47
Selenium	24.04	22.85	95	75-128	1	20
Silver	2.404	2.351	98	77-120	1	20
Thallium	24.04	22.57	94	76-120	1	20
Vanadium	24.04	40.52	93	65-150	0	28
Zinc	24.04	46.81	119	44-158	10	33

RPD= Relative Percent Difference

Batch QC Report

California Title 22 Metals

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	EPA 7471A
Analyte:	Mercury	Diln Fac:	1.000
Type:	BLANK	Batch#:	238064
Lab ID:	QC847358	Prepared:	08/15/16
Matrix:	Soil	Analyzed:	08/15/16
Units:	mg/Kg		

Result	RL	MDL
0.0058 J	0.016	0.0029

J= Estimated value
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Batch QC Report

California Title 22 Metals

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	EPA 7471A
Analyte:	Mercury	Batch#:	238064
Matrix:	Soil	Prepared:	08/15/16
Units:	mg/Kg	Analyzed:	08/16/16
Diln Fac:	1.000		

Type	Lab ID	Spiked	Result	%REC	Limits	RPD	Lim
BS	QC847359	0.2083	0.1913	92	80-120		
BSD	QC847360	0.2049	0.1943	95	80-120	3	20

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

California Title 22 Metals

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	EPA 7471A
Analyte:	Mercury	Diln Fac:	1.000
Field ID:	ZZZZZZZZZZ	Batch#:	238064
MSS Lab ID:	279344-001	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	mg/Kg	Prepared:	08/15/16
Basis:	as received	Analyzed:	08/15/16

Type	Lab ID	MSS Result	Spiked	Result	%REC	Limits	RPD	Lim
MS	QC847361	0.2728	0.2016	0.4747	100	69-142		
MSD	QC847362		0.1953	0.4610	96	69-142	2	36

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Total Organic Carbon (TOC)

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	WALKLEY-BLACK
Analyte:	Total Organic Carbon	Batch#:	237846
Matrix:	Soil	Sampled:	08/04/16
Units:	%	Received:	08/04/16
Basis:	dry	Analyzed:	08/08/16
Diln Fac:	1.000		

Field ID	Type	Lab ID	Result	RL	Moisture
MW #2	SAMPLE	279335-001	0.86	0.05	8%
SB #3	SAMPLE	279335-002	0.43	0.05	7%
	BLANK	QC846469	ND	0.01	

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

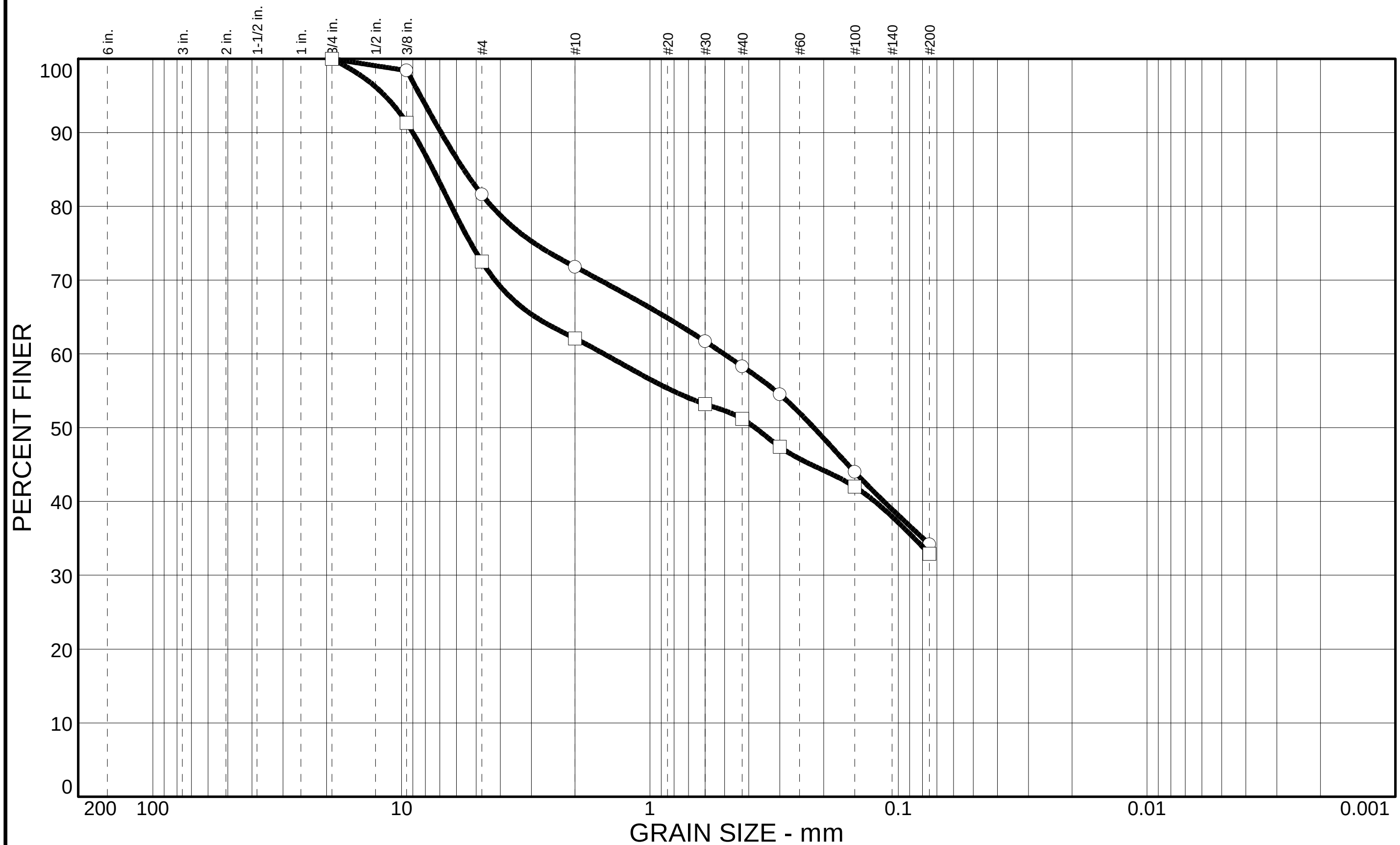
Total Organic Carbon (TOC)

Lab #:	279335	Location:	Former Nursery Detention Basin
Client:	GEI Consultants, Inc.	Prep:	METHOD
Project#:	1610277	Analysis:	WALKLEY-BLACK
Analyte:	Total Organic Carbon	Diln Fac:	1.000
Field ID:	MW #1	Batch#:	237846
MSS Lab ID:	279328-001	Sampled:	08/03/16
Matrix:	Soil	Received:	08/03/16
Units:	%	Analyzed:	08/08/16
Basis:	dry		

Type	Lab ID	MSS Result	Spiked	Result	%REC	Limits	Moisture	RPD	Lim
LCS	QC846470		0.1300	0.1240	95	80-120			
MS	QC846471	1.020	0.7030	1.655	90	66-120	8%		
MSD	QC846472		0.6996	1.579	80	66-120	8%	5	20

RPD= Relative Percent Difference

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		18.4	47.4	34.2					
□		27.5	39.6	32.9					

SIEVE inches size	PERCENT FINER ○	□	
3/4"	100.0	100.0	
3/8"	98.4	91.3	
	GRAIN SIZE		
D_{60}	0.504	1.53	
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	81.6	72.5	
#10	71.8	62.1	
#30	61.7	53.2	
#40	58.3	51.2	
#50	54.5	47.4	
#100	44.0	42.0	
#200	34.2	32.9	

SOIL DESCRIPTION

○ Yellowish Brown Clayey SAND w/ Gravel

□ Olive Brown Clayey SAND w/ Gravel

REMARKS:

○

□

○ Source: MW #2

□ Source: SB #3

COOPER TESTING LABORATORY

Client: Curtis & Tompkins

Project: Nursery Detention Basin - 279335

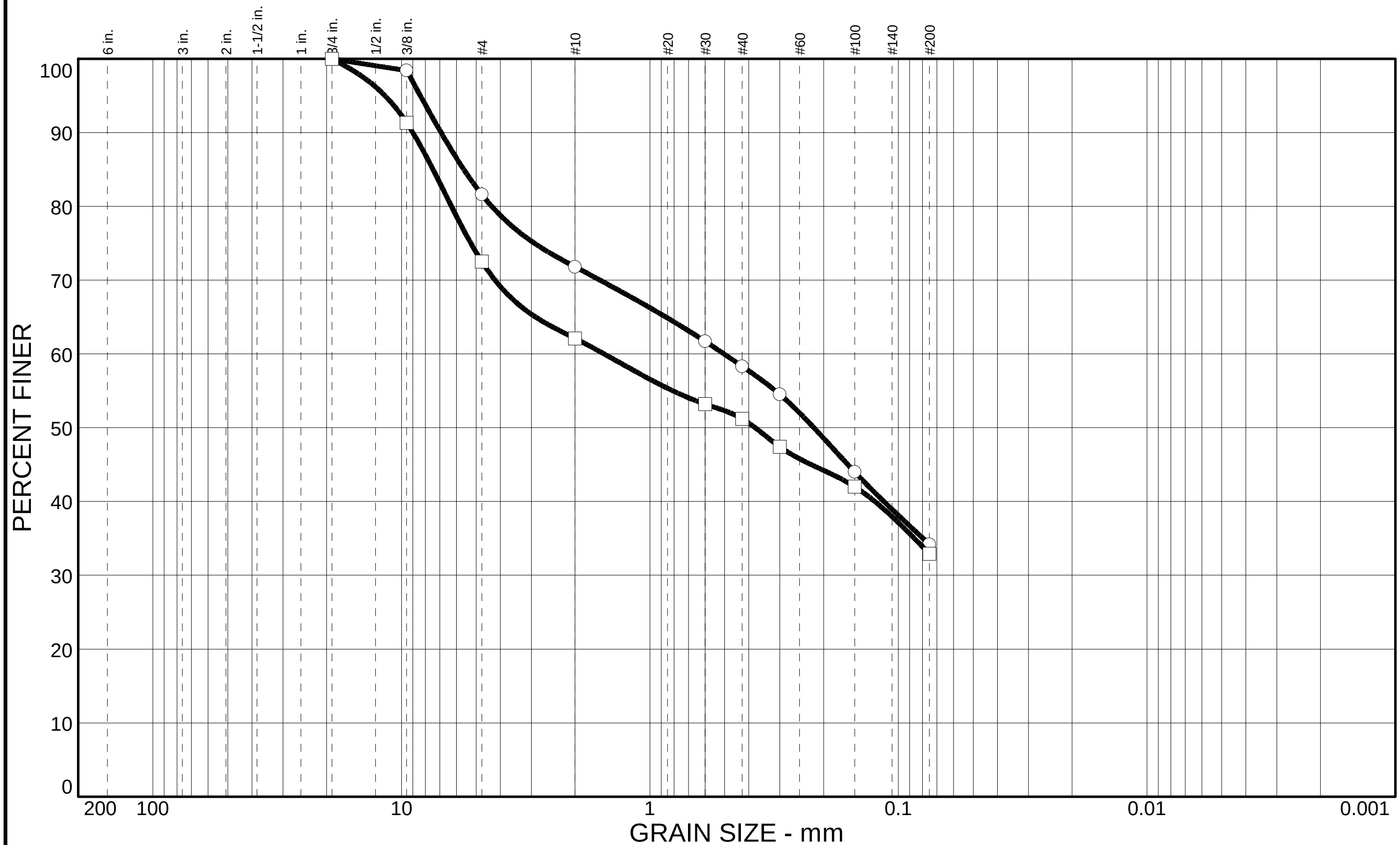
Project No.: 202-067 Figure

Laboratory Job Number 279335

Subcontracted Products

Cooper Testing Labs

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		18.4	47.4	34.2					
□		27.5	39.6	32.9					

SIEVE inches size	PERCENT FINER ○	□	
3/4"	100.0	100.0	
3/8"	98.4	91.3	
	GRAIN SIZE		
D_{60}	0.504	1.53	
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	81.6	72.5	
#10	71.8	62.1	
#30	61.7	53.2	
#40	58.3	51.2	
#50	54.5	47.4	
#100	44.0	42.0	
#200	34.2	32.9	

SOIL DESCRIPTION

○ Yellowish Brown Clayey SAND w/ Gravel

□ Olive Brown Clayey SAND w/ Gravel

REMARKS:

○

□

○ Source: MW #2

□ Source: SB #3

COOPER TESTING LABORATORY

Client: Curtis & Tompkins

Project: Nursery Detention Basin - 279335

Project No.: 202-067

Figure

Appendix D

Transducer Installation Records, Calibration Reports, and CD of Operation Manual

Table D-1 - Transducer Installation Records
Former Nursery Detention Basin Project, Marin County Flood Control and Water Conservation District

Piezometer	Ground Surface Elevation (feet)[1]	Height of Vault Above Ground Surface (feet)	Date	Time	Manual Depth to Water From Top of Vault (feet)	Transducer Pressure Reading (psi)[2]	Absolute Pressure Reading (psi)	Height of Water Above Transducer (feet)	Calculated Transducer Elevation (feet)	Transducer Elevation for Pressure Conversion (feet)
MW#1	233.9	0.17	12/5/2016	2:05 PM	8.71	19.11	4.48	10.33	215.03	**215.02**
			11/23/2016	11:05 AM	8.84	19.18	4.43	10.22	215.01	
MW#2	234.6	0.08	12/5/2016	2:40 PM	8.78	19.49	4.86	11.22	214.68	**214.70**
			11/23/2016	10:00 AM	9.00	19.51	4.75	10.97	214.71	
MW#3	232.9	0.08	12/5/2016	3:00 PM	8.31	19.37	4.74	10.95	213.72	**213.73**
			11/23/2016	10:35 AM	8.52	19.40	4.64	10.72	213.74	
Baro	N/A	N/A	12/5/2016	2:00 PM	N/A	14.64	0.00	0.00	N/A	N/A
			12/5/2016	3:00 PM	N/A	14.63	0.00	0.00	N/A	N/A
			11/23/2016	12:00 PM	N/A	14.76	0.00	0.00	N/A	N/A

Notes:

[1]Existing Ground Elevations (ft) obtained from MCFCWD LiDAR assembled in 2011 and revised in 2013 (6th edition, dated 12/18/2013)

[2]Readings from transducer collected on 11/23/16 at 11:00 AM & 12:00 PM; 12/5/16 at 2:00 PM

MW-1

In-Situ Inc.

Calibration Report

Report Number: 20160928155447-478804

221 East Lincoln Avenue, Fort Collins, CO 80524 USA
1-970-498-1500, 1-800-446-7488, FAX: 1-970-498-1598
Visit us at www.in-situ.com

Instrument Details:

Instrument Model:	**Rugged TROLL 200**
Full Scale Depth Range:	**0- 30 Ft (0- 9 m)**
Serial Number:	**478804**
Hardware Version:	0
Firmware Version:	1.02

Calibration Details:

Calibration Result:	**PASS**
Calibration Date:	2016-09-28 15:54:47 (UTC)
Nominal Range of Applied Temperature:	0 C to +50 C
Temperature Accuracy Specification:	+/- 0.3 C From 0 C to +50 C
Nominal Range of Applied Pressure:	7 PSI - 30 PSI Absolute
Pressure Accuracy Specification:	Typical +/-0.1% FS, Maximum +/-0.3% FS

Post-Calibration Check:

Parameter	Applied	Reported	Deviation	Unit
Depth	35.7452	35.7479	0.0027	FT
Depth	18.0596	18.0641	0.0045	FT
Depth	0.3756	0.3750	-0.0005	FT
Temperature	19.9755	19.9323	-0.0432	C

Calibration Procedures and Equipment Used:

Manu MENSOR Model 600 SerialNo 621434
Manu Agilent Model 53131A-010 SerialNo MY47000169
Manu Instrulab Model 406X-0031-01 SerialNo 2-31140
Manu Instrulab Model 3312A-14-15-24 SerialNo 31139
Manu Agilent Model 34970A SerialNo MY44038788

Notes:

1. Standards used in this calibration are traceable to the National Institute of Standards and Technology.
2. This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.
3. Pressure calibration is conducted in units of PSI Absolute.
4. The total range of applied pressure includes pressure due to both the water column and 1 bar of atmosphere.
5. The pressure accuracy specification is in terms of the full-scale capability of the pressure sensor (i.e. maximum water depth + 1 bar atmosphere).
6. The Post-Calibration data is expressed, for convenience, in terms of water depth. An ambient barometric pressure of 1 bar is assumed.
7. Conversion factors: 2.30666 FT/PSI, 14.50377 PSI/bar.

Performed By: TG

MW-2

In-Situ Inc.

Calibration Report

Report Number: 2016092815533-478802

221 East Lincoln Avenue, Fort Collins, CO 80524 USA
1-970-498-1500, 1-800-446-7488, FAX: 1-970-498-1598
Visit us at www.in-situ.com

Instrument Details:

Instrument Model:	**Rugged TROLL 200**
Full Scale Depth Range:	**0- 30 Ft (0- 9 m)**
Serial Number:	**478802**
Hardware Version:	0
Firmware Version:	1.02

Calibration Details:

Calibration Result:	**PASS**
Calibration Date:	2016-09-28 15:53:03 (UTC)
Nominal Range of Applied Temperature:	0 C to +50 C
Temperature Accuracy Specification:	+/- 0.3 C From 0 C to +50 C
Nominal Range of Applied Pressure:	7 PSI - 30 PSI Absolute
Pressure Accuracy Specification:	Typical +/-0.1% FS, Maximum +/-0.3% FS

Post-Calibration Check:

Parameter	Applied	Reported	Deviation	Unit
Depth	35.7450	35.7414	-0.0036	FT
Depth	18.0594	18.0516	-0.0078	FT
Depth	0.3754	0.3797	0.0044	FT
Temperature	19.8705	19.8818	0.0113	C

Calibration Procedures and Equipment Used:

Manu MENSOR Model 600 SerialNo 621384
Manu Agilent Model 53131A-010 SerialNo MY40012869
Manu Instrulab Model 406X-0031-01 SerialNo 3-31103
Manu Instrulab Model 3312A-14-15-24 SerialNo 31140

Notes:

1. Standards used in this calibration are traceable to the National Institute of Standards and Technology.
2. This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.
3. Pressure calibration is conducted in units of PSI Absolute.
4. The total range of applied pressure includes pressure due to both the water column and 1 bar of atmosphere.
5. The pressure accuracy specification is in terms of the full-scale capability of the pressure sensor (i.e. maximum water depth + 1 bar atmosphere).
6. The Post-Calibration data is expressed, for convenience, in terms of water depth. An ambient barometric pressure of 1 bar is assumed.
7. Conversion factors: 2.30666 FT/PSI, 14.50377 PSI/bar.

Performed By: TG

MW-3

In-Situ Inc.

Calibration Report

Report Number: 20160419154829-454884

221 East Lincoln Avenue, Fort Collins, CO 80524 USA
1-970-498-1500, 1-800-446-7488, FAX: 1-970-498-1598
Visit us at www.in-situ.com

Instrument Details:

Instrument Model:	**Rugged TROLL 200**
Full Scale Depth Range:	**0- 30 Ft (0- 9 m)**
Serial Number:	**454884**
Hardware Version:	0
Firmware Version:	1.02

Calibration Details:

Calibration Result:	**PASS**
Calibration Date:	2016-04-19 15:48:29 (UTC)
Nominal Range of Applied Temperature:	0 C to +50 C
Temperature Accuracy Specification:	+/- 0.3 C From 0 C to +50 C
Nominal Range of Applied Pressure:	7 PSI - 30 PSI Absolute
Pressure Accuracy Specification:	Typical +/-0.1% FS, Maximum +/-0.3% FS

Post-Calibration Check:

Parameter	Applied	Reported	Deviation	Unit
Depth	35.7454	35.7428	-0.0027	FT
Depth	18.0598	18.0584	-0.0015	FT
Depth	0.3747	0.3767	0.0021	FT
Temperature	19.9885	19.9421	-0.0464	C

Calibration Procedures and Equipment Used:

Manu MENSOR Model 600 SerialNo 621384
Manu Agilent Model 53131A-010 SerialNo MY47000169
Manu Instrulab Model 406X-0031-01 SerialNo 31098-2
Manu Instrulab Model 3312A-14-15-24 SerialNo 31139

Notes:

1. Standards used in this calibration are traceable to the National Institute of Standards and Technology.
2. This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.
3. Pressure calibration is conducted in units of PSI Absolute.
4. The total range of applied pressure includes pressure due to both the water column and 1 bar of atmosphere.
5. The pressure accuracy specification is in terms of the full-scale capability of the pressure sensor (i.e. maximum water depth + 1 bar atmosphere).
6. The Post-Calibration data is expressed, for convenience, in terms of water depth. An ambient barometric pressure of 1 bar is assumed.
7. Conversion factors: 2.30666 FT/PSI, 14.50377 PSI/bar.

Performed By: KK

In-Situ Inc.

Calibration Report

Report Number: 20160921203032-477615
221 East Lincoln Avenue, Fort Collins, CO 80524 USA
1-970-498-1500, 1-800-446-7488, FAX: 1-970-498-1598
Visit us at www.in-situ.com

Instrument Details:

Instrument Model:	**Rugged BaroTROLL**
Full Scale Depth Range:	**0- 15 Ft (0- 1 m)**
Serial Number:	**477615**
Hardware Version:	0
Firmware Version:	1.01

Calibration Details:

Calibration Result:	**PASS**
Calibration Date:	2016-09-21 20:30:32 (UTC)
Nominal Range of Applied Temperature:	0 C to +50 C
Temperature Accuracy Specification:	+/- 0.3 C From 0 C to +50 C
Nominal Range of Applied Pressure:	7 PSI - 30 PSI Absolute
Pressure Accuracy Specification:	Typical +/-0.1% FS, Maximum +/-0.3% FS

Post-Calibration Check:

Parameter	Applied	Reported	Deviation	Unit
Depth	35.7450	35.7488	0.0038	FT
Depth	9.2175	9.2204	0.0029	FT
Depth	-17.3088	-17.3105	-0.0016	FT
Temperature	19.9940	20.0006	0.0066	C

Calibration Procedures and Equipment Used:

Manu Mensor Model APC600 SerialNo 622739
Manu Agilent Model 53131A-010 SerialNo MY47001576
Manu Instrulab Model 406X-0031-01 SerialNo 1-31139
Manu Instrulab Model 3312A-14-15-24 SerialNo 31134
Manu Mensor Model APC600 SerialNo 610914

Notes:

1. Standards used in this calibration are traceable to the National Institute of Standards and Technology.
2. This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.
3. Pressure calibration is conducted in units of PSI Absolute.
4. The total range of applied pressure includes pressure due to both the water column and 1 bar of atmosphere.
5. The pressure accuracy specification is in terms of the full-scale capability of the pressure sensor (i.e. maximum water depth + 1 bar atmosphere).
6. The Post-Calibration data is expressed, for convenience, in terms of water depth. An ambient barometric pressure of 1 bar is assumed.
7. Conversion factors: 2.30666 FT/PSI, 14.50377 PSI/bar.

Performed By: RG

APPENDIX D

Hydrology Supporting Documentation

Table of Contents

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Guide to Appendix D

This appendix is a compilation of a number of technical memoranda and other reports that provide detailed information about the flood modeling with and without the Project, alone and in combination with foreseeable projects, and the alternatives to it that were discussed in the Draft EIR's Chapter 6, *Alternatives*. The appendix also includes information about potential geomorphic change within the watershed. Some of the most relevant contents of this appendix are as follows.

<u>Basin Design Drawings</u>

For Nursery Basin design drawings, including the different basins considered in Chapter 6's alternatives to the proposed Project, see figures on **pages 10 through 13** in D-1: *San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin* (Stetson Engineers, January 2018). The Nursery Basin Element design for the proposed Project is on **Figure 1** on **page 10**. This is the same design as in Alternative – Raised Building Alternative. The Nursery Basin Element design for Alternative 4 – Increased Capacity Basin Alternative is on **Figure 2** on **page 11**. The Nursery Basin Element design for the Alternative 2 – Morningside/Passive Basin Alternative is on **Figure 4** on **page 13**. This is the same design as in the "Modified Alternative".

<u>Flood Model Results – Proposed Project vs. Existing Conditions</u>

For flood modeling comparing existing conditions and proposed Project completion for the 10-year, 25-year, and 100-year events, see figures on **pages 14 through 22** in D-1: *San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin.* The 10-year event results are shown on **Figures 5a**, **5b**, and **5c** of that document. The 25-year event results are shown on **Figures 6a**, **6b**, and **6c** of that document. The 100-year event results are shown on **Figures 7a**, **7b**, and **7c** of that document. In that same document, **Figures 8a**, **8b**, and **8c** show the only changes (the differences) between the existing conditions and the post-Project implementation conditions for the 10-year event. **Figures 9a**, **9b**, and **9c** show the changes in the 25-year event; **Figures 10a**, **10b**, and **10c** show the changes in the 100-year event. These figures are on **pages 23 through 31**.

<u>Flood Model Results – Proposed Project PLUS Expected Future Projects vs. Existing Conditions</u>

For flood modeling of the Project with expected future projects, including those being planned as part of the Ross Valley Flood Protection and Watershed Program (e.g., the Winship Bridge Replacement Project and others, as discussed in Chapter 5, *Growth-Inducing and Cumulative Impacts*), see **Figures 5c, 5d, 6c, 6d, 7c,** and **7d** in D-3: *Supplemental Report on Hydraulic Analysis of San Anselmo Flood Risk Reduction Project, Option 2A: Hydraulic Analysis of Complete Removal of Bridge Building #2.* These figures are on **pages 10 through 15**.

Flood Model Results – Alternatives to the Project

For flood modeling of alternatives to the proposed Project (as presented in *Chapter 6, Alternatives*), see the following:

- **Alternative 2 – Morningside/Passive Basin Alternative** – The 10-year event results are shown on **Figures 1a, 1b, 1c,** and **1d** of the D-2: *Report on Hydraulic Analysis of the Morningside Alternative.* The 25-year event results are shown on **Figures 2a, 2b, 2c,** and **2d** of that document. The 100-year event results are shown on **Figures 3a, 3b, 3c,** and **3d** of that document. The Morningside/Passive Basin Alternative combined with the foreseeable projects (i.e., the same expected future removals of the Winship Bridge and others) for the 10-year event results are shown on **Figures 4a, 4b, 4c,** and **4d.** The Morningside/Passive Basin Alternative combined with foreseeable projects for the 25-year event results are shown on **Figures 5a, 5b, 5c,** and **5d.** The Morningside/Passive Basin Alternative combined with foreseeable projects for the 100-year event results are shown on **Figures 6a, 6b, 6c,** and **6d.**
- **Alternative 3 – Raised Building Alternative** – This alternative was not separately modeled for changes in flood risk because – with the building's foundation out of the creek channel – the effects on hydraulics and flooding would be almost identical to the proposed Project.
- **Alternative 4 – Increased Capacity Basin Alternative** – The 10-year event results are shown on **Figures 8a, 8b,** and **8c** of the D-1: *San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin.* The 25-year event results are shown on **Figures 9a, 9b,** and **9c** of that document. The 100-year event results are shown on **Figures 10a, 10b,** and **10c** of that document. These figures are on **pages 23 through 31**.

Modified Alternative (Passive Basin from Alternative 2 plus Downtown San Anselmo element from proposed Project) - The 10-year event results are shown on **Figures 11a, 11b,** and **11c** of the D-1: *San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin.* The 25-year event results are shown on **Figures 12a, 12b,** and **12c** of that document. The 100-year event results are shown on **Figures 13a, 13b,** and **13c** of that document. These figures are on **pages 32 through 40**.

D-1 San Anselmo Flood Risk Reduction Project CEQA Support Conceptual Designs and Supplemental Modeling of Option 2A for Different Layouts of Sunnyside Detention Basin

San Anselmo Flood Risk Reduction Project CEQA Support
Conceptual Designs and Supplemental Modeling of Option 2A
for Different Layouts of Sunnyside Detention Basin

Stetson Engineers Inc.
January 31, 2018

Background

Stetson previously prepared a conceptual design of the Sunnyside Nursery DB (about 39 acre-ft in storage capacity at the spillway crest; Layout 1 in Table 1) and prepared HEC-RAS hydraulic modeling of the San Anselmo Flood Risk Reduction Project, Option 2A[1] (Stetson, 2017). The previous modeling analysis found that the Sunnyside DB would provide flood reduction benefit during the 10-year flood in the Fairfax and Downtown San Anselmo areas, but, due to its limited storage capacity, would have less benefit during the 25-year flood and very little benefit during the 100-year flood.

Stetson recently revised the conceptual design of the Sunnyside Nursery DB (about 34 acre-ft in storage capacity at the spillway crest; Layout 3 in Table 1) based on CH2M's gravity design and the District's direction to narrow the width of the perimeter road from 15 ft to 10 ft. Hydraulic modeling analysis of this layout was also performed and documented (Stetson, 2018). As expected, the revised DB design would further reduce the flood damage reduction benefit due to the reduction in storage capacity.

As an alternative, the District also considered a deepened/enlarged Sunnyside DB with a pump for complete draining. The deepening was to the depth needed to achieve the storage capacity of 39 acre-ft at the spillway crest to match Stetson's previous design. The purpose of the pump would be to prevent the DB from partially filling (in the day/hours prior to initiation of detention operations) due to inflowing groundwater seepage, and thereby maintain open space in the DB for a later time when detention of floodwater is needed. The pump would also be used after detention operations to remove water down to the floor of the basin in order to ready the basin for detention again, if/when needed. The concept design of this layout (Layout 4 in Table 1) was documented in the Stetson 12/20/2017 technical memorandum entitled "San Anselmo Flood Risk Reduction Project CEQA Support/ Conceptual Designs for Deepened/Enlarged Sunnyside Detention Basin and Pump Station."

The District is now also considering other layouts. Table 1 shows a list of layouts. This technical memorandum summarizes the conceptual designs and hydraulic modeling for Layouts 2, 6, and 7.

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[1]The San Anselmo Flood Risk Reduction Project, Option 2A aims to reduce the risk and the extent and severity of flooding in Ross Valley by providing temporary storage of floodwaters and increasing the capacity of the creek to convey floodwaters. Floodwater storage would be provided in an improved former Nursery near White Hill, just west of Fairfax, commonly referred to as the "Former Nursery Detention Basin" or "Sunnyside Nursery Detention Basin." Increased conveyance capacity would be achieved by removing the commercial building that spans over the creek in downtown San Anselmo located at 634-636 San Anselmo Avenue, commonly referred to as Building Bridge #2.

Table 1 Design Layouts for Sunnyside Detention Basin									
Layout	**Description**	**E&W setback (feet)**	**E berm top. elev. (ft NAVD 88)**	**WSE at Spillway Crest (ft NAVD88)**	**Storage Capacity at Spillway Crest (acre-feet)**	**Modeled by Stetson ?**	**How was DB modeled?**	**EIR analysis?**	**Notes**
1	Naturalistic design dated 6/14/17 with 2:1 side slopes, no perimeter road incoporated	50	238	235	39	Yes	Storage Area	No	Relied on LIDAR and side slopes steeper than current design, this design didn't incorporate permiter road
2 (Proposed Project)	CH2M gravity design, 15' wide perimeter road, same berm top elevation as Option 1	50	238	235	33	No, but assume results would be similar to Option 3		**Yes, Proposed Project**	Consistent with NOP; Detailed field survey topo data provided by CH2M
3	Stetson's gravity design dated 12/7/17 where the perimeter road width is reduced from 15' to 10'	50	238	235	34	Yes	2D Flow Area	No	Consistent with NOP; Detailed field survey topo data provided by CH2M
4	Stetson's pump design dated 12-7-17 with basin deepened by 2.5', 10' wide perimeter road	50	238	235	39	No, but assume results would be similar to Option 1		No	Detailed field survey topo data provided by CH2M
5	Narrower setback, same berm top, gravity design, 15' wide perimeter road	25	238	235	36	No		No	
6 (Deeper Basin)	Narrower setback, same berm top and deepened basin by 2.5', basin drains by pump, 15' wide perimeter road	25	238	235	41	To be modeled by Stetson	2D Flow Area	**Yes, Alternative**	Detailed field survey topo data provided by CH2M
7 (Passive Basin)	Narrower setbacks, basin fills and drains passively with no creek diversion structure; berms on the east and west end of the basin, 15' wide perimeter road	25	232	N/A (No spillway)	20 acre-ft at the max WSE	To be modeled by Stetson	2D Flow Area	**Yes, Alternative**	Detailed field survey topo data provided by CH2M

Conceptual Designs for Layouts 2, 6, and 7 of the Sunnyside DB

Conceptual Design for Layout 2 (Proposed Project)

Figure 1 shows the conceptual design for Layout 2 of the Sunnyside DB based on the CH2M gravity design with a 15 ft wide perimeter road. Layout 2 has a setback of 50 ft from the property lines on the east and west sides. The design was based on the field topographic survey data provided by CH2M. The top of the perimeter road has an elevation of 238 ft NAVD88 and the DB has a lowest bottom floor elevation of 223.8 ft NAVD88 at the southeast corner. The resulting storage at the spillway crest elevation of 235 ft NAVD88 is about 33 acre-ft, which is about 6 acre-ft less than the previous design by Stetson for Layout 1. The conceptual design was intended to address concerns expressed by nearby property owners regarding the configuration and positioning of the basin.

Because of the limited storage capacity of the detention basin and the need to use available storage space to its fullest to reduce flooding downstream, the detention basin was designed to have two outlets penetrating the spillway structure across the creek: one is a smaller (6 ft by 4 ft) ungated box culvert that is always open to allow limited, continuous discharge during detention operations and to allow passage of sediment, woody debris, and wildlife; and the other is a larger (10 ft by 5 ft) box culvert with a gate control which would normally be kept open to allow unimpeded passage of a range of flows. The larger gated culvert would be closed during a flood event. The timing of closure of the gated culvert would be just before the time of incipient flooding downstream. When the gated culvert is closed, the creek water level behind the spillway will rise until it reaches the top of the left bank (looking downstream). When the rising creek water level rises above the top of the left bank, flood water will then start to flow over the left bank into the detention basin area. This overflow would be similar to flow over a side weir.

A 36-inch diameter low-level drain outlet pipe with an invert elevation at about 223.8 ft NAVD88 was designed to drain the detention basin. After a flood event, the basin will first be passively drained by the ungated culvert (6 ft by 4 ft box culvert) to about 228 ft NAVD88 (the lowest top elevation of the left bank). The remainder of the basin will be actively drained by opening of the low-level outlet pipe (by a flood operator). It would take about 8 hours for the outlet pipe to fully drain the water remaining in the basin. The low-level drain outlet pipe would normally be kept open[2] and then closed for flood detention at the same time the gated culvert on the spillway structure is closed.

The spillway structure includes a 95-ft long broad-crested spillway which, in conjunction with the ungated culvert, conveys surcharge flows downstream. There are 3 ft of *freeboard*, which is the difference between the elevation of the spillway crest (235 ft NAVD88) and the elevation of the top of the berm (238 ft NAVD88). The spillway structure conveys discharges up to the 1,000-year discharge with 1.5 ft of *residual freeboard*, which is the difference between the maximum water surface elevation (during

[2] The need for a backflow gate on the low-level drain outlet pipe will be evaluated during final design.

the 1,000-year flood) and the top of the berm. This complies with DSOD's requirement for a minimum of 1.5 ft of *residual freeboard*.

Conceptual Design for Layout 6 (Deeper Basin)

Figure 2 shows the conceptual design for Layout 6, the deepened/enlarged Sunnyside DB. This design is similar to Layout 4 except that the width of the perimeter road is widened from 10 ft to 15 ft and the setback on the east and west sides is narrowed from 50 ft to 25 ft. Layout 6 has a storage capacity of about 41 acre-ft at the spillway crest.

The conceptual design for Layout 6 of the deepened/enlarged Sunnyside DB (Figure 2) also shows the configuration of the inlet/outlet features of a pump station. Figure 3 shows the pump station profile. A vertical turbine pump would be suitable for this application. The pump house should be located well above the 100-year water level of about 236.5 ft NAVD. The pump station was designed with the following main elements:

- catch basin with trash rack/sediment screen at the southeast corner of the DB;
- pipe for directing flow from the catch basin to the pump sump;
- vertical turbine pump with concrete supporting structures; and
- pump discharge pipe.

The sizing of the pump station and general rules of the DB operations provided for Layout 4 would also apply for Layout 6. Refer to the Stetson 12/20/2017 technical memorandum entitled "San Anselmo Flood Risk Reduction Project CEQA Support/ Conceptual Designs for Deepened/Enlarged Sunnyside Detention Basin and Pump Station", for sizing of the pump station and general rules of the DB operations.

The pump station was sized to have a minimum hydraulic power of about 10 horsepower for delivery of water at a discharge rate of 1,170 gpm.

The following is a summary of general rules of the DB operations:

More than 24 hours prior to a forecasted flood event (i.e., normal operations):

1. Keep the 36-inch diameter low-level drain outlet pipe open for draining the groundwater seepage and minimizing accumulation of water in the DB[3].

24-hour prior to a forecasted flood event:

1) Turn the pump on to evacuate any accumulated water in the deepened part of the DB and prevent further accumulation of water prior to the time when the DB gate is closed.

Immediately prior to a flood event:

1) Close the 36-inch diameter low-level drain outlet pipe for flood detention at the same time the gated culvert is closed.
2) Turn off the pump.

[3] The need for a backflow gate on the low-level drain outlet pipe will be evaluated during final design.

3) Close the gated culvert to initiate floodwater diversion (Note: The timing of closure of the gated culvert would be just before the time of incipient flooding downstream).

Immediately after a flood event:

1) Open the gated culvert for draining floodwater.
2) Open the 36-inch diameter low-level drain outlet pipe for additional draining of floodwater and keep it open.

Conceptual Design for Layout 7 (Passive Basin)

Figure 4 shows the conceptual design for Layout 7 of the Sunnyside DB with no creek diversion structure for passive operations. The side weir along the left bank of the creek was designed to have a crest elevation of 228 ft NAVD88. This elevation is the water surface elevation in the creek at the DB site at the time of incipient flooding downstream. In other words, at the time when downstream incipient flooding occurs, a portion of flood water would begin to passively enter into the DB over the side weir. The side weir of Layout 7 has the same crest elevation and length as Layouts 2 and 6. This allows for an even comparison of flood reduction benefit among the three layouts. Layout 7 has an east berm top elevation of 232 ft NAVD88 and a storage capacity of about 20 acre-ft at the simulated 100-year maximum water surface elevation (229.9 ft NAVD88).

Under this concept, the 36-inch diameter low-level outlet pipe would be kept open all the time for passive operations[4].

Hydraulic Modeling for Layouts 2, 6, and 7 of the Sunnyside DB with Complete Removal of Building Bridge #2

Stetson performed hydraulic modeling to assess the project effects and cumulative effects of Option 2A with regard to flooding. For the modeling, Stetson used US Army Corp of Engineers software, HEC-RAS version 5.0, which has combined 1D and 2D hydraulic modeling capabilities. Stetson recently developed a combined 1D/2D unsteady-flow model application for the Corte Madera Creek watershed. The model starts at the bay and extends upstream along the mainstream and tributaries to the proposed upper watershed detention basins in Fairfax that are currently under environmental review. The model was calibrated to the 12/15/2016 bankfull event and the 12/31/2005 flood event (an approximate 100-year flood), and verified to the 1/4/1982 flood event (an approximate 150-year flood; Stetson, 2017). The model was peer reviewed by the US Army Corp of Engineers in 2017.

[4] The need for a backflow gate on the low-level drain outlet pipe will be evaluated during final design.

The following scenarios were analyzed:

- Existing Conditions (EC), to serve as the "Baseline" basis for comparison
- Option 2A (Sunnyside DB Layout 2 and complete removal of BB#2) added to EC, to assess "Project" effects
- Option 2A (Sunnyside DB Layout 6 and complete removal of BB#2) added to EC, to assess "Project" effects
- Option 2A (Sunnyside DB Layout 7 and complete removal of BB#2) added to EC, to assess "Project" effects

For each scenario, the following three flood events were analyzed:

- Q100, major, rare flood, similar to 12/31/05 flood
- Q25, moderate, infrequent flood
- Q10, minor flood, less frequent than 2017 flood event (7-year flood event)

Results of Hydraulic Analysis in Terms of Floodplain Inundation

Figures 5a to 5c show the changes in the HEC-RAS model-simulated floodplain inundation extent and depth between Option 2A (Sunnyside DB Layout 2 and complete removal of BB#2) and existing conditions for the 10-year flood. Figures are provided covering Fairfax, Upper San Anselmo, and Lower San Anselmo areas. Similarly, Figures 6a to 6c show the model-simulated results for the 25-year flood and Figures 7a to 7c for the 100-year flood.

Figures 8a to 8c show the changes in the HEC-RAS model-simulated floodplain inundation extent and depth between Option 2A (Sunnyside DB Layout 6 and complete removal of BB#2) and existing conditions for the 10-year flood. Similarly, Figures 9a to 9c show the model-simulated results for the 25-year flood and Figures 10a to 10c for the 100-year flood.

Figures 11a to 11c show the changes in the HEC-RAS model-simulated floodplain inundation extent and depth between Option 2A (Sunnyside DB Layout 7 and complete removal of BB#2) and existing conditions for the 10-year flood. Similarly, Figures 12a to 12c show the model-simulated results for the 25-year flood and Figures 13a to 13c for the 100-year flood.

Tables 2, 3, and 4 are a summary of results for Option 2A for the three layouts of Sunnyside DB (Layout 2, Layout 6, and Layout 7, respectively).

Table 2 Summary of Benefits of Option 2A (Sunnyside DB Layout 2 and Complete Removal of BB#2) Compared to Existing Condition

Figure No.	Flow Condition	Location	Summary of Benefits	Any Flooding Increase?
Figure 5a	Q10	Fairfax	• Reduces inundation extent due to Sunnyside detention basin • Reduces inundation depth by up to 10 inches	None
Figure 5b		Downtown SA (Upper)	• Reduces inundation extent due to Sunnyside detention basin and Building Bridge #2 removal • Reduces inundation depth by up to 17 inches	None
Figure 5c		Downtown SA (Lower)	• Reduces inundation extent due to Sunnyside detention basin and Building Bridge #2 removal • Reduces inundation depth by up to 18 inches	None
Figure 6a	Q25	Fairfax	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 1 inch	None
Figure 6b		Downtown SA (Upper)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 6 inches	None
Figure 6c		Downtown SA (Lower)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 6 inches	Minor increase in flooding in the area between Winship and Barber Bridges
Figure 7a	Q100	Fairfax	• Nearly zero reduction	None
Figure 7b		Downtown SA (Upper)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 5 inches	None
Figure 7c		Downtown SA (Lower)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 5 inches	Minor increase in flooding in the area between Winship and Barber Bridges

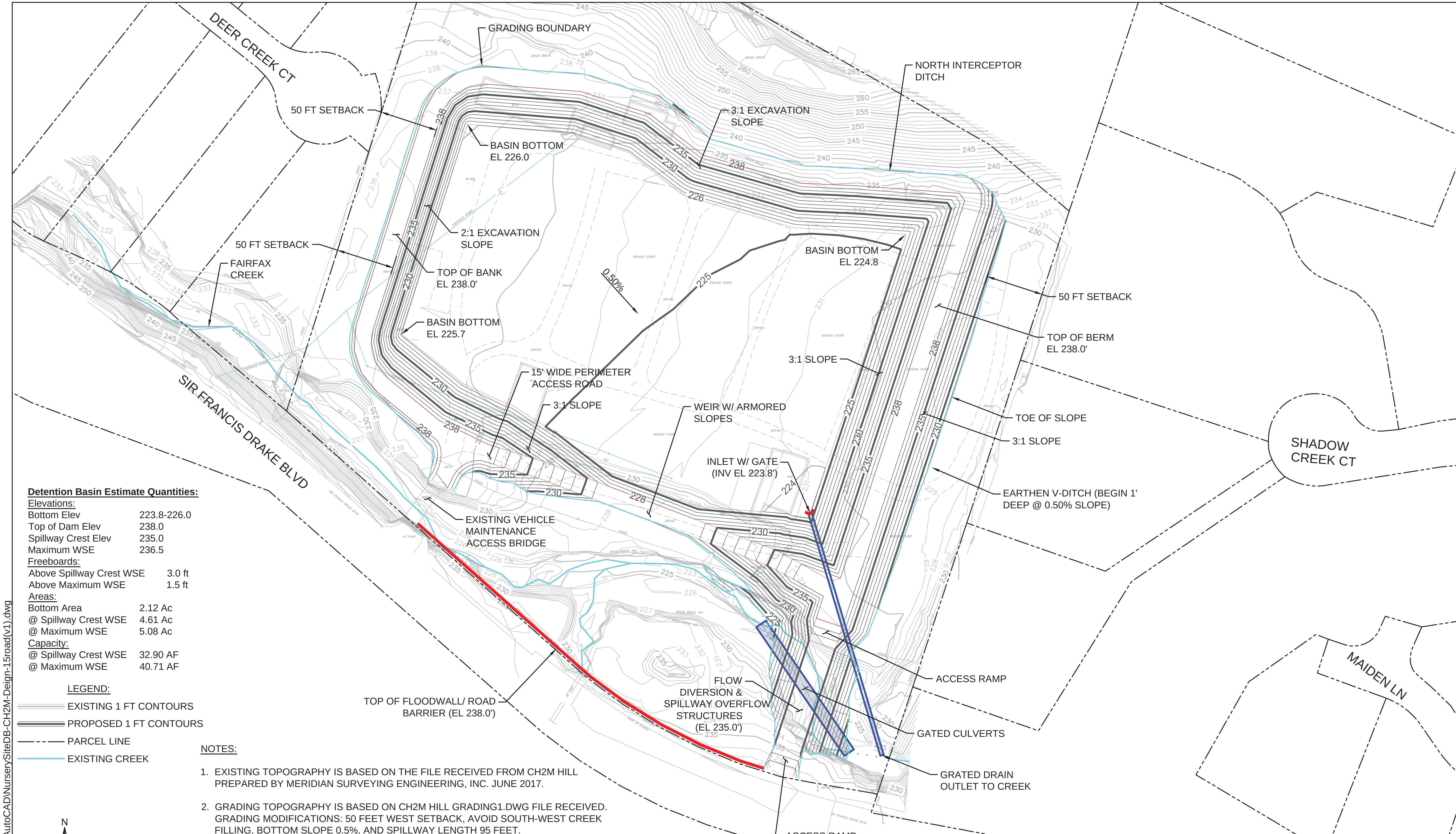
Table 3 Summary of Benefits of Option 2A (Sunnyside DB Layout 6 and Complete Removal of BB#2) Compared to Existing Condition

Figure No.	Flow Condition	Location	Summary of Benefits	Any Flooding Increase?
Figure 8a	Q10	Fairfax	• Reduces inundation extent due to Sunnyside detention basin • Reduces inundation depth by up to 14 inches	None
Figure 8b		Downtown SA (Upper)	• Reduces inundation extent due to Sunnyside detention basin and Building Bridge #2 removal • Reduces inundation depth by up to 23 inches	None
Figure 8c		Downtown SA (Lower)	• Reduces inundation extent due to Sunnyside detention basin and Building Bridge #2 removal • Reduces inundation depth by up to 24 inches	None
Figure 9a	Q25	Fairfax	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 2 inches	None
Figure 9b		Downtown SA (Upper)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 6 inches	None
Figure 9c		Downtown SA (Lower)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 6 inches	Minor increase in flooding in the area between Winship and Barber Bridges
Figure 10a	Q100	Fairfax	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 2 inches	None
Figure 10b		Downtown SA (Upper)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 7 inches	None
Figure 10c		Downtown SA (Lower)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 6 inches	Minor increase in flooding in the area between Winship and Barber Bridges

Table 4 Summary of Benefits of Option 2A (Sunnyside DB Layout 7 and Complete Removal of BB#2) Compared to Existing Condition

Figure No.	Flow Condition	Location	Summary of Benefits	Any Flooding Increase?
Figure 11a	Q10	Fairfax	• Reduces inundation extent due to Sunnyside detention basin • Reduces inundation depth by up to 4 inches	None
Figure 11b		Downtown SA (Upper)	• Reduces inundation extent due to Sunnyside detention basin and Building Bridge #2 removal • Reduces inundation depth by up to 12 inches	None
Figure 11c		Downtown SA (Lower)	• Reduces inundation extent due to Sunnyside detention basin and Building Bridge #2 removal • Reduces inundation depth by up to 13 inches	None
Figure 12a	Q25	Fairfax	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 1 inch	None
Figure 12b		Downtown SA (Upper)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 4 inches	None
Figure 12c		Downtown SA (Lower)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 4 inches	Minor increase in flooding in the area between Winship and Barber Bridges
Figure 13a	Q100	Fairfax	• Nearly zero reduction	None
Figure 13b		Downtown SA (Upper)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 5 inches	None
Figure 13c		Downtown SA (Lower)	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 4 inches	Minor increase in flooding in the area between Winship and Barber Bridges

Figure 1



Detention Basin Estimate Quantities:

Elevations:	
Bottom Elev	223.8-226.0
Top of Dam Elev	238.0
Spillway Crest Elev	235.0
Maximum WSE	236.5
Freeboards:	
Above Spillway Crest WSE	3.0 ft
Above Maximum WSE	1.5 ft
Areas:	
Bottom Area	2.12 Ac
@ Spillway Crest WSE	4.61 Ac
@ Maximum WSE	5.08 Ac
Capacity:	
@ Spillway Crest WSE	32.90 AF
@ Maximum WSE	40.71 AF

LEGEND:

- EXISTING 1 FT CONTOURS
- PROPOSED 1 FT CONTOURS
- PARCEL LINE
- EXISTING CREEK

N S W E

SCALE (FEET)
0 40 80

NOTES:

1. EXISTING TOPOGRAPHY IS BASED ON THE FILE RECEIVED FROM CH2M HILL PREPARED BY MERIDIAN SURVEYING ENGINEERING, INC. JUNE 2017.
2. GRADING TOPOGRAPHY IS BASED ON CH2M HILL GRADING1.DWG FILE RECEIVED. GRADING MODIFICATIONS: 50 FEET WEST SETBACK, AVOID SOUTH-WEST CREEK FILLING, BOTTOM SLOPE 0.5%, AND SPILLWAY LENGTH 95 FEET.
3. PARCEL BOUNDARIES ARE BASED ON THE SHAPE FILES DOWNLOADED FROM THE COUNTY WEBSITE.
4. COORDINATES OF THIS DRAWING IS IN CALIFORNIA STATE PLANES, NAD83, ZONE 3.
5. VERTICAL DATUM IN THIS DRAWING IS NAVD88.

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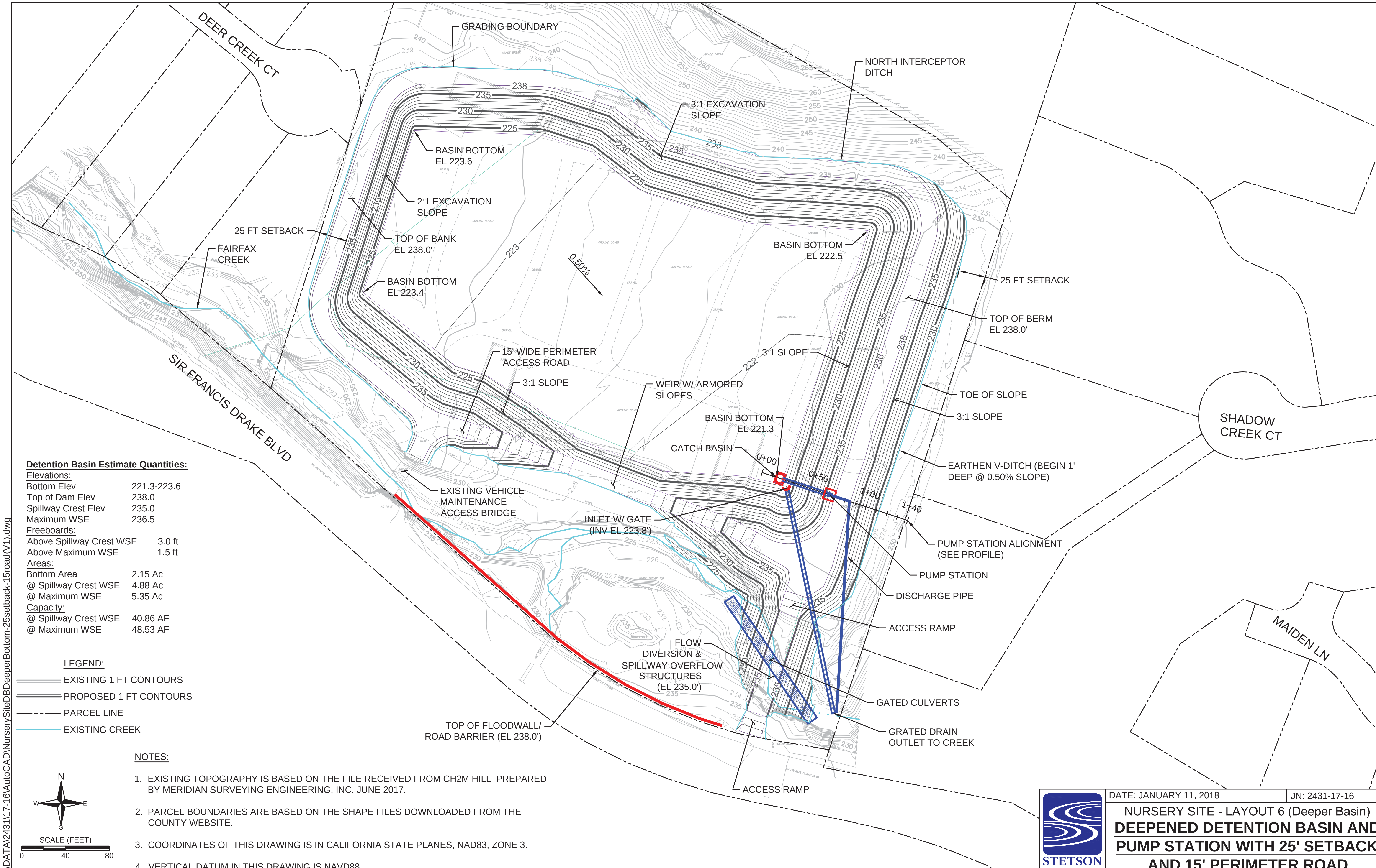
STETSON ENGINEERS INC.

DATE: JANUARY 12, 2018 | JN: 2431-17-16

NURSERY SITE - LAYOUT 2 (Proposed Project)

CH2M HILL DESIGN DETENTION BASIN WITH 50' SETBACK AND 15' PERIMETER ROAD

Figure 2



Detention Basin Estimate Quantities:

Elevations:	
Bottom Elev	221.3-223.6
Top of Dam Elev	238.0
Spillway Crest Elev	235.0
Maximum WSE	236.5
Freeboards:	
Above Spillway Crest WSE	3.0 ft
Above Maximum WSE	1.5 ft
Areas:	
Bottom Area	2.15 Ac
@ Spillway Crest WSE	4.88 Ac
@ Maximum WSE	5.35 Ac
Capacity:	
@ Spillway Crest WSE	40.86 AF
@ Maximum WSE	48.53 AF

LEGEND:
- EXISTING 1 FT CONTOURS
- PROPOSED 1 FT CONTOURS
- PARCEL LINE
- EXISTING CREEK

N W E S

SCALE (FEET)
0 40 80

NOTES:

1. EXISTING TOPOGRAPHY IS BASED ON THE FILE RECEIVED FROM CH2M HILL PREPARED BY MERIDIAN SURVEYING ENGINEERING, INC. JUNE 2017.
2. PARCEL BOUNDARIES ARE BASED ON THE SHAPE FILES DOWNLOADED FROM THE COUNTY WEBSITE.
3. COORDINATES OF THIS DRAWING IS IN CALIFORNIA STATE PLANES, NAD83, ZONE 3.
4. VERTICAL DATUM IN THIS DRAWING IS NAVD88.

STETSON ENGINEERS INC.

DATE: JANUARY 11, 2018 | JN: 2431-17-16

NURSERY SITE - LAYOUT 6 (Deeper Basin)

DEEPENED DETENTION BASIN AND PUMP STATION WITH 25' SETBACK AND 15' PERIMETER ROAD

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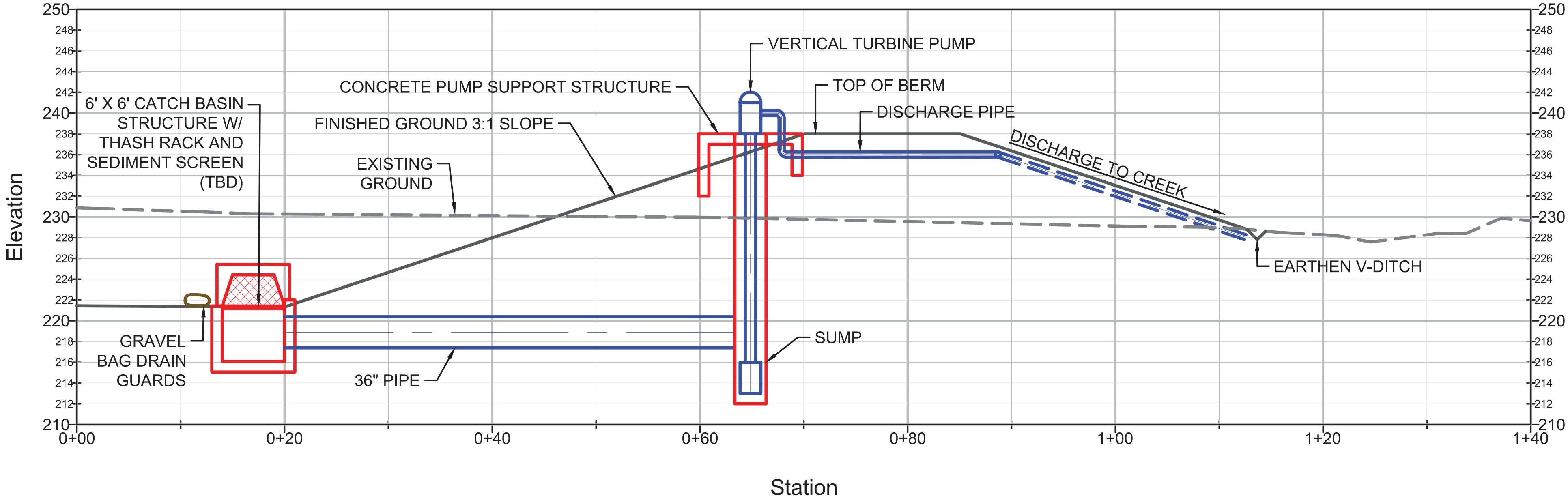
Figure 3

PUMP STATION PROFILE



SCALE (FEET)

0 7.5 15

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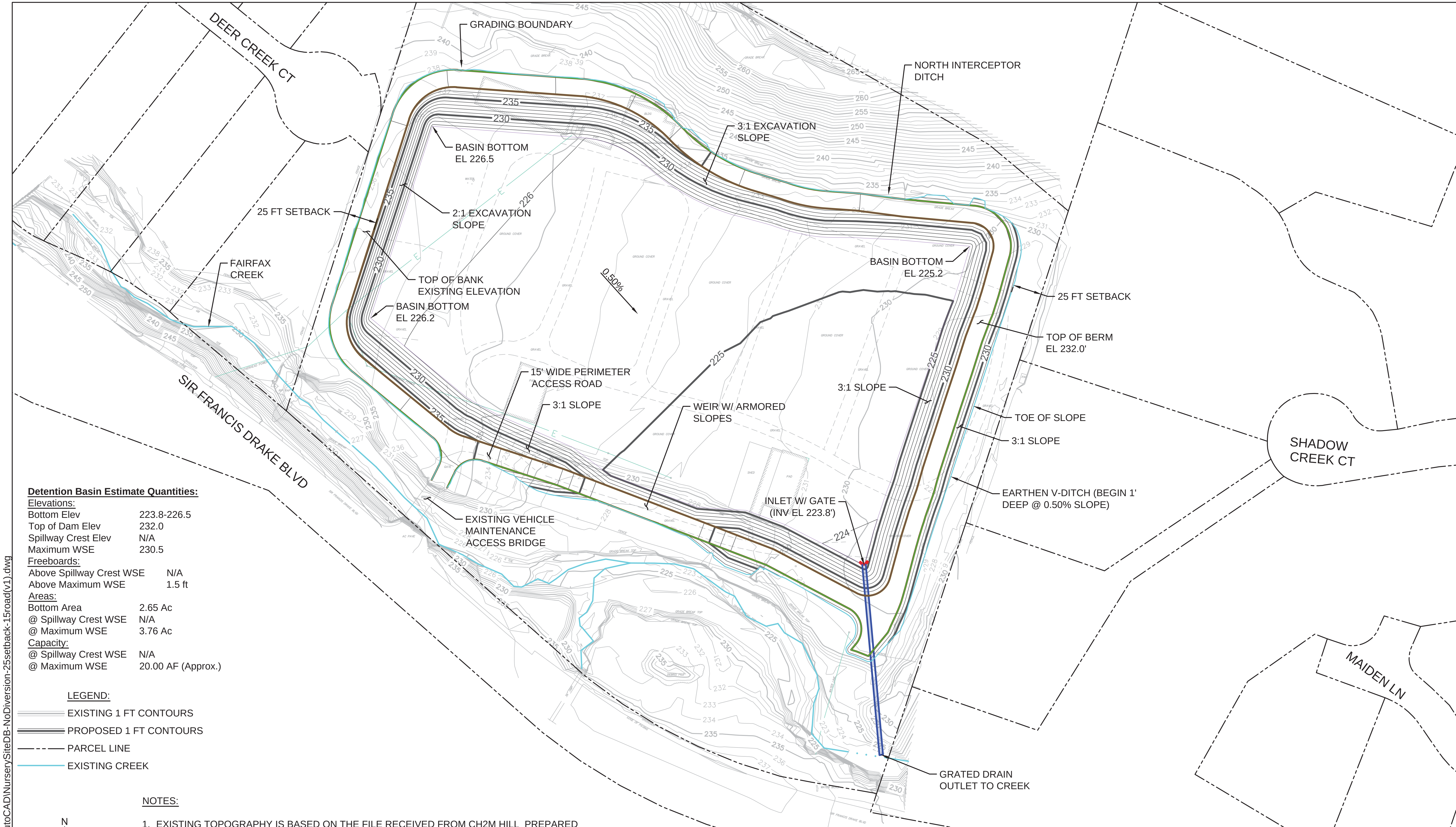
STETSON ENGINEERS INC.

DATE: JANUARY 11, 2018	JN: 2431-17-16

NURSERY SITE - LAYOUT 6

DEEPENED DETENTION BASIN AND PUMP STATION WITH 25' SETBACK AND 15' PERIMETER ROAD

PUMP STATION PROFILE



Detention Basin Estimate Quantities:

Elevations:	
Bottom Elev	223.8-226.5
Top of Dam Elev	232.0
Spillway Crest Elev	N/A
Maximum WSE	230.5
Freeboards:	
Above Spillway Crest WSE	N/A
Above Maximum WSE	1.5 ft
Areas:	
Bottom Area	2.65 Ac
@ Spillway Crest WSE	N/A
@ Maximum WSE	3.76 Ac
Capacity:	
@ Spillway Crest WSE	N/A
@ Maximum WSE	20.00 AF (Approx.)

LEGEND:

- EXISTING 1 FT CONTOURS
- PROPOSED 1 FT CONTOURS
- PARCEL LINE
- EXISTING CREEK

NOTES:

1. EXISTING TOPOGRAPHY IS BASED ON THE FILE RECEIVED FROM CH2M HILL PREPARED BY MERIDIAN SURVEYING ENGINEERING, INC. JUNE 2017.
2. PARCEL BOUNDARIES ARE BASED ON THE SHAPE FILES DOWNLOADED FROM THE COUNTY WEBSITE.
3. COORDINATES OF THIS DRAWING IS IN CALIFORNIA STATE PLANES, NAD83, ZONE 3.
4. VERTICAL DATUM IN THIS DRAWING IS NAVD88.

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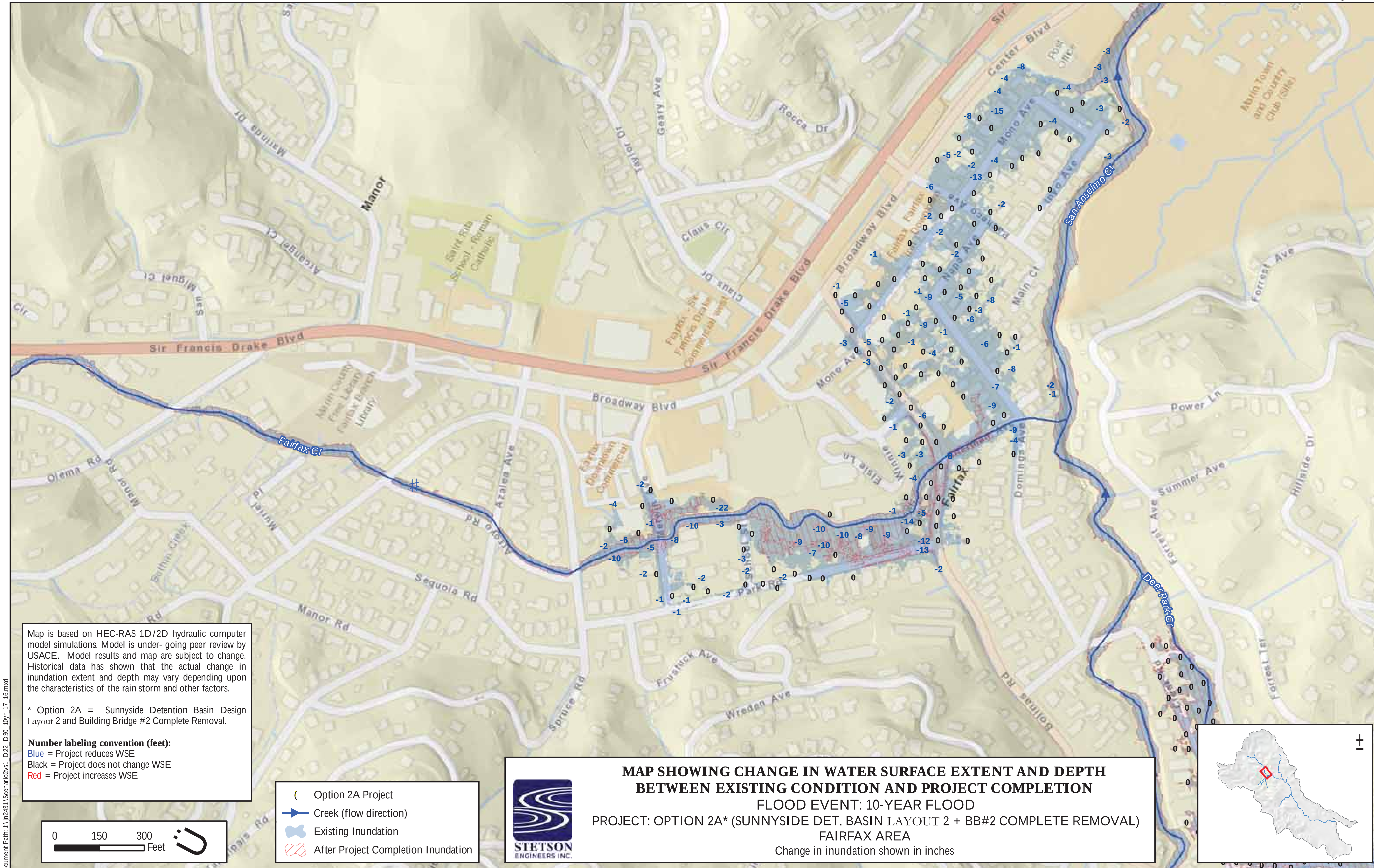
STETSON ENGINEERS INC.

DATE: JANUARY 11, 2018 | JN: 2431-17-16

NURSERY SITE - LAYOUT 7 (Passive Basin)

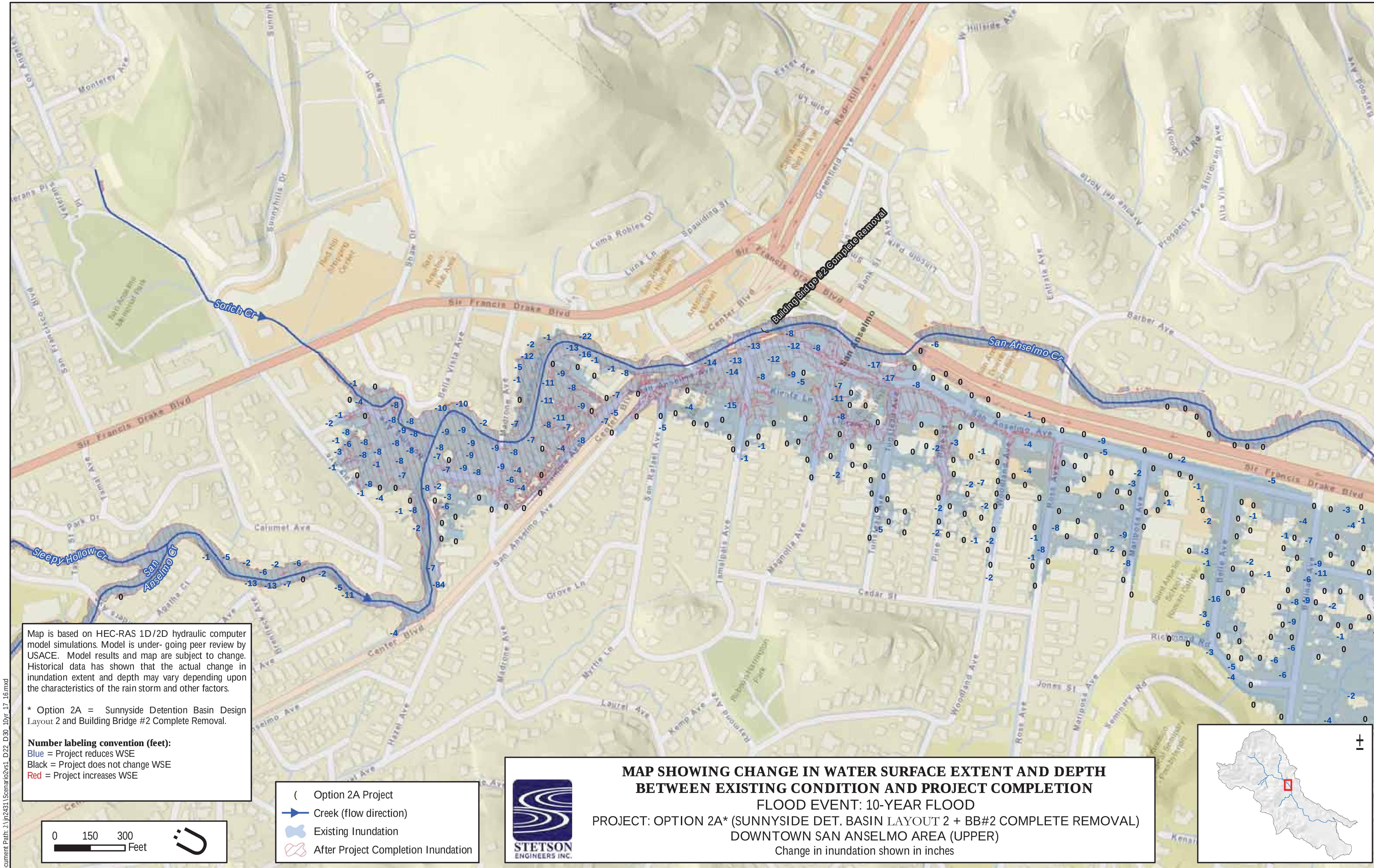
NO CREEK DIVERSION DETENTION BASIN OPTION WITH 25' SETBACK AND 15' PERIMETER ROAD

Figure 5a



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.
* Option 2A = Sunnyside Detention Basin Design Layout 2 and Building Bridge #2 Complete Removal.
Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE
0 150 300 Feet
Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation
STETSON ENGINEERS INC.
MAP SHOWING CHANGE IN WATER SURFACE EXTENT AND DEPTH BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 10-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 2 + BB#2 COMPLETE REMOVAL)
FAIRFAX AREA
Change in inundation shown in inches
Sir Francis Drake Blvd
Broadway Blvd
Fairfax Cr
San Anselmo Cr
Deer Park Cr

Figure 5b



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 2 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

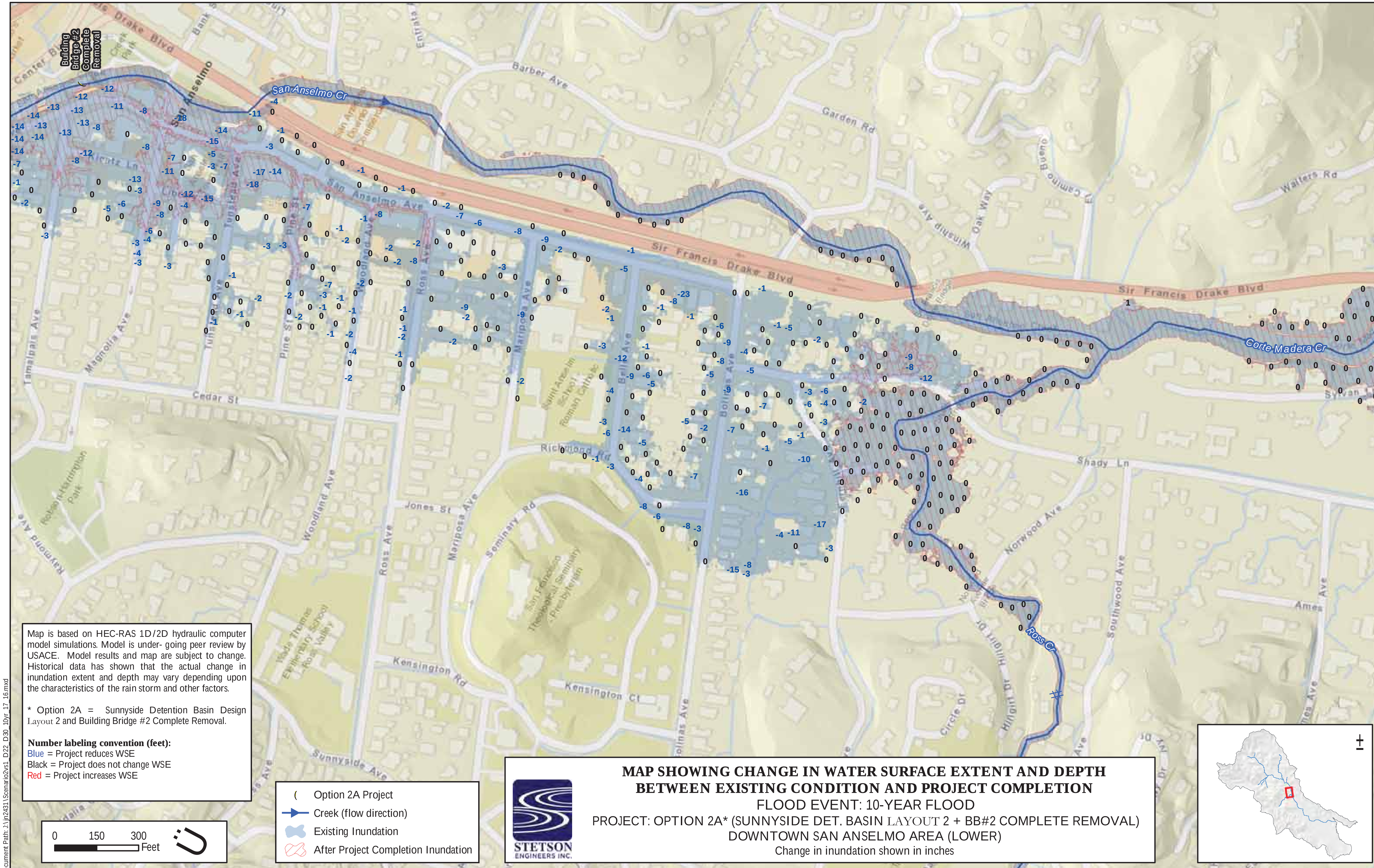
0 150 300 Feet

(Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE EXTENT AND DEPTH BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 10-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 2 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (UPPER)
Change in inundation shown in inches

Document Path: J:\jn2431\Scenario2vs1_D22_D30_10yr_17_16.mxd



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 2 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

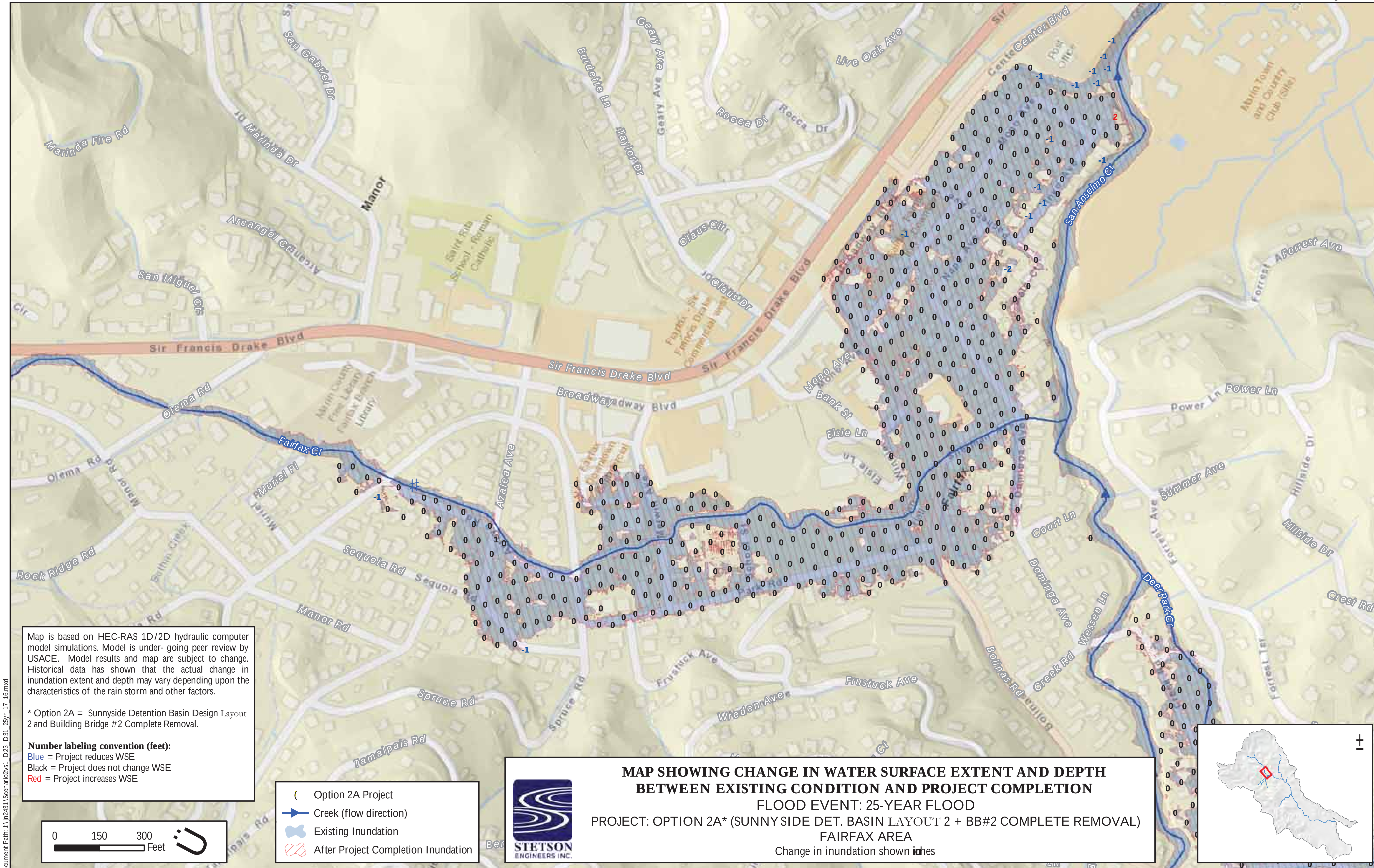
0 150 300 Feet

Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

MAP SHOWING CHANGE IN WATER SURFACE EXTENT AND DEPTH BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 10-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 2 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\Scenario2vs1_D22_D30_10yr_17_16.mxd



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 2 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

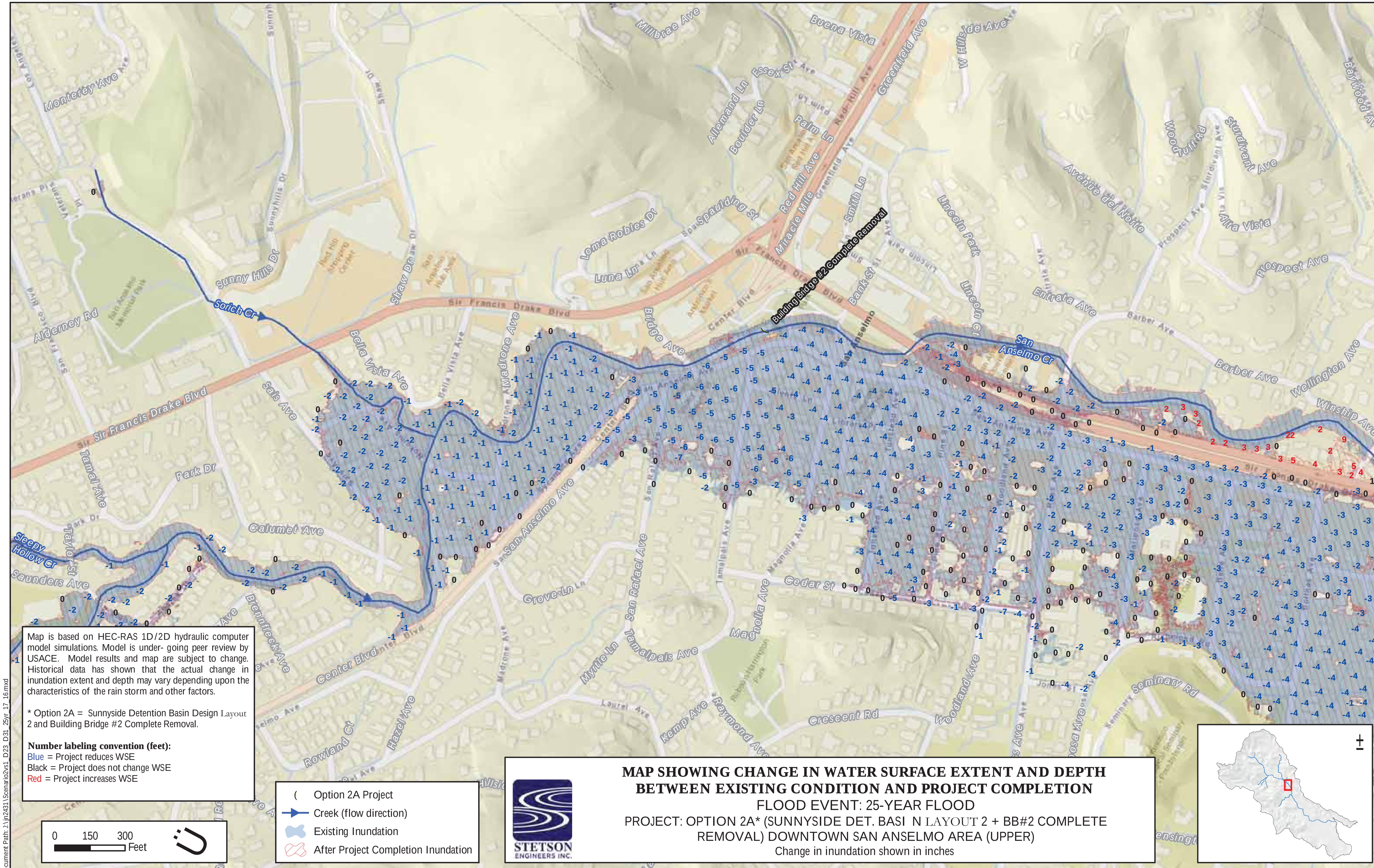
Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

MAP SHOWING CHANGE IN WATER SURFACE EXTENT AND DEPTH BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 25-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNY SIDE DET. BASIN LAYOUT 2 + BB#2 COMPLETE REMOVAL)
FAIRFAX AREA
Change in inundation shown inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\Scenario2vs1_D23_D31_25yr_17_16.mxd

Figure 6b



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 2 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

MAP SHOWING CHANGE IN WATER SURFACE EXTENT AND DEPTH BETWEEN EXISTING CONDITION AND PROJECT COMPLETION

FLOOD EVENT: 25-YEAR FLOOD

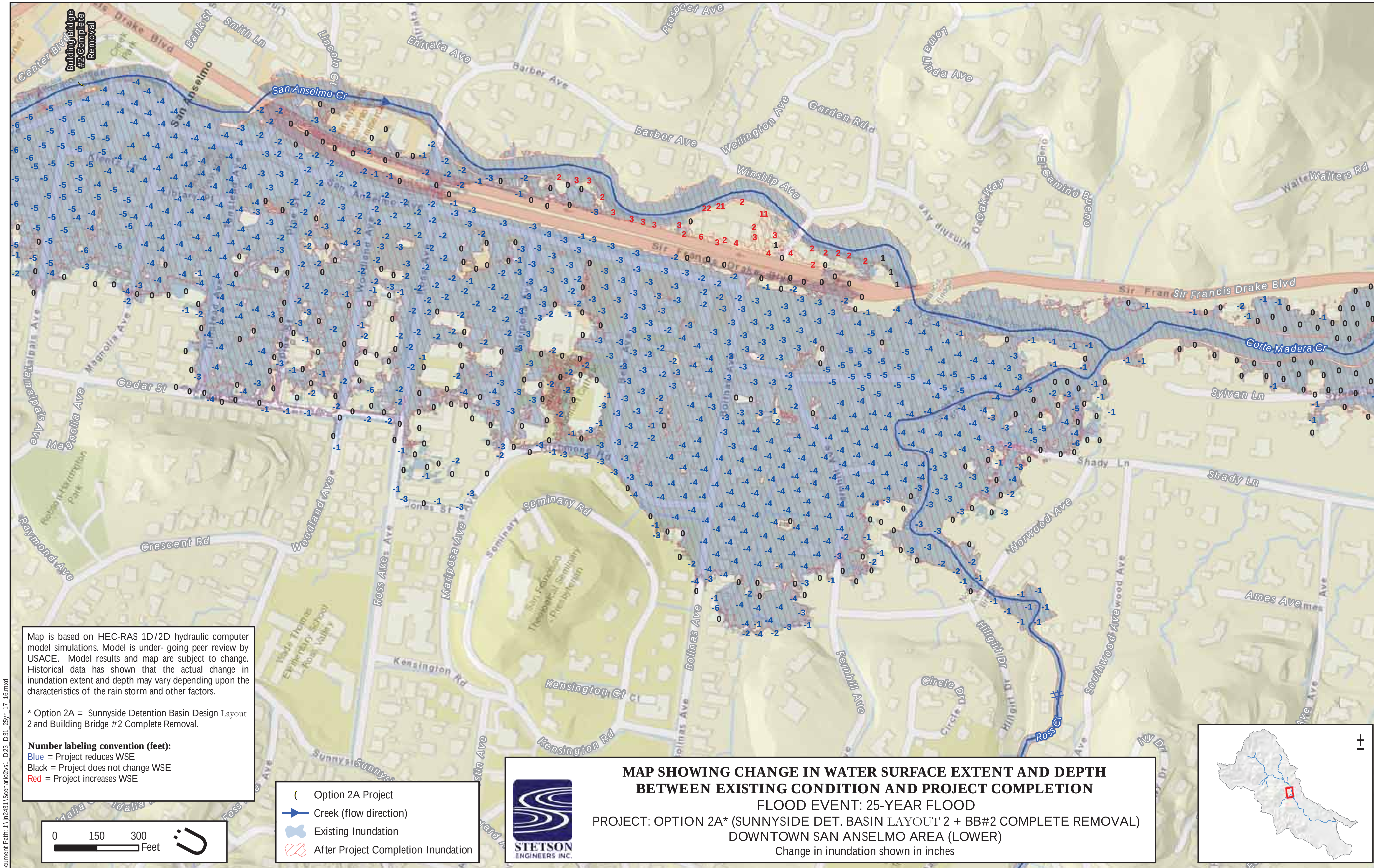
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASI N LAYOUT 2 + BB#2 COMPLETE REMOVAL) DOWNTOWN SAN ANSELMO AREA (UPPER)

Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\Scenario2vs1_D23_D31_25yr_17_16.mxd

Figure 6c



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 2 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

0 150 300 Feet

MAP SHOWING CHANGE IN WATER SURFACE EXTENT AND DEPTH BETWEEN EXISTING CONDITION AND PROJECT COMPLETION

FLOOD EVENT: 25-YEAR FLOOD

PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 2 + BB#2 COMPLETE REMOVAL)

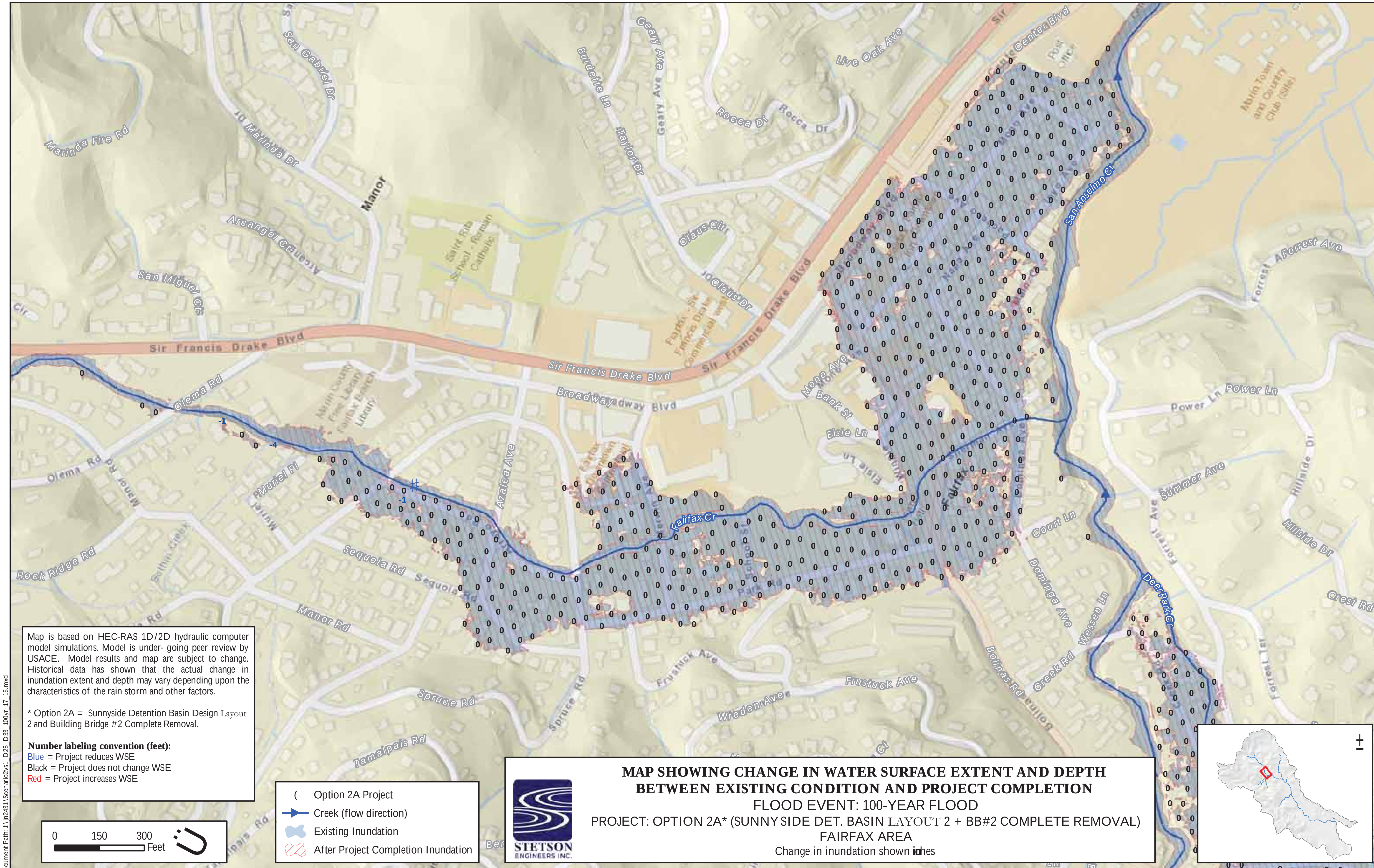
DOWNTOWN SAN ANSELMO AREA (LOWER)

Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\Scenario2vs1_D23_D31_25yr_17_16.mxd

Figure 7a



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 2 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

MAP SHOWING CHANGE IN WATER SURFACE EXTENT AND DEPTH BETWEEN EXISTING CONDITION AND PROJECT COMPLETION

FLOOD EVENT: 100-YEAR FLOOD

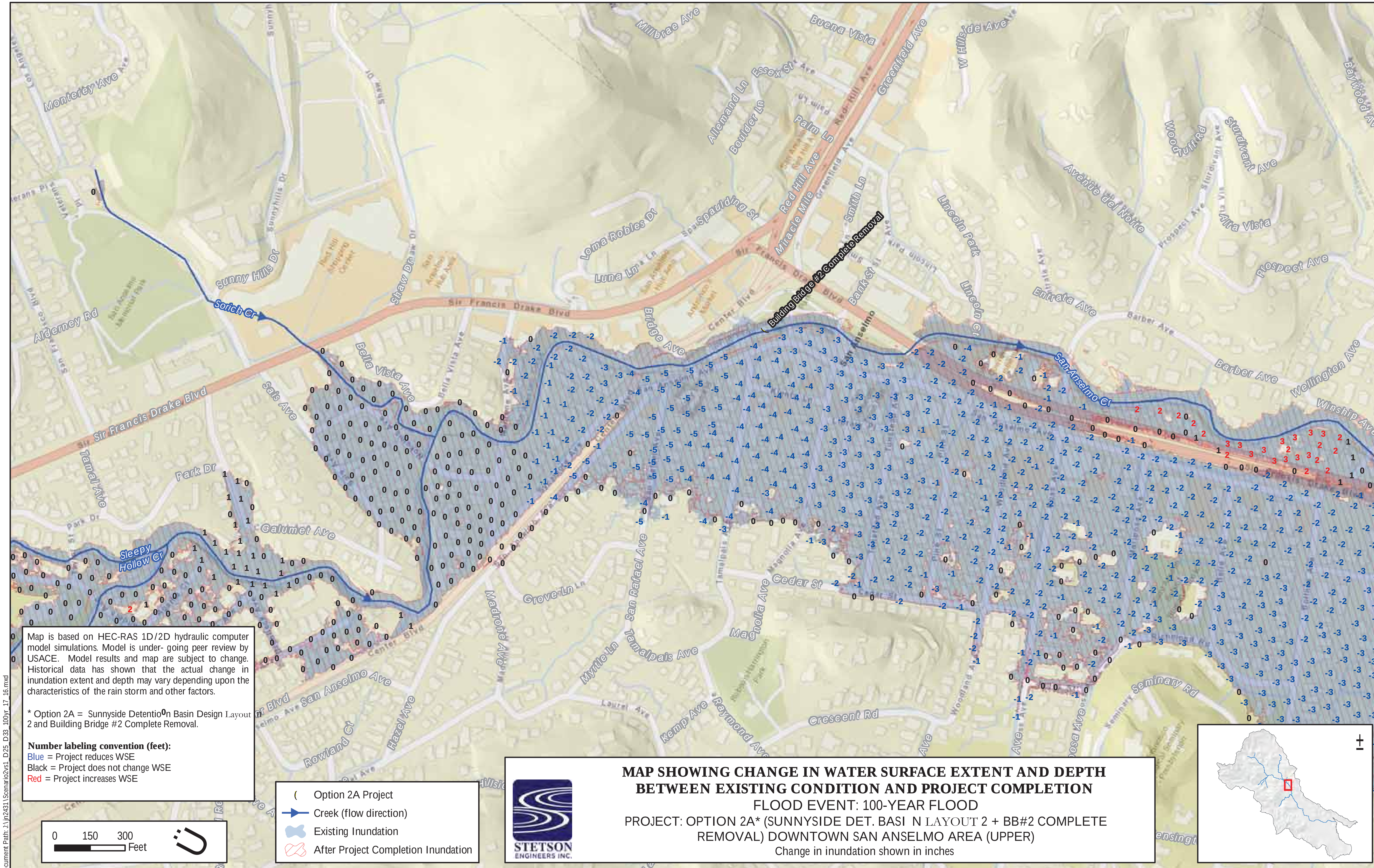
PROJECT: OPTION 2A* (SUNNY SIDE DET. BASIN LAYOUT 2 + BB#2 COMPLETE REMOVAL)

FAIRFAX AREA

Change in inundation shown inches

STETSON ENGINEERS INC.

Figure 7b



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 2 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

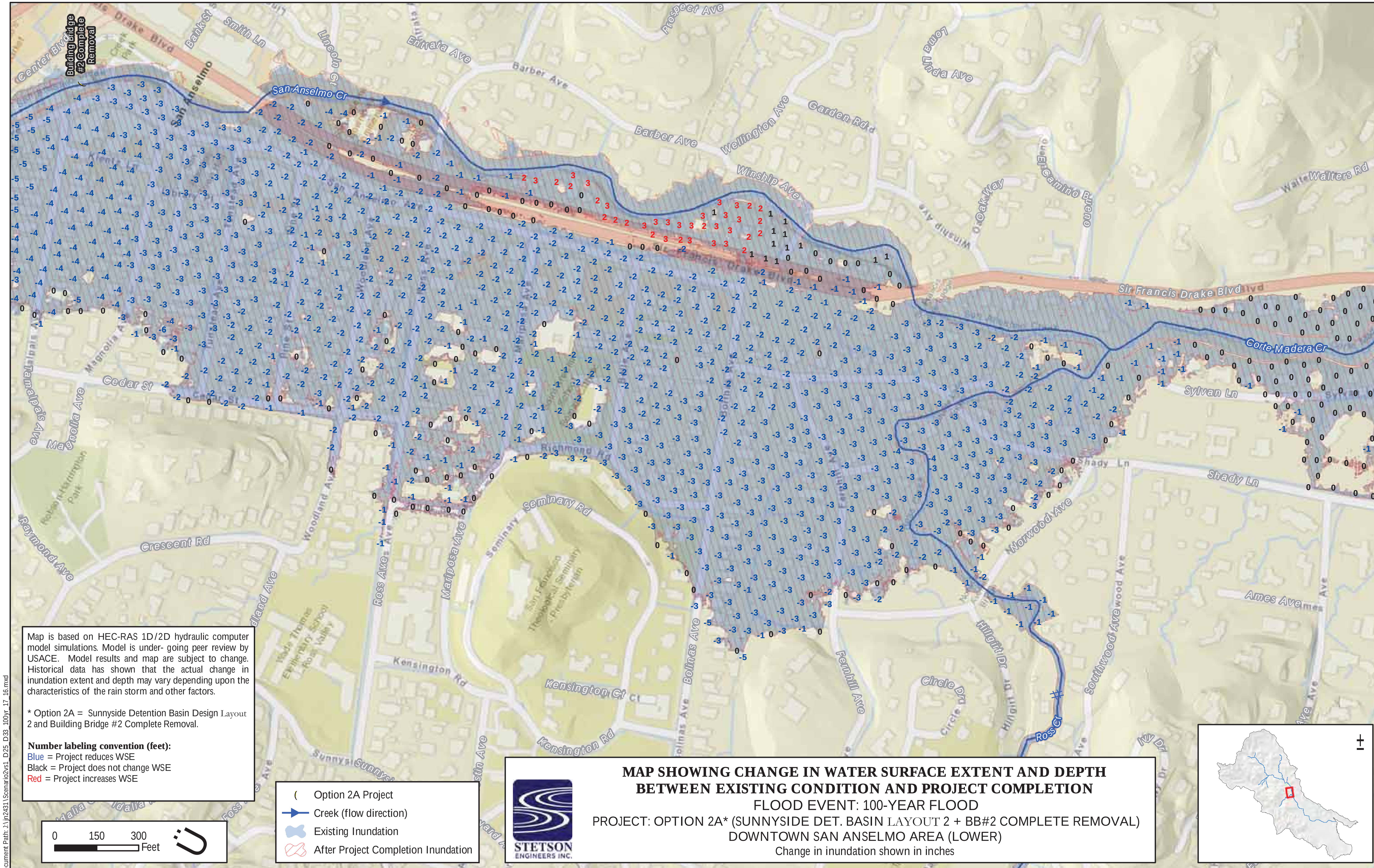
Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE EXTENT AND DEPTH BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 100-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 2 + BB#2 COMPLETE REMOVAL) DOWNTOWN SAN ANSELMO AREA (UPPER)
Change in inundation shown in inches

Document Path: J:\jn2431\Scenario2vs1_D25_D33_100yr_17_16.mxd

Figure 7c



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 2 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

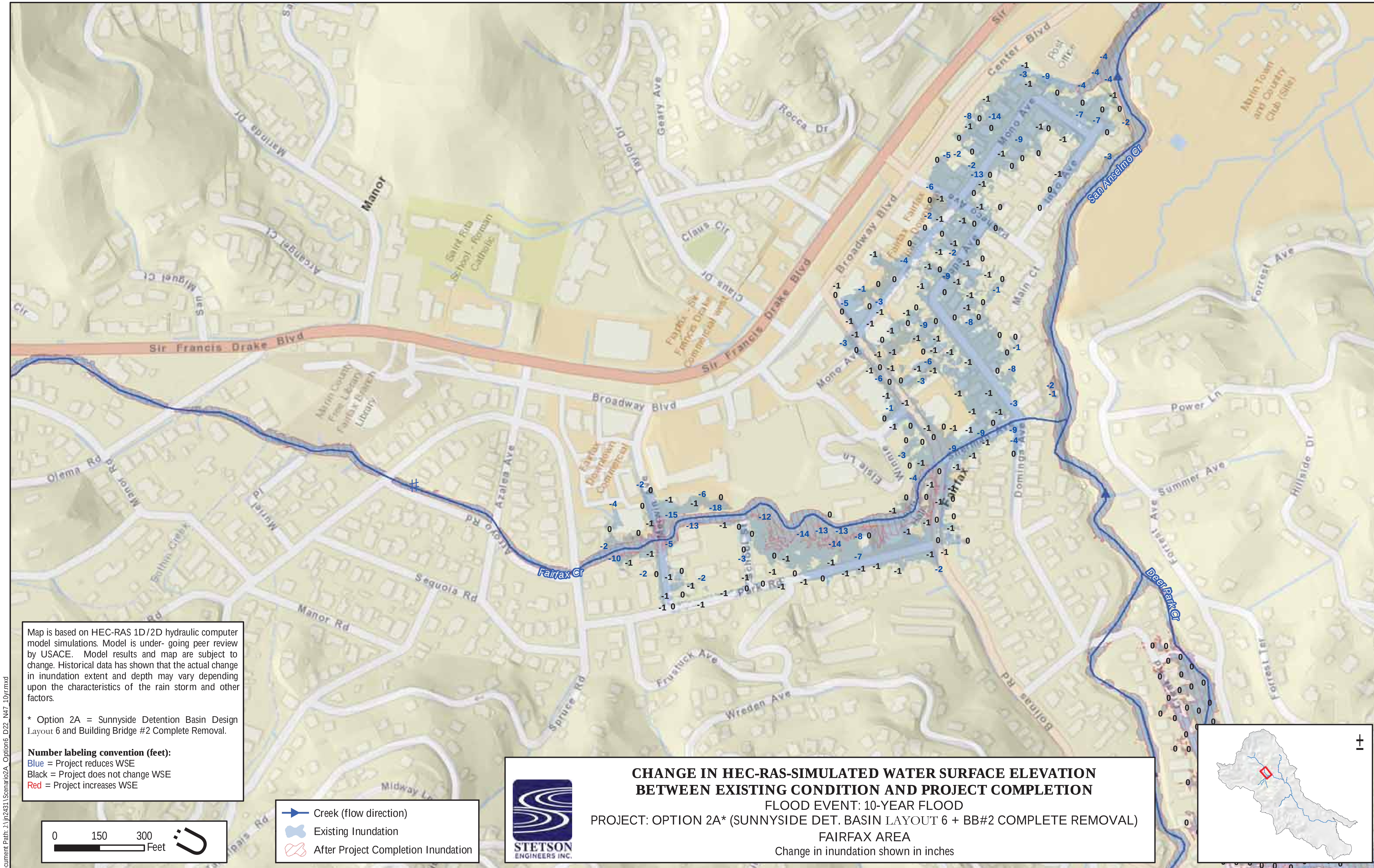
0 150 300 Feet

Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

MAP SHOWING CHANGE IN WATER SURFACE EXTENT AND DEPTH BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 100-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 2 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\Scenario2vs1_D25_D33_100yr_17_16.mxd



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 6 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 10-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 6 + BB#2 COMPLETE REMOVAL)
FAIRFAX AREA
Change in inundation shown in inches

Document Path: J:\jn2431\Scenario2A_Option6_D22_N47_10yr.mxd

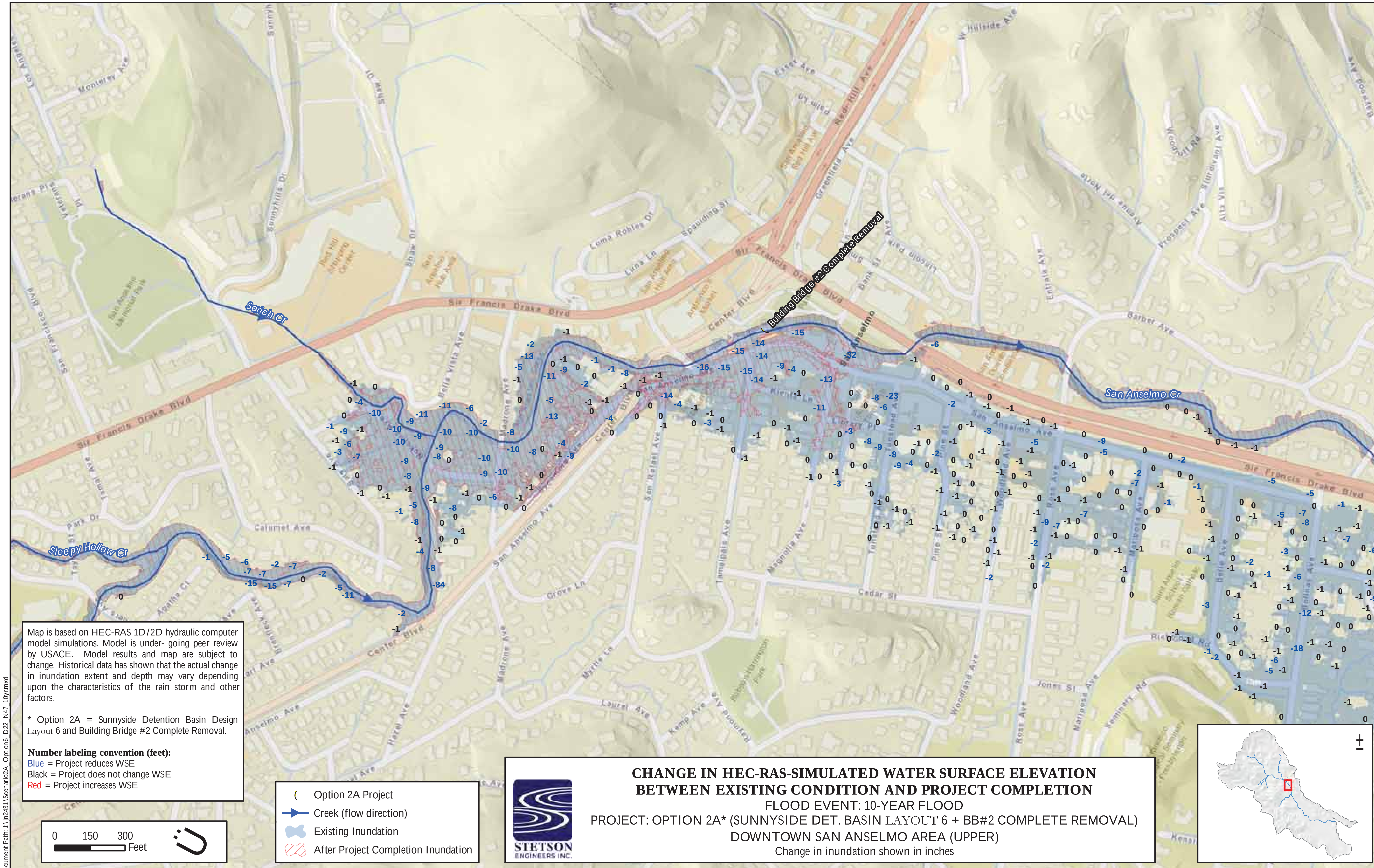


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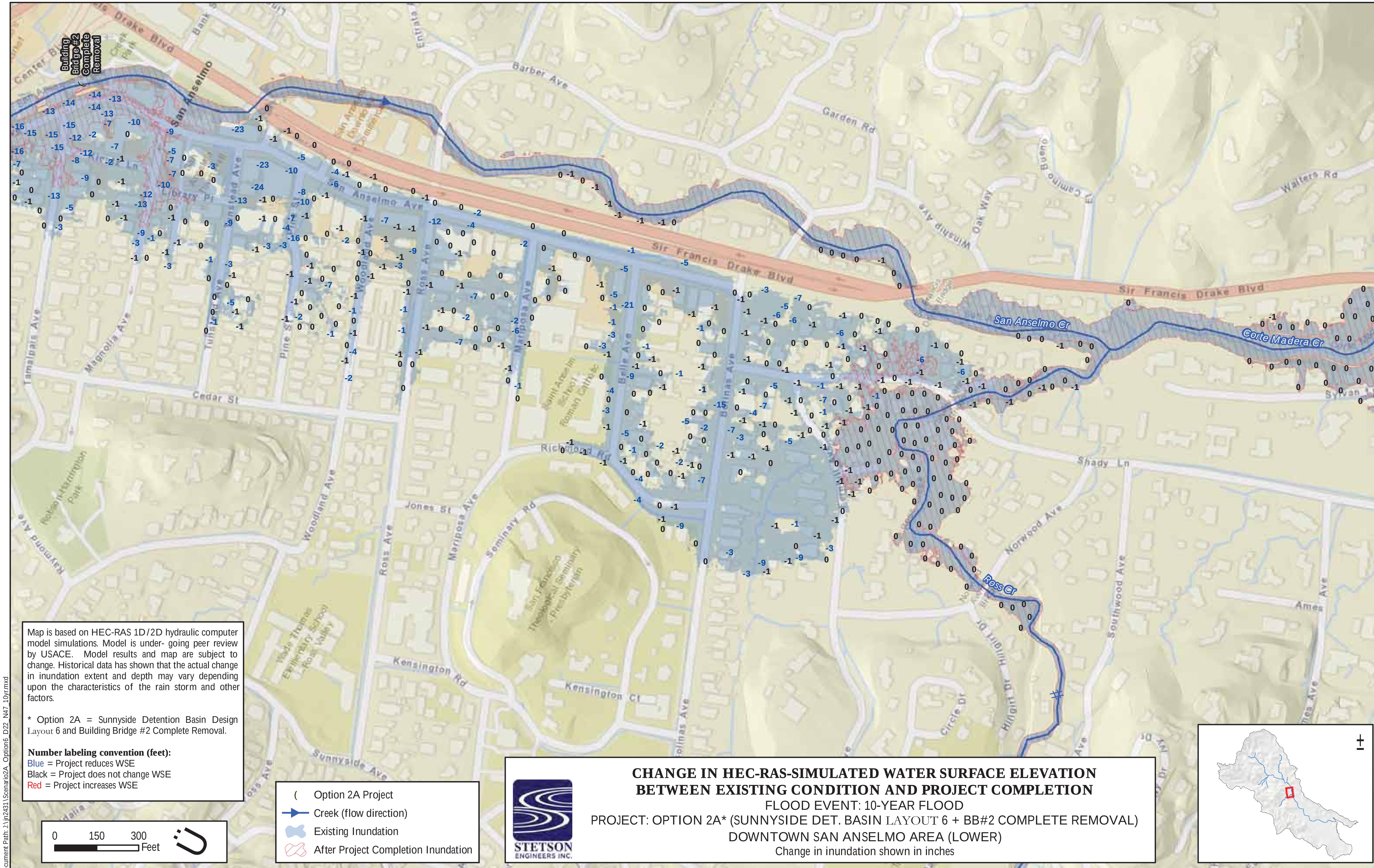
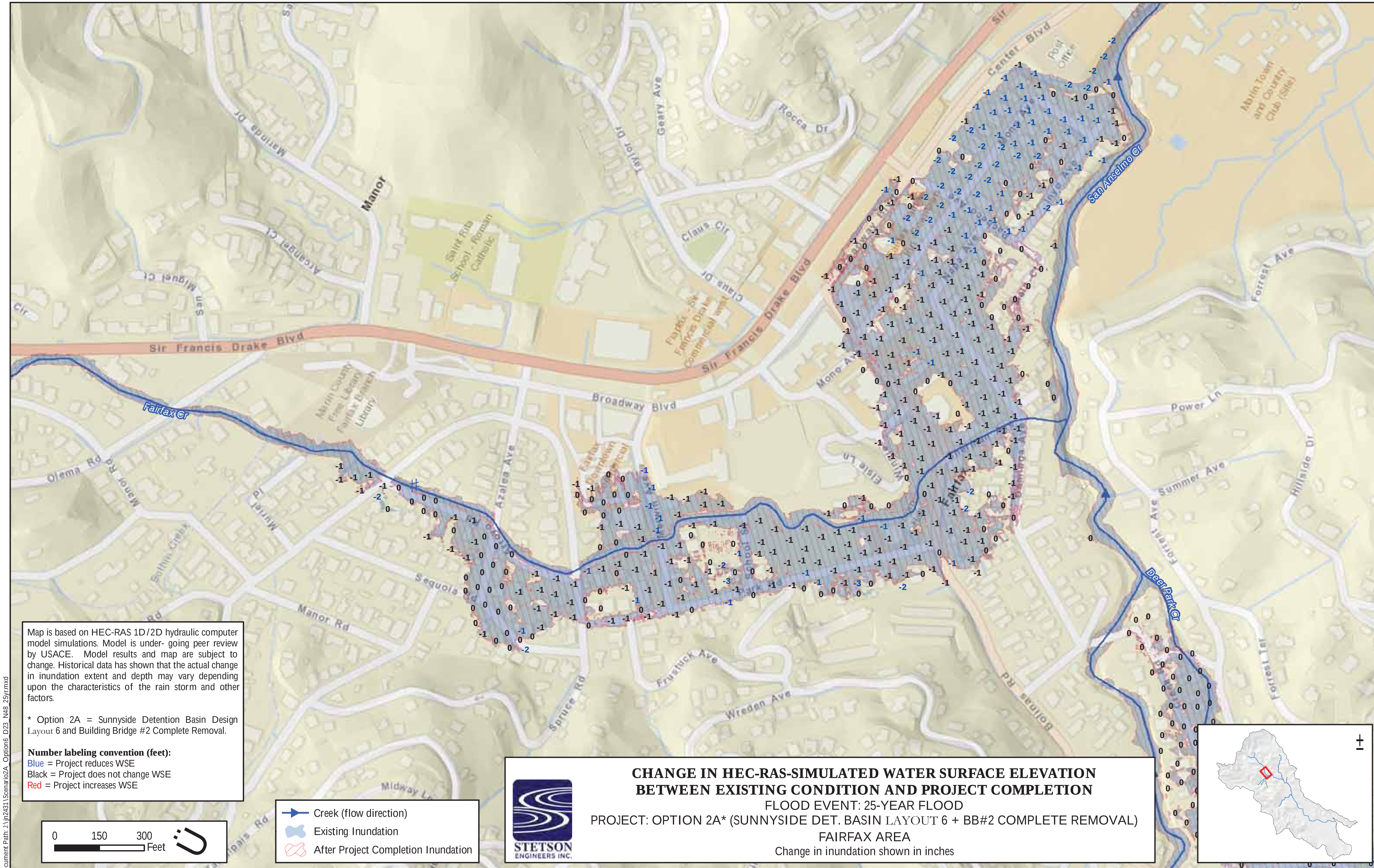
Figure 8c



CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION
BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 10-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 6 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches
STETSON ENGINEERS INC.
Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.
* Option 2A = Sunnyside Detention Basin Design Layout 6 and Building Bridge #2 Complete Removal.
Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE
Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation
0
150
300
Feet
Building Bridge #2 Complete Removal
Sir Francis Drake Blvd
San Anselmo Ave
San Anselmo Cr
Corte Madera Cr
Ross Cr
Barber Ave
Garden Rd
Cedar St
Jones St
Kensington Rd
Kensington Ct
Sunnyside Ave
Shady Ln
Norwood Ave
Southwood Ave
Magnolia Ave
Tamalpais Ave
Raymond Ave
Woodland Ave
Ross Ave
Mariposa Ave
Belle Ave
Bolinas Ave
Library Pl
Richmond Rd
Seminary Rd
Circle Dr
Hilgirt Dr
Walters Rd
Oak Way
Winship Ave
Ames
Robson-Harrington Park
Saint Anselm School Roman Catholic
San Francisco Theological Seminary Presbyterian
Wade Thomas Elementary School Ross Valley
Document Path: J:\jn2431\Scenario2A_Option6_D22_N47_10yr.mxd



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 6 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

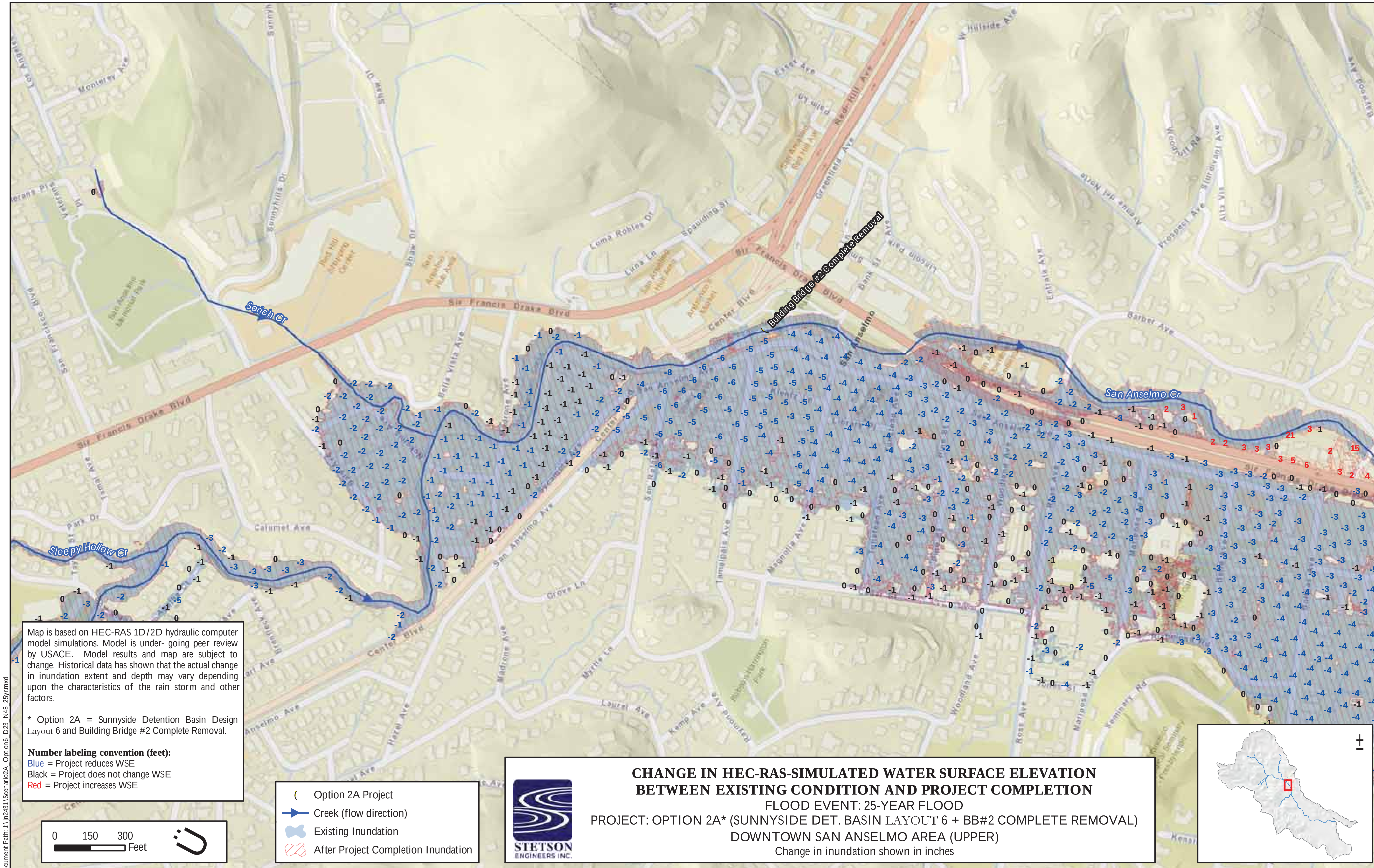
0 150 300 Feet

Creek (flow direction)
Existing Inundation
After Project Completion Inundation

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 25-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 6 + BB#2 COMPLETE REMOVAL)
FAIRFAX AREA
Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\Scenario2A_Option6_D23_N48_25yr.mxd



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 6 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

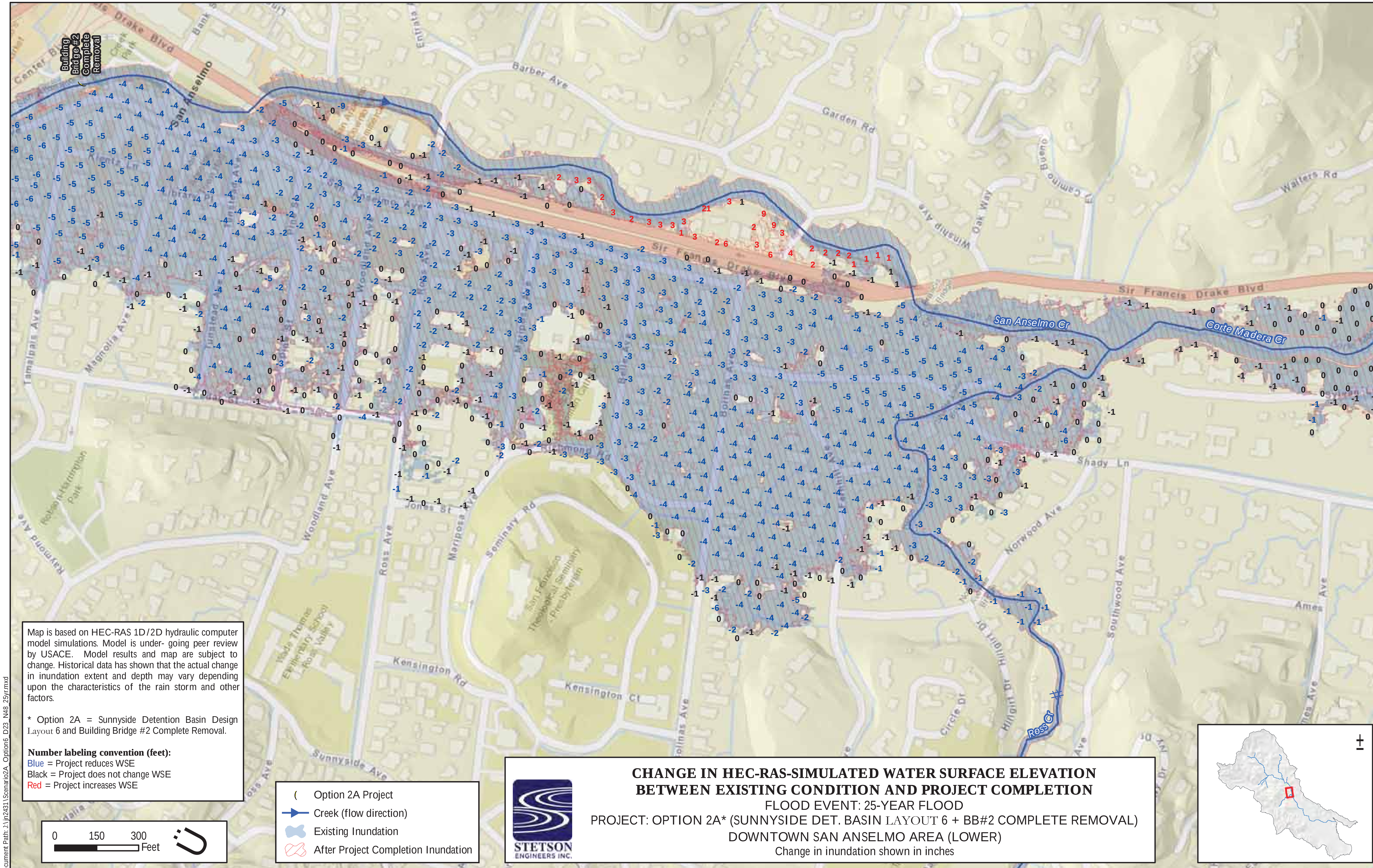
0 150 300 Feet

Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION

FLOOD EVENT: 25-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 6 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (UPPER)
Change in inundation shown in inches



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 6 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 25-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 6 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\Scenario2A_Option6_D23_N48_25yr.mxd

Figure 10a

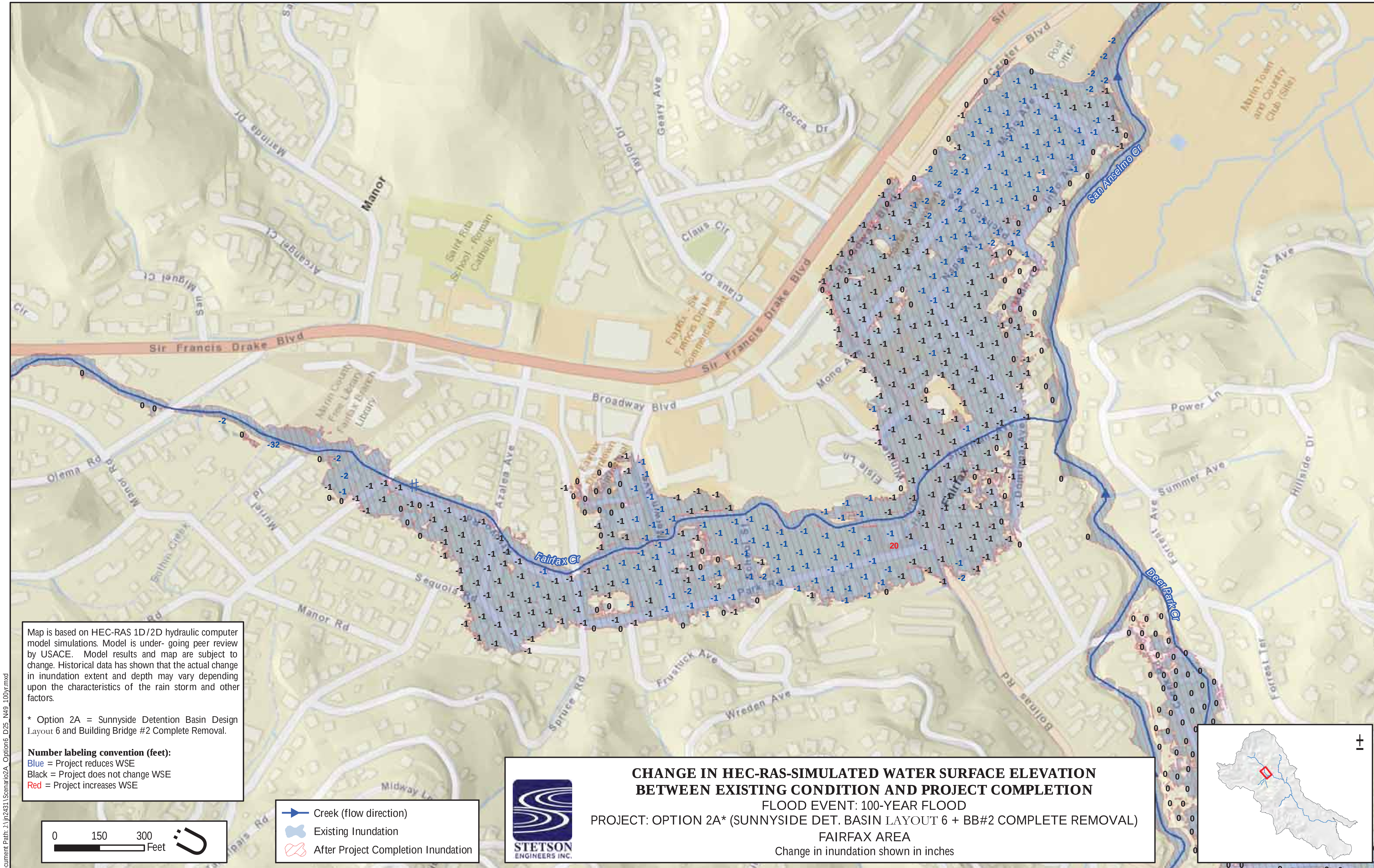
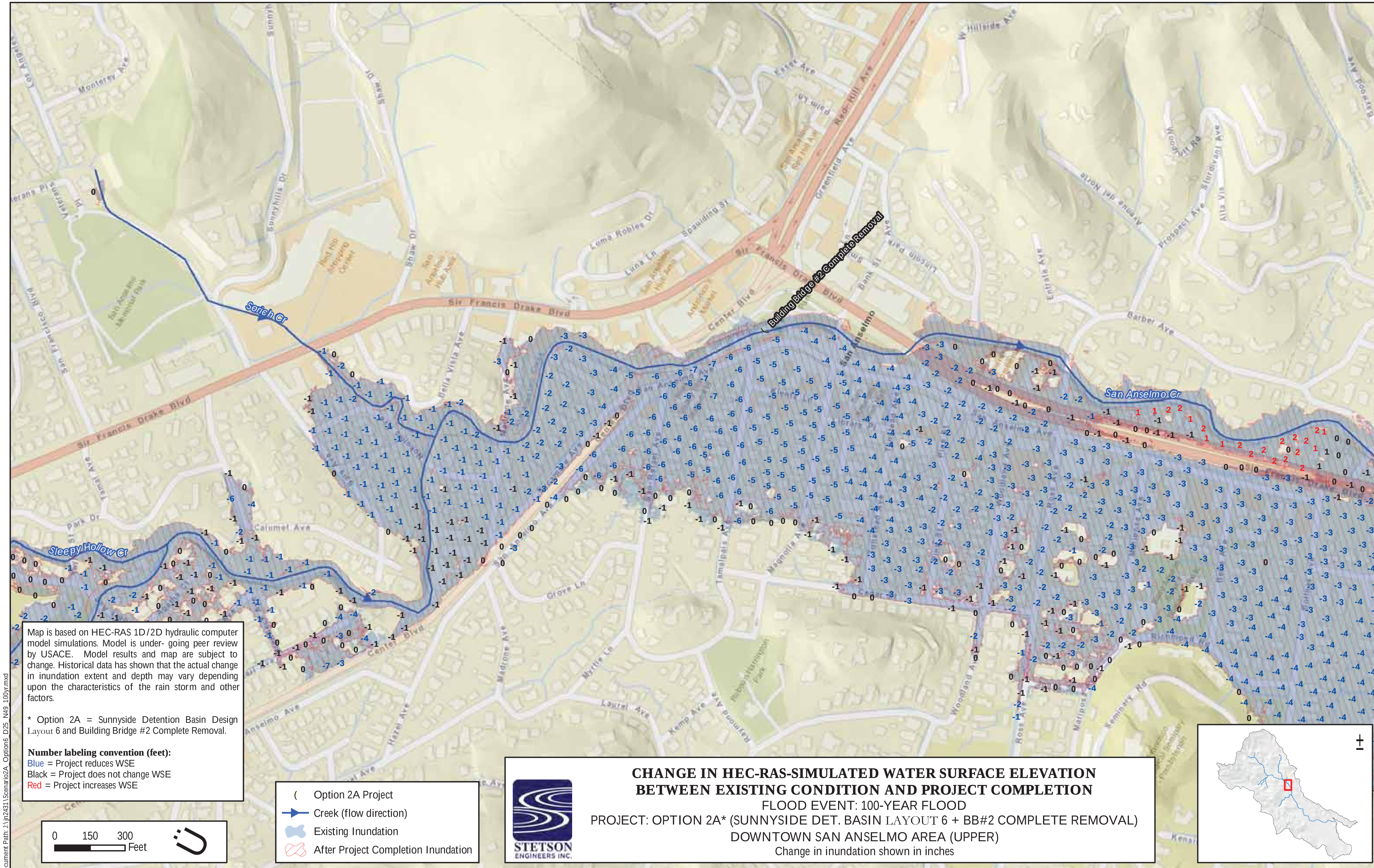
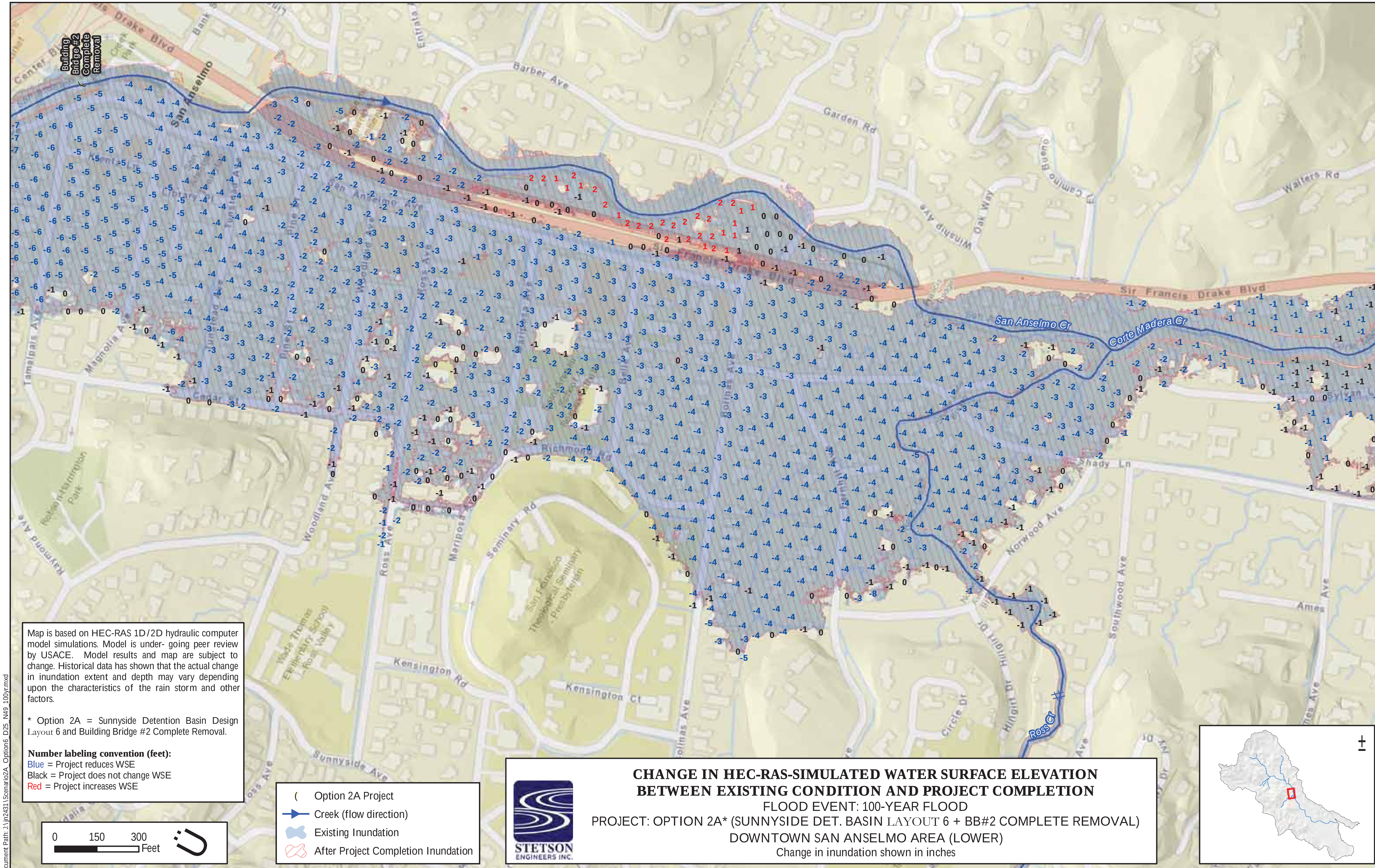

Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.
* Option 2A = Sunnyside Detention Basin Design Layout 6 and Building Bridge #2 Complete Removal.
Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE
0 150 300 Feet
Creek (flow direction)
Existing Inundation
After Project Completion Inundation
STETSON ENGINEERS INC.
CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION
BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 100-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 6 + BB#2 COMPLETE REMOVAL)
FAIRFAX AREA
Change in inundation shown in inches
Sir Francis Drake Blvd
Broadway Blvd
Fairfax Cr
San Anselmo Cr
Deer Park Cr
Marin Town and Country Club (Site)
Saint Rita School - Roman Catholic
Marin County Free Library Fairfax Branch Library
Center Blvd
Manor Rd
Olema Rd
Azalea Ave
Sequoia Rd
Frustuck Ave
Wreden Ave
Spruce Rd
Bolinas Rd
Forrest Ave
Summer Ave
Power Ln
Hillside Dr
Rocca Dr
Claus Cir
Taylor Dr
Geary Ave
Marinda Dr
Arcangel Ct
Miguel Ct
Mono Ave
Elsie Ln
Park Rd
Midway Ln
Document Path: J:\jn2431\Scenario2A_Option6_D25_N49_100yr.mxd

Figure 10b



Document Path: J:\jn2431\Scenario2A_Option6_D25_N49_100yr.mxd



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 6 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

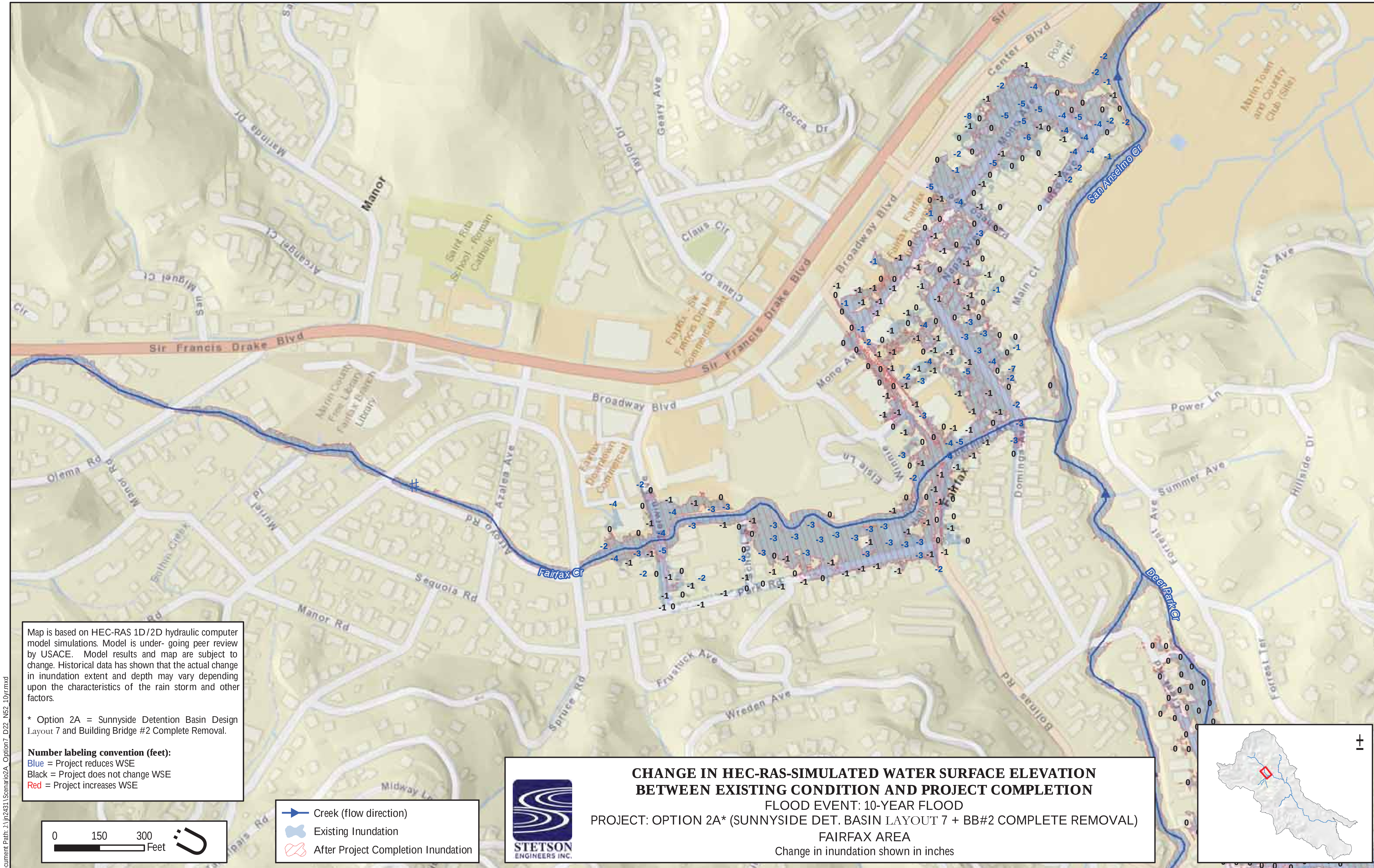
Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 100-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 6 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

Document Path: J:\jn2431\Scenario2A_Option6_D25_N49_100yr.mxd

Figure 11a



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 7 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION

FLOOD EVENT: 10-YEAR FLOOD

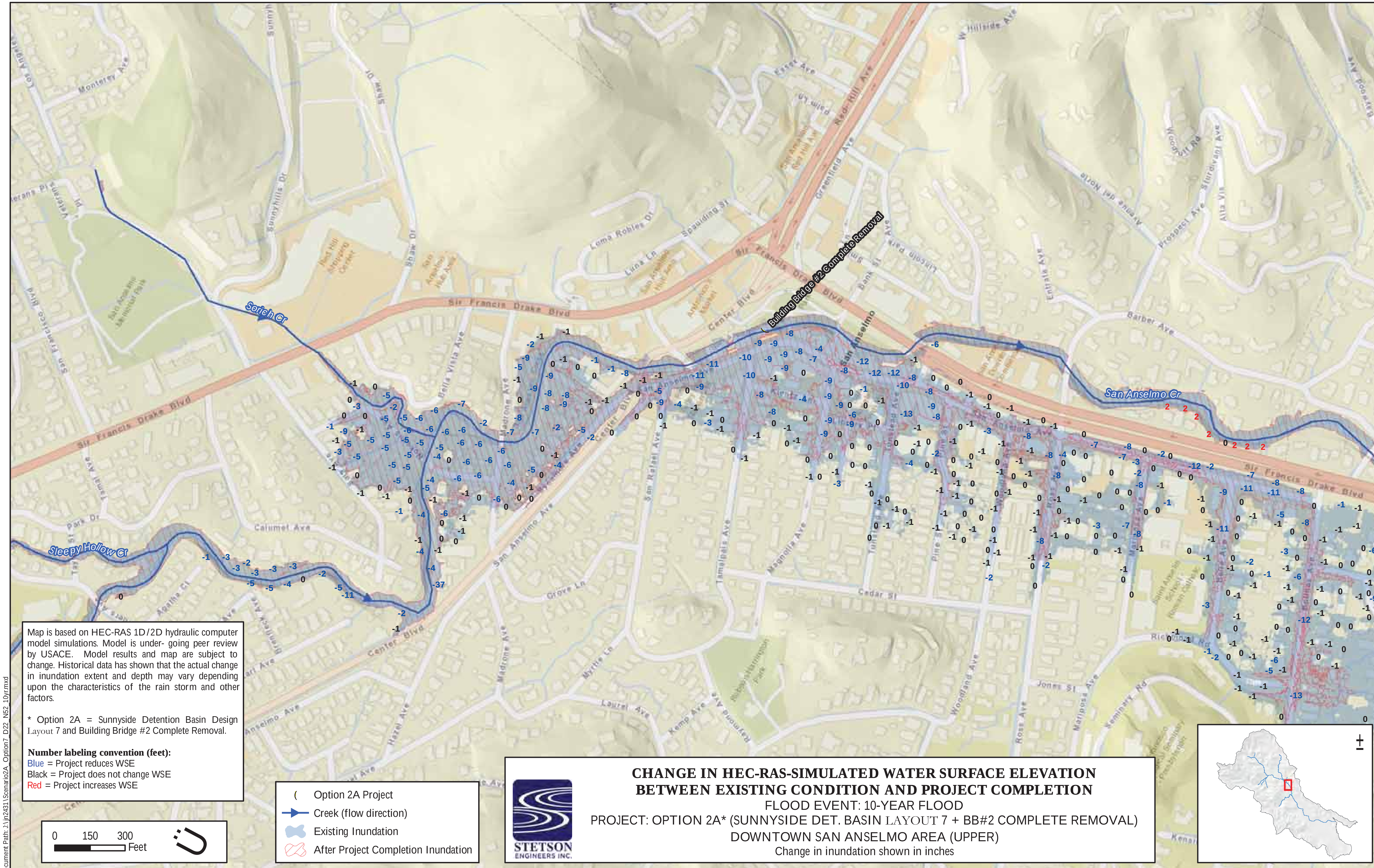
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 7 + BB#2 COMPLETE REMOVAL)

FAIRFAX AREA

Change in inundation shown in inches

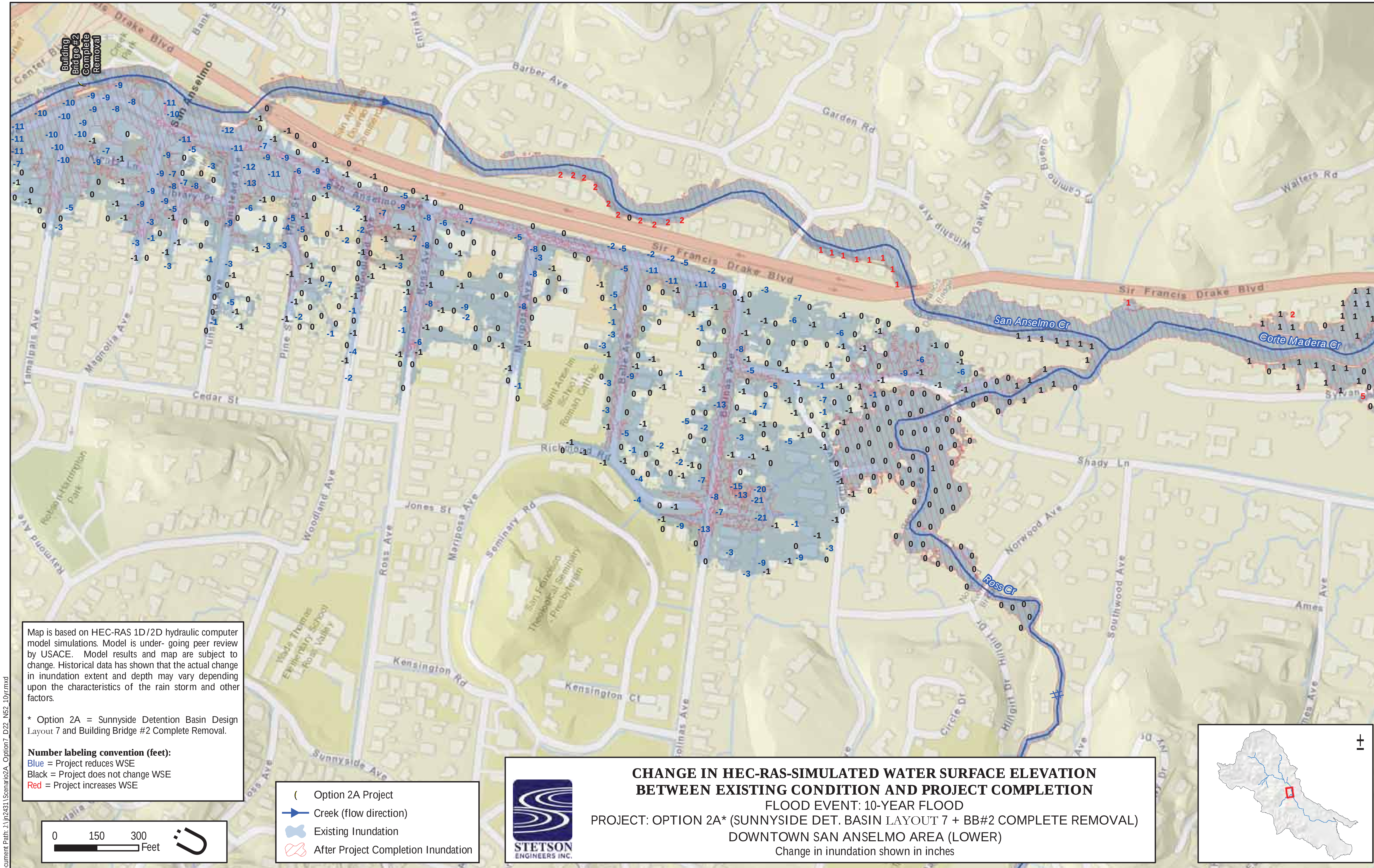
STETSON ENGINEERS INC.

Document Path: J:\jn2431\Scenario2A_Option7_D22_N52_10yr.mxd



Document Path: J:\jn2431\Scenario2A_Option7_D22_N52_10yr.mxd

Figure 11c



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 7 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

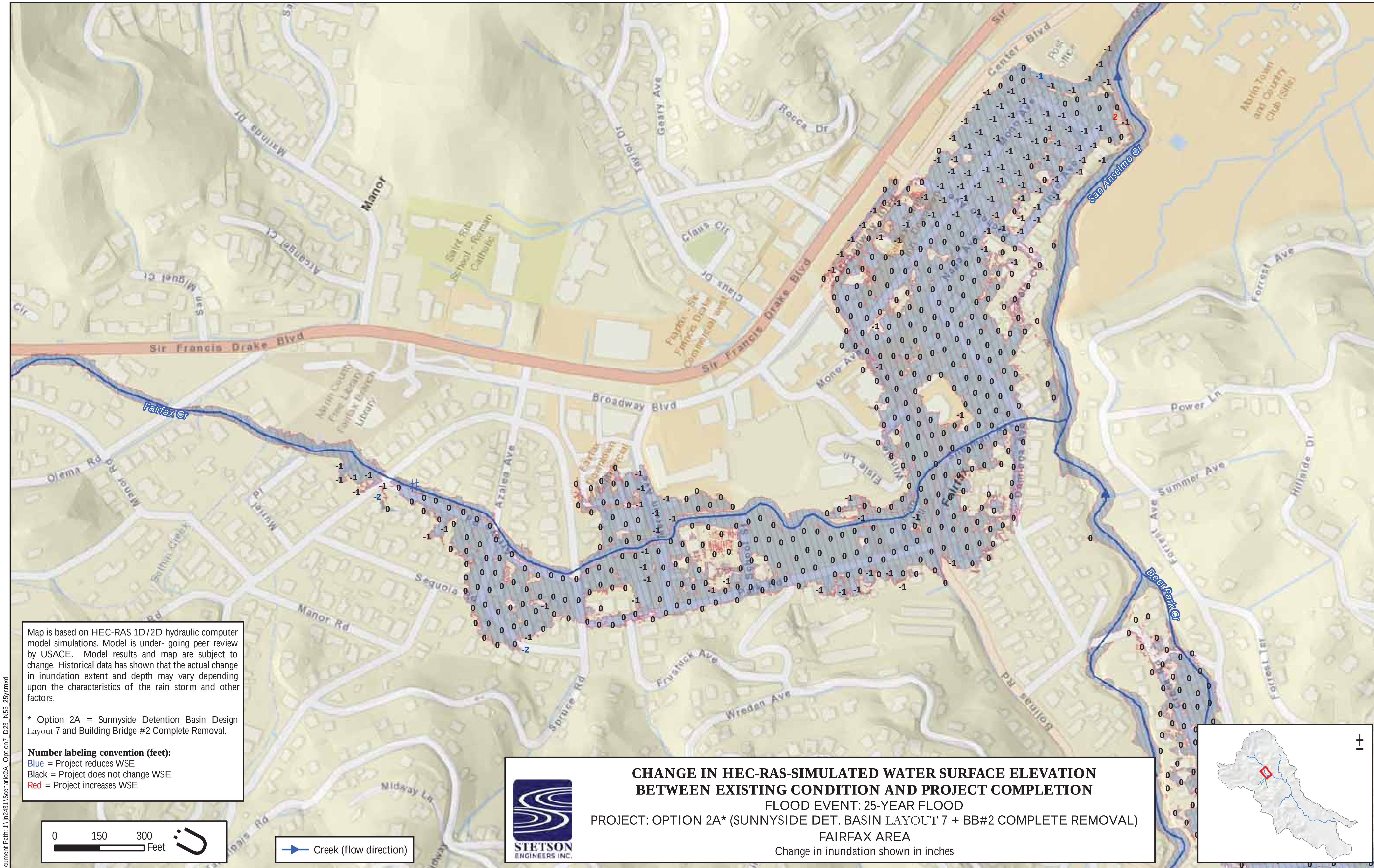
0 150 300 Feet

Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 10-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 7 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\Scenario2A_Option7_D22_N52_10yr.mxd



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 7 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

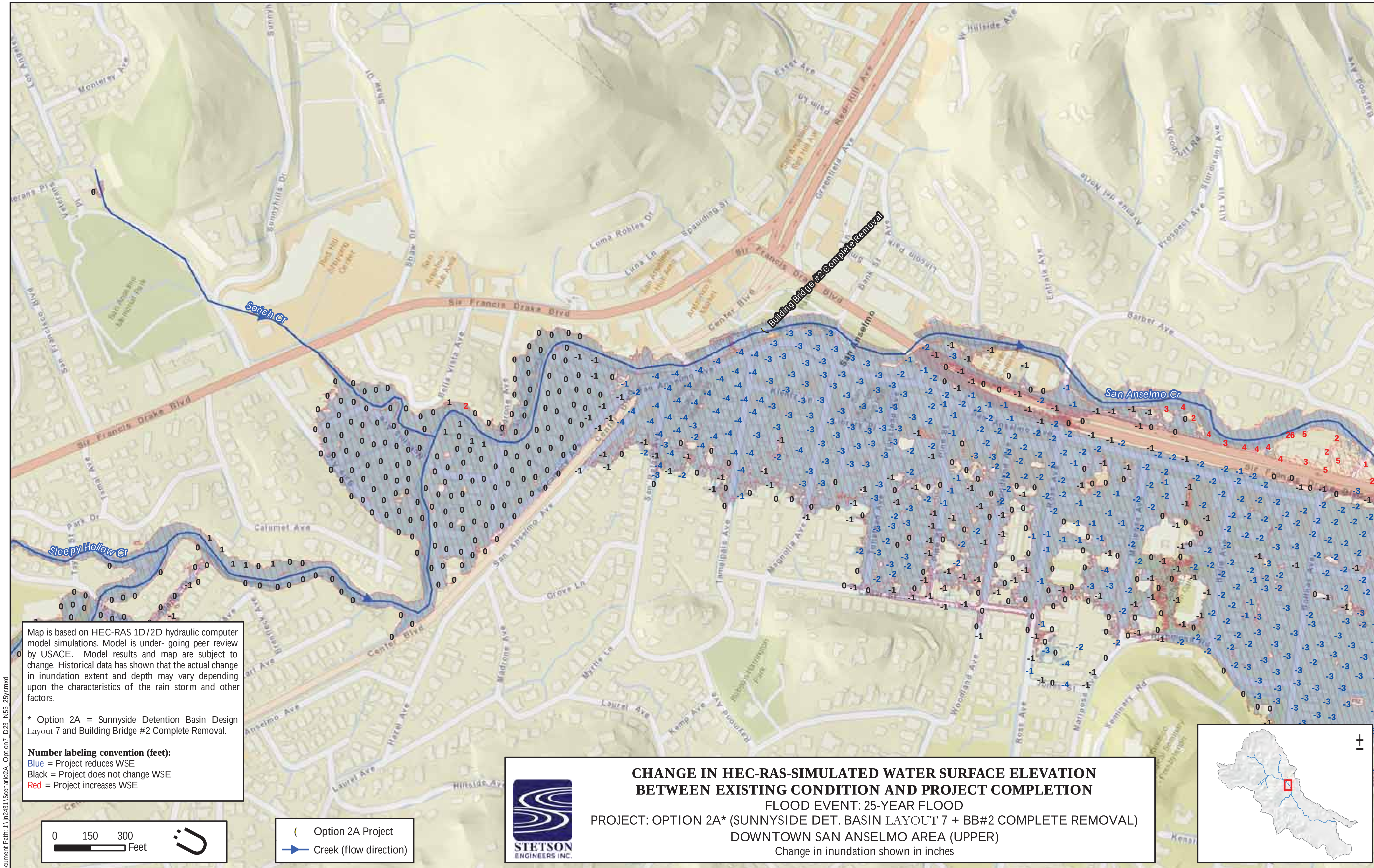
Creek (flow direction)

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 25-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 7 + BB#2 COMPLETE REMOVAL)
FAIRFAX AREA
Change in inundation shown in inches

Document Path: J:\jn2431\Scenario2A_Option7_D23_N53_25yr.mxd

Figure 12b



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 7 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION

FLOOD EVENT: 25-YEAR FLOOD

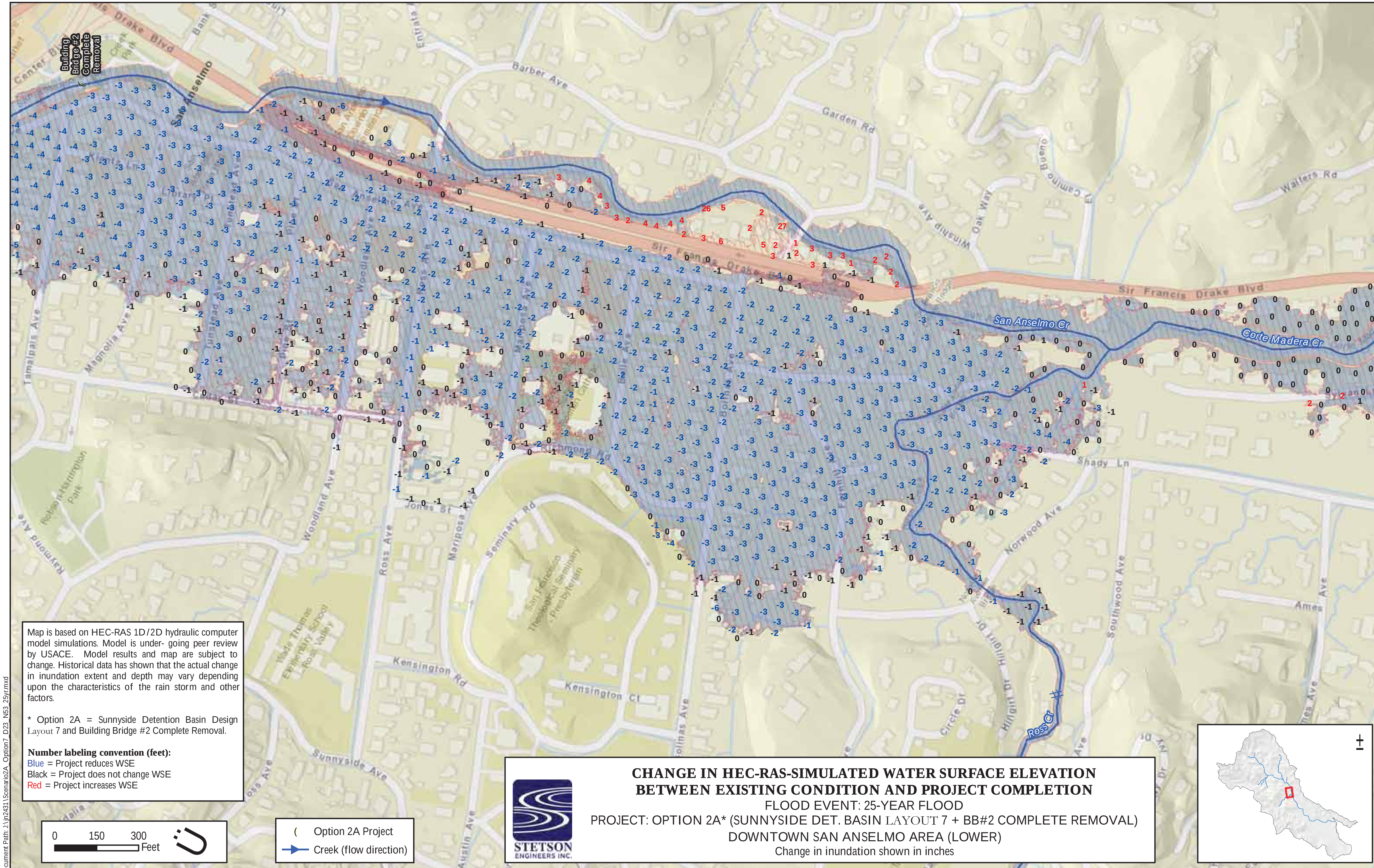
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 7 + BB#2 COMPLETE REMOVAL)

DOWNTOWN SAN ANSELMO AREA (UPPER)

Change in inundation shown in inches

STETSON ENGINEERS INC.

Figure 12c



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 7 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

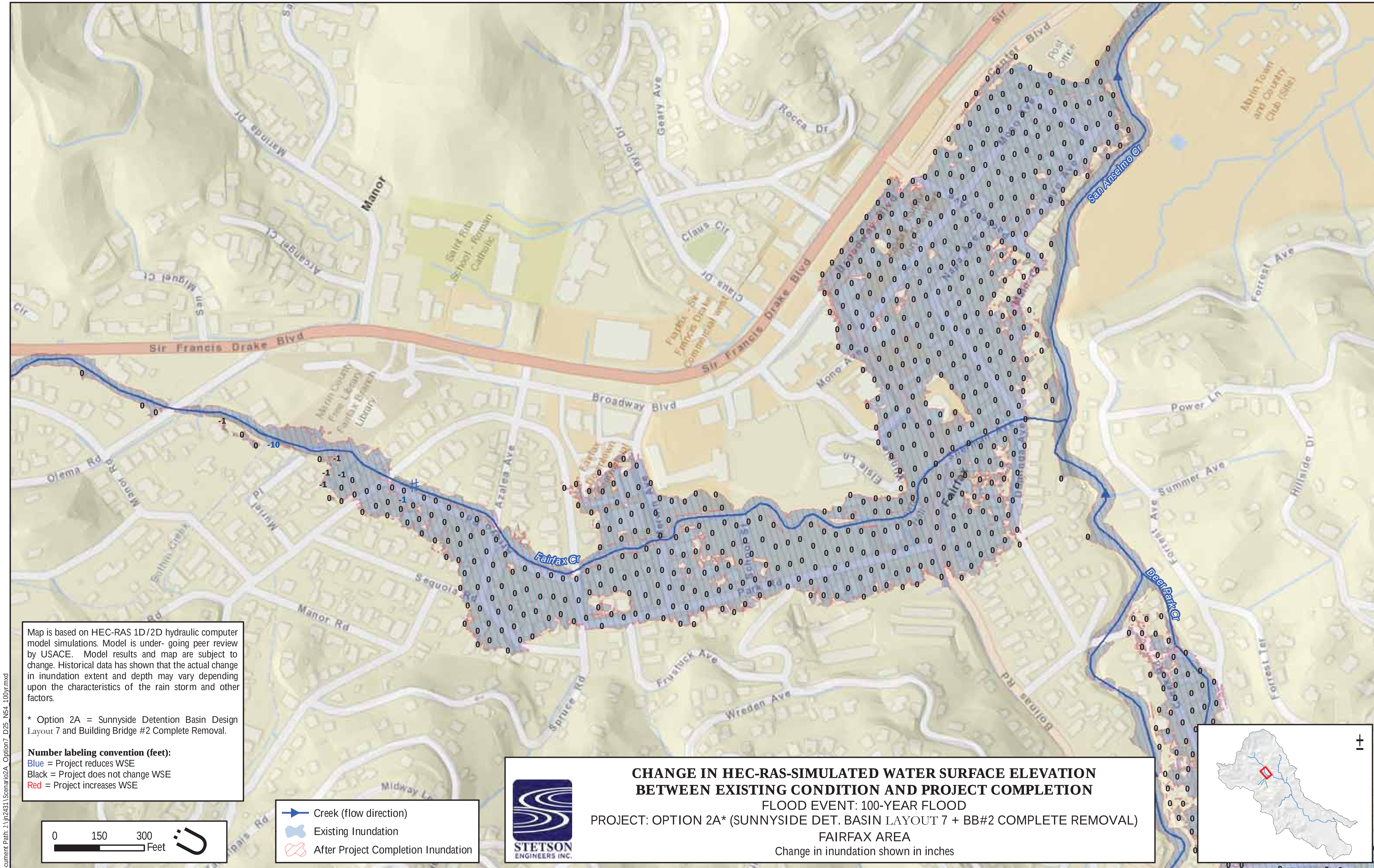
Option 2A Project
Creek (flow direction)

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION
FLOOD EVENT: 25-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 7 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

Document Path: J:\jn2431\Scenario2A_Option7_D23_N53_25yr.mxd

Figure 13a



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 7 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION

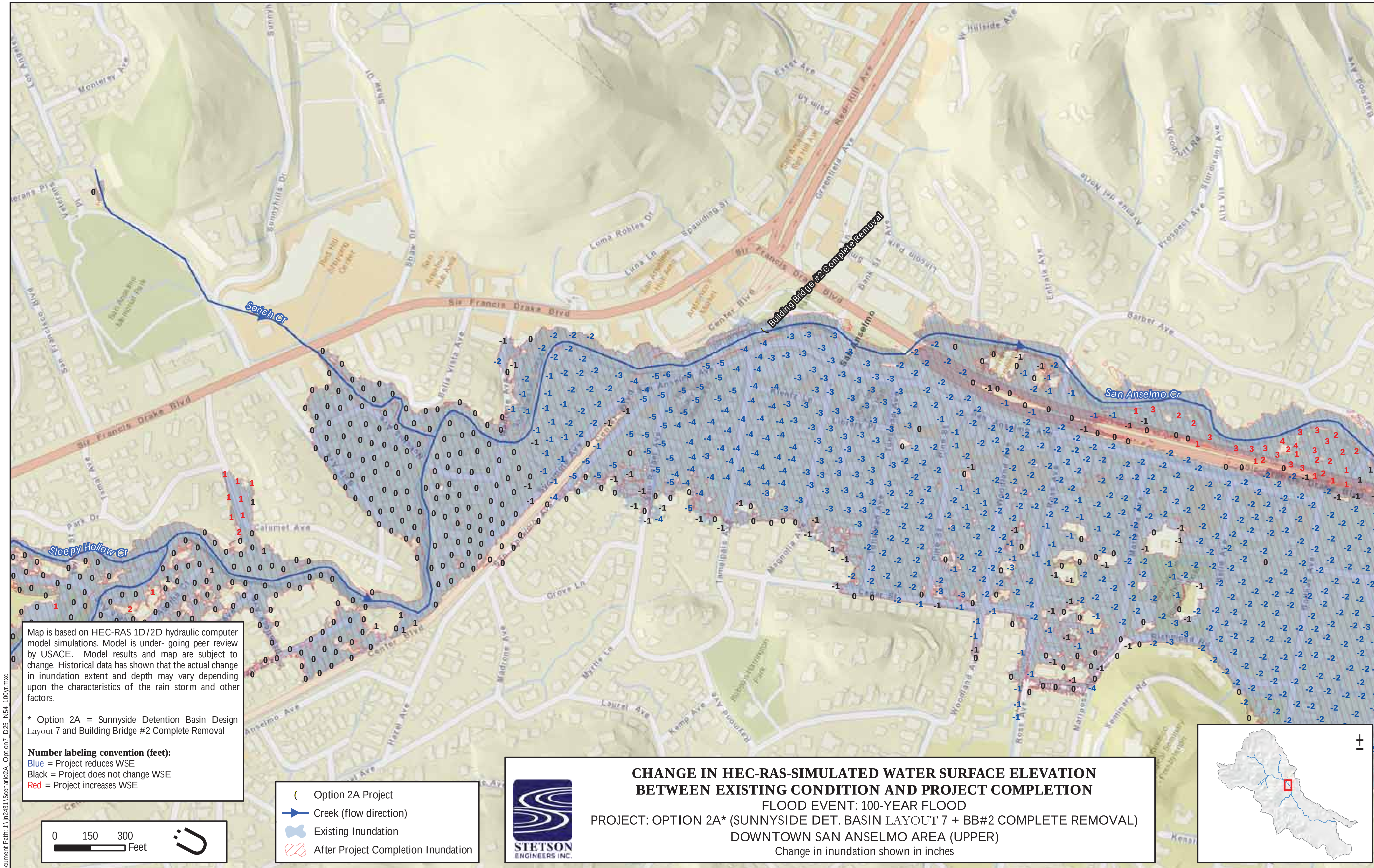
FLOOD EVENT: 100-YEAR FLOOD

PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 7 + BB#2 COMPLETE REMOVAL)

FAIRFAX AREA

Change in inundation shown in inches

Document Path: J:\jn2431\Scenario2A_Option7_D25_N54_100yr.mxd



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 7 and Building Bridge #2 Complete Removal

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION

FLOOD EVENT: 100-YEAR FLOOD

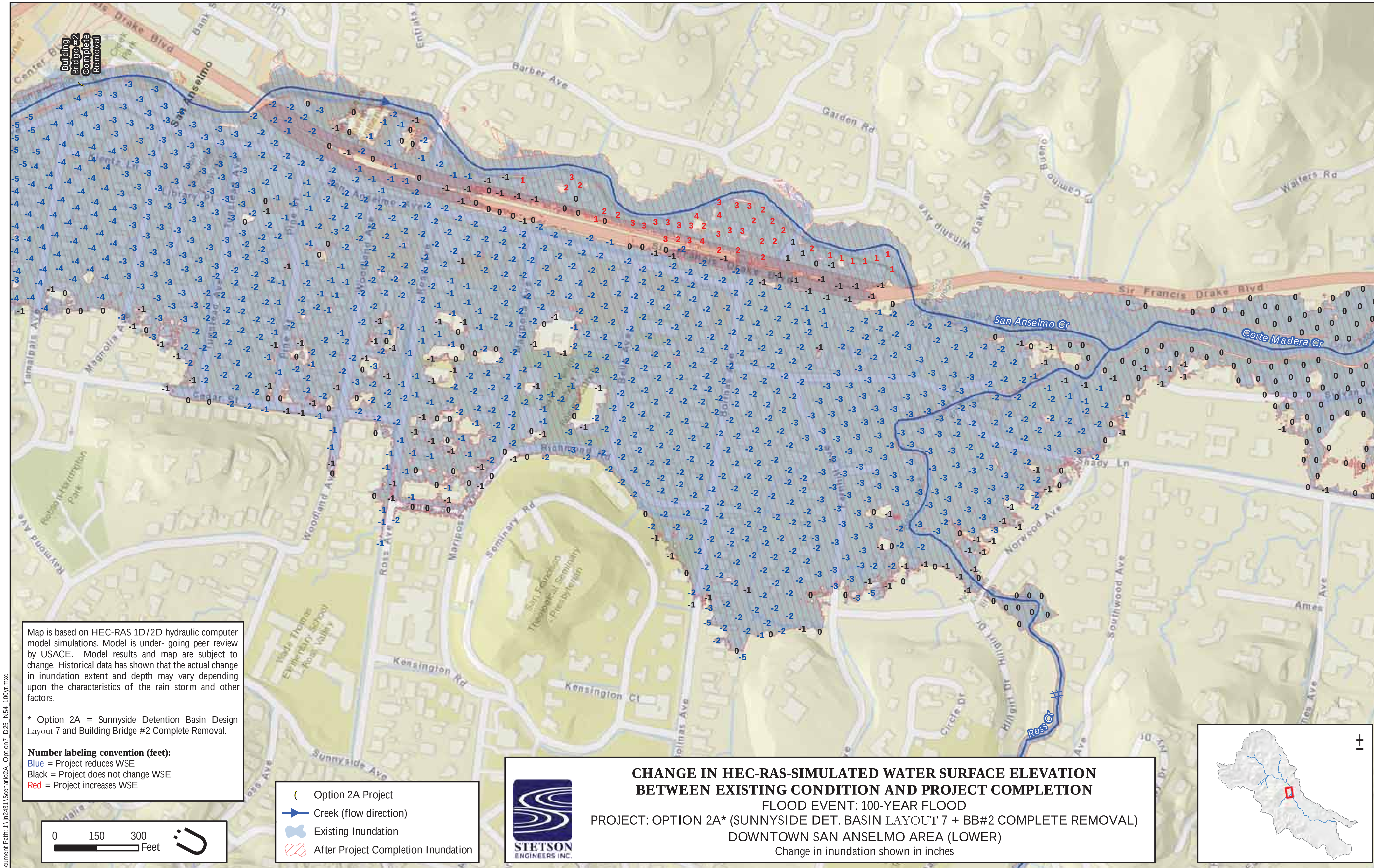
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 7 + BB#2 COMPLETE REMOVAL)

DOWNTOWN SAN ANSELMO AREA (UPPER)

Change in inundation shown in inches

Document Path: J:\jn2431\Scenario2A_Option7_D25_N54_100yr.mxd

Figure 13c



Map is based on HEC-RAS 1D/2D hydraulic computer model simulations. Model is under- going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

* Option 2A = Sunnyside Detention Basin Design Layout 7 and Building Bridge #2 Complete Removal.

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 150 300 Feet

Option 2A Project
Creek (flow direction)
Existing Inundation
After Project Completion Inundation

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED WATER SURFACE ELEVATION BETWEEN EXISTING CONDITION AND PROJECT COMPLETION

FLOOD EVENT: 100-YEAR FLOOD
PROJECT: OPTION 2A* (SUNNYSIDE DET. BASIN LAYOUT 7 + BB#2 COMPLETE REMOVAL)
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

Document Path: J:\jn2431\Scenario2A_Option7_D25_N54_100yr.mxd

D-2 Report on Hydraulic Analysis of the Morningside Alternative

Report on Hydraulic Analysis of the Morningside Alternative

Stetson Engineers Inc.
May 2, 2018

Introduction

This report documents the hydraulic analysis and assessment of the Morningside Alternative for flood risk management of Sleepy Hollow Creek. The assessment considered both project effects and cumulative effects in conjunction with other foreseeable projects[1] with regard to flooding.

The Morningside Alternative consists of the following measures:

- Removal of Morningside Bridge;
- Replacement of Mountain View Bridge; and
- Construction of Sunnyside passive detention basin (DB).

Stetson prepared a conceptual design for the Mountain View replacement bridge in November 2016 and for the Sunnyside passive DB[2] in January 2018. The design for the Mountain View replacement bridge would create a bigger opening and raise the bridge soffit from the existing elevation 76.9 ft to 78.3 ft NAVD88. Refer to Attachment A for the conceptual design. The approximate flood magnitude when the water surface elevation reaches the new soffit in terms of recurrence interval is about the 9-year flood.

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[1] The foreseeable projects here are the same foreseeable projects as in other reports related to the San Anselmo Flood Risk Management Project <u>except no Building Bridge #2 removal</u>. Specifically, the foreseeable projects here include the following projects:

- Azalea Avenue Bridge Replacement;
- Madrone Avenue Bridge Replacement;
- Nokomis Avenue Bridge Replacement;
- Sycamore Avenue/Center Boulevard Bridge Replacement;
- Bridge Avenue Bridge Replacement;
- Winship Avenue Bridge Replacement; and
- Unit 4 Measures 1, 2, and 3 in Stetson's 2008 Letter Report to the Corps.

[2] The Sunnyside passive DB was designed with no creek diversion structure. The side weir along the left bank of the creek was designed to have a crest elevation of 228 ft NAVD88. This elevation is the water surface elevation in the creek at the DB site at the time of incipient flooding downstream in Fairfax. In other words, at the time when downstream incipient flooding occurs, a portion of flood water would begin to passively enter into the DB over the side weir. The Sunnyside passive DB would have an east berm top elevation of 232 ft NAVD88 and a storage capacity of about 20 acre-ft at the simulated 100-year maximum water surface elevation (229.9 ft NAVD88).

A 36-inch diameter low-level drain outlet pipe with an invert elevation at about 223.8 ft NAVD88 was designed to drain the detention basin. Under this concept, the designed 36-inch diameter low-level outlet pipe would be kept open at all times.

Hydraulic Modeling for the Morningside Alternative

Stetson performed hydraulic modeling to assess the project effects and cumulative effects of the Morningside Alternative with regard to flooding. For the modeling, Stetson used US Army Corps of Engineers software, HEC-RAS version 5.0, which has combined 1D and 2D hydraulic modeling capabilities. Stetson recently developed a combined 1D/2D unsteady-flow model application for the Corte Madera Creek watershed. The model starts from the bay and extends upstream along the mainstream and tributaries (including the Sleepy Hollow Creek) to the proposed upper watershed detention basins in Fairfax that are currently under environmental review. The model was calibrated to the 12/15/2016 bankfull event and the 12/31/2005 flood event (an approximate 100-year flood), and verified to the 1/4/1982 flood event (an approximate 150-year flood; Stetson, 2017). The model is undergoing peer review by the US Army Corps of Engineers.

The following three scenarios were analyzed:

- Existing Conditions (EC), to serve as the "Baseline" basis for comparison
- Morningside Alternative added to EC, to assess "Project" effects
- Morningside Alternative + Foreseeable Projects added to EC, to assess "cumulative" effects

For each scenario, the following three flood events were analyzed:

- Q100, major, rare flood, similar to 12/31/05 flood
- Q25, moderate, infrequent flood
- Q10, minor flood, less frequent than 2017 flood event (7-year flood event)

<u>Results of Hydraulic Analysis in Terms of Floodplain Inundation</u>

Figures 1a to 1d show the changes in the HEC-RAS model-simulated floodplain inundation extent and depth between Morningside Alternative and existing conditions for the 10-year flood. Figures are provided covering Fairfax, Sleepy Hollow, Upper San Anselmo, and Lower San Anselmo areas. Similarly, Figures 2a to 2d show the model-simulated results for the 25-year flood and Figure 3a to 3d for the 100-year flood.

Figures 4a to 4d show the changes in the HEC-RAS model-simulated floodplain inundation extent and depth between Morningside Alternative + Foreseeable Projects and existing conditions for the 10-year flood. Similarly, Figures 5a to 5d show the model-simulated results for the 25-year flood and Figures 6a to 6d for the 100-year flood.

Table 1 is a summary of results for Morningside Alternative and Table 2 is a summary of results for Morningside Alternative + Foreseeable Projects.

The Morningside Alternative alone would slightly increase flooding in the Downtown SA area during the 25-year (see Figures 1c and 1d). But the Morningside Alternative + the Foreseeable Projects would mitigate for the slight increase in flooding caused by Morningside Alternative alone.

Table 2 Summary of Benefits of Morningside Alternative verses Existing Condition

Figure No.	Flow Condition	Location	Summary of Benefits	Any Flooding Increase?
Figure 1a	Q10	Fairfax	• Reduces inundation extent due to Sunnyside passive DB • Reduces inundation depth by up to 13 inches	None
Figure 1b		Sleepy Hollow	• Reduces inundation extent due to Morningside measures • Reduces inundation depth by up to 28 inches	Slightly increases flooding in the area near Sorich Creek confluence
Figure 1c		Downtown SA (Upper)	• No effect	Slightly increases flooding in the area near Sorich Creek confluence
Figure 1d		Downtown SA (Lower)	• No effect	None
Figure 2a	Q25	Fairfax	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 2 inch	None
Figure 2b		Sleepy Hollow	• Reduces inundation extent due to Morningside measures • Reduces inundation depth by up to 24 inches	Slightly increases flooding in the area below Mountain View replacement bridge and in the area between Sleepy Hollow Creek and Sorich Creek
Figure 2c		Downtown SA (Upper)	• Nearly zero effect in inundation extent	Slightly increases flooding in the upper Down SA area
Figure 2d		Downtown SA (Lower)	• Nearly zero effect in inundation extent	Slightly increases flooding in the lower Down SA area
Figure 3a	Q100	Fairfax	• No effect	None
Figure 3b		Sleepy Hollow	• Nearly zero reduction in inundation extent • Reduces inundation depth by up to 7 inch	Slightly increases flooding in the area below Mountain View replacement bridge
Figure 3c		Downtown SA (Upper)	• No effect	None
Figure 3d		Downtown SA (Lower)	• No effect	None

Table 3 Summary Benefits of Morningside Alternative + Foreseeable Projects verses Existing Condition

Figure No.	Flow Condition	Location	Summary of Results	Any Increased Flooding?
Figure 4a	Q10	Fairfax	• Reduces inundation extent due to Sunnyside passive DB • Reduces inundation depth by up to 13 inches	None
Figure 4b		Sleepy Hollow	• Reduces inundation extent due to Morningside measures • Reduces inundation depth by up to 28 inches	None
Figure 4c		Downtown SA (Upper)	• Reduces inundation extent due to replacements of Nokomis, Madrone, Center and Bridge Ave Bridges. • Reduces inundation depth by up to 26 inches	None
Figure 4d		Downtown SA (Lower)	• Reduces inundation extent due to replacements of Center and Bridge Ave Bridges. • Reduces inundation depth by up to 16 inches	None
Figure 5a	Q25	Fairfax	• Reduces inundation extent due to replacement of Azalea Bridge • Reduces inundation depth by up to 27 inches	None
Figure 5b		Sleepy Hollow	• Reduces inundation extent due to Morningside measures • Reduces inundation depth by up to 24 inches	Slightly increases flooding in the area below Mountain View replacement bridge
Figure 5c		Downtown SA (Upper)	• Reduces inundation extent • Reduces inundation depth by up to 20 inches	None
Figure 5d		Downtown SA (Lower)	• Nearly no effect	Slightly increases flooding in the area below Winship replacement bridge
Figure 6a	Q100	Fairfax	• Reduces inundation extent due to replacement of Azalea Bridge • Reduces inundation depth by up to 14 inches	None
Figure 6b		Sleepy Hollow	• Nearly no effect on inundation extent • Reduces inundation depth by up to 7 inches	Slightly increases flooding in the area below Mountain View replacement bridge
Figure 6c		Downtown SA (Upper)	• Reduces inundation extent • Reduces inundation depth by up to 18 inches	None
Figure 6d		Downtown SA (Lower)	• Reduces inundation extent • Reduces inundation depth by up to 18 inches	None

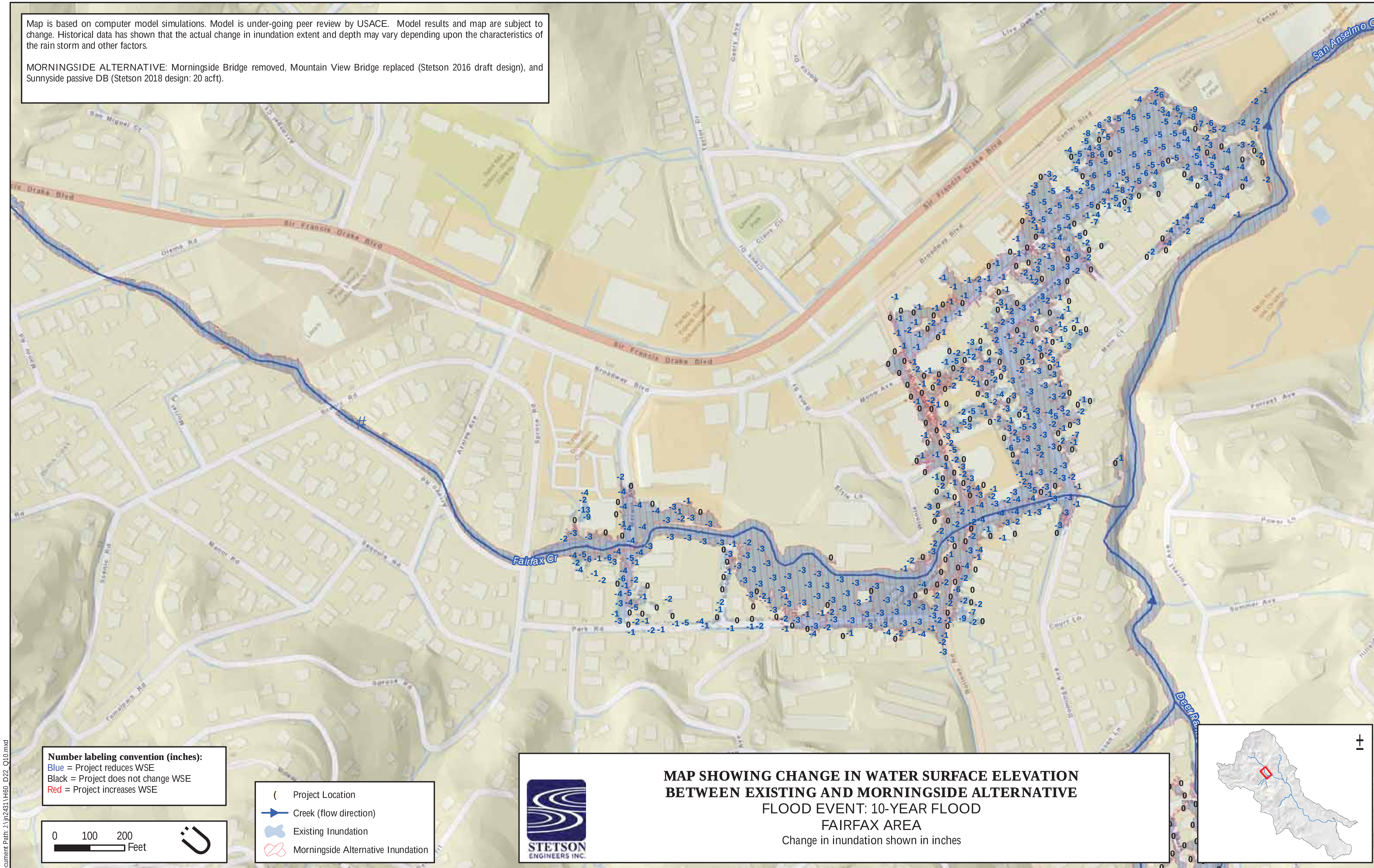
Results of Hydraulic Analysis in Terms of Channel Water Surface Level

Figures 7a to 7c compare the HEC-RAS model-simulated channel water surface profiles along Fairfax Creek for the 10-year flood, 25-year flood, and 100-year flood, respectively[3]. Similarly, Figures 8a to 8c compare the simulated channel water surface profiles along Sleepy Hollow Creek and Figures 9a to 9c compare the simulated channel water surface profiles along San Anselmo Creek. Each figure includes three water surface profiles: (1) existing condition, (2) after project construction, and (3) after project + Foreseeable Projects construction.

[3] The Fairfax water surface profile in the 1D in-channel model does not show the creek water surface onto and across Bolinas Ave and down to Sherman Ave. The water surface downstream of the entrance to the Sherman Ave culvert is shown in the 2D floodplain model results (see Figures 1a, 2a, 3a, 4a, 5a, and 6a). This is related to the 1D/2D model configuration. In this HEC-RAS 1D/2D model configuration, a single 2D Flow Area is used for the Fairfax Creek floodplain. This single 2D Flow Area covers the both the right and left floodplains of the creek as well as the ground above the Fairfax (Sherman Ave) culvert. Floodwaters in the right floodplain and left floodplain can have a direct connection/exchange as floodwaters flow over and above the culvert.

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

MORNINGSIDE ALTERNATIVE: Morningside Bridge removed, Mountain View Bridge replaced (Stetson 2016 draft design), and Sunnyside passive DB (Stetson 2018 design: 20 acft).



Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE

FLOOD EVENT: 10-YEAR FLOOD

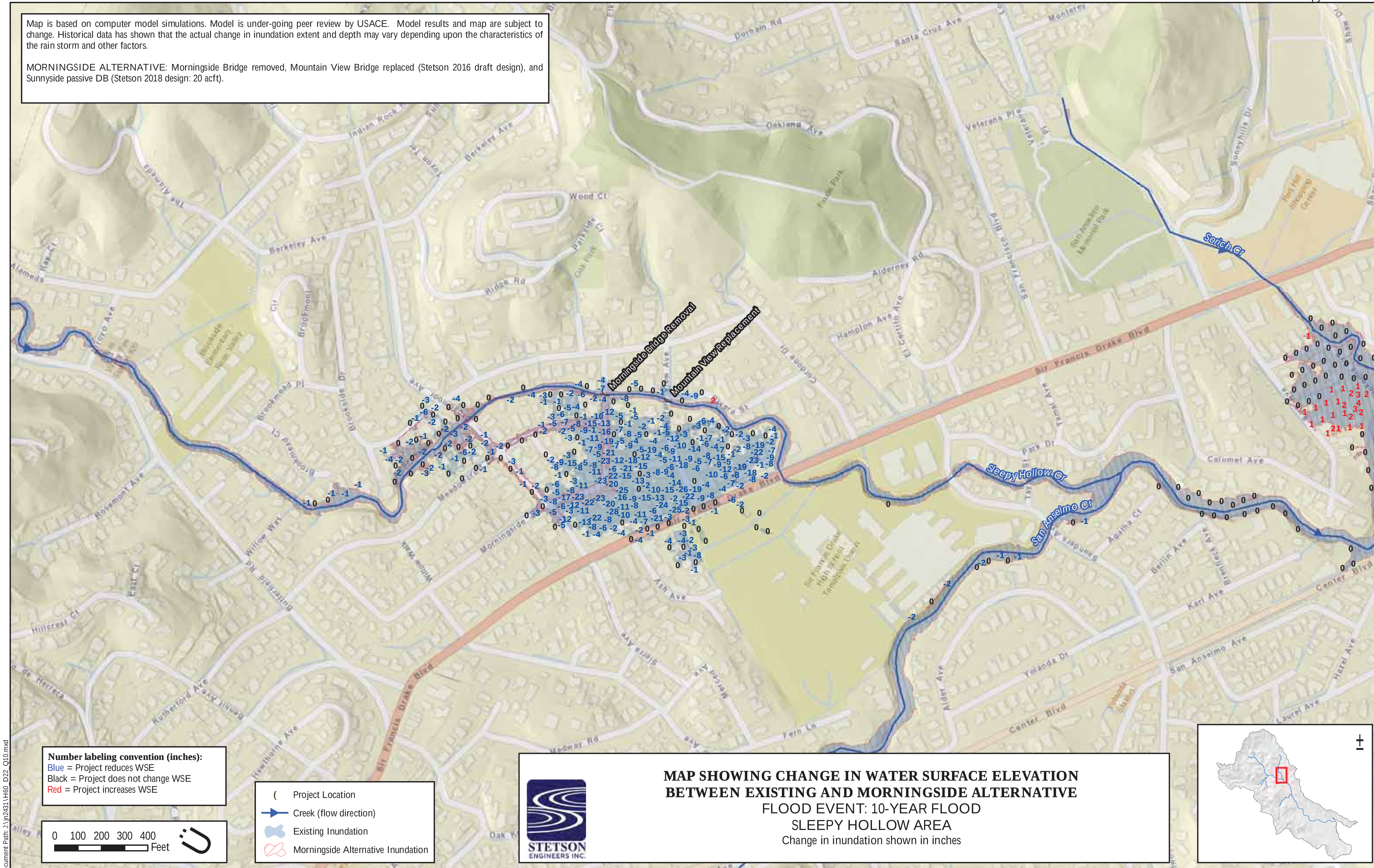
FAIRFAX AREA

Change in inundation shown in inches

STETSON ENGINEERS INC.

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

MORNINGSIDE ALTERNATIVE: Morningside Bridge removed, Mountain View Bridge replaced (Stetson 2016 draft design), and Sunnyside passive DB (Stetson 2018 design: 20 acft).



Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

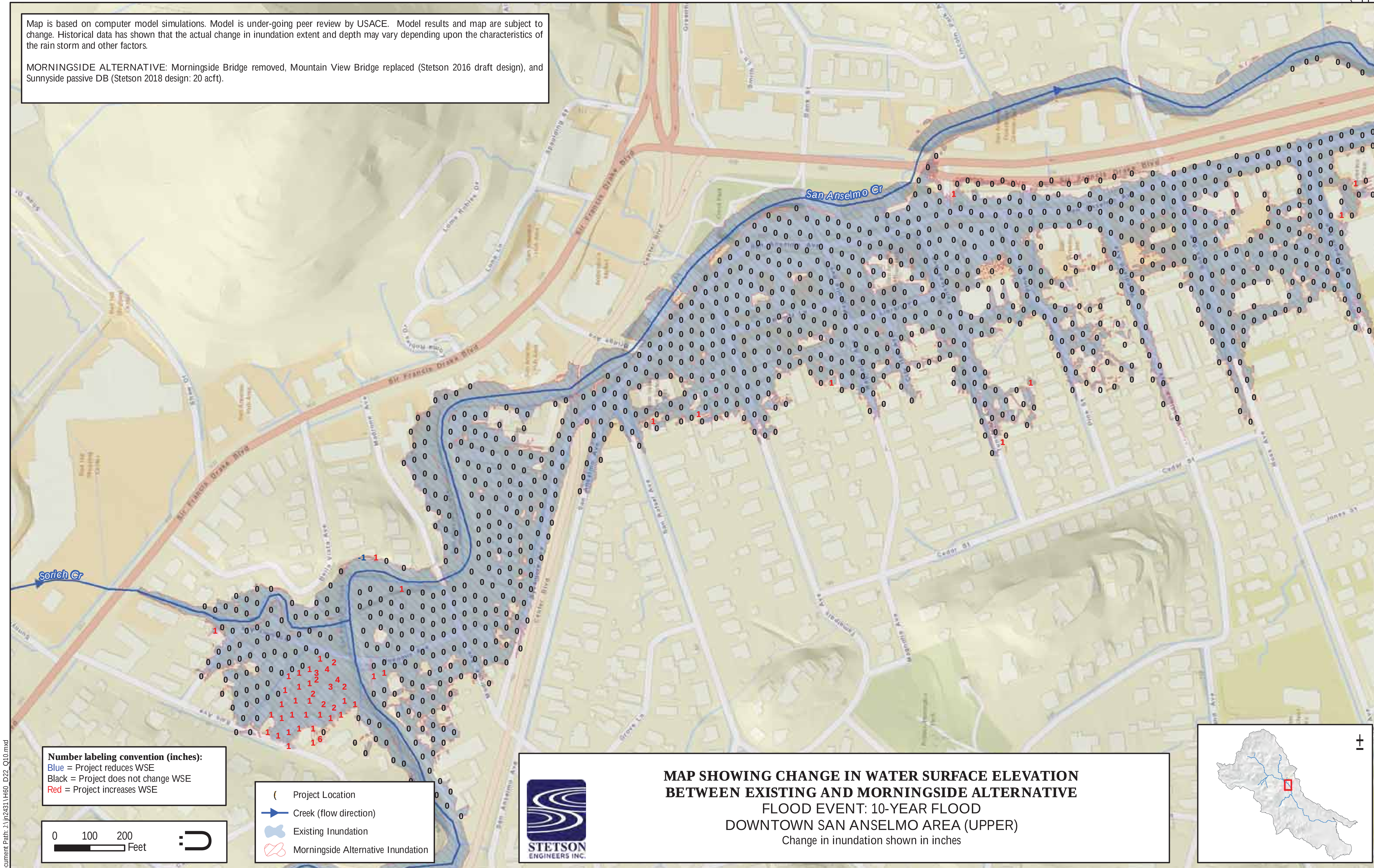
0 100 200 300 400
Feet

Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE
FLOOD EVENT: 10-YEAR FLOOD
SLEEPY HOLLOW AREA
Change in inundation shown in inches

Document Path: J:\jn2431\H60_D22_Q10.mxd



Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

MORNINGSIDE ALTERNATIVE: Morningside Bridge removed, Mountain View Bridge replaced (Stetson 2016 draft design), and Sunnyside passive DB (Stetson 2018 design: 20 acft).

Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200
Feet

Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

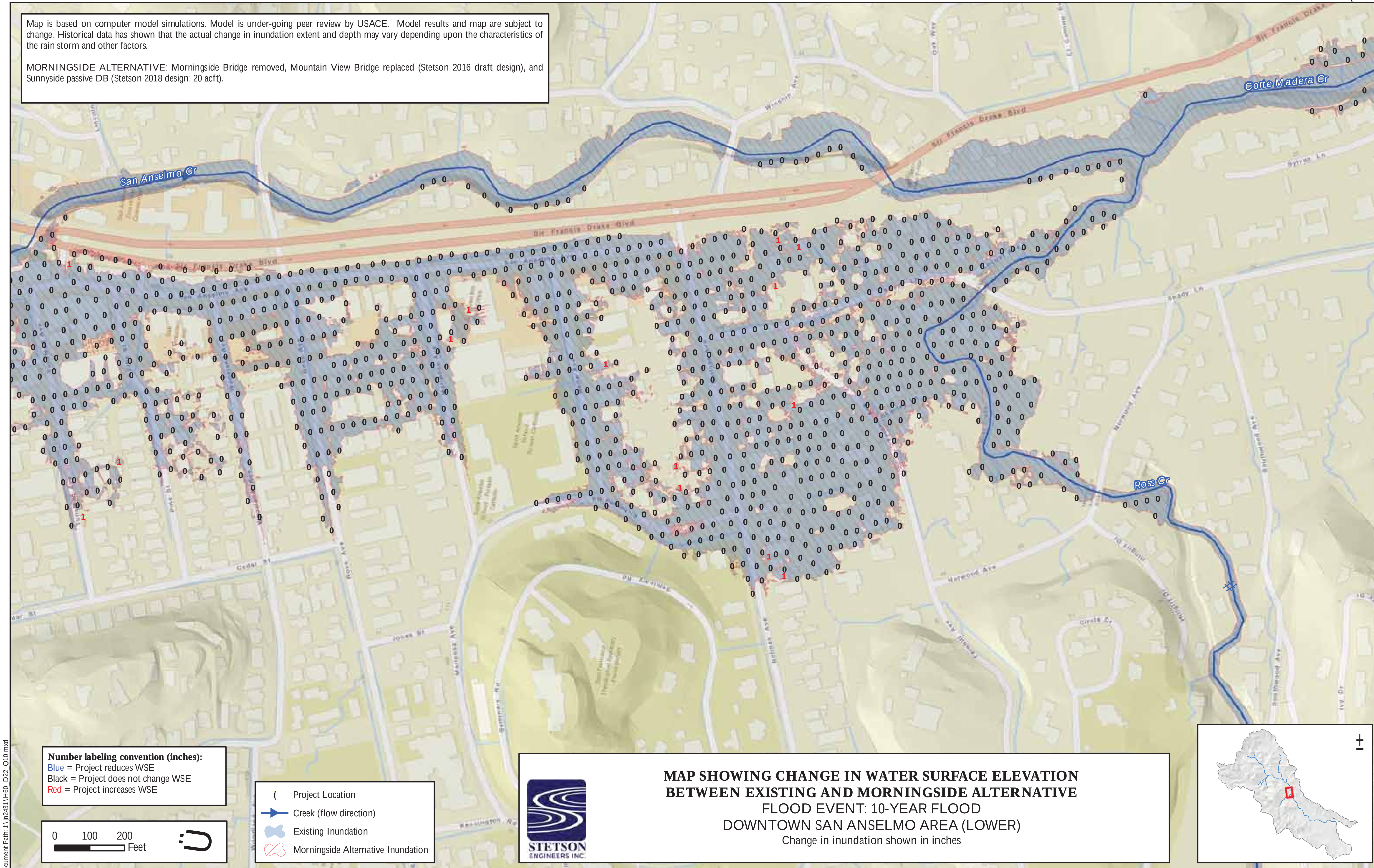
STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE
FLOOD EVENT: 10-YEAR FLOOD
DOWNTOWN SAN ANSELMO AREA (UPPER)
Change in inundation shown in inches

Document Path: J:\jn2431\H60_D22_Q10.mxd

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

MORNINGSIDE ALTERNATIVE: Morningside Bridge removed, Mountain View Bridge replaced (Stetson 2016 draft design), and Sunnyside passive DB (Stetson 2018 design: 20 acft).



Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

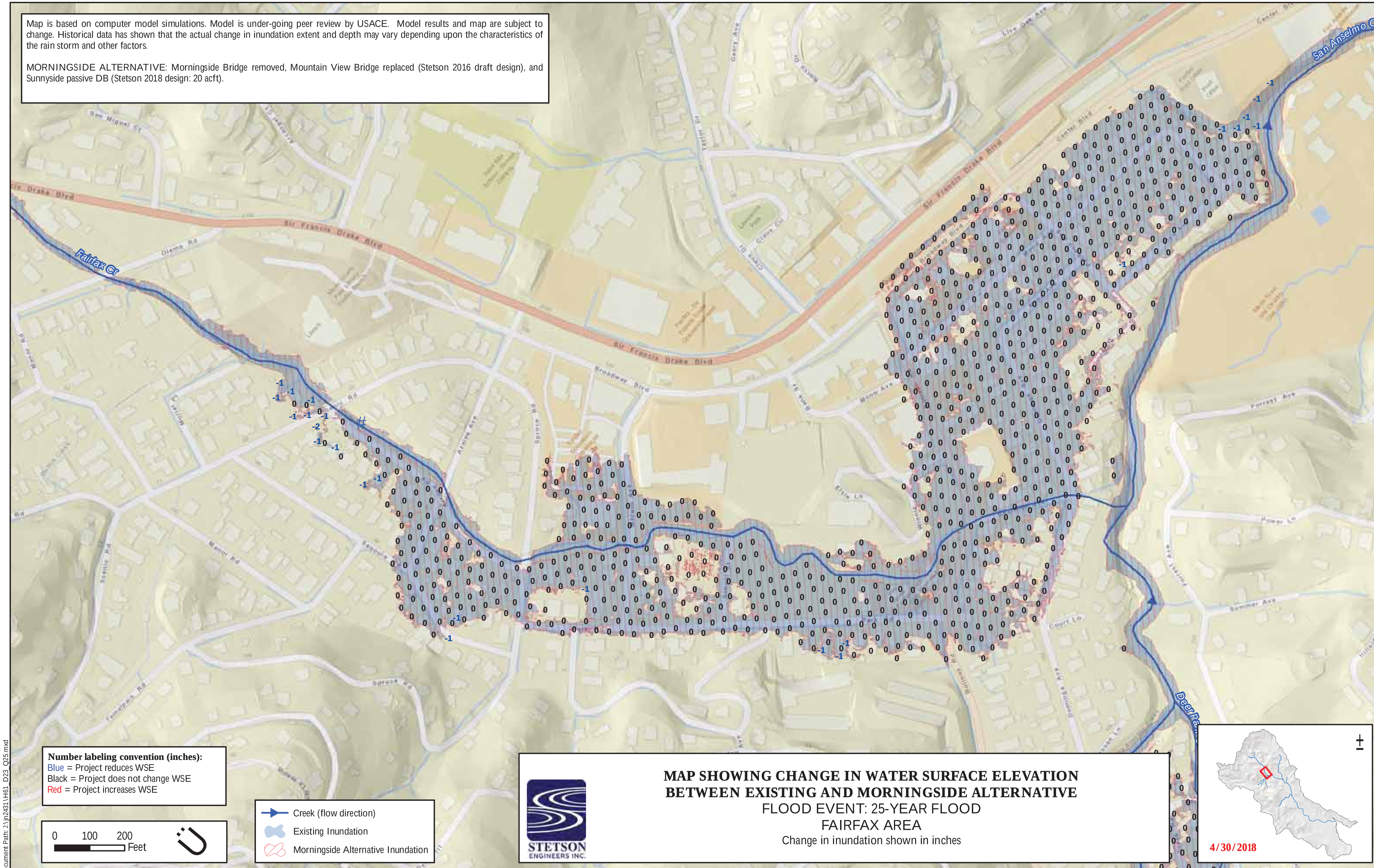
STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE
FLOOD EVENT: 10-YEAR FLOOD
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

Document Path: J:\jn2431\H60_D22_Q10.mxd

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

MORNINGSIDE ALTERNATIVE: Morningside Bridge removed, Mountain View Bridge replaced (Stetson 2016 draft design), and Sunnyside passive DB (Stetson 2018 design: 20 acft).



Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE

FLOOD EVENT: 25-YEAR FLOOD

FAIRFAX AREA

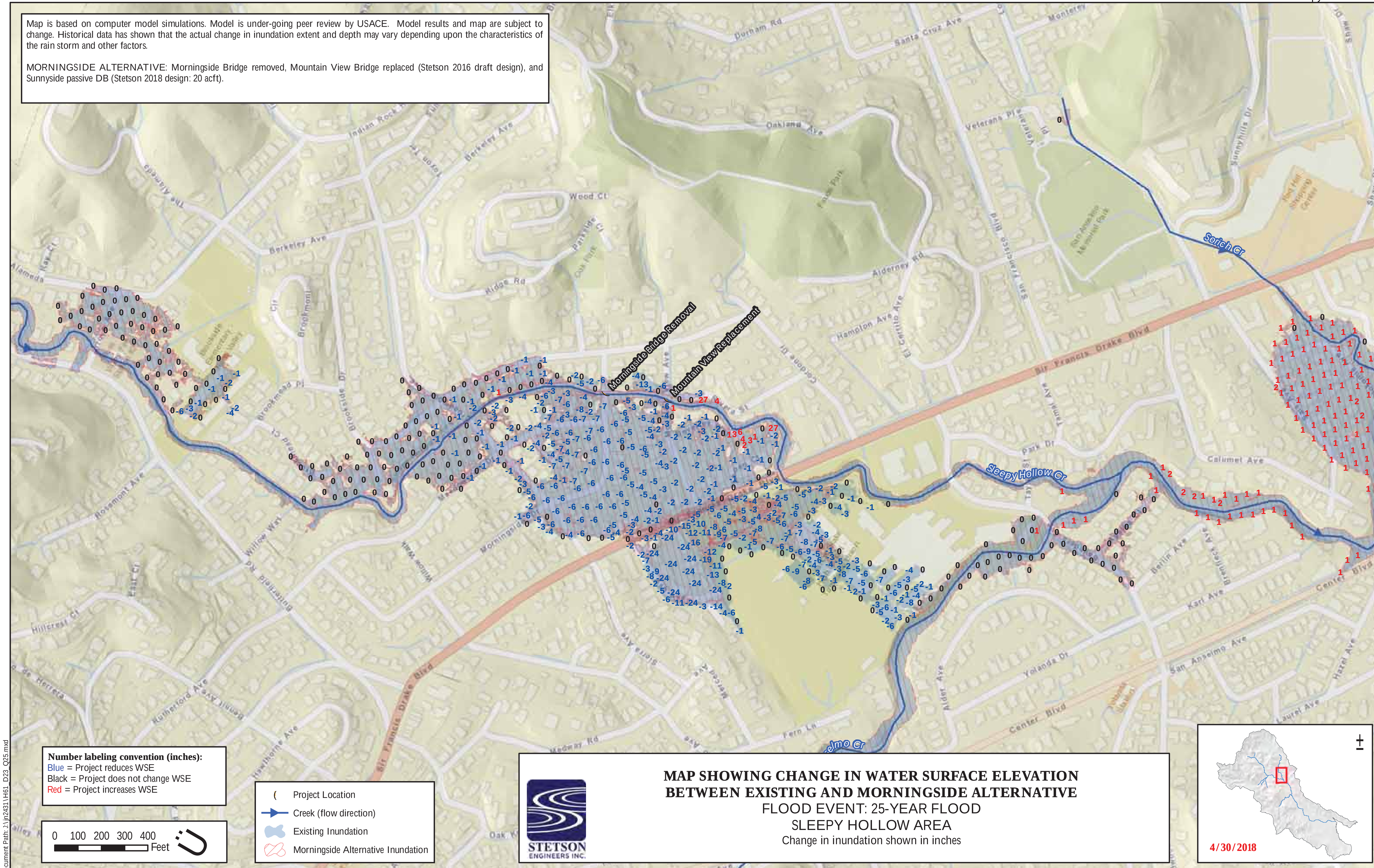
Change in inundation shown in inches

4/30/2018

Document Path: J:\jn2431\H61_D23_Q25.mxd

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

MORNINGSIDE ALTERNATIVE: Morningside Bridge removed, Mountain View Bridge replaced (Stetson 2016 draft design), and Sunnyside passive DB (Stetson 2018 design: 20 acft).



Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 300 400 Feet

Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

STETSON ENGINEERS INC.

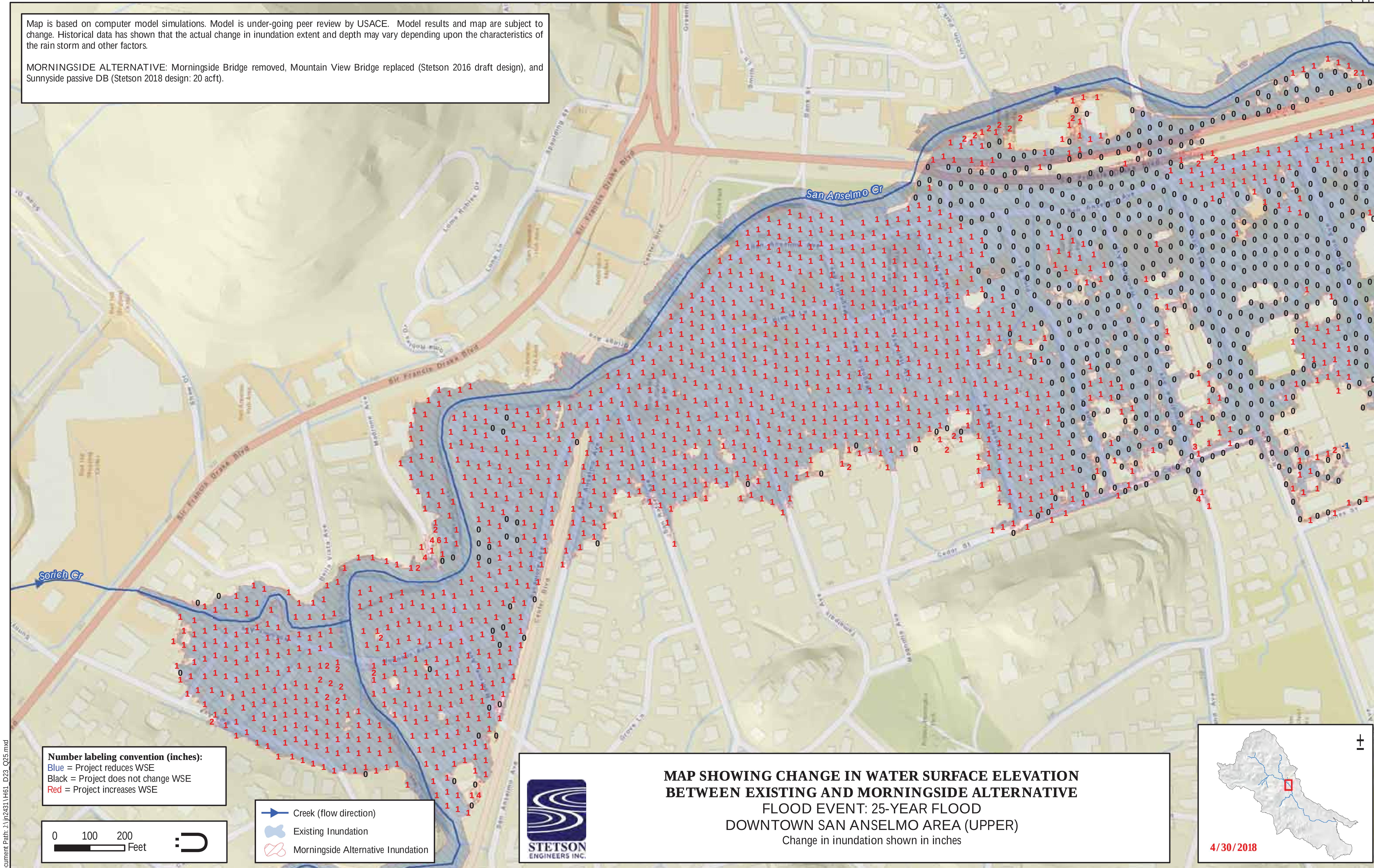
MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE
FLOOD EVENT: 25-YEAR FLOOD
SLEEPY HOLLOW AREA
Change in inundation shown in inches

4/30/2018

Document Path: J:\jn2431\H61_D23_Q25.mxd

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

MORNINGSIDE ALTERNATIVE: Morningside Bridge removed, Mountain View Bridge replaced (Stetson 2016 draft design), and Sunnyside passive DB (Stetson 2018 design: 20 acft).



Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

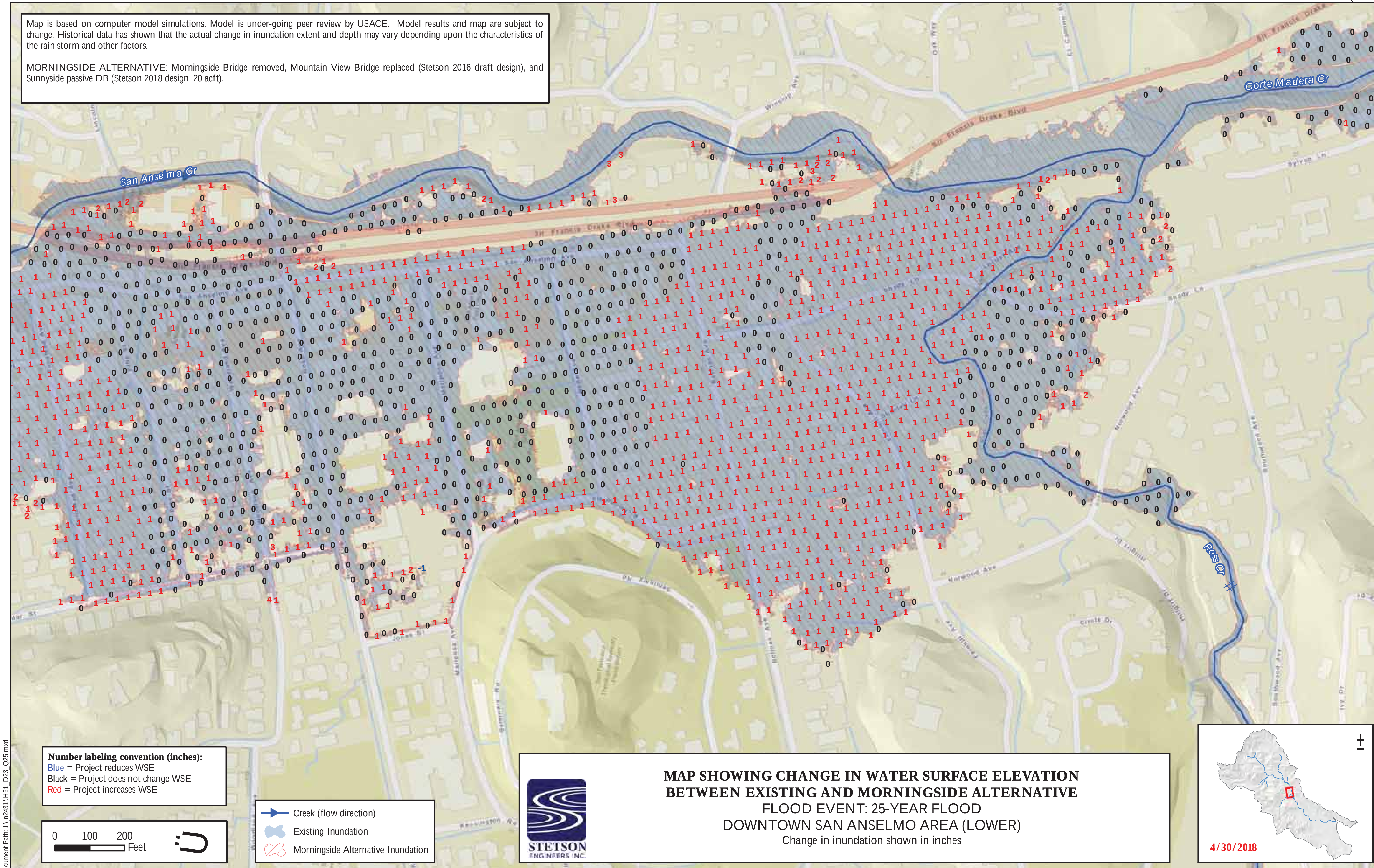
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE
FLOOD EVENT: 25-YEAR FLOOD
DOWNTOWN SAN ANSELMO AREA (UPPER)
Change in inundation shown in inches

STETSON ENGINEERS INC.

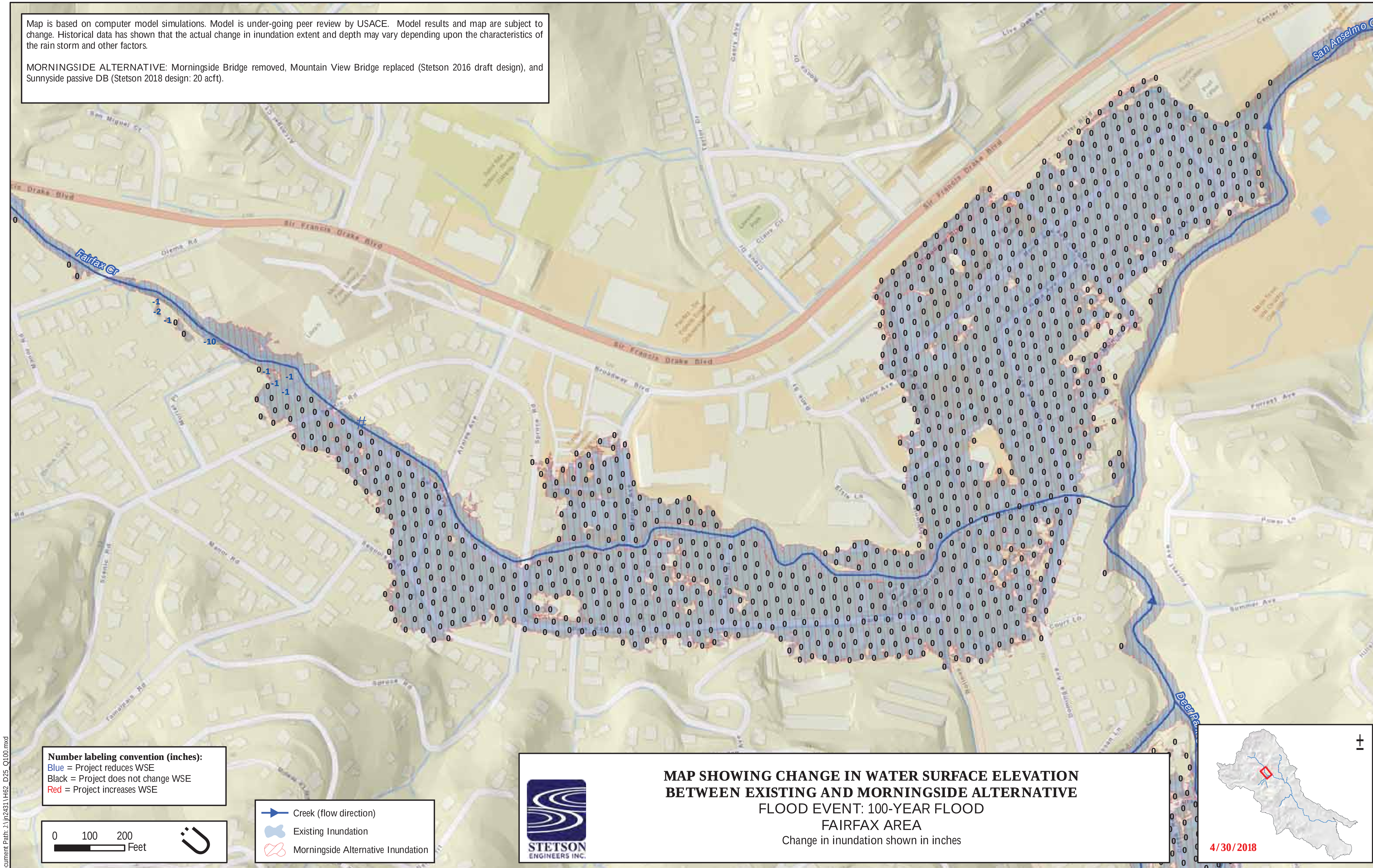
4/30/2018

Document Path: J:\jn2431\H61_D23_Q25.mxd


Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.
MORNINGSIDE ALTERNATIVE: Morningside Bridge removed, Mountain View Bridge replaced (Stetson 2016 draft design), and Sunnyside passive DB (Stetson 2018 design: 20 acft).
San Anselmo Cr
Corte Madera Cr
Ross Cr
Sir Francis Drake Blvd
Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE
0 100 200 Feet
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation
MAP SHOWING CHANGE IN WATER SURFACE ELEVATION
BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE
FLOOD EVENT: 25-YEAR FLOOD
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches
STETSON ENGINEERS INC.
4/30/2018
Document Path: J:\jn2431\H61_D23_Q25.mxd

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

MORNINGSIDE ALTERNATIVE: Morningside Bridge removed, Mountain View Bridge replaced (Stetson 2016 draft design), and Sunnyside passive DB (Stetson 2018 design: 20 acft).



Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 Feet

Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE

FLOOD EVENT: 100-YEAR FLOOD

FAIRFAX AREA

Change in inundation shown in inches

STETSON ENGINEERS INC.

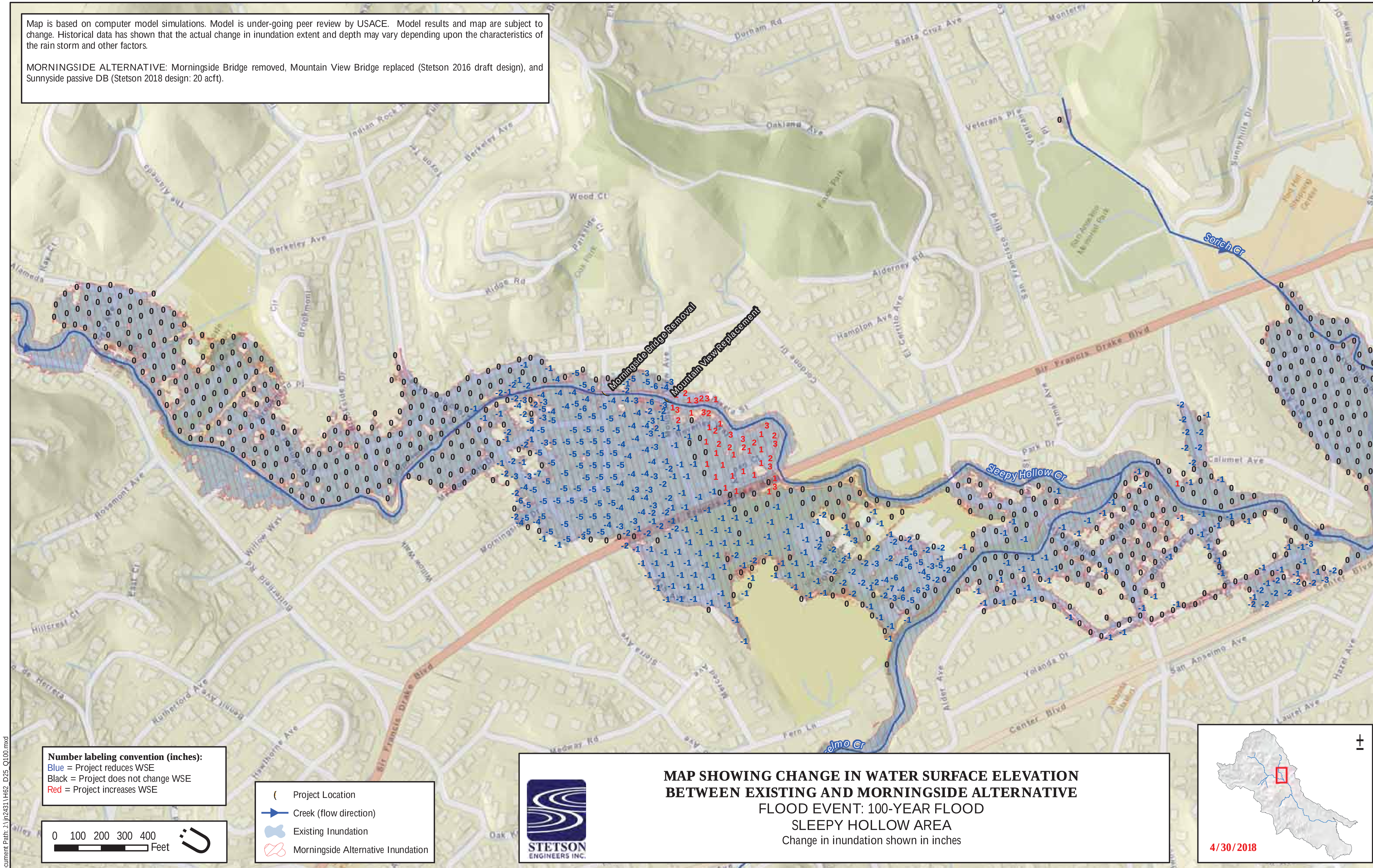
4/30/2018

Document Path: J:\jn2431\H62_D25_Q100.mxd

FIGURE 3b - Sleepy Hollow Area

Map is based on computer model simulations. Model is under-going peer review by USACE. Model results and map are subject to change. Historical data has shown that the actual change in inundation extent and depth may vary depending upon the characteristics of the rain storm and other factors.

MORNINGSIDE ALTERNATIVE: Morningside Bridge removed, Mountain View Bridge replaced (Stetson 2016 draft design), and Sunnyside passive DB (Stetson 2018 design: 20 acft).



Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

0 100 200 300 400 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE

FLOOD EVENT: 100-YEAR FLOOD

SLEEPY HOLLOW AREA

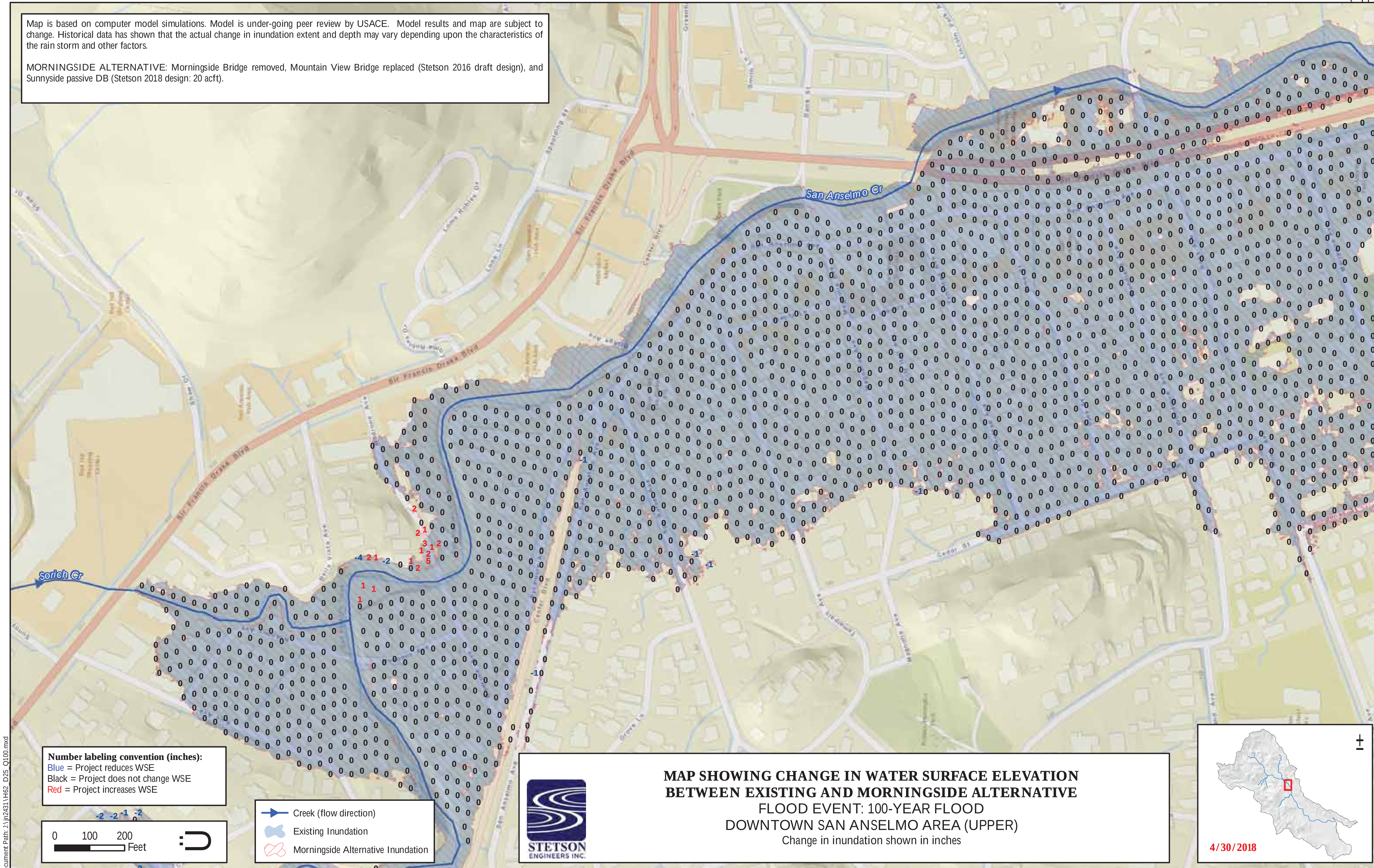
Change in inundation shown in inches

STETSON ENGINEERS INC.

4/30/2018

Document Path: J:\jn2431\H62_D25_Q100.mxd

FIGURE 3c - Downtown San Anselmo Area (Upper)



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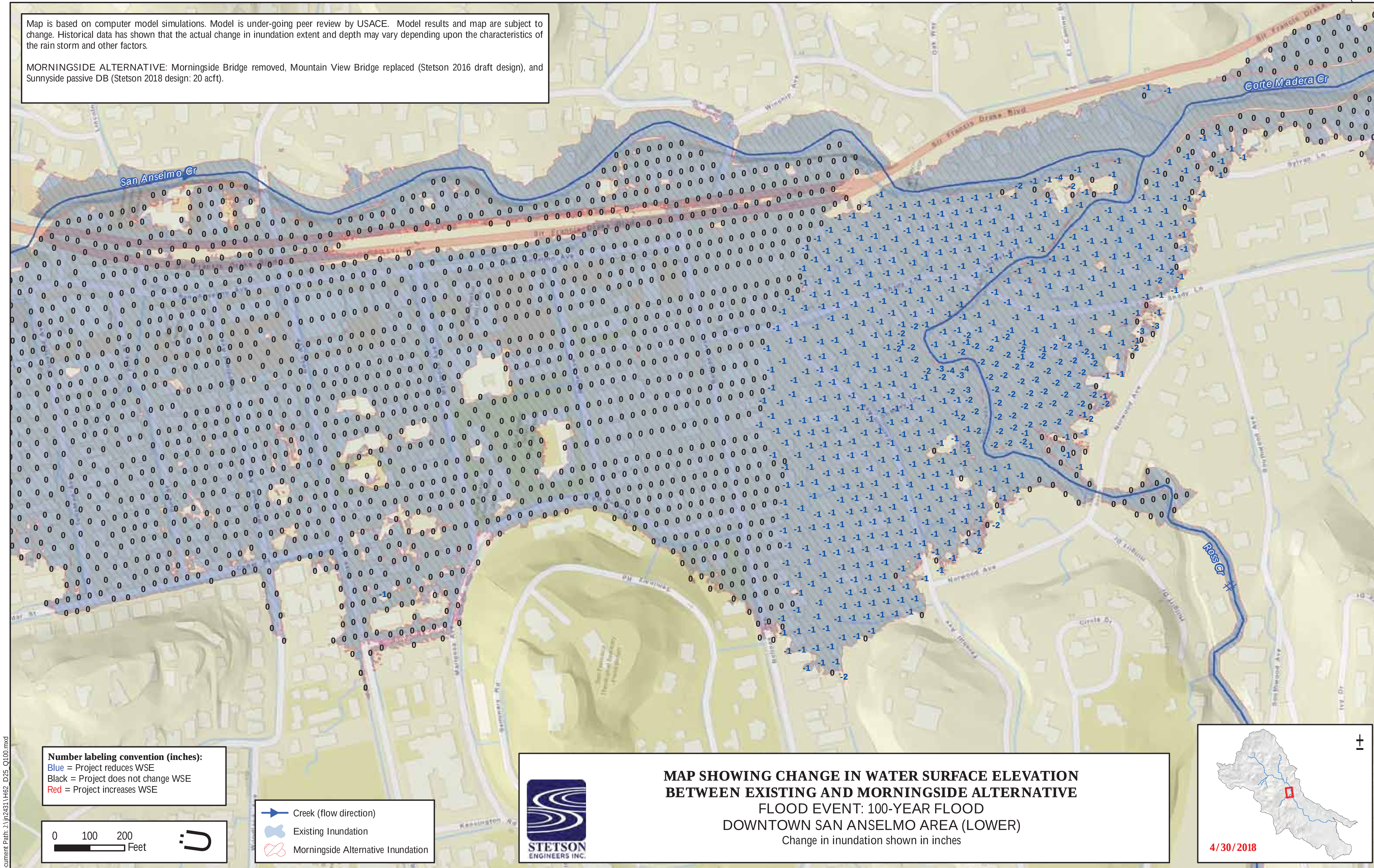

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Number labeling convention (inches):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE

FLOOD EVENT: 100-YEAR FLOOD

DOWNTOWN SAN ANSELMO AREA (LOWER)

Change in inundation shown in inches

4/30/2018

Document Path: J:\jn2431\H62_D25_Q100.mxd

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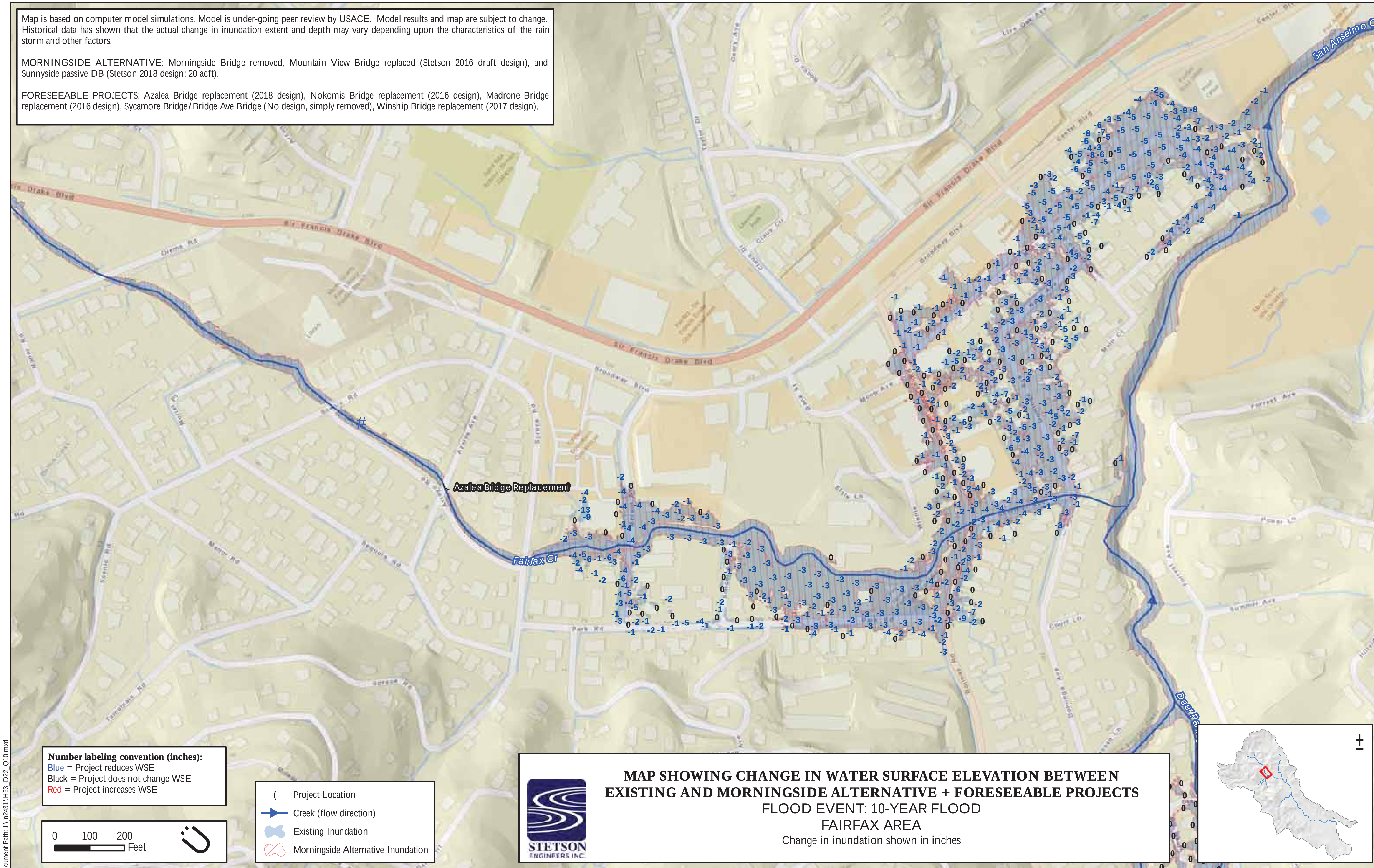

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Red = Project increases WSE

0 100 200 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 10-YEAR FLOOD

FAIRFAX AREA

Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\H63_D22_Q10.mxd

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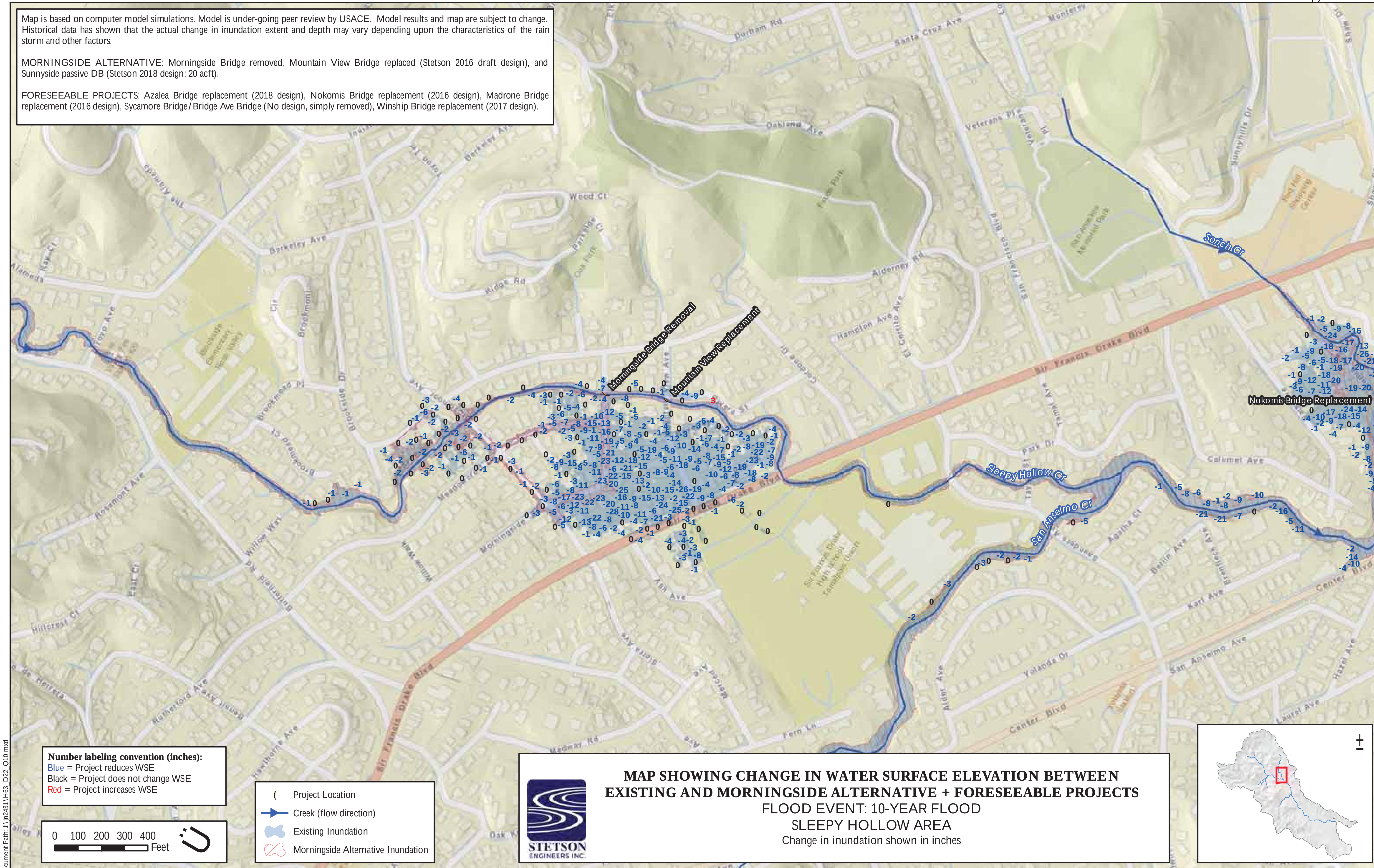

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Red = Project increases WSE

0 100 200 300 400 Feet

Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS
FLOOD EVENT: 10-YEAR FLOOD
SLEEPY HOLLOW AREA
Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\H63_D22_Q10.mxd

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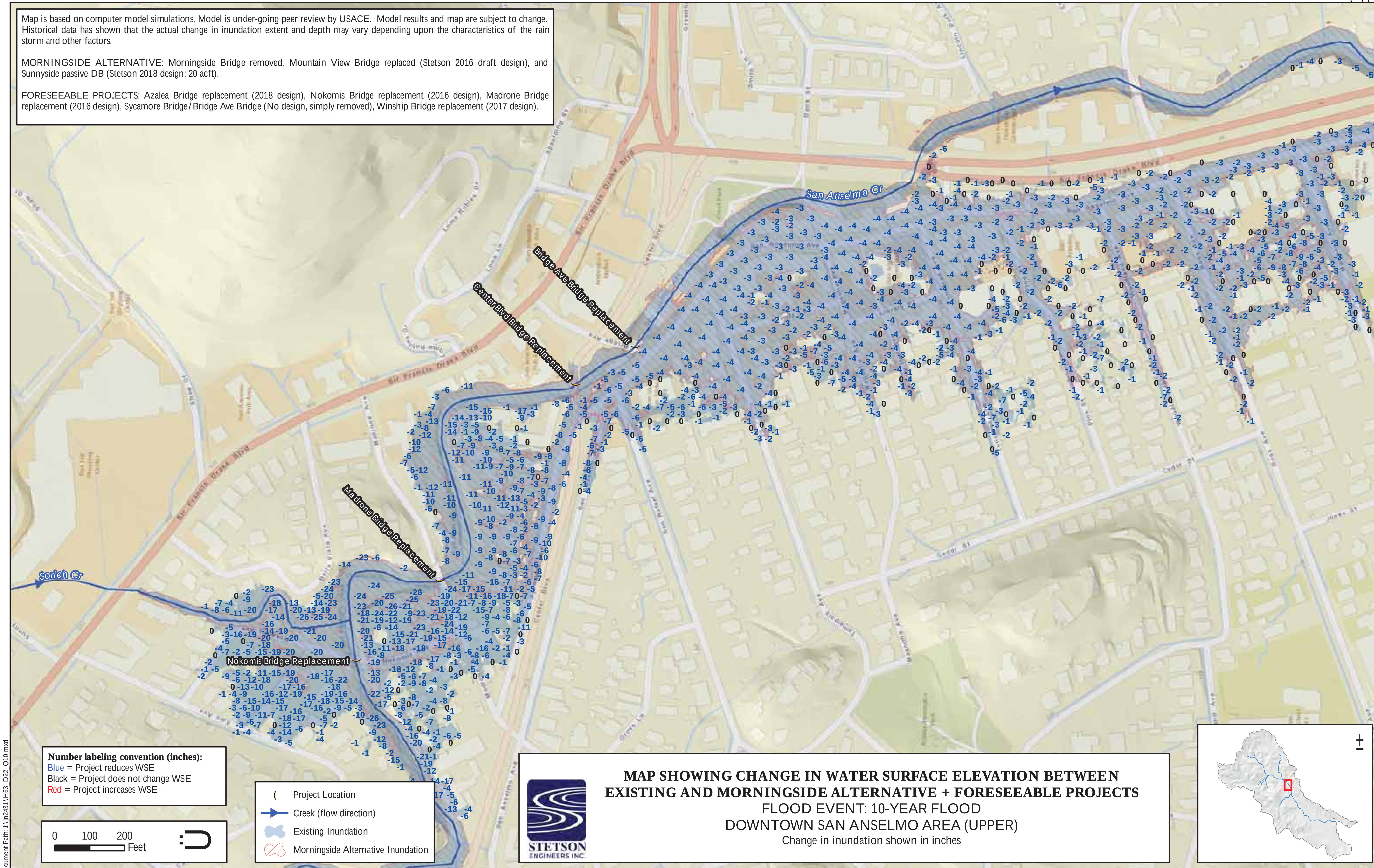

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Red = Project increases WSE

0 100 200 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 10-YEAR FLOOD
DOWNTOWN SAN ANSELMO AREA (UPPER)
Change in inundation shown in inches

Document Path: J:\jn2431\H63_D22_Q10.mxd

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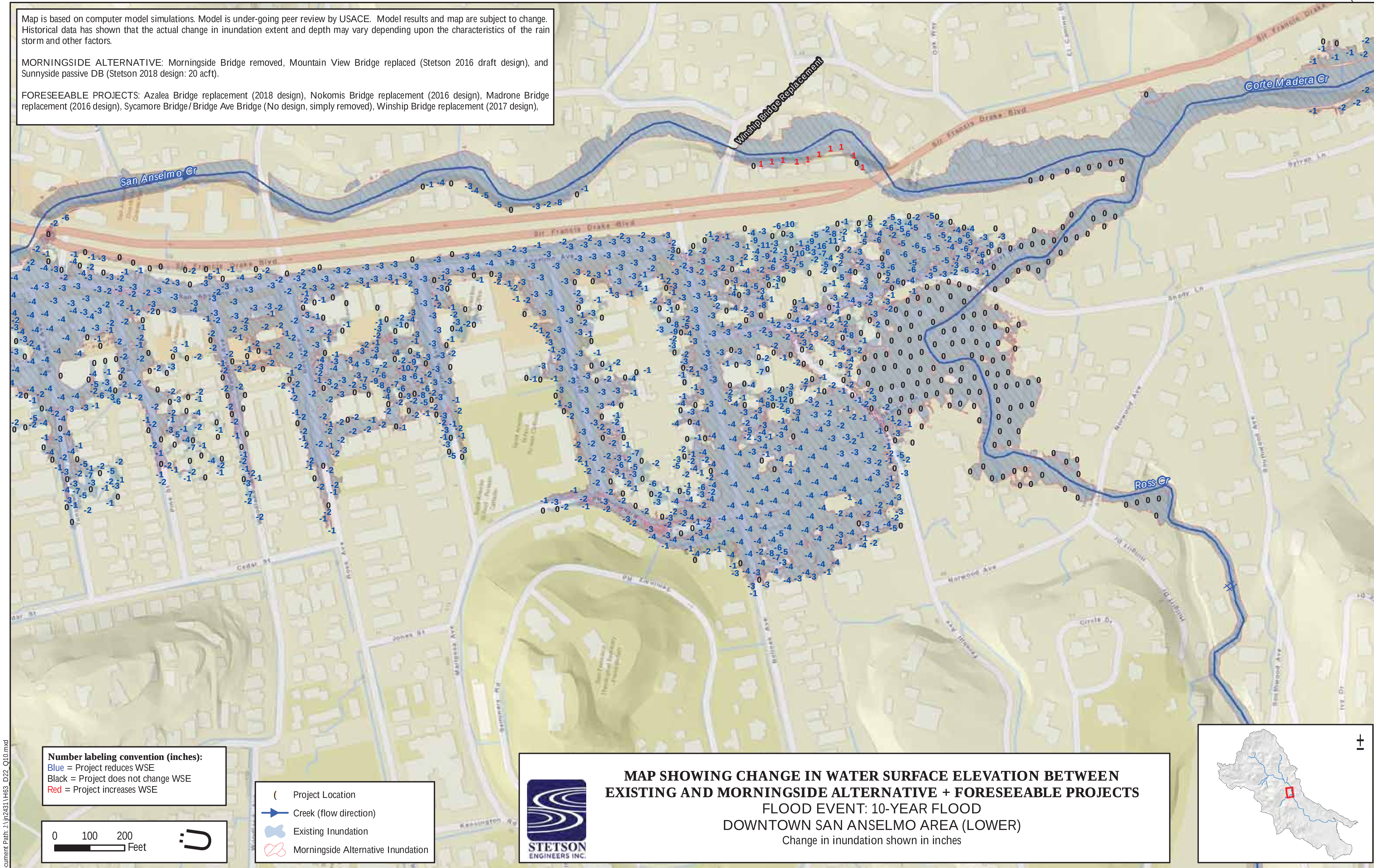

Number labeling convention (inches):
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Black = Project does not change WSE
Red = Project increases WSE

0 100 200
Feet

Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 10-YEAR FLOOD
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

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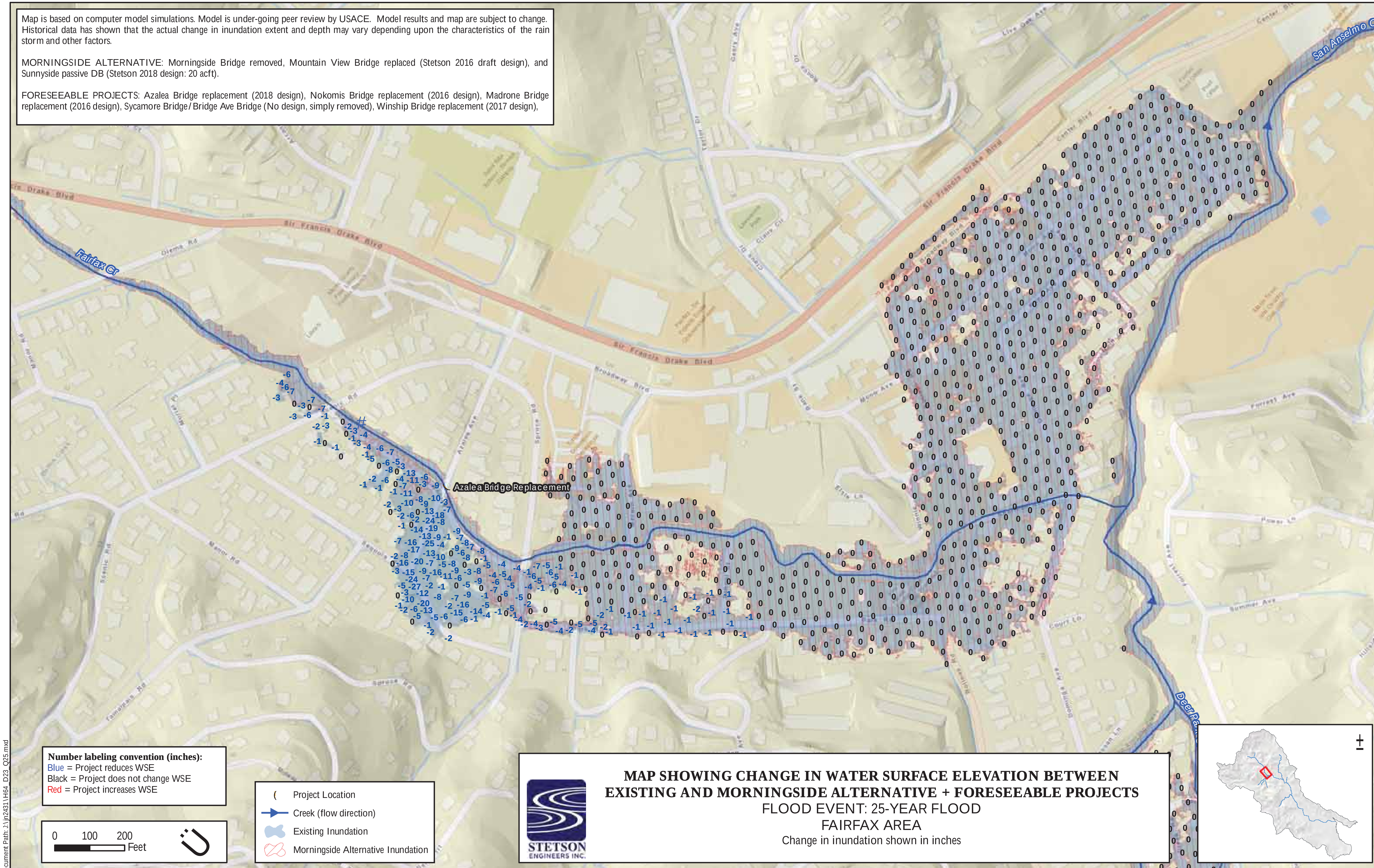

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Red = Project increases WSE

0 100 200
Feet

Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 25-YEAR FLOOD
FAIRFAX AREA
Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\H64_D23_Q25.mxd

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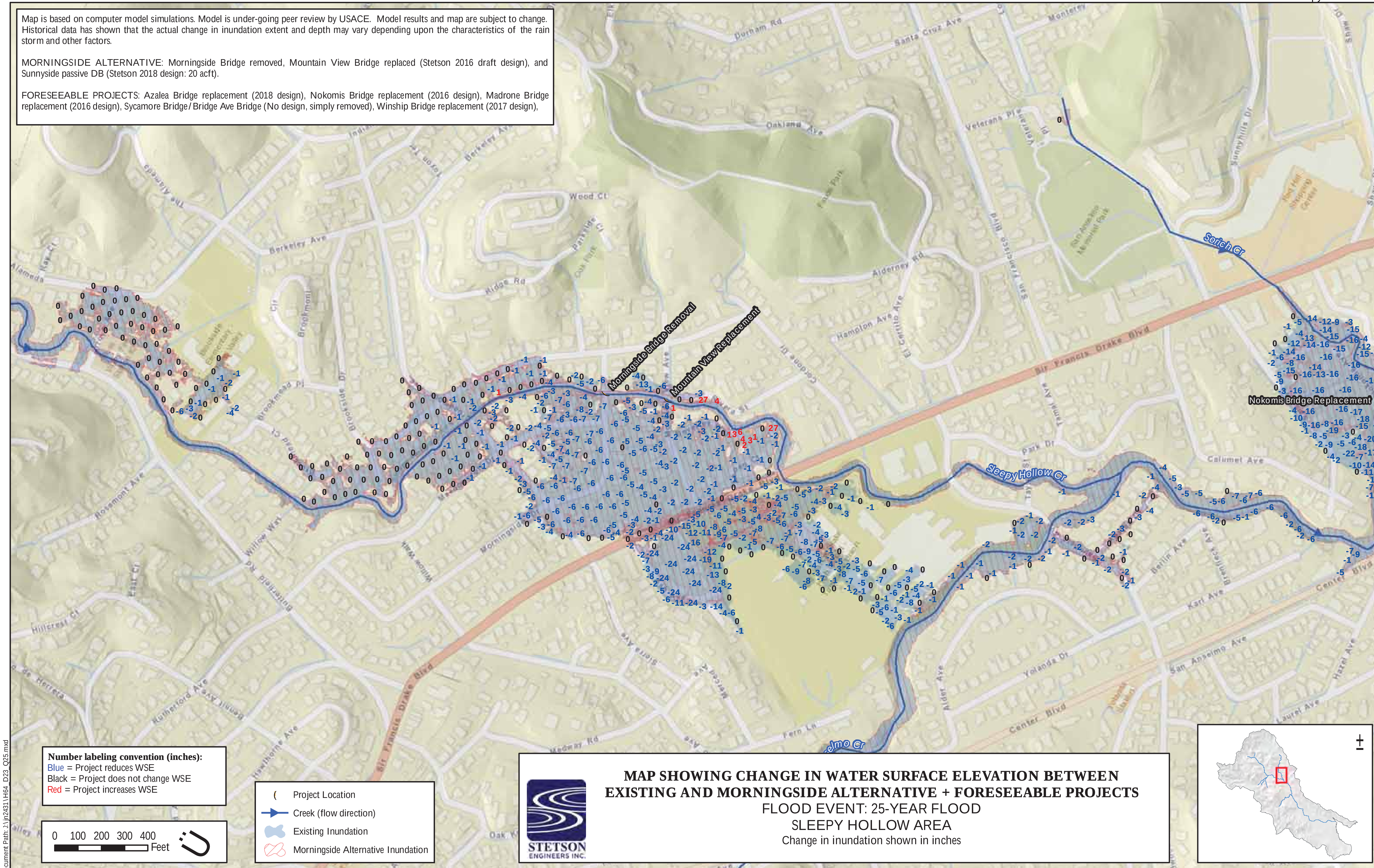

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Red = Project increases WSE

0 100 200 300 400
Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 25-YEAR FLOOD
SLEEPY HOLLOW AREA
Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\H64_D23_Q25.mxd

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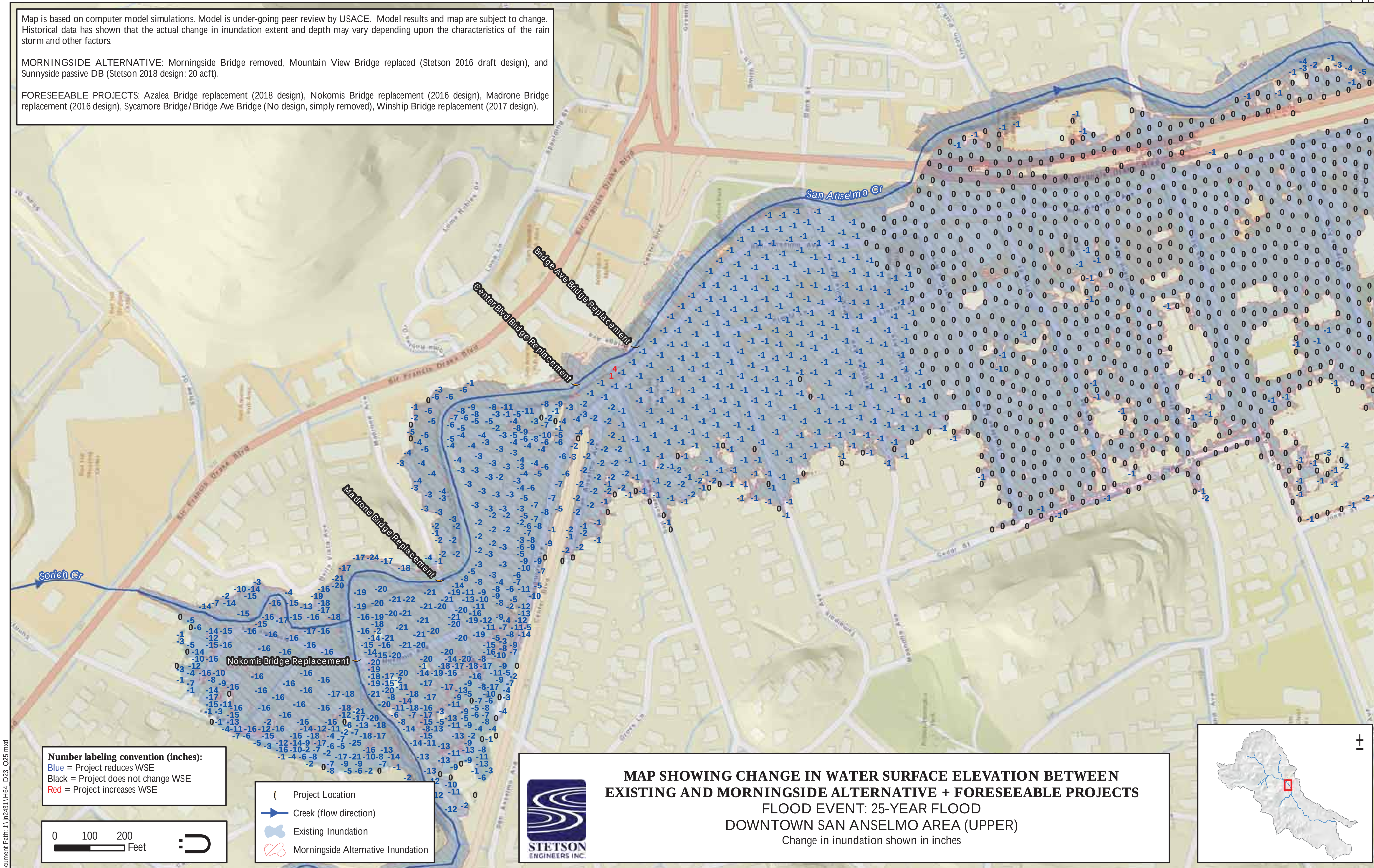

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0 100 200 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 25-YEAR FLOOD

DOWNTOWN SAN ANSELMO AREA (UPPER)

Change in inundation shown in inches

STETSON ENGINEERS INC.

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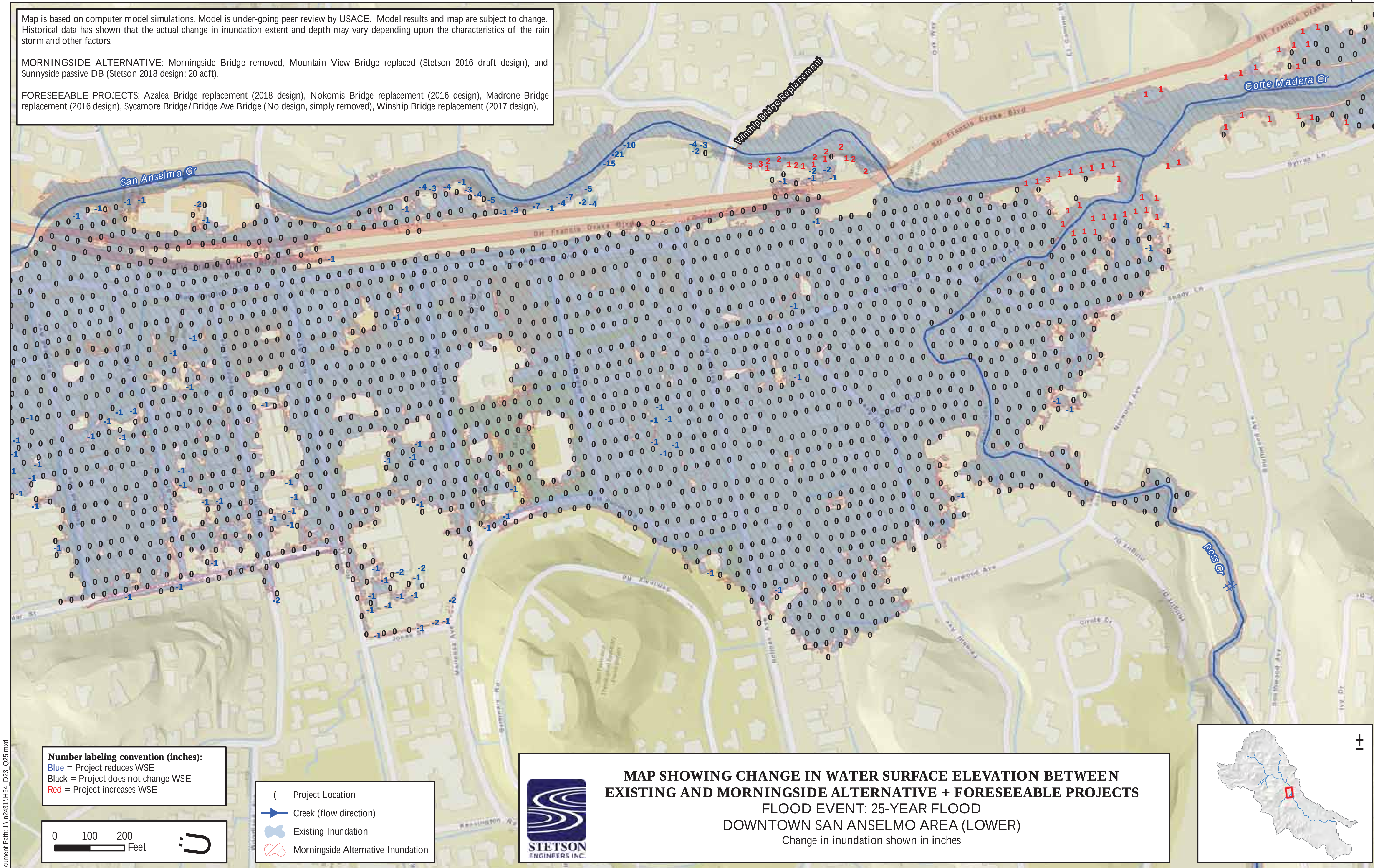

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Red = Project increases WSE

0 100 200 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS
FLOOD EVENT: 25-YEAR FLOOD
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

Document Path: J:\jn2431\H64_D23_Q25.mxd

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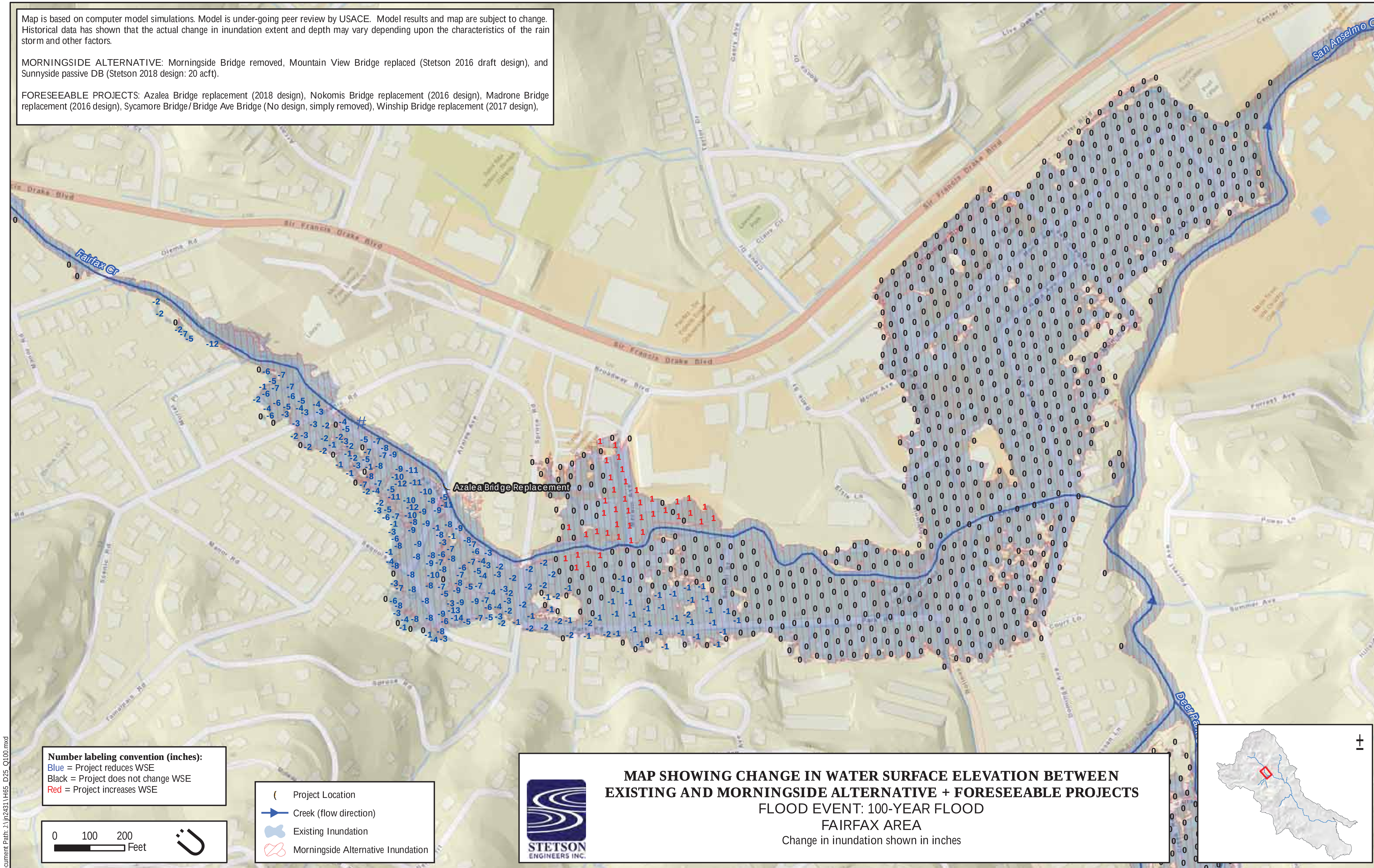

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0 100 200 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 100-YEAR FLOOD

FAIRFAX AREA

Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\H65_D25_Q100.mxd

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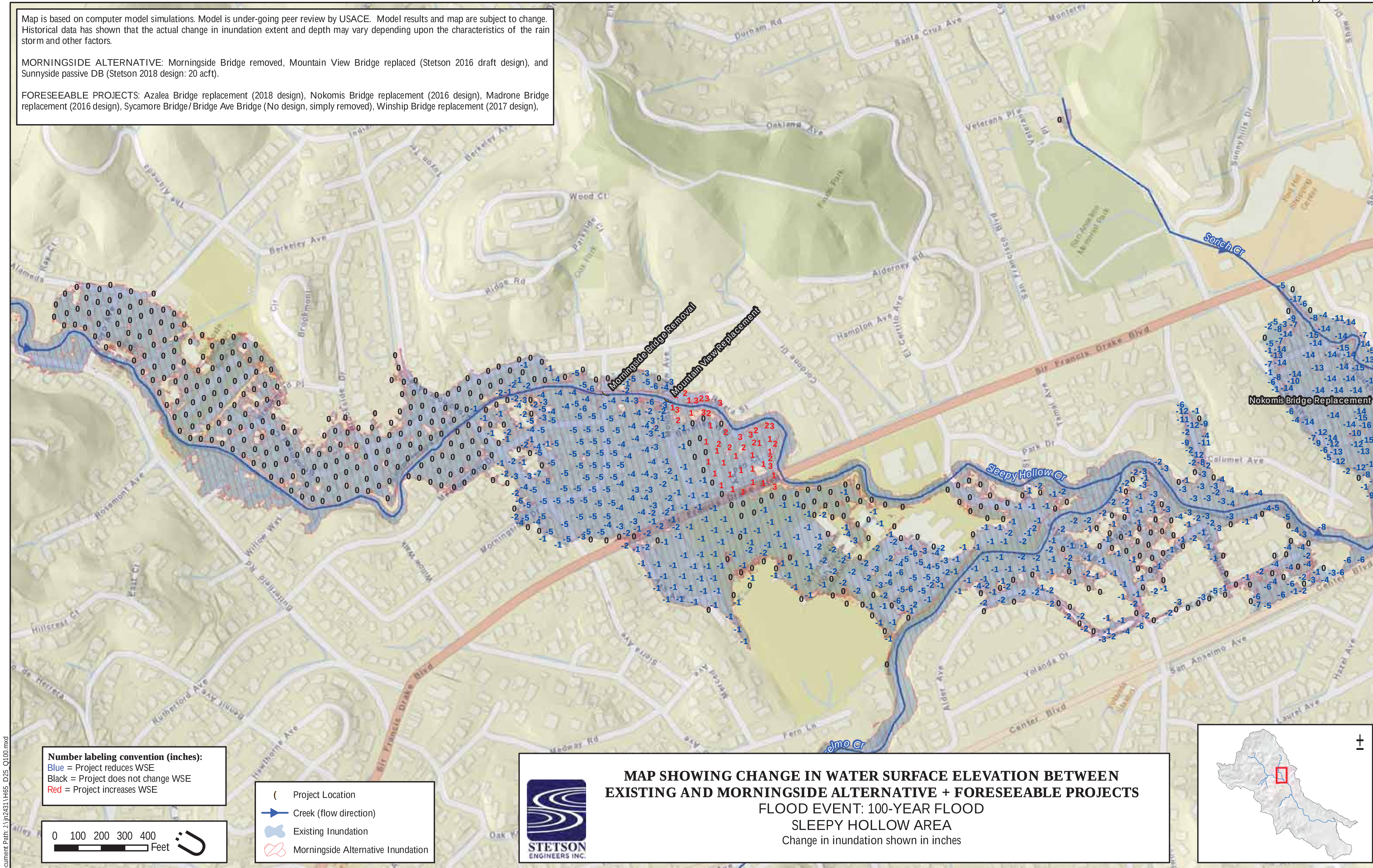

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0 100 200 300 400 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 100-YEAR FLOOD

SLEEPY HOLLOW AREA

Change in inundation shown in inches

STETSON ENGINEERS INC.

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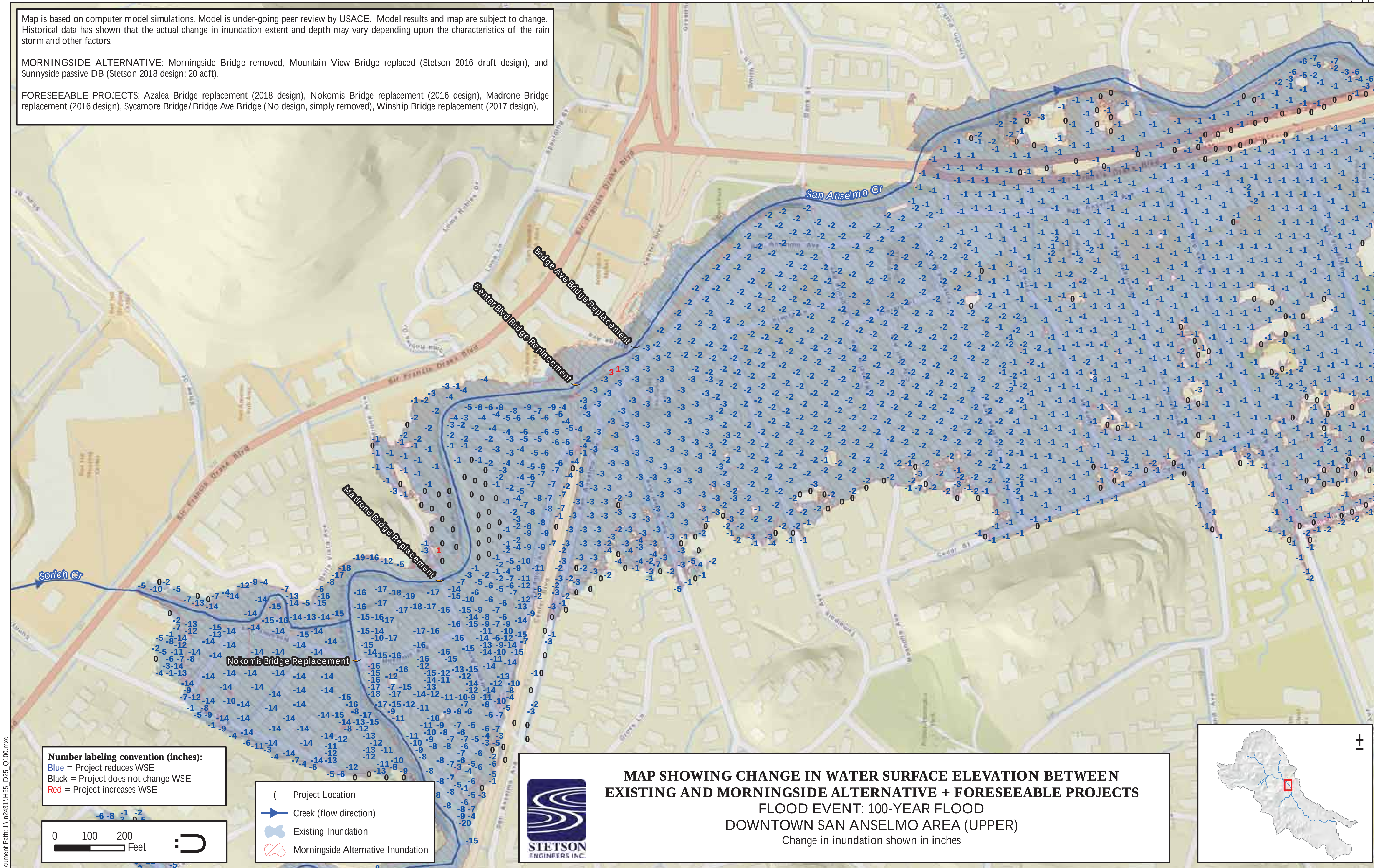

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0 100 200 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

STETSON ENGINEERS INC.

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS

FLOOD EVENT: 100-YEAR FLOOD

DOWNTOWN SAN ANSELMO AREA (UPPER)

Change in inundation shown in inches

Document Path: J:\jn2431\H65_D25_Q100.mxd

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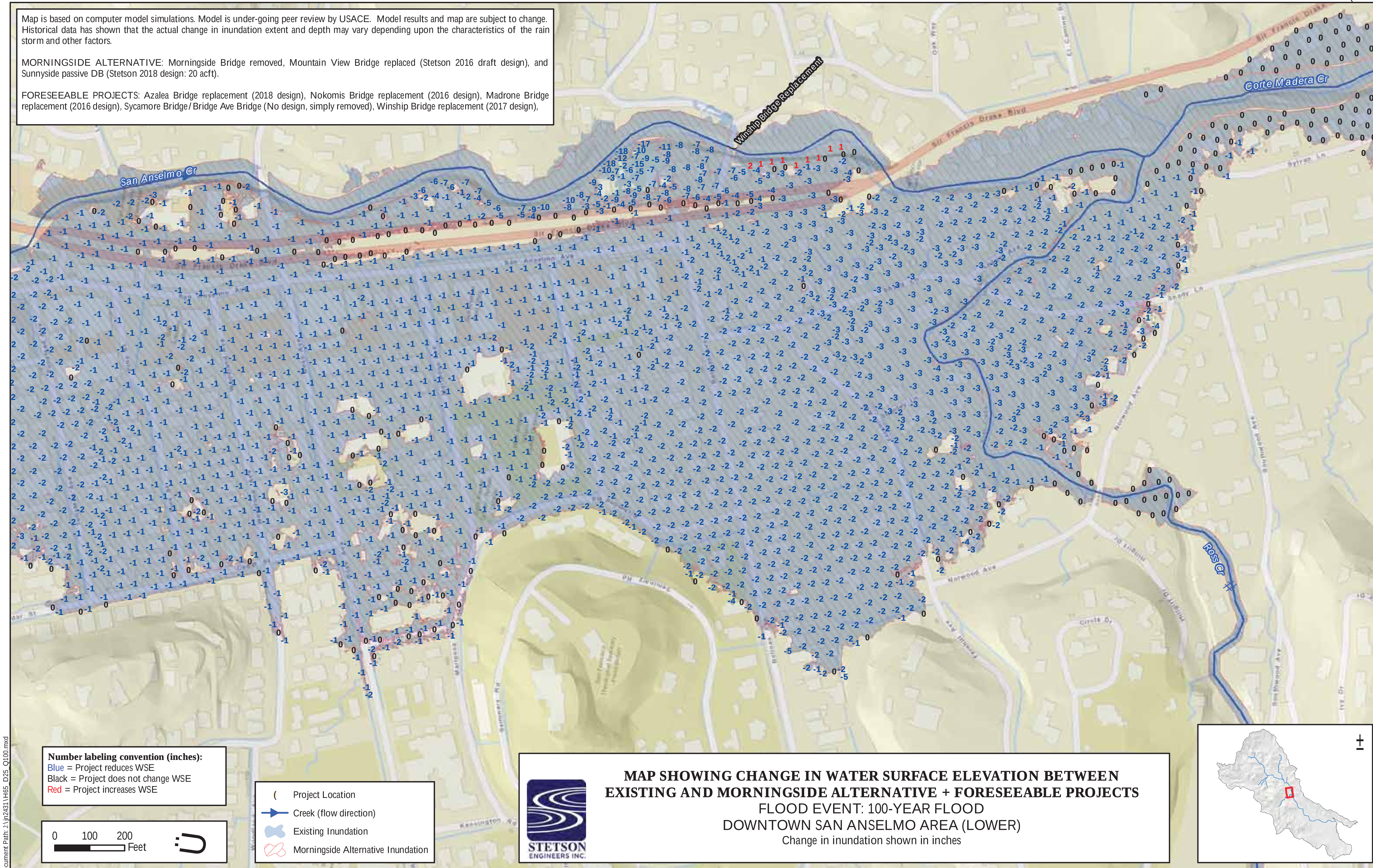

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Red = Project increases WSE

0 100 200 Feet

(Project Location
Creek (flow direction)
Existing Inundation
Morningside Alternative Inundation

MAP SHOWING CHANGE IN WATER SURFACE ELEVATION BETWEEN EXISTING AND MORNINGSIDE ALTERNATIVE + FORESEEABLE PROJECTS
FLOOD EVENT: 100-YEAR FLOOD
DOWNTOWN SAN ANSELMO AREA (LOWER)
Change in inundation shown in inches

STETSON ENGINEERS INC.

Document Path: J:\jn2431\H65_D25_Q100.mxd

Figure 7a 10-Year Water Surface Profiles along Fairfax Creek

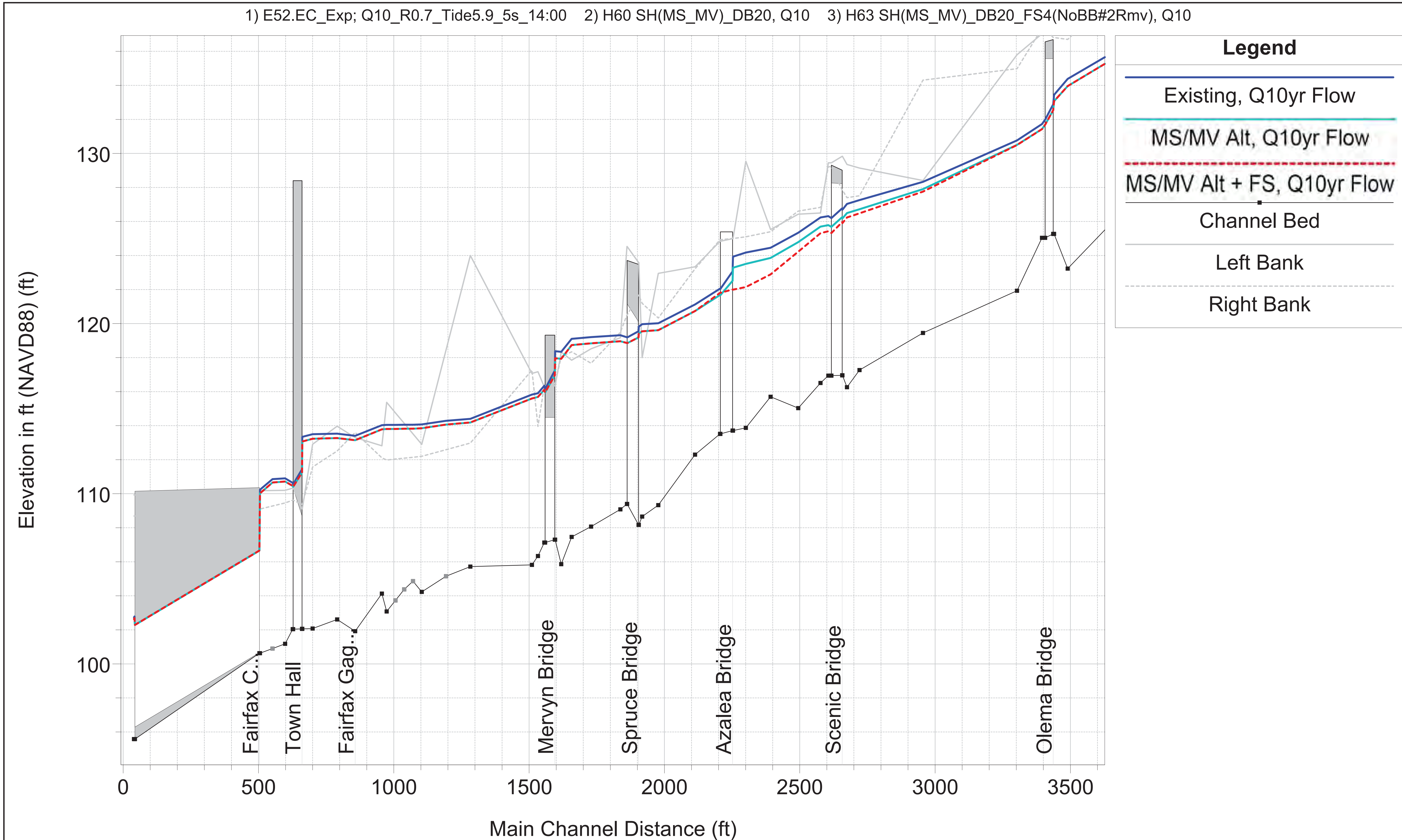


Figure 7b 25-Year Water Surface Profiles along Fairfax Creek

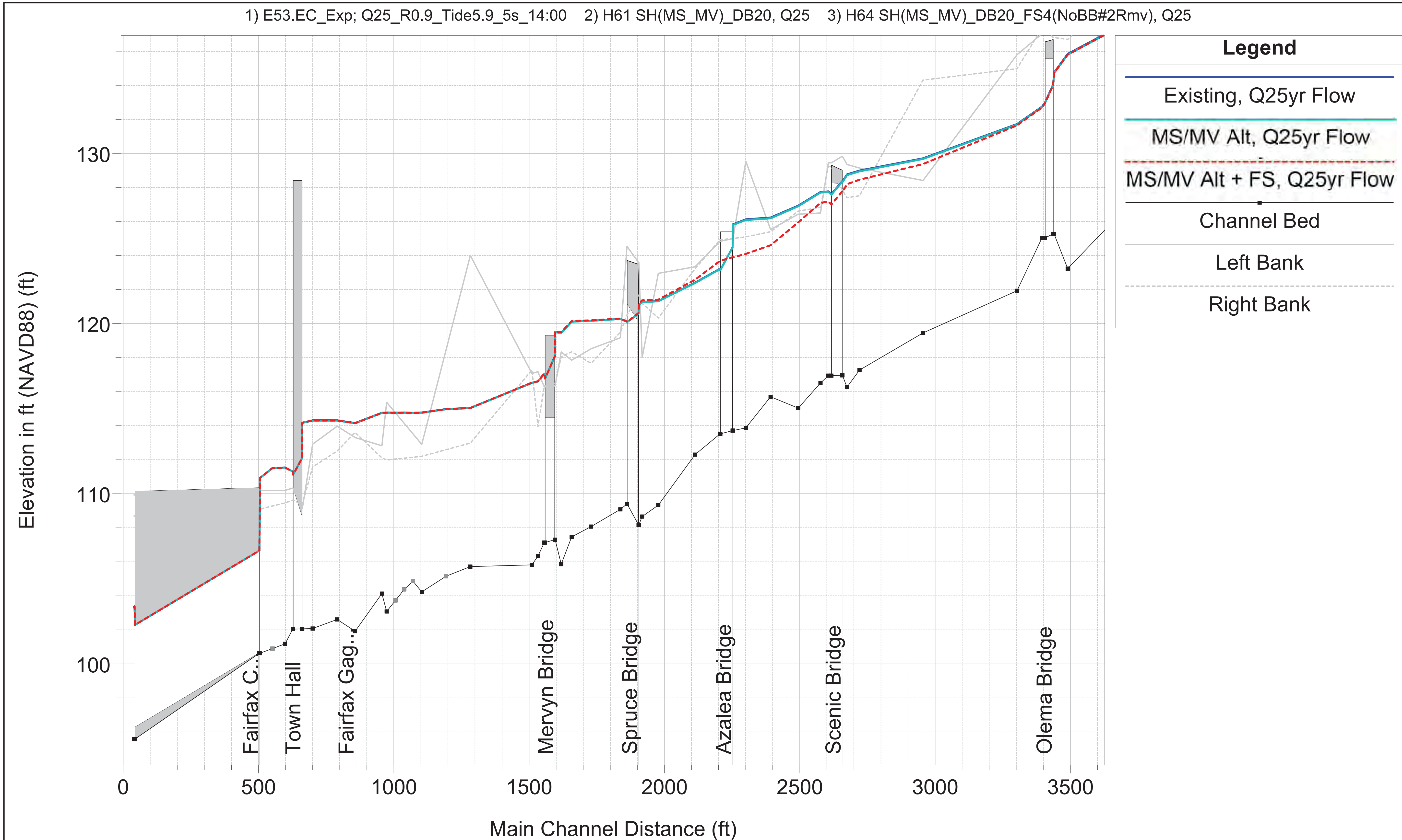


Figure 7c 100-Year Water Surface Profiles along Fairfax Creek

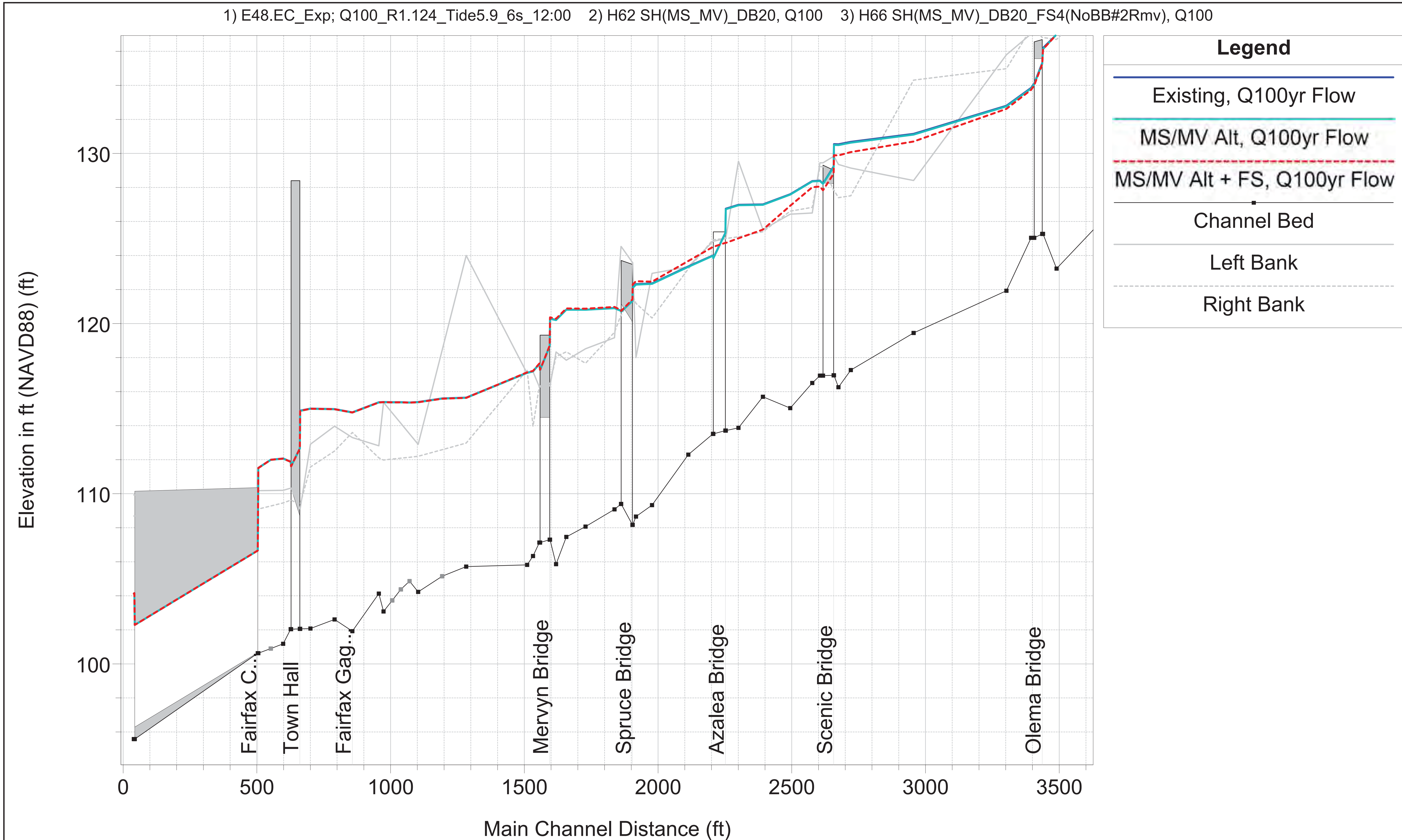


Figure 8a 10-Year Water Surface Profiles along Sleepy Hollow Creek

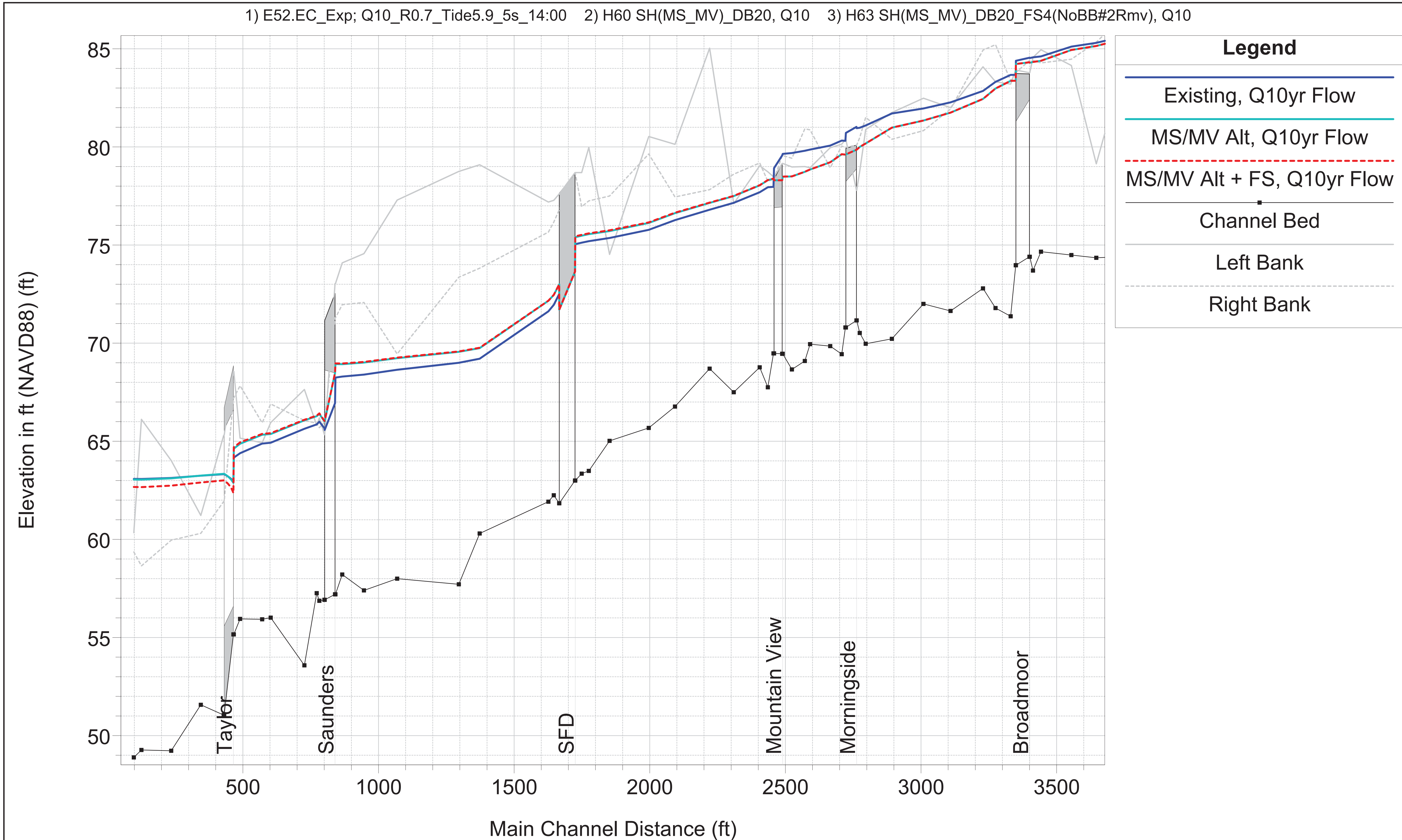


Figure 8b 25-Year Water Surface Profiles along Sleepy Hollow Creek

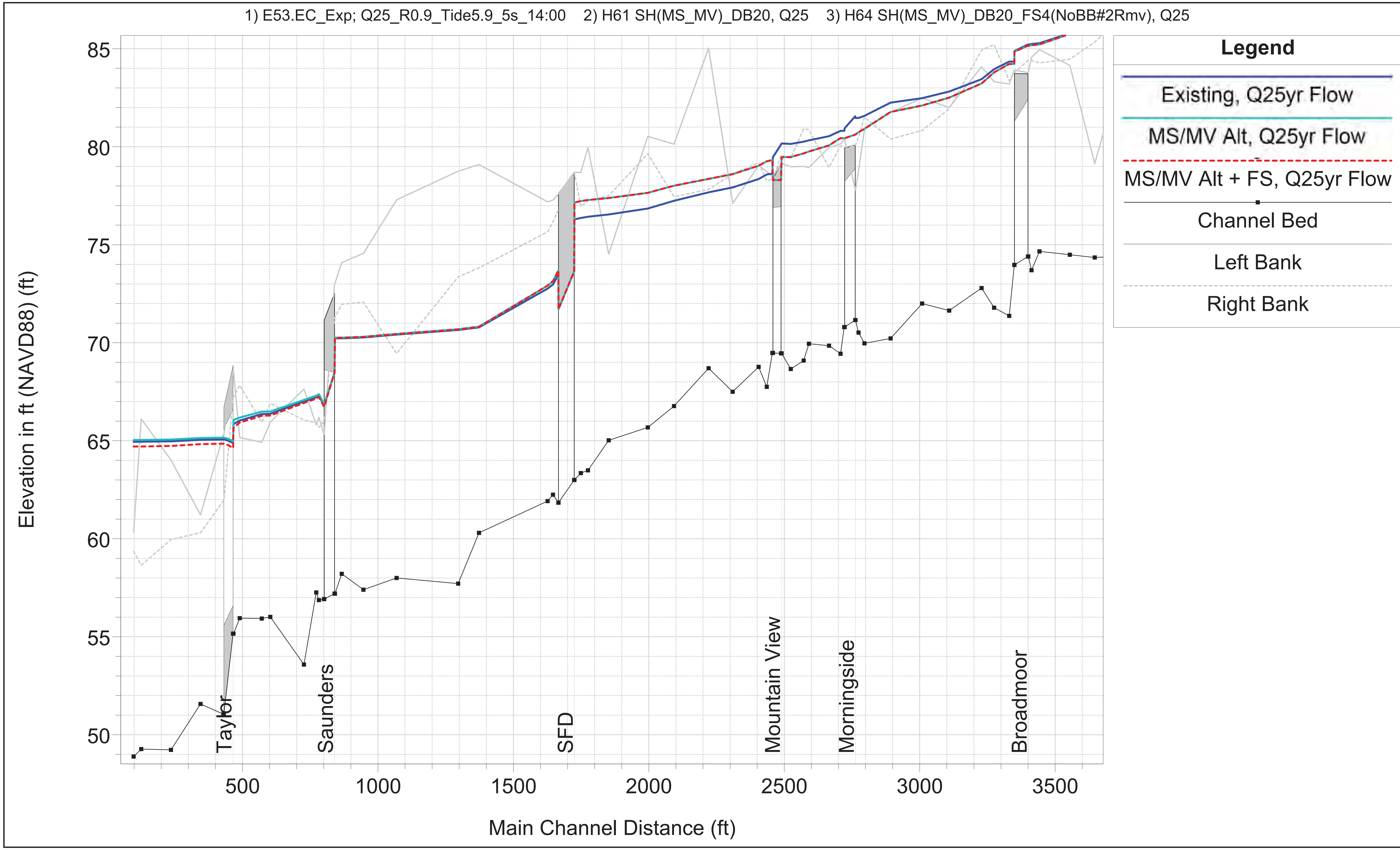


Figure 8c 100-Year Water Surface Profiles along Sleepy Hollow Creek

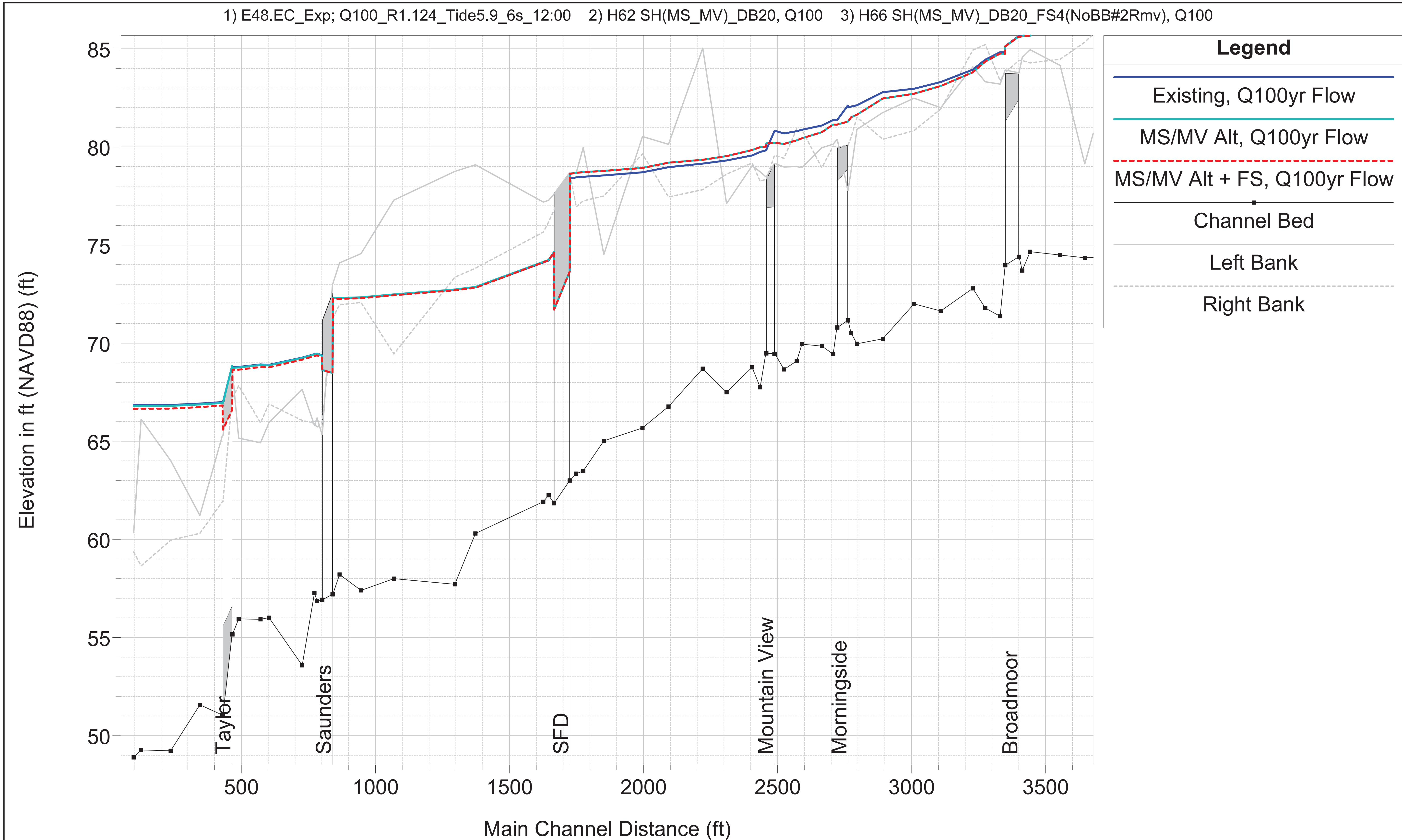
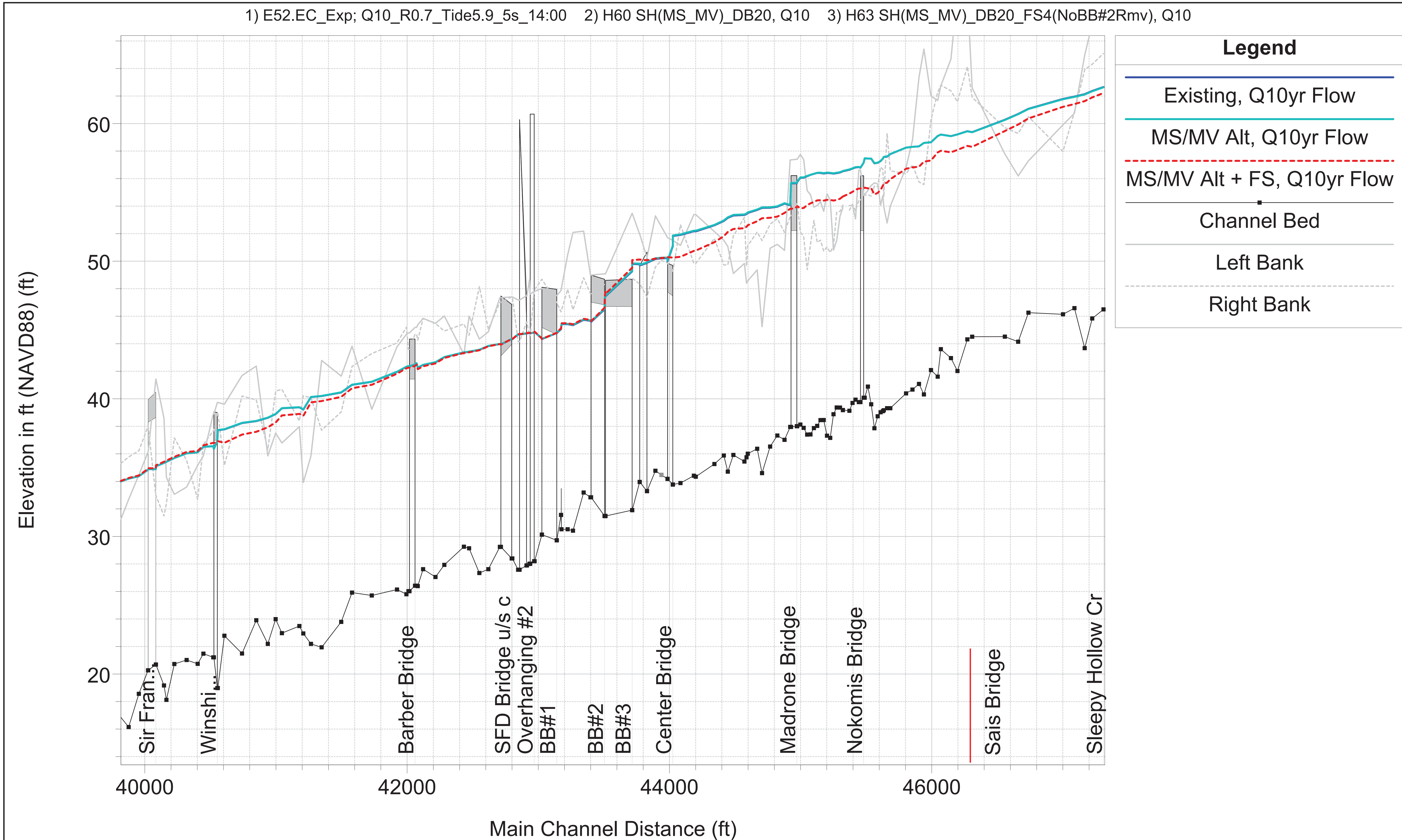


Figure 9a 10-Year Water Surface Profiles along San Anselmo Creek



Note: The Sais Ave footbridge is not included in the model and not shown in the graph This bridge is high and above the creek water surface elevation and, thus, has no backwater effect. The relatively high top of bank elevations at the Sais Ave footbridge shown in the graph is an indication of the high elevation of the bridge.

Figure 9b 25-Year Water Surface Profiles along San Anselmo Creek

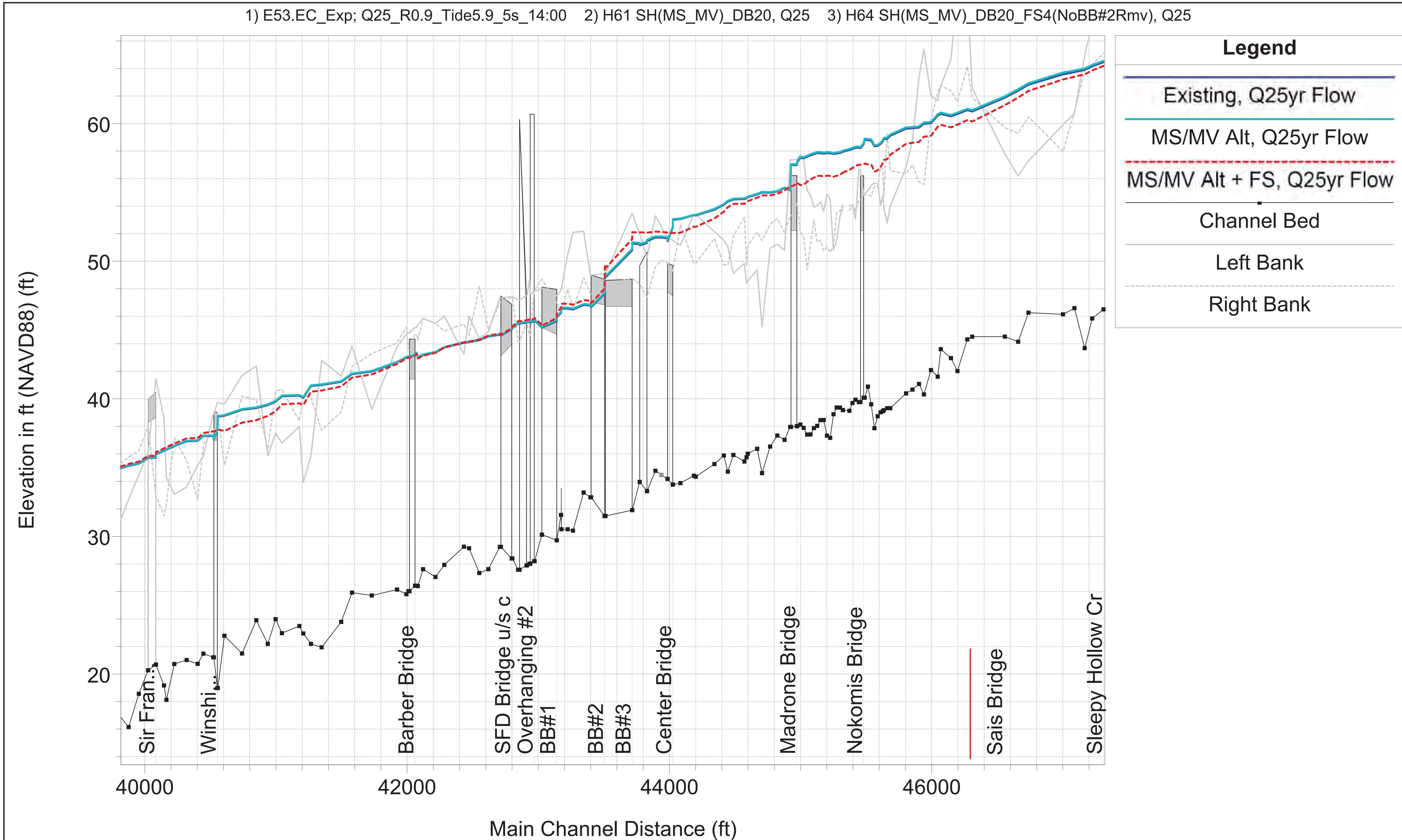


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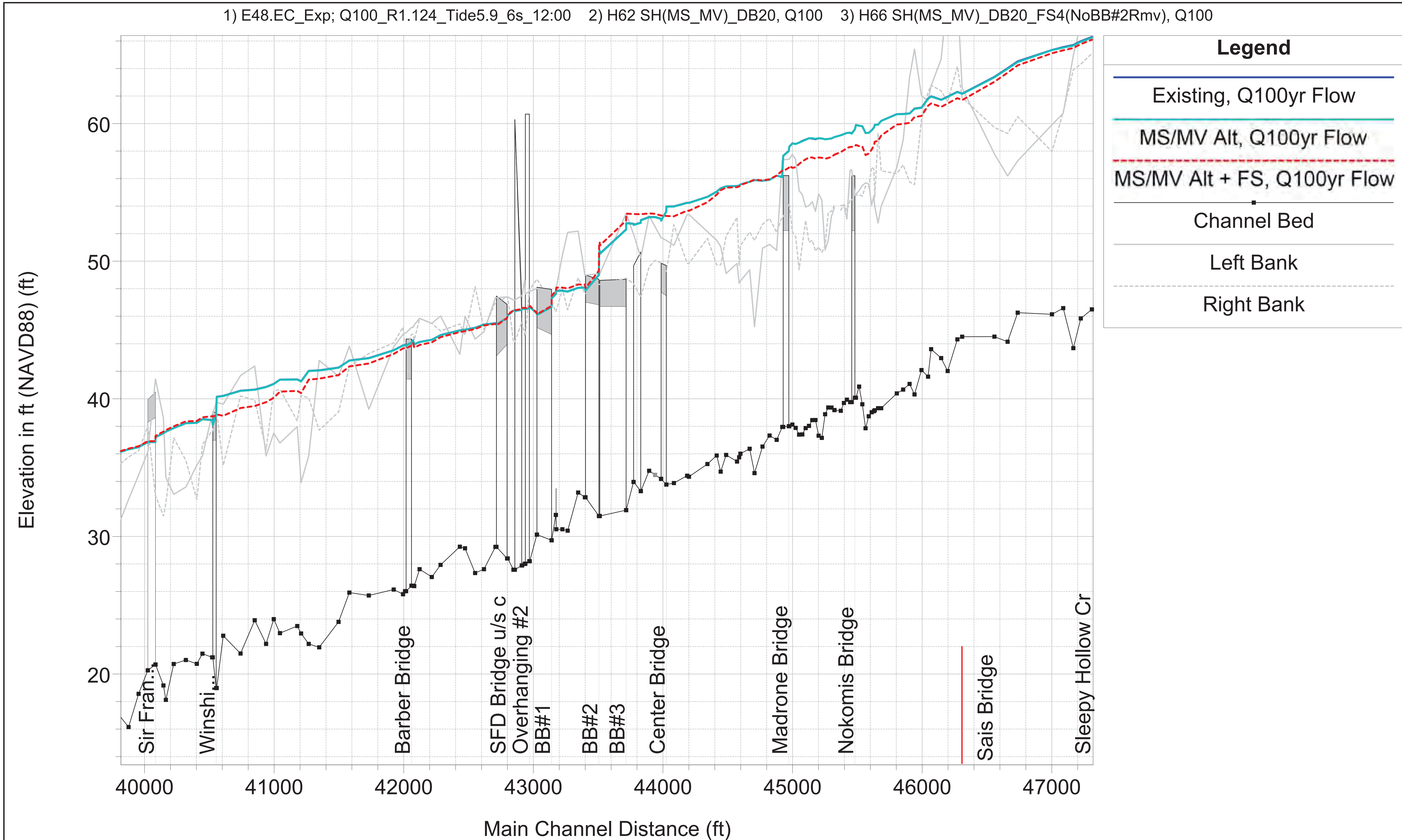
Figure 9c 100-Year Water Surface Profiles along San Anselmo Creek



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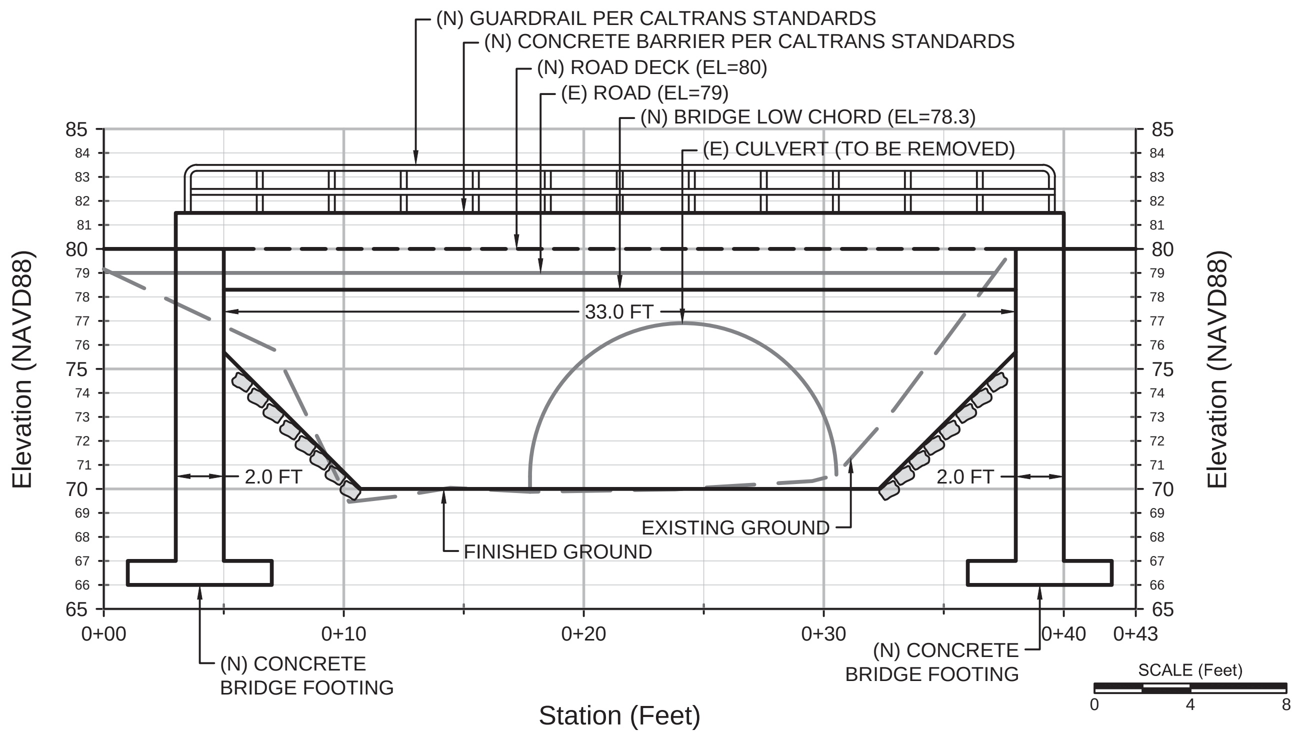
Attachment A

Conceptual Designs and Mountain View Replacement Bridge and Sunnyside Passive Detention Basin



LEGEND

- REMOVE EXISTING SEWER
- INSTALL NEW SEWER

N W E S

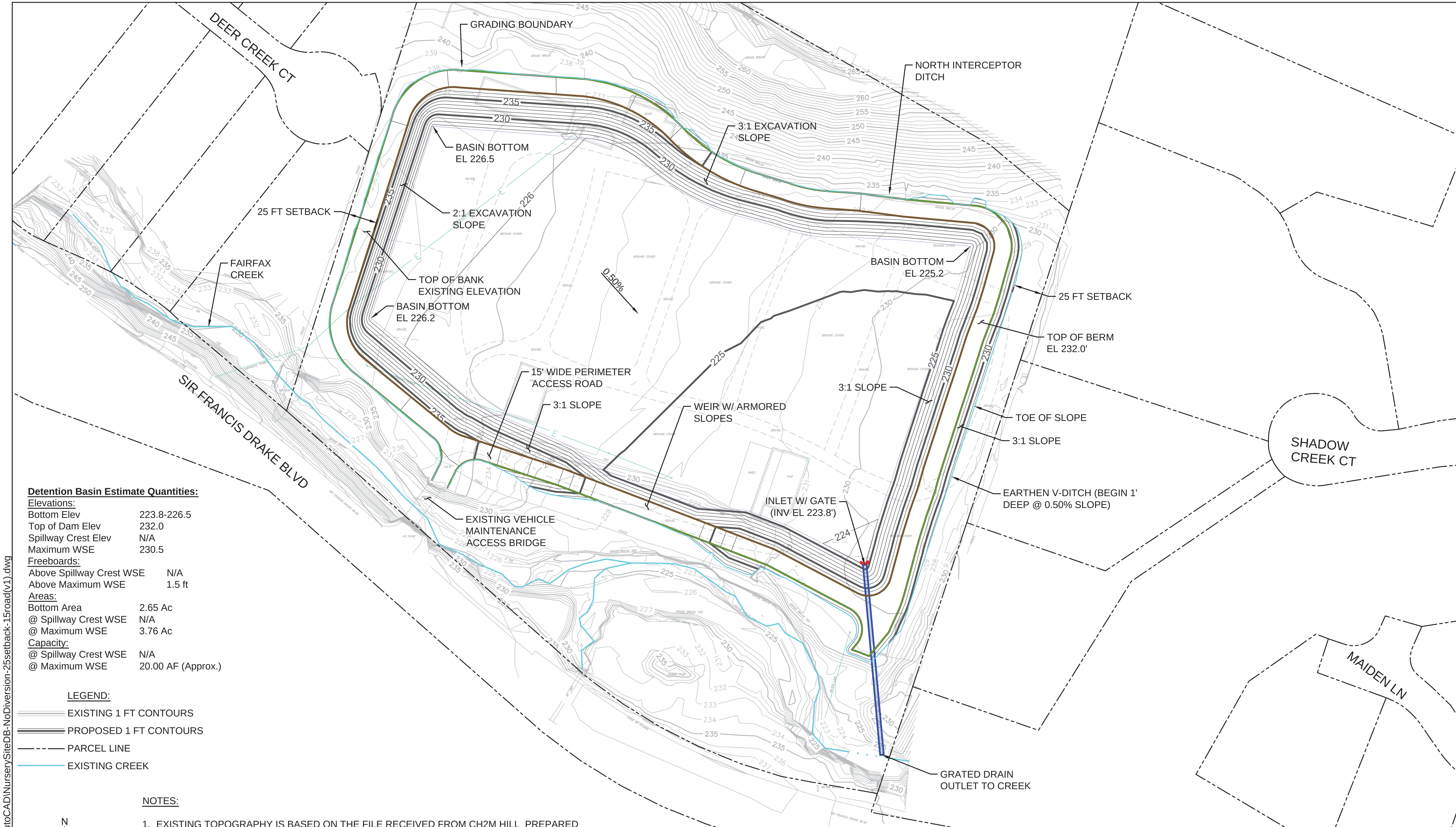
SCALE (Feet)
0 8 16

STETSON ENGINEERS INC.

DATE: NOVEMBER 30, 2016 | JN: 2431-16-1

MOUNTAIN VIEW AVE BRIDGE REPLACEMENT

F:\DATA\2431\AutoCAD\Sleepy Hollow\ConceptDesign.dwg



Detention Basin Estimate Quantities:

Elevations:

Bottom Elev	223.8-226.5
Top of Dam Elev	232.0
Spillway Crest Elev	N/A
Maximum WSE	230.5

Freeboards:

Above Spillway Crest WSE	N/A
Above Maximum WSE	1.5 ft

Areas:

Bottom Area	2.65 Ac
@ Spillway Crest WSE	N/A
@ Maximum WSE	3.76 Ac

Capacity:

@ Spillway Crest WSE	N/A
@ Maximum WSE	20.00 AF (Approx.)

LEGEND:

- EXISTING 1 FT CONTOURS
- PROPOSED 1 FT CONTOURS
- PARCEL LINE
- EXISTING CREEK

NOTES:

1. EXISTING TOPOGRAPHY IS BASED ON THE FILE RECEIVED FROM CH2M HILL PREPARED BY MERIDIAN SURVEYING ENGINEERING, INC. JUNE 2017.
2. PARCEL BOUNDARIES ARE BASED ON THE SHAPE FILES DOWNLOADED FROM THE COUNTY WEBSITE.
3. COORDINATES OF THIS DRAWING IS IN CALIFORNIA STATE PLANES, NAD83, ZONE 3.
4. VERTICAL DATUM IN THIS DRAWING IS NAVD88.

F:\DATA\2431\17-16\AutoCAD\NurserySiteDB-NoDiversion-25setback-15road(v1).dwg

STETSON ENGINEERS INC.

DATE: JANUARY 11, 2018 | JN: 2431-17-16

NURSERY SITE - PASSIVE BASIN

NO CREEK DIVERSION DETENTION BASIN OPTION WITH 25' SETBACK AND 15' PERIMETER ROAD

D-3 Supplemental Report on Hydraulic Analysis of San Anselmo Flood Risk Reduction Project, Option 2A: Hydraulic Analysis of Complete Removal of Building Bridge #2

Supplemental Report

on Hydraulic Analysis of San Anselmo Flood Risk Reduction Project, Option 2A:

Hydraulic Analysis of Complete Removal of Building Bridge #2

Stetson Engineers Inc.

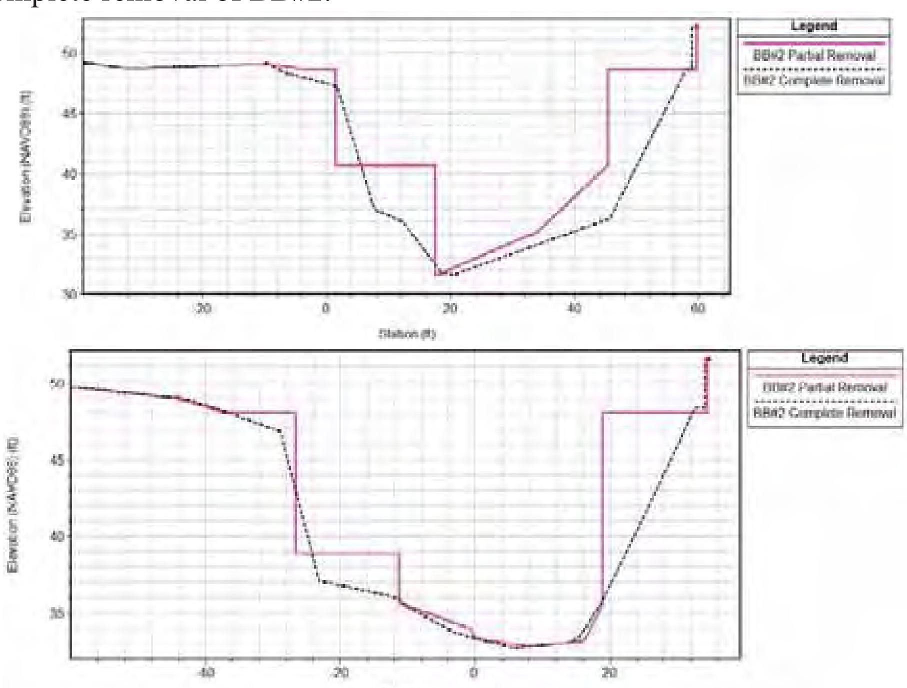
September 15, 2017

Introduction

The "Report on Hydraulic Analysis of San Anselmo Flood Risk Reduction Project, Option 2A" dated August 23, 2017 documented the hydraulic analysis of Option 2A which consists of partial removal of Building Bridge #2 (BB#2) and the Sunnyside Nursery detention basin. The report also included an assessment of both project effects and cumulative effects in conjunction with other foreseeable projects with regard to flooding.

This supplemental report documents the same hydraulic analysis and assessment, except that the partial removal of BB#2 in Option 2A is changed to complete removal of BB#2.

Stetson prepared a conceptual design for the complete removal of BB #2 in June 2014. In the conceptual design (attached), the building structure crossing the creek and all concrete foundation and retailing walls would be removed. Creek restoration measures would be implemented. For comparison, the concrete foundation and retailing walls would remain in the conceptual design for the partial removal of BB#2. The graph below compares cross sections for partial and complete removal of BB#2.



Comparison of Cross Sections between Partial Removal and Complete Removal of BB#2

(Top: upstream cross section at station 43507; Bottom: downstream cross section at station 43397)

Supplemental Hydraulic Modeling for Option 2A (Complete Removal of BB#2)

Stetson performed supplemental hydraulic modeling to assess the project effects and cumulative effects of Option 2A (complete removal of BB#2) with regard to flooding. The supplemental analysis used the same combined HEC-RAS1D/2D unsteady-flow model that was used in the hydraulic analysis of the partial removal of BB#2.

Similar to the hydraulic analysis of the partial removal of BB#2, the following three scenarios were analyzed:

- Existing Conditions (EC), to serve as the "Baseline" basis for comparison
- EC + Option 2A (complete removal of BB#2), to assess "Project" effects
- EC + Option 2A (complete removal of BB#2) + Foreseeable Projects, to assess "cumulative" effects

For each scenario, the following three flood events were analyzed:

- Q100, major, rare flood, similar to 12/31/05 and 1/4/82 floods
- Q25, moderate, infrequent flood
- Q10, minor, less infrequent flood

Results of Hydraulic Analysis in Terms of Floodplain Inundation

In terms of comparison to partial removal of BB#2, results of modeling complete removal of BB#2 only show differences in floodplain inundation in the Downtown San Anselmo area. Therefore, only the results for the Downtown San Anselmo area are shown in this supplemental report. The results for other areas (i.e., Fairfax, Sleepy Hollow, and Ross/Kentfield) are the same as those under partial removal and, therefore, are not shown in this supplemental report. For easier comparison of the results for partial removal and complete removal, the same figure numbering used in the 8/23/2017 report for partial removal was applied in this supplemental report. For example, in both the 8/23/2017 report and this supplemental report, Figure 2c shows the 10-year floodplain inundation results for the Downtown San Anselmo Area (Upper).

Figures 2c and 2d show the changes in the HEC-RAS model-simulated floodplain inundation extent and depth between Option 2A (complete removal of BB#2) and existing conditions for the 10-year flood for the Downtown San Anselmo area. Similarly, Figures 3c and 3d show the model-simulated results for the 25-year flood, and Figures 4c and 4d for the 100-year flood.

Figures 5c and 5d show the changes in the HEC-RAS model-simulated floodplain inundation extent and depth between Option 2A (complete removal of BB#2) + Foreseeable Projects and existing conditions for the 10-year flood in the Downtown San Anselmo area. Similarly, Figures 6c and 6d show the model-simulated results for the 25-year flood, and Figures 7c and 7d for the 100-year flood.

In general, complete removal of BB#2 has the similar floodplain inundation extent as partial removal of BB#2 under the three different flood conditions (10-year, 25-year, and 100-year). Complete removal of BB#2 would reduce floodplain inundation depth just slightly more than partial removal of BB#2 by up to 0.1 ft.

Option 2A (complete removal of Building Bridge #2) would slightly increase flooding in the area between Winship and Barber Bridges during the 25-year and 100-year floods (see Figures 3d and 4d). This increase is similar to the increase resulting from partial removal of BB#2. Option 2A (complete removal of Building Bridge #2) + the Foreseeable Projects would mitigate for the slight increase in flooding caused by Option 2A alone.

Results of Hydraulic Analysis in Terms of Channel Water Surface Level

Figures 8 to 10 compare the HEC-RAS model-simulated in-channel water surface profiles along the San Anselmo Creek for partial removal with complete removal of BB#2 for the 10-year flood, 25-year flood, and 100-year flood, respectively, under the Option 2A condition.

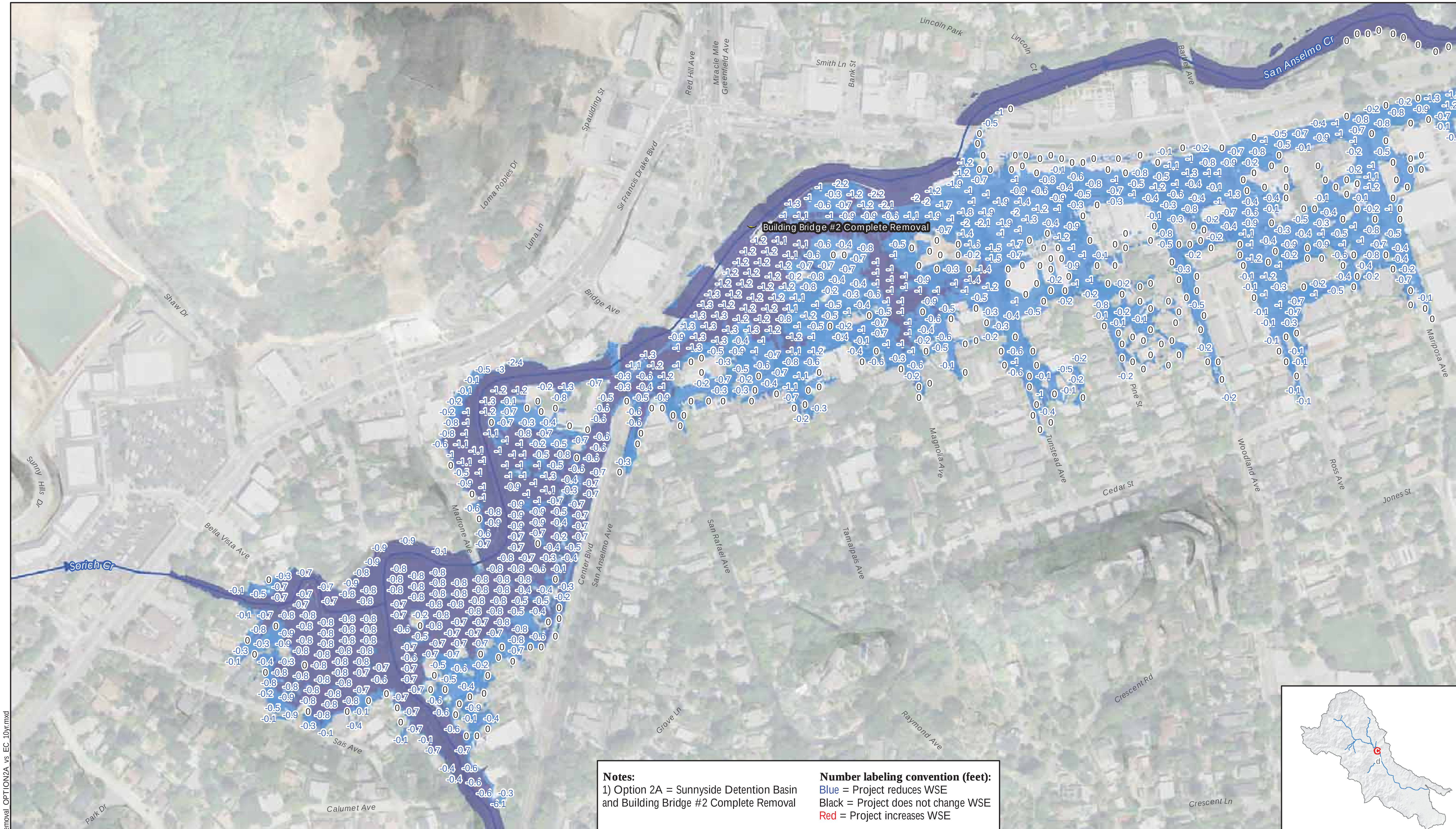
Similarly, Figures 11 to 13 compare the simulated in-channel water surface profiles along the San Anselmo Creek for partial removal with complete removal of BB#2 under the Option 2A + Foreseeable Projects condition.

Complete removal of BB#2 would lower the in-channel water surface elevation at the upstream face of BB#2 slightly more than partial removal of BB#2 by up to 0.1 ft.

Results of Hydraulic Analysis in Terms of Channel Hydraulic Capacity

Compared to partial removal of BB#2, complete removal of BB#2 provides negligible increase in channel hydraulic capacity because its lowering of the in-channel water surface elevation is minimal.

FIGURE 2c



Notes:
1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

Document Path: J:\jn2646\FullRemoval_OPTION2A_vs_EC_10yr.mxd

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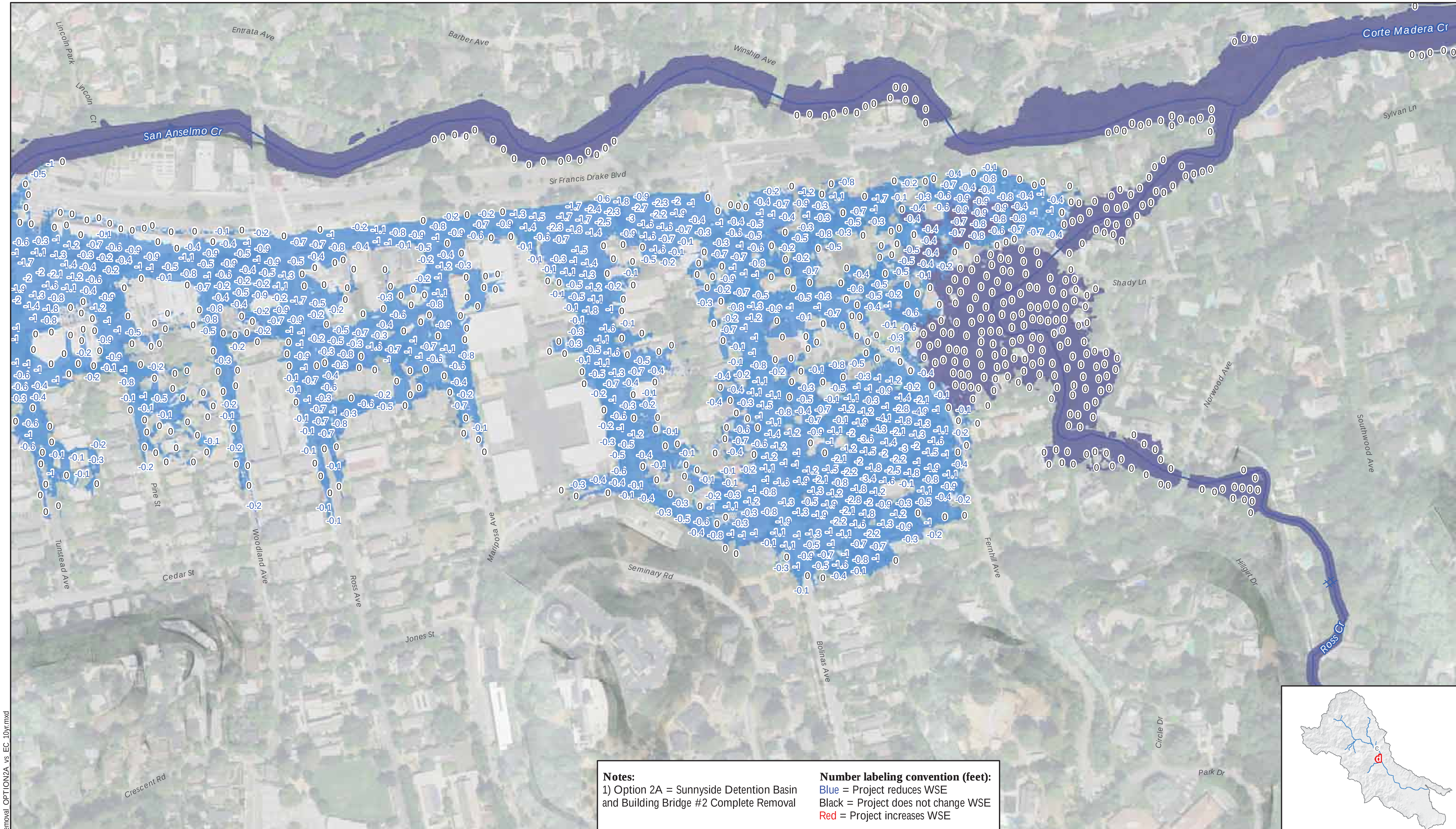
Existing Inundation
Option 2A Inundation
Existing Inundation & Option 2A Inundation
Creek (flow direction)
Option 2A Project

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) AND EXISTING CONDITIONS FOR 10-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (UPPER)

0 110 220 Feet

FIGURE 2d



Notes:
1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

Document Path: J:\jn2646\FullRemoval_OPTION2A_vs_EC_10yr.mxd

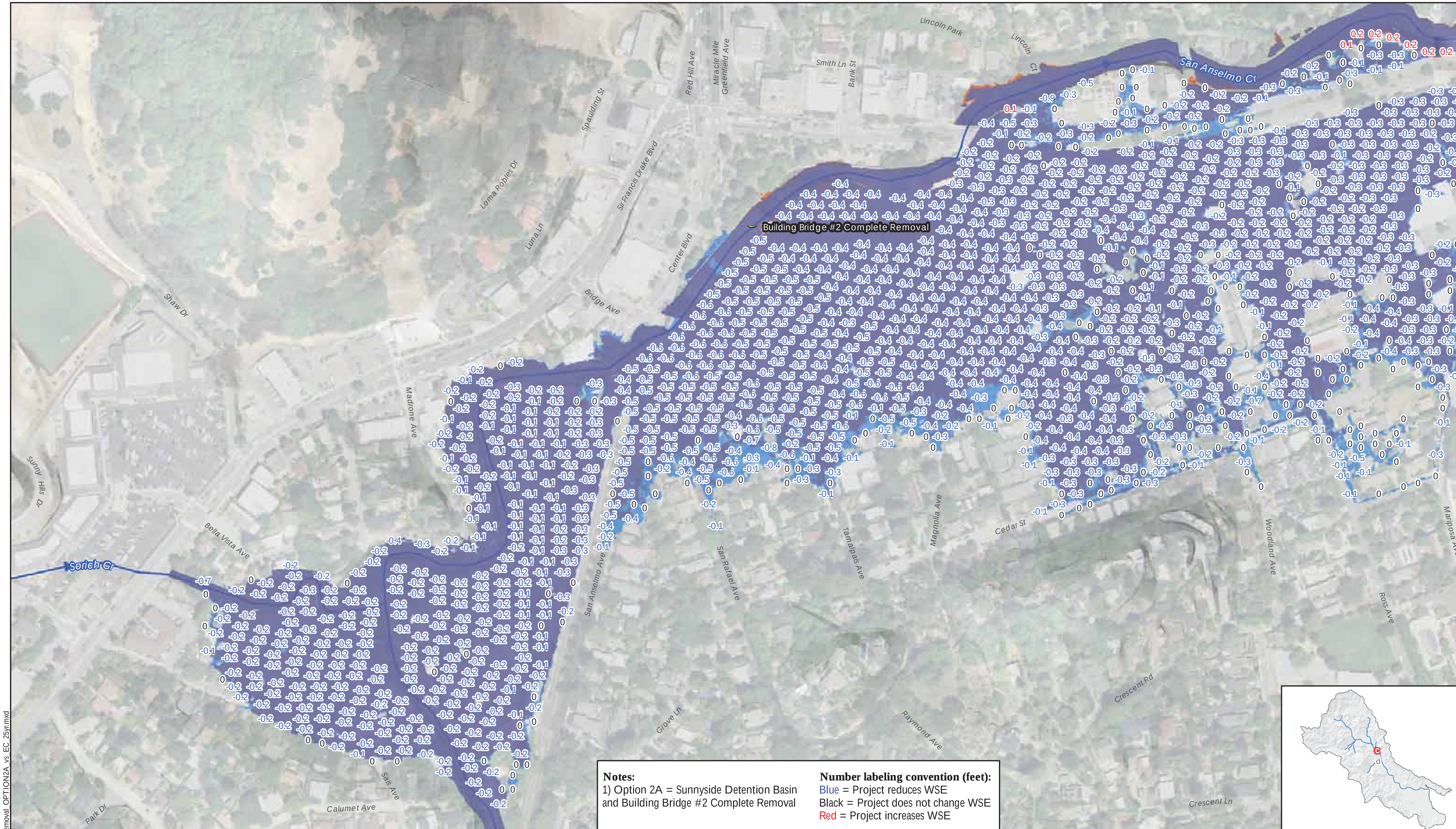
STETSON ENGINEERS INC.

Existing Inundation
Option 2A Inundation
Existing Inundation & Option 2A Inundation
Creek (flow direction)

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) AND EXISTING CONDITIONS FOR 10-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (LOWER)

0 100 200 Feet

FIGURE 3c



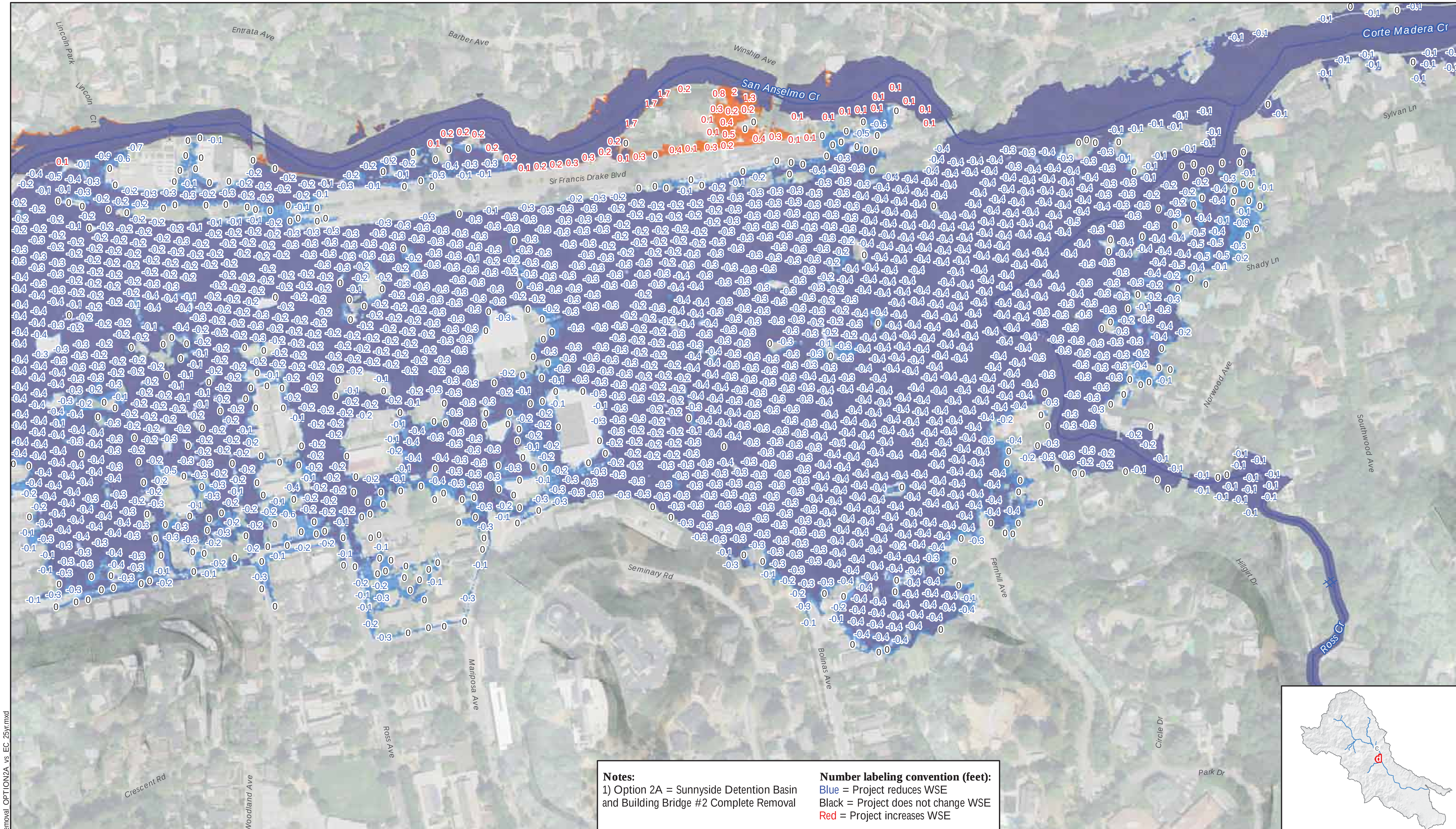
Existing Inundation
Option 2A Inundation
Existing Inundation & Option 2A Inundation
Creek (flow direction)
Option 2A Project

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) AND EXISTING CONDITIONS FOR 25-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (UPPER)

0 110 220 Feet

STETSON ENGINEERS INC.

Document Path: J:\jn2646\FullRemoval_OPTION2A_vs_EC_25yr.mxd



Notes:
1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

Existing Inundation
Option 2A Inundation
Existing Inundation & Option 2A Inundation
Creek (flow direction)

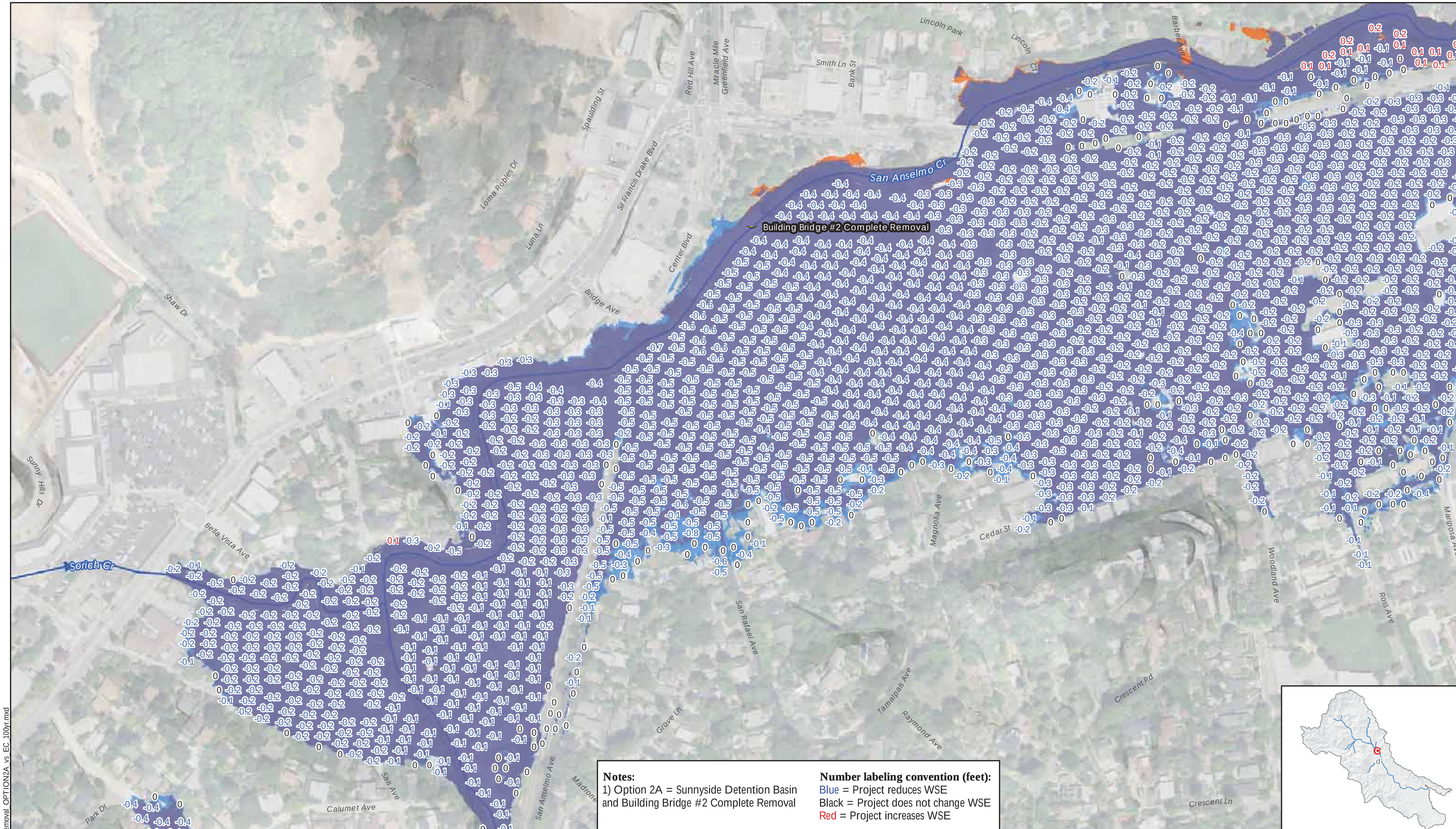
STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) AND EXISTING CONDITIONS FOR 25-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (LOWER)

0 100 200 Feet

Document Path: J:\jn2646\FullRemoval_OPTION2A_vs_EC_25yr.mxd

FIGURE 4c



STETSON ENGINEERS INC.

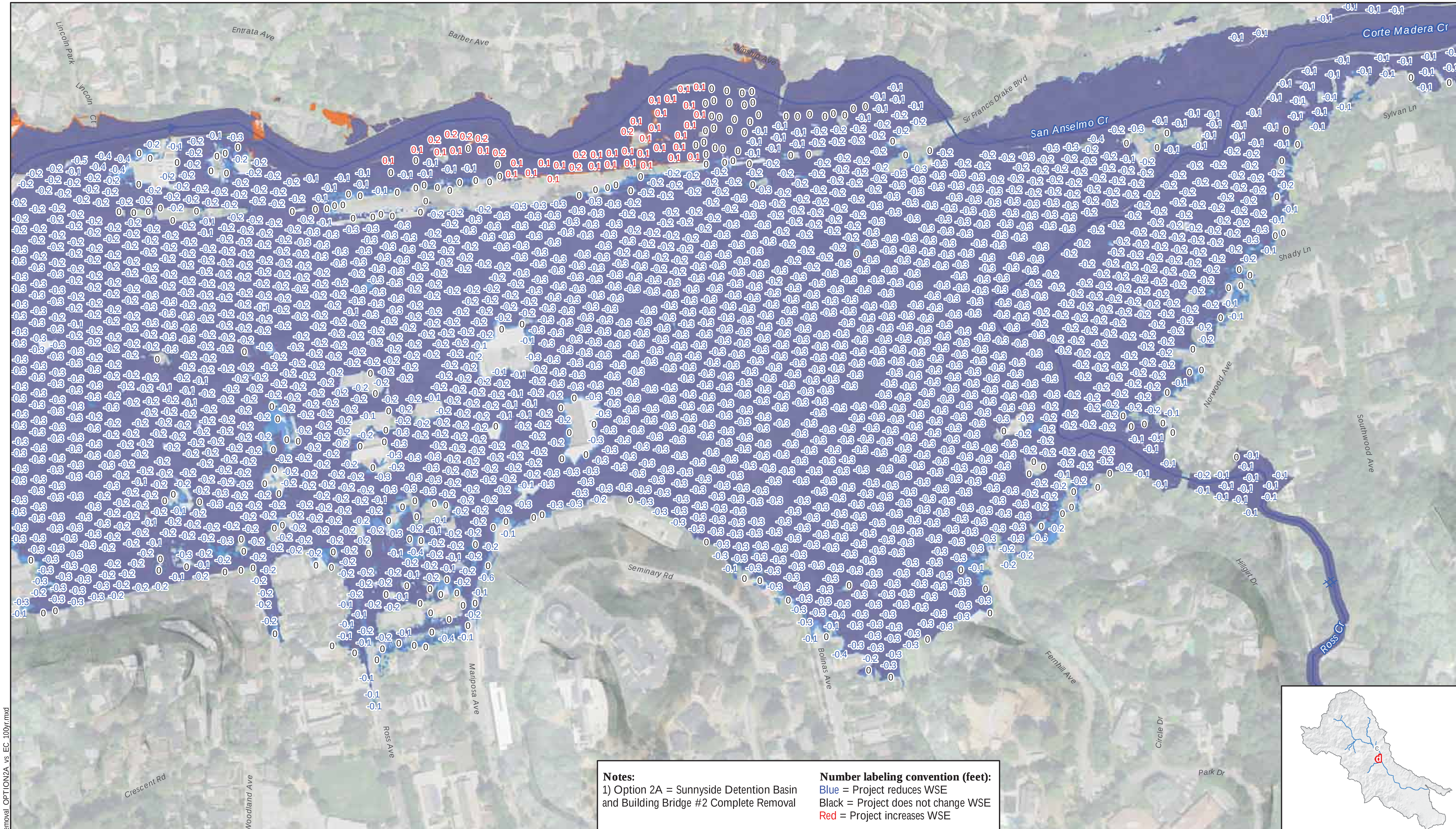
Existing Inundation
Option 2A Inundation
Existing Inundation & Option 2A Inundation
Creek (flow direction)
Option 2A Project

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) AND EXISTING CONDITIONS FOR 100-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (UPPER)

0 110 220 Feet

Document Path: J:\jn2646\FullRemoval_OPTION2A_vs_EC_100yr.mxd

FIGURE 4d



Notes:
1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

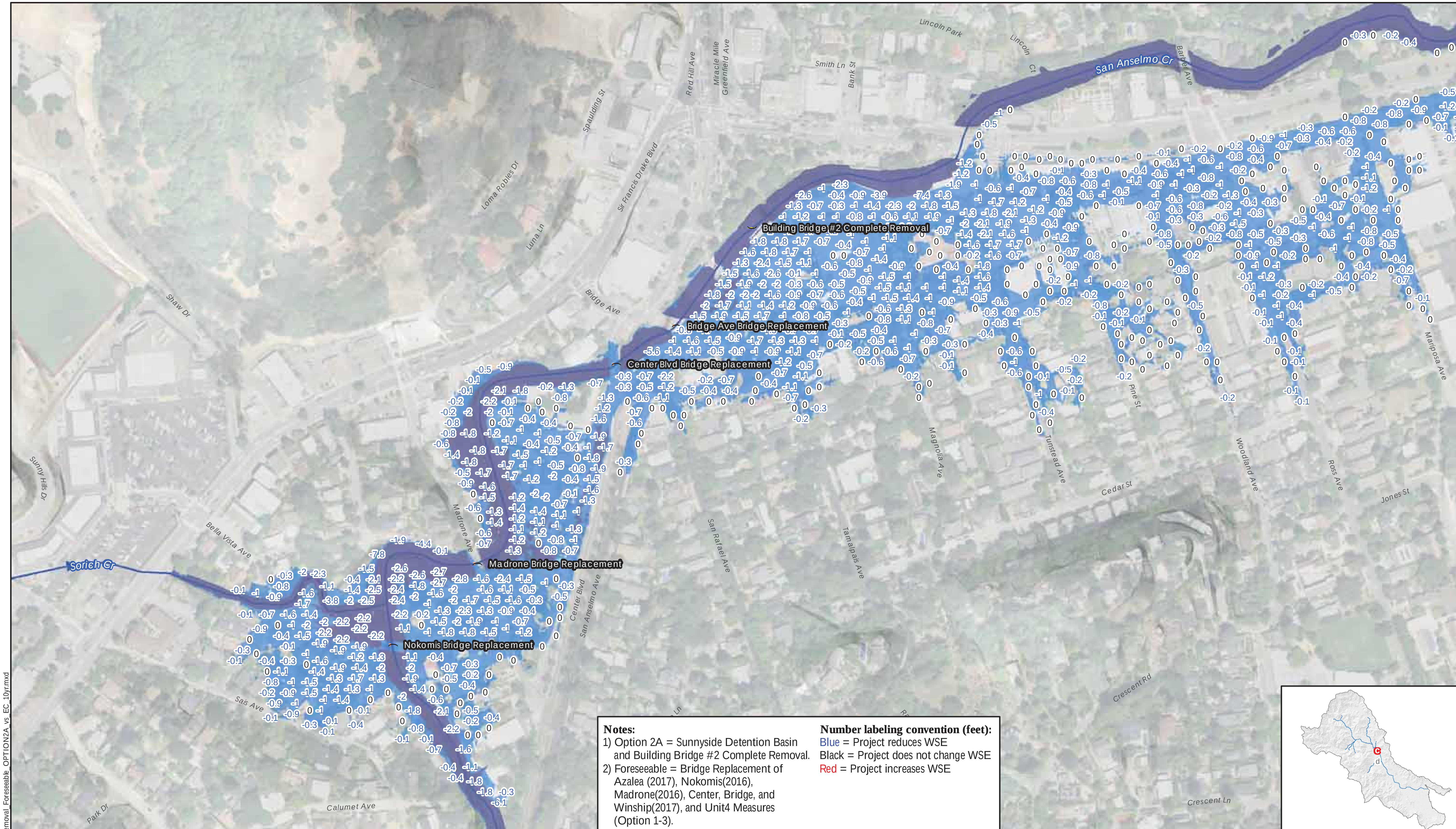
Existing Inundation
Option 2A Inundation
Existing Inundation & Option 2A Inundation
Creek (flow direction)

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) AND EXISTING CONDITIONS FOR 100-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (LOWER)

0 100 200 Feet

Document Path: J:\jn2646\FullRemoval_OPTION2A_vs_EC_100yr.mxd



Notes:
1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal.
2) Foreseeable = Bridge Replacement of Azalea (2017), Nokomis(2016), Madrone(2016), Center, Bridge, and Winship(2017), and Unit4 Measures (Option 1-3).

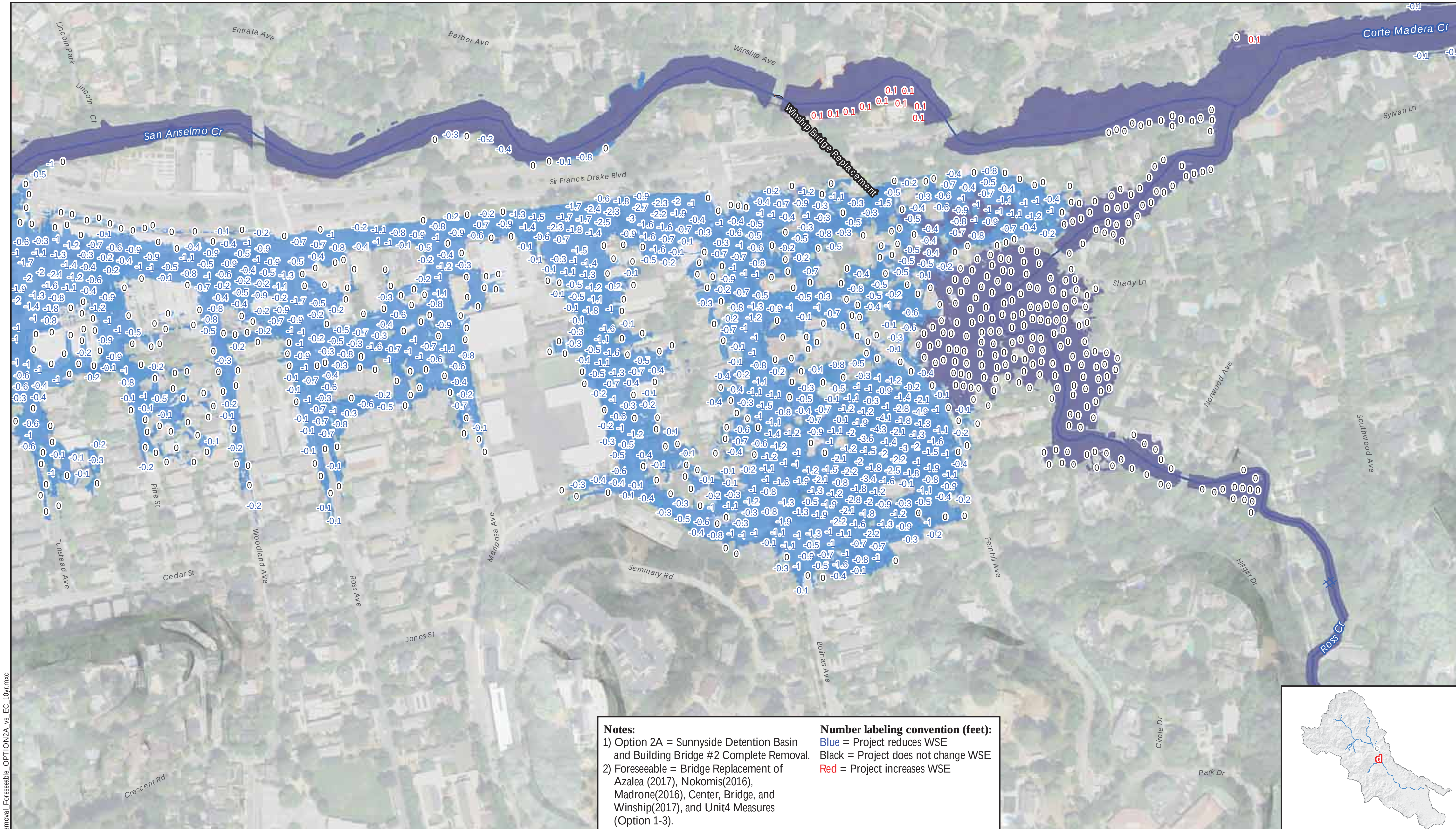
Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

Existing Inundation
Option 2A + Foreseeable Inundation
Existing Inundation & Option 2A + Foreseeable Inundation
Creek (flow direction)
Option 2A Project
Foreseeable Project

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) + FORESEEABLE PROJECTS AND EXISTING CONDITIONS FOR 10-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (UPPER)

0 110 220
Feet



Notes:
1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal.
2) Foreseeable = Bridge Replacement of Azalea (2017), Nokomis(2016), Madrone(2016), Center, Bridge, and Winship(2017), and Unit4 Measures (Option 1-3).

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

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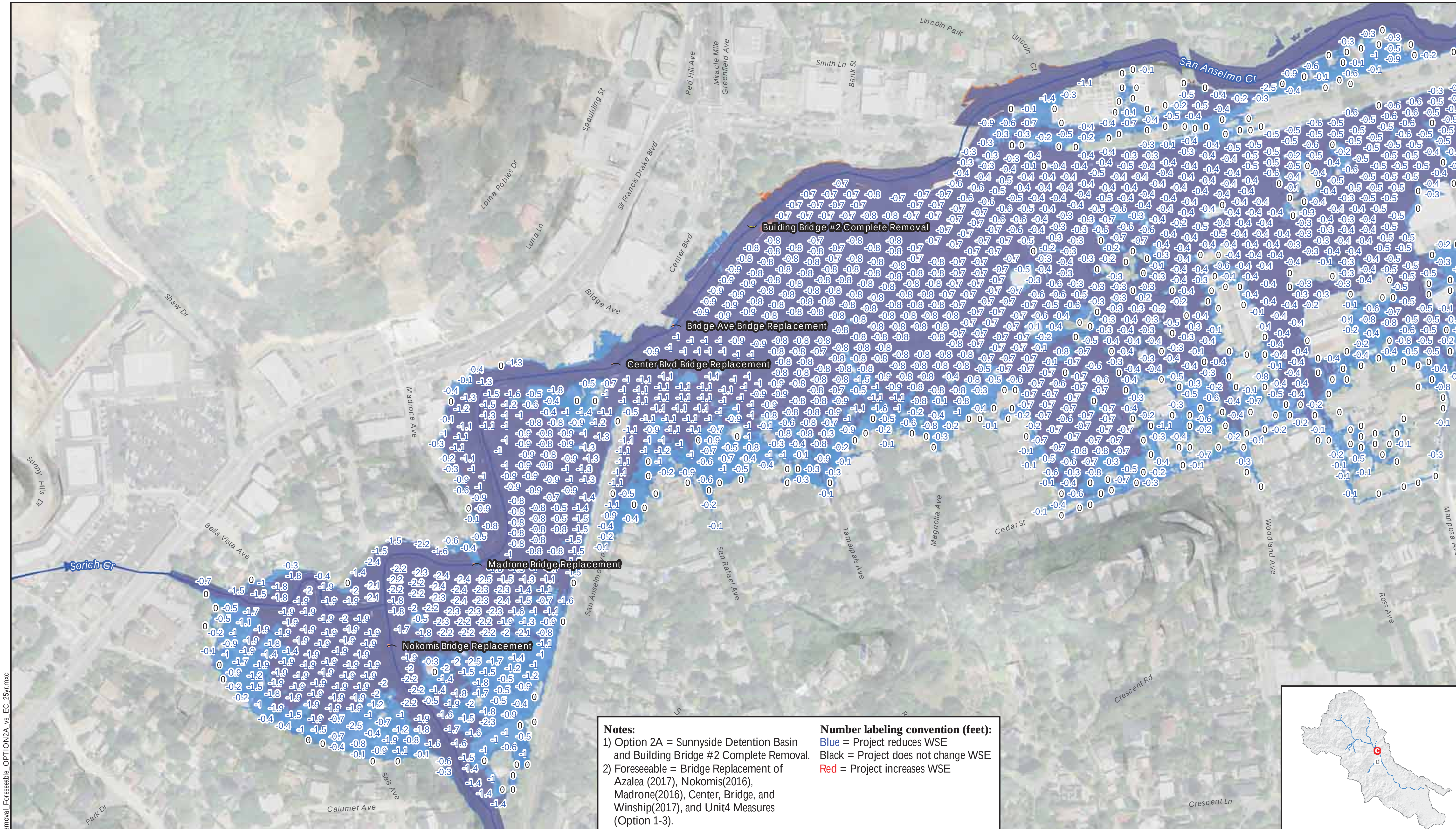
Existing Inundation
Option 2A + Foreseeable Inundation
Existing Inundation & Option 2A + Foreseeable Inundation
Creek (flow direction)
Option 2A Project
Foreseeable Project

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) + FORESEEABLE PROJECTS AND EXISTING CONDITIONS FOR 10-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (LOWER)

0 100 200 Feet

Document Path: J:\jn2646\FullRemoval_Foreseeable_OPTION2A_vs_EC_10yr.mxd

FIGURE 6c



Notes:
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2) Foreseeable = Bridge Replacement of Azalea (2017), Nokomis(2016), Madrone(2016), Center, Bridge, and Winship(2017), and Unit4 Measures (Option 1-3).

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

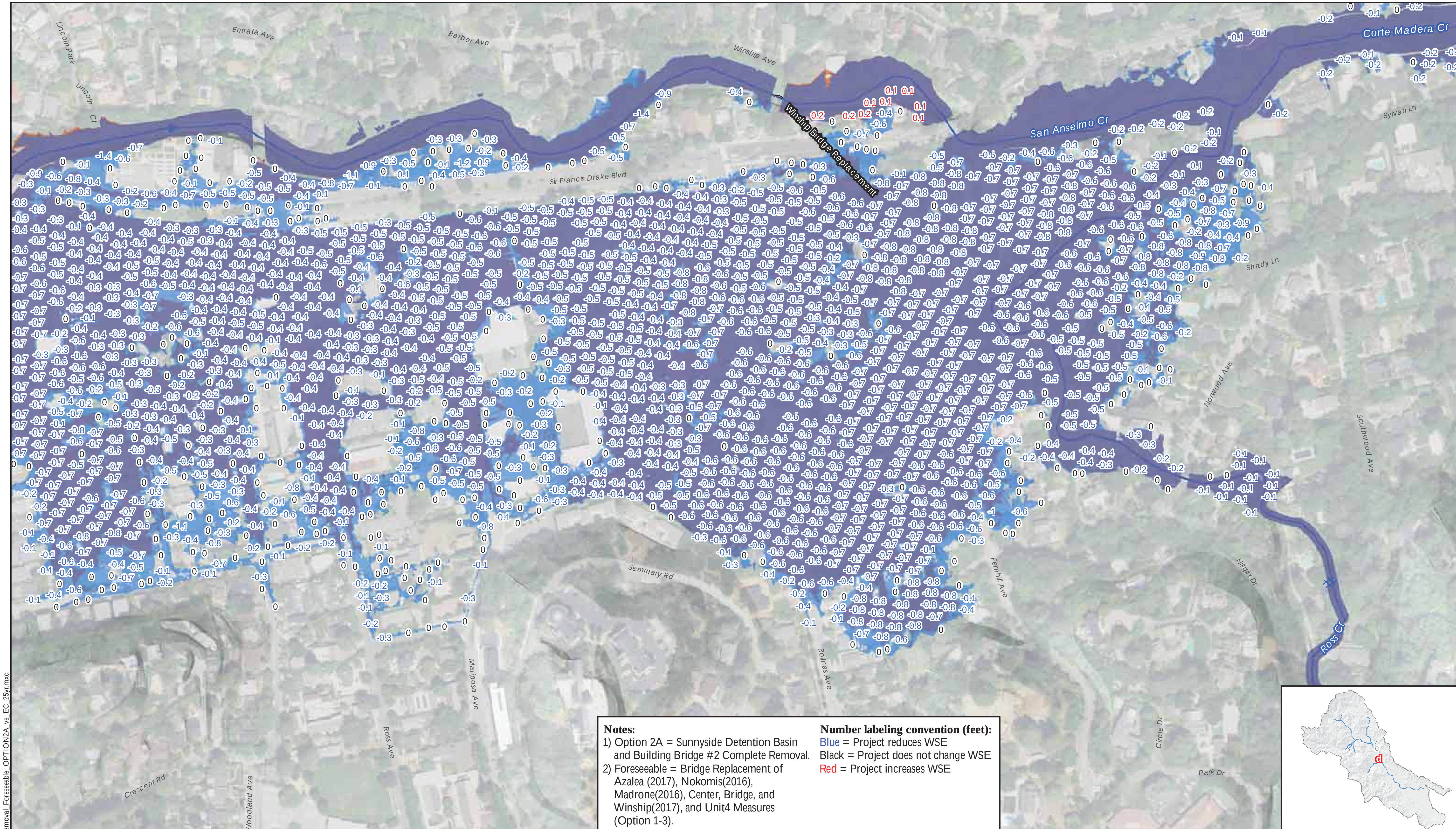
Document Path: J:\jn2646\FullRemoval_Foreseeable_OPTION2A_vs_EC_25yr.mxd

STETSON ENGINEERS INC.

Existing Inundation
Option 2A + Foreseeable Inundation
Existing Inundation & Option 2A + Foreseeable Inundation
Creek (flow direction)
Option 2A Project
Foreseeable Project

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) + FORESEEABLE PROJECTS AND EXISTING CONDITIONS FOR 25-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (UPPER)

0 110 220 Feet



Notes:
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2) Foreseeable = Bridge Replacement of Azalea (2017), Nokomis(2016), Madrone(2016), Center, Bridge, and Winship(2017), and Unit4 Measures (Option 1-3).

Number labeling convention (feet):
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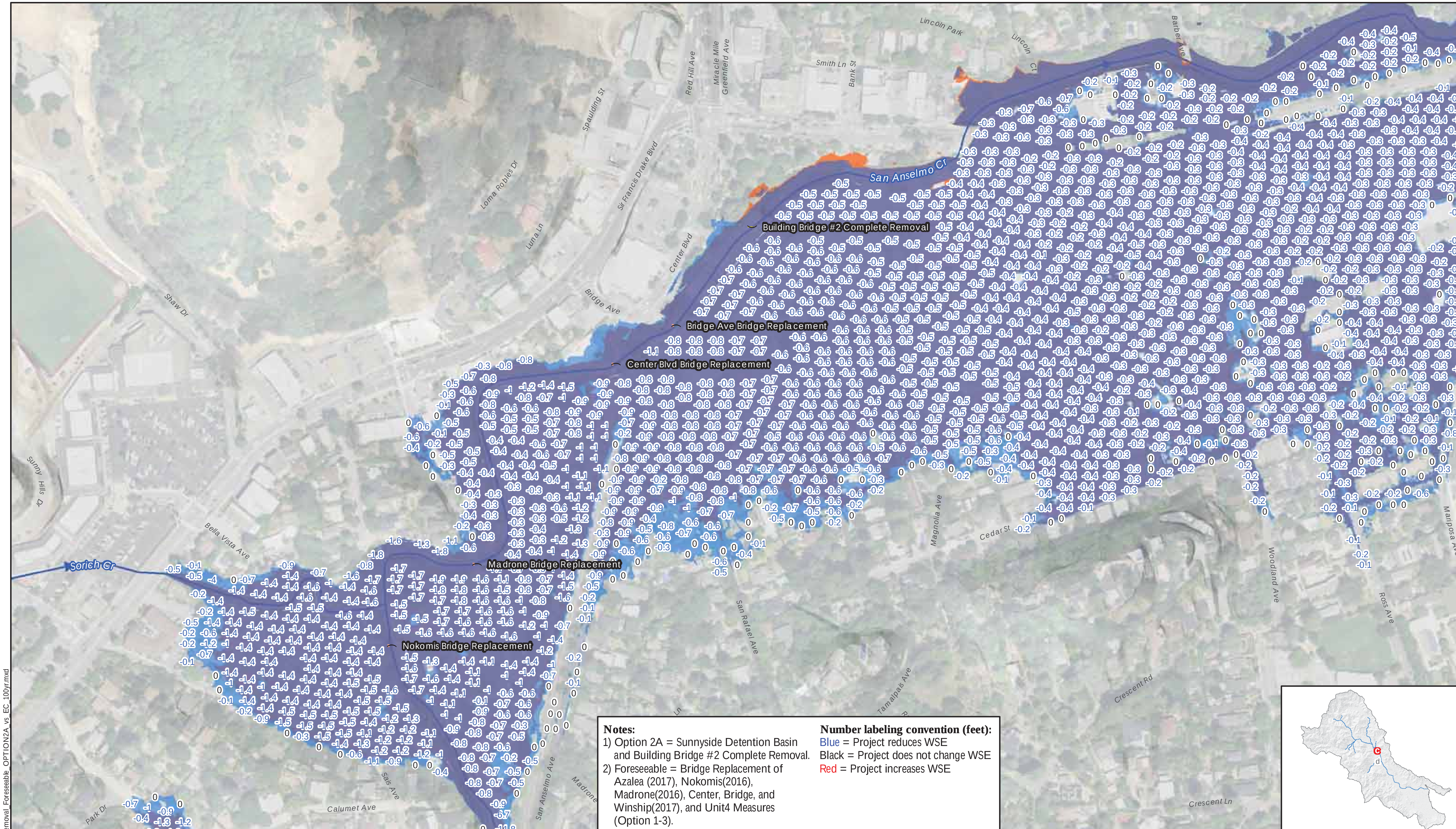
Document Path: J:\jn2646\FullRemoval_Foreseeable_OPTION2A_vs_EC_25yr.mxd

STETSON ENGINEERS INC.

Existing Inundation
Option 2A + Foreseeable Inundation
Existing Inundation & Option 2A + Foreseeable Inundation
Creek (flow direction)
Foreseeable Project

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) + FORESEEABLE PROJECTS AND EXISTING CONDITIONS FOR 25-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (LOWER)

0 100 200 Feet



Notes:
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2) Foreseeable = Bridge Replacement of Azalea (2017), Nokomis(2016), Madrone(2016), Center, Bridge, and Winship(2017), and Unit4 Measures (Option 1-3).

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

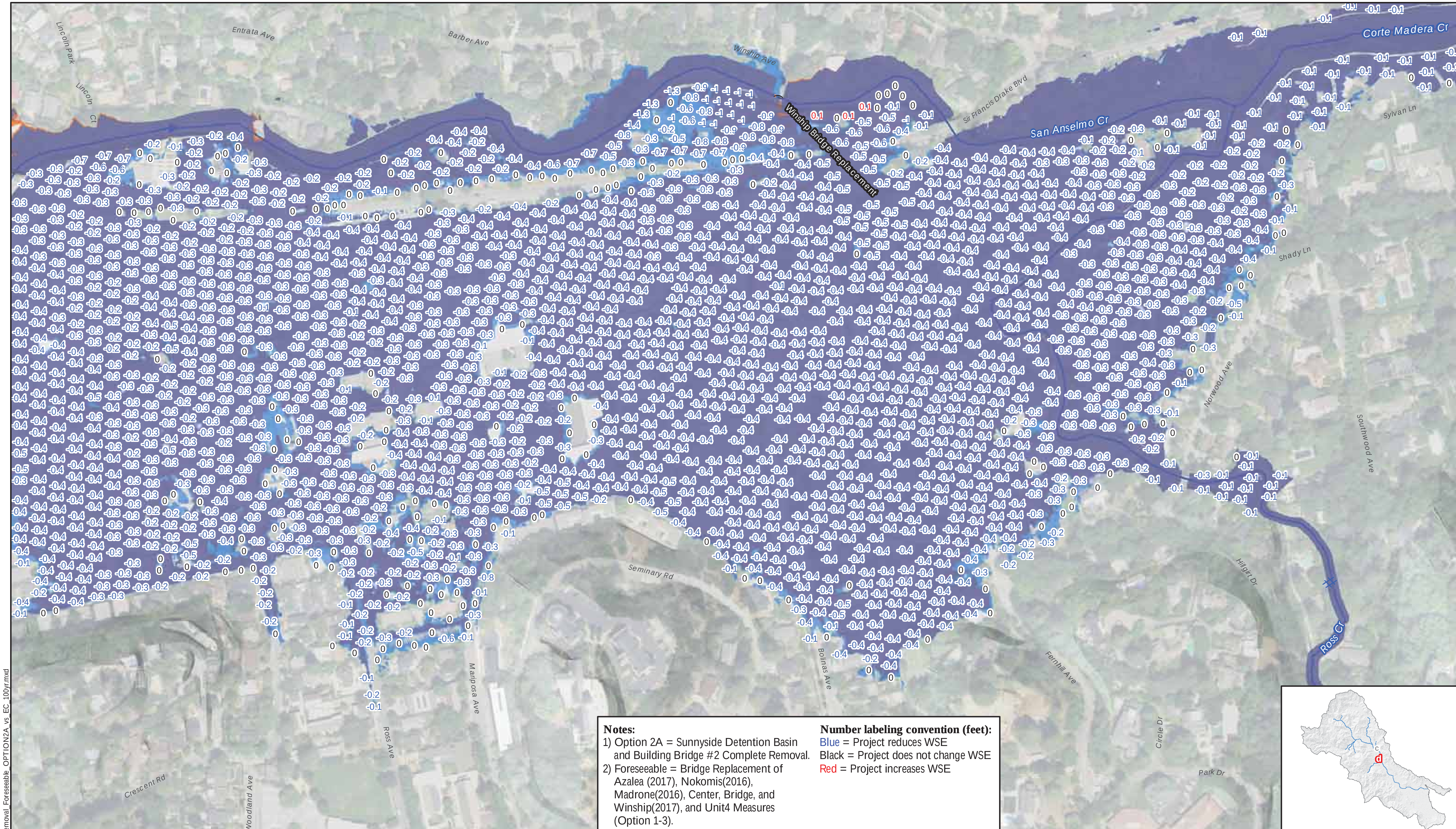
Existing Inundation
Option 2A + Foreseeable Inundation
Existing Inundation & Option 2A + Foreseeable Inundation
Creek (flow direction)
Option 2A Project
Foreseeable Project

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) + FORESEEABLE PROJECTS AND EXISTING CONDITIONS FOR 100-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (UPPER)

0 110 220 Feet

FIGURE 7d



Notes:
1) Option 2A = Sunnyside Detention Basin and Building Bridge #2 Complete Removal.
2) Foreseeable = Bridge Replacement of Azalea (2017), Nokomis(2016), Madrone(2016), Center, Bridge, and Winship(2017), and Unit4 Measures (Option 1-3).

Number labeling convention (feet):
Blue = Project reduces WSE
Black = Project does not change WSE
Red = Project increases WSE

Existing Inundation
Option 2A + Foreseeable Inundation
Existing Inundation & Option 2A + Foreseeable Inundation
Creek (flow direction)
Foreseeable Project

STETSON ENGINEERS INC.

CHANGE IN HEC-RAS-SIMULATED INUNDATION EXTENT AND DEPTH BETWEEN OPTION 2A (COMPLETE REMOVAL) + FORESEEABLE PROJECTS AND EXISTING CONDITIONS FOR 100-YEAR FLOOD DOWNTOWN SAN ANSELMO AREA (LOWER)

0 100 200 Feet

Document Path: J:\jn2646\FullRemoval_Foreseeable_OPTION2A_vs_EC_100yr.mxd

Figure 8 Comparison of Water Surface Profiles along the San Anselmo Creek between Complete and Partial Removal of BB#2 , 10-Year Flow (Upper/Lower San Anselmo Area), **Option 2A**

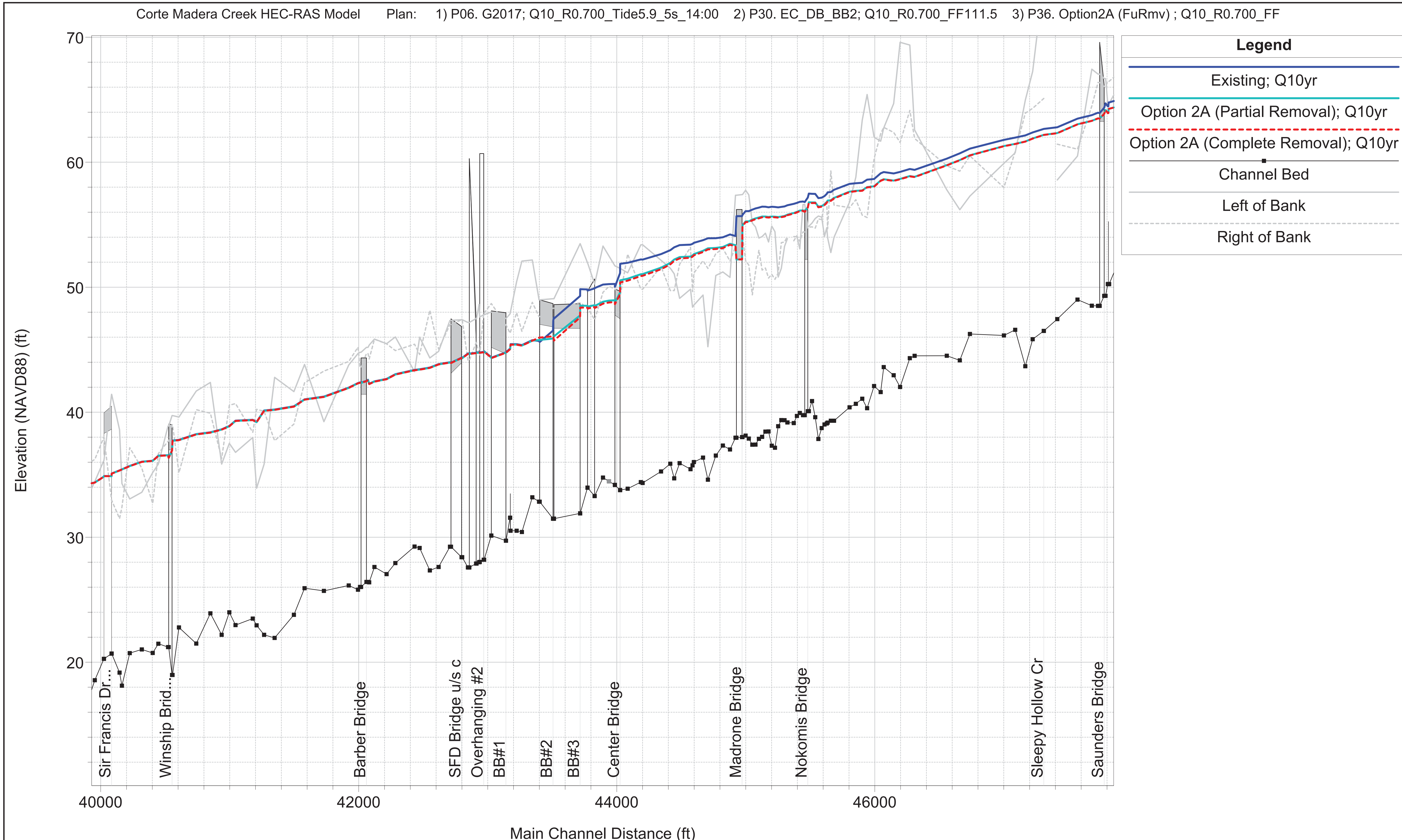


Figure 9 Comparison of Water Surface Profiles along the San Anselmo Creek between Complete and Partial Removal of BB#2 , 25-Year Flow (Upper/Lower San Anselmo Area), **Option 2A**

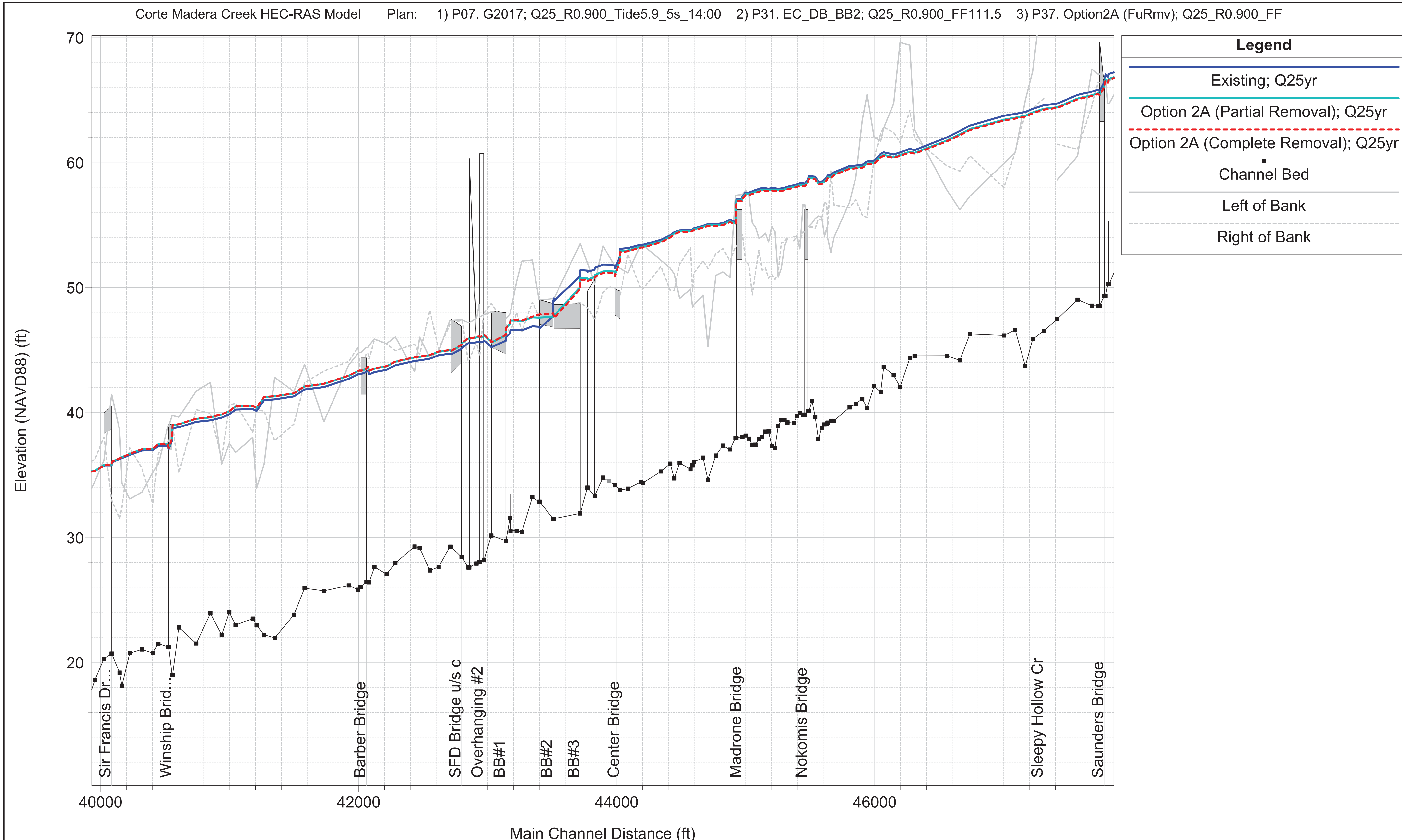


Figure 10 Comparison of Water Surface Profiles along the San Anselmo Creek between Complete and Partial Removal of BB#2 , 100-Year Flow (Upper/Lower San Anselmo Area), **Option 2A**

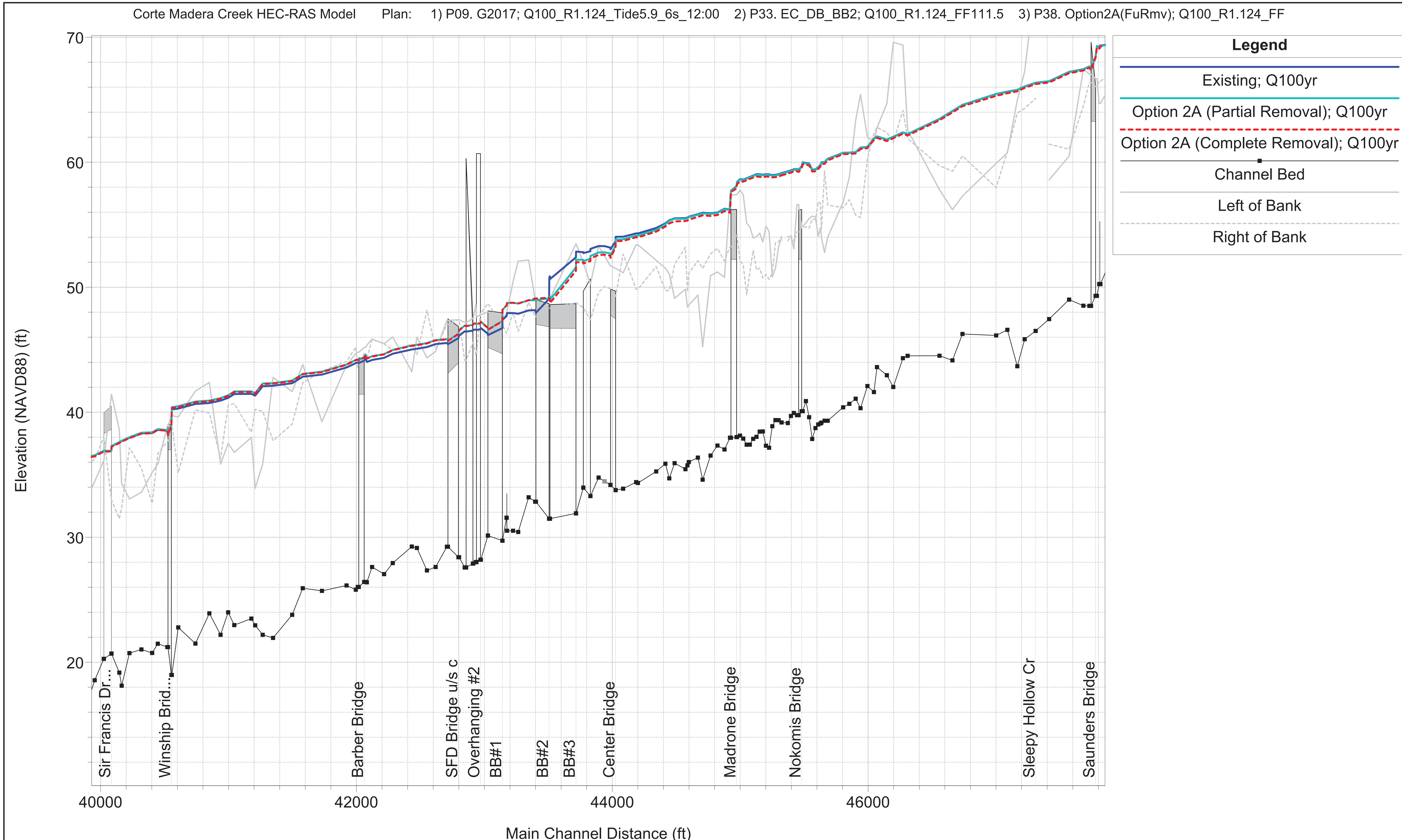


Figure 11 Comparison of Water Surface Profiles along the San Anselmo Creek between Complete and Partial Removal of BB#2 , 10-Year Flow (Upper/Lower San Anselmo Area), **Option 2A + Foreseeable Projects**

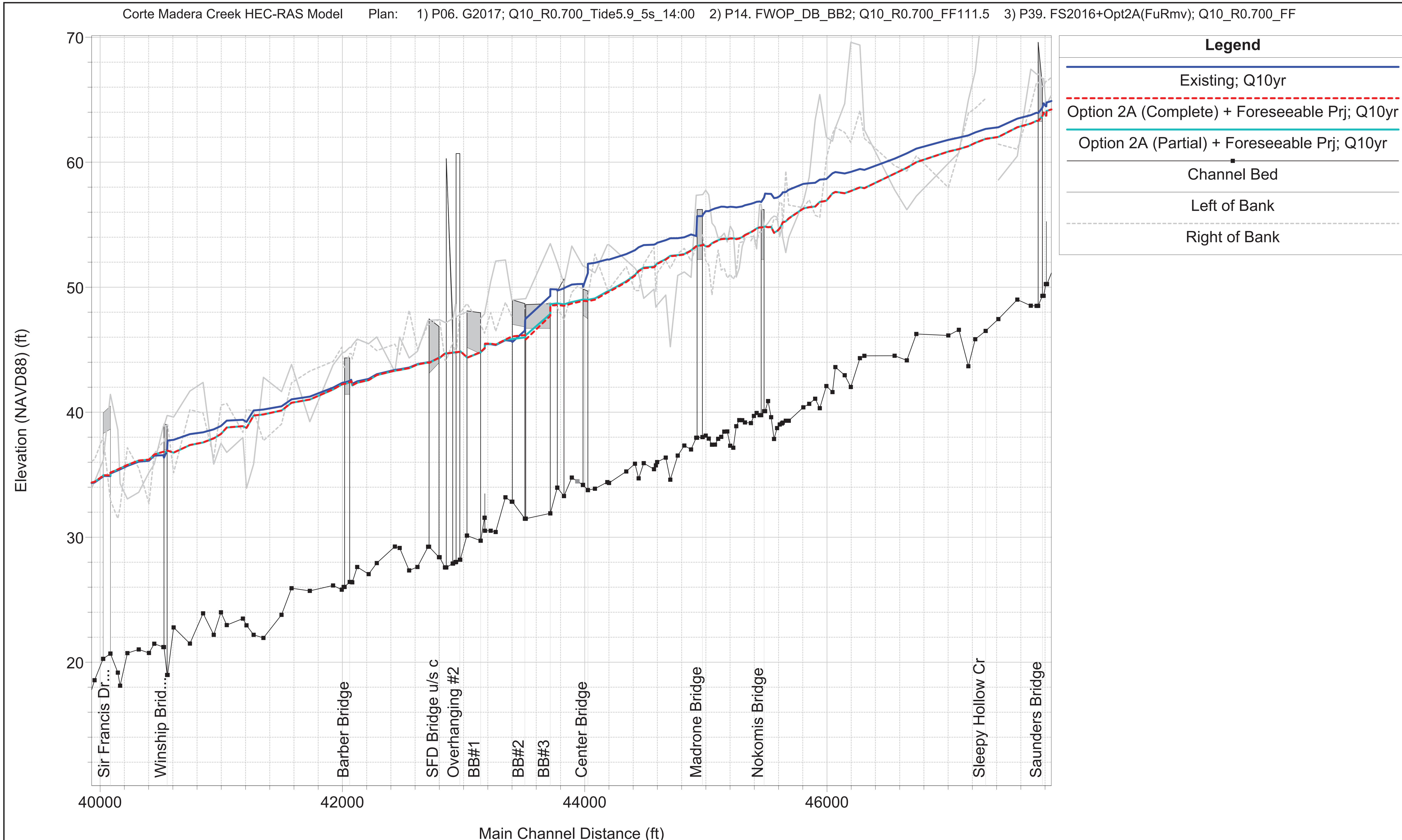


Figure 12 Comparison of Water Surface Profiles along the San Anselmo Creek between Complete and Partial Removal of BB#2 , 25-Year Flow (Upper/Lower San Anselmo Area), **Option 2A + Foreseeable Projects**

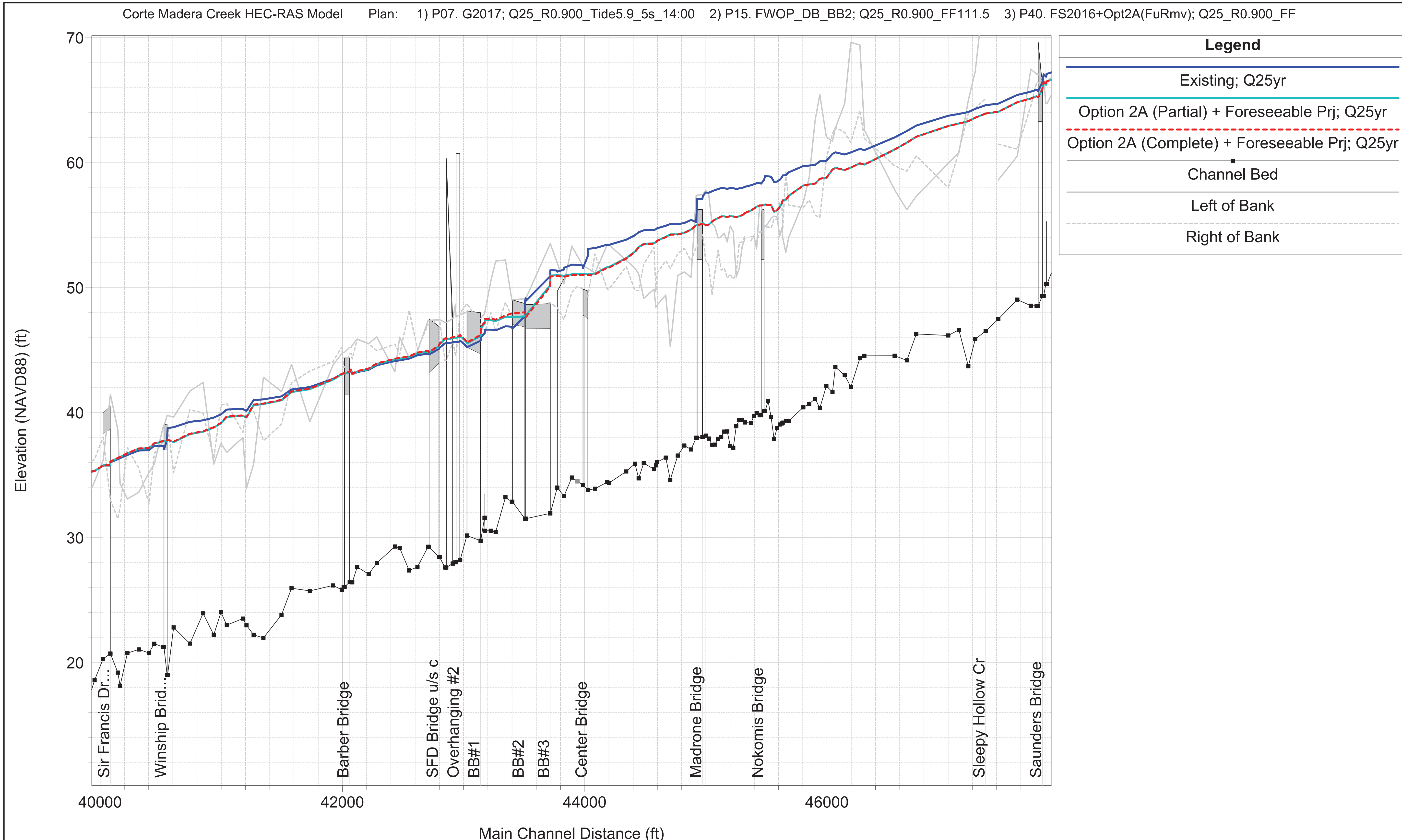
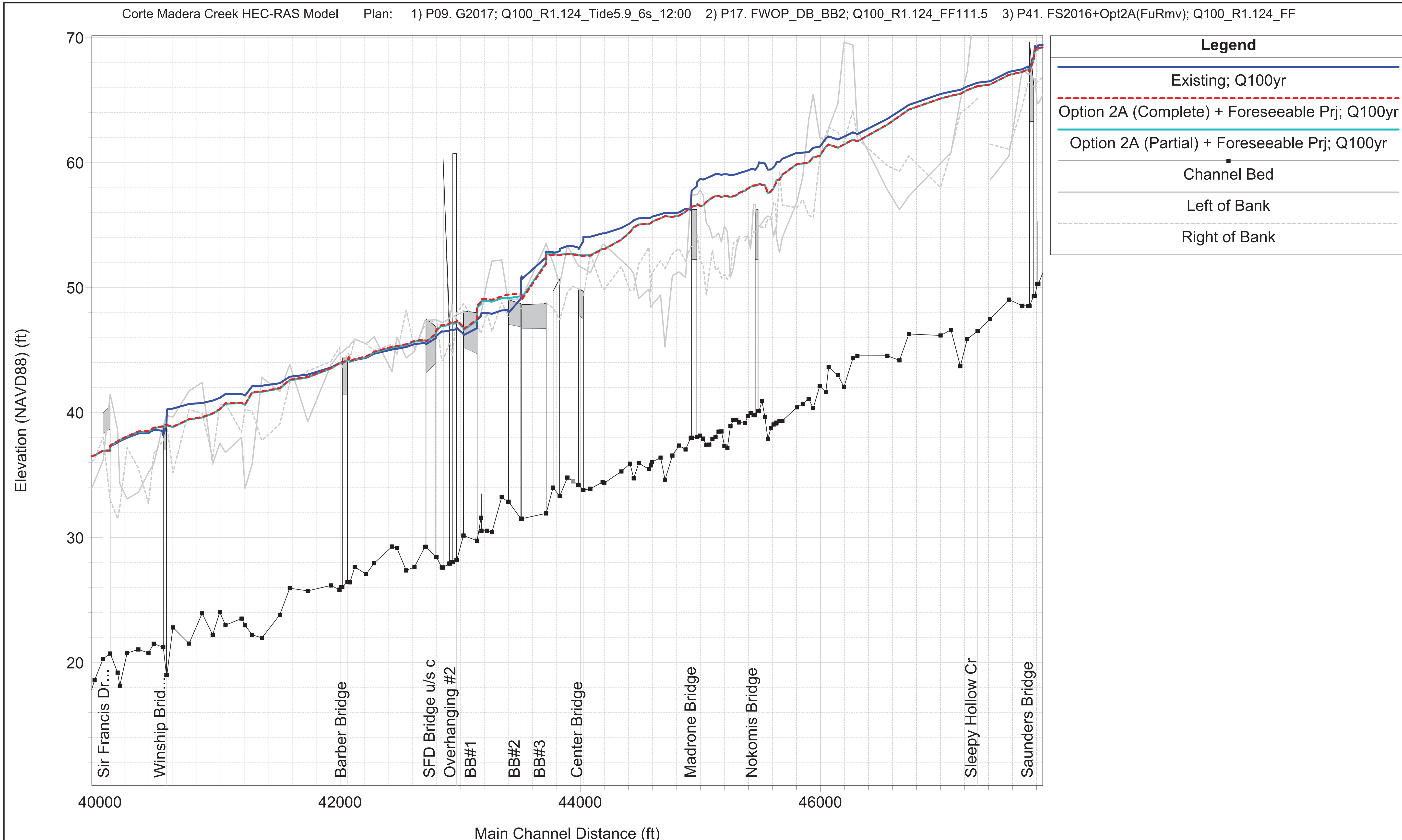
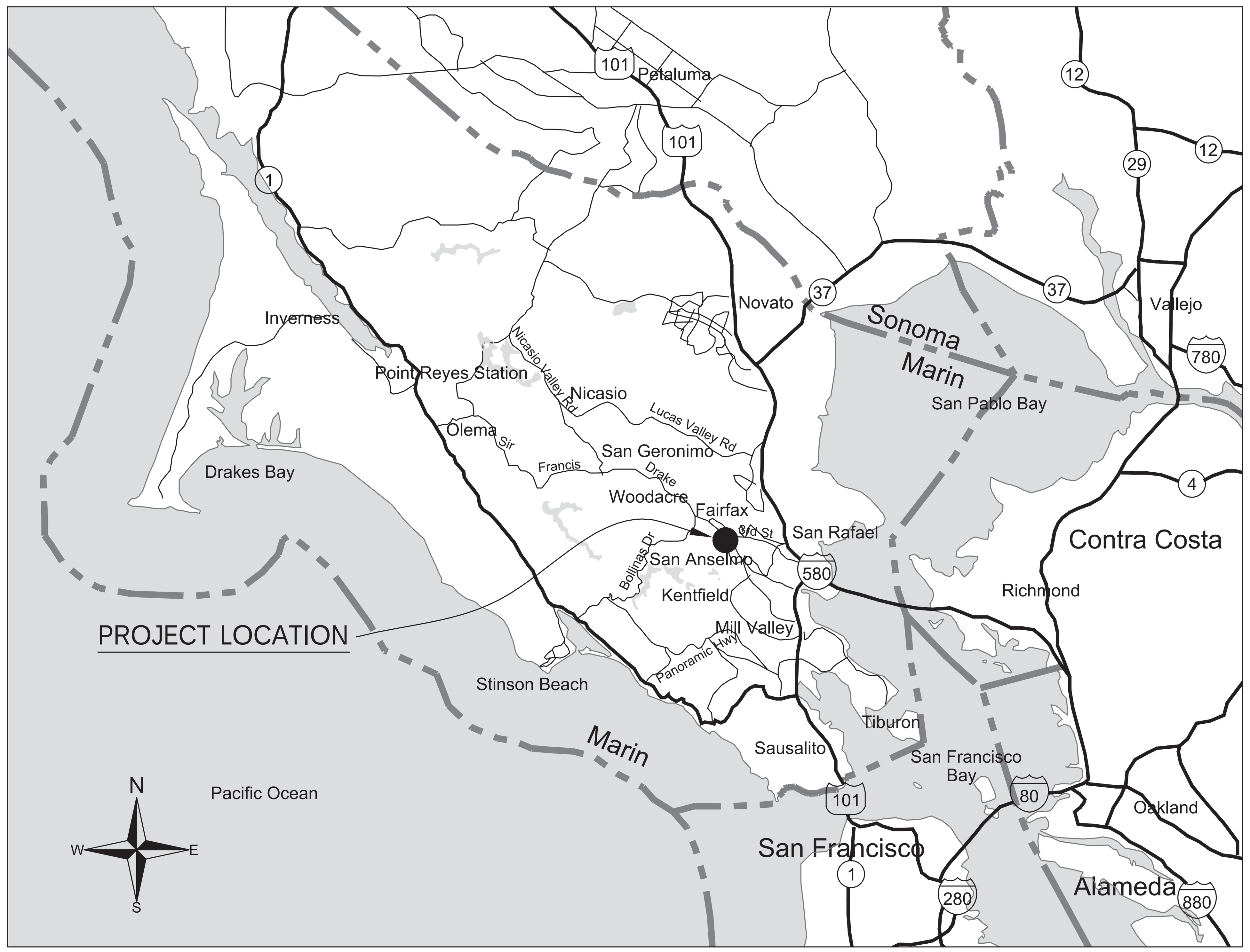


Figure 13 Comparison of Water Surface Profiles along the San Anselmo Creek between Complete and Partial Removal of BB#2 , 100-Year Flow (Upper/Lower San Anselmo Area), **Option 2A + Foreseeable Projects**



TOWN OF SAN ANSELMO PROPERTY ACQUISITION AND DEMOLITION OF BRIDGE BUILDING # 2 AND RIPARIAN RESTORATION PROJECT, MARIN COUNTY, CALIFORNIA



VICINITY MAP

AGENCY NAME: TOWN OF SAN ANSELMO
LAND OWNER: MR. GEOFFREY KOBLICK
SITE ADDRESS: 634 - 636 SAN ANSELMO AVE.
SAN ANSELMO, CA. 94960
CIVIL ENGINEER: JAMES REILLY PE.
STETSON ENGINEERS INC.
2171 E. FRANCISCO BLVD., SUITE K
SAN RAFAEL, CA. 94901
MAP PREPARER: GUSTAVO TRINIDAD PE.
DATE: JUNE 10, 2014

SHEET INDEX

SHEET No.	DESCRIPTION
1	TITLE SHEET AND LOCATION MAP
2	SITE PLAN VIEW
3	SITE CROSS-SECTIONS AND DETAIL

ABBREVIATIONS

APPROX	APPROXIMATE
AVE	AVENUE
CY	CUBIC YARD
DIA	DIAMETER
(E)	EXISTING
ELEV	ELEVATION
FL	FLOW LINE
FT	FEET
IN	INCHES
H	HORIZONTAL
HWY	HIGHWAY
LN	LINE
LT	LIGHT
MAX	MAXIMUM
MIN	MINIMUM
(N)	NEW
No	NUMBER
O.C	ON CENTER
PSI	POUNDS PER SQUARE INCH
RD	ROAD
SF	SQUARE FEET
ST	STREET
STA	STATION
TYP	TYPICAL
V	VERTICAL
#	NUMBER
'	FEET
"	INCHES

LOCATION MAP

SCALE (Feet)
0 200 400

LEGEND
CREEK
PARCEL LINE
PROJECT SITE

I:\DATA\2482\AutoCAD\Grant Application\Title&Location.dwg

DESIGNED:	G. Trinidad	No.	DATE	REVISION	BY	APPROVED
DRAFTED:	G. Trinidad					
CHECKED:	J. Reilly					

STETSON ENGINEERS INC.

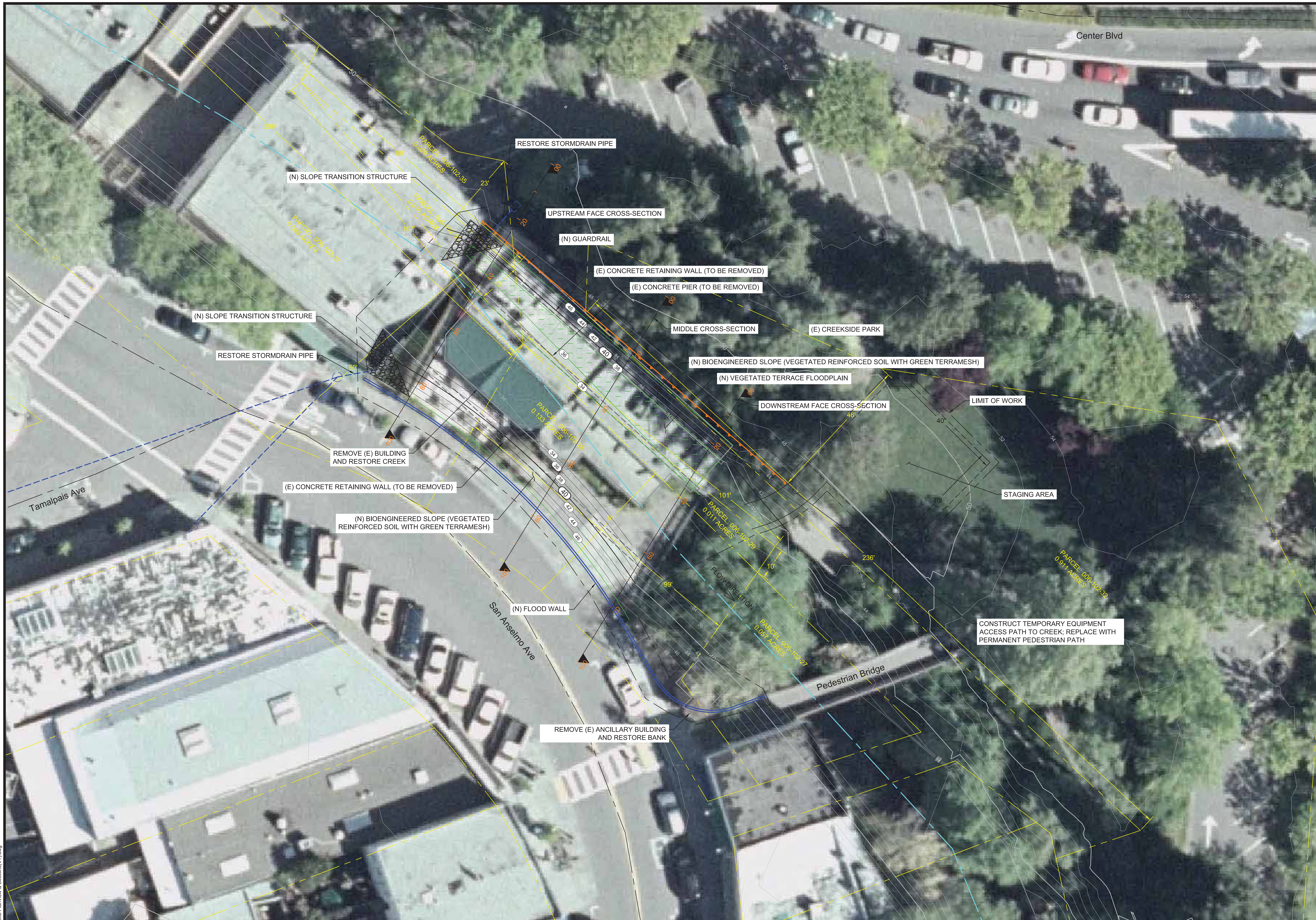
Stetson Engineers Inc.
2171 E. Francisco Blvd., Suite K
San Rafael, CA. 94901
(415) 457-0701

TOWN OF SAN ANSELMO PROPERTY ACQUISITION AND DEMOLITION OF BRIDGE BUILDING # 2 AND RIPARIAN RESTORATION PROJECT, MARIN COUNTY, CALIFORNIA

TITLE SHEET AND LOCATION MAP

DATE: JUNE 10, 2014
SCALE: AS INDICATED
PROJECT No.: 2482-02

SHEET 1 OF 3



N

SCALE (Feet)

0 15 30

LEGEND

- EXISTING CONTOUR LINES (2009 LIDAR DATA)
- PROPOSED CONTOUR LINES
- EXISTING BUILDING TO BE REMOVED
- CREEK FLOW LINE
- STORM DRAIN PIPE (APPROX LOCATION)
- EXISTING CONCRETE WALL TO BE REMOVED
- ROAD CENTERLINE
- PARCEL LINE
- NEW GUARDRAIL
- NEW FLOOD WALL
- NEW VEGETATED TERRACE
- STAGING AREA LINE
- LIMIT OF WORK LINE

ESTIMATED QUANTITIES:

BUILDINGS TO BE REMOVED AREA = 3,200 SF
CONCRETE TO BE REMOVED VOLUME = 1,000 CY
NEW FLOOD WALL LENGTH = 175 FT
NEW GUARDRAIL LENGTH = 125 FT
NEW BIO ENGINEERING SLOPE AREA = 2,500 SF
NEW VEGETATED TERRACE AREA = 800 SF

NOTES:

1. VERTICAL DATUM NAVD88.
2. TOPOGRAPHY AND EXISTING FEATURES SHOWN ARE APPROXIMATE, MAY NOT REFLECT ACTUAL LOCATIONS.
3. PARCEL LAYOUT IS APPROXIMATE BASED ON COUNTY OF MARIN WEBSITE DATA.
4. NO MAJOR UTILITIES IN LIMIT OF WORK. UTILITIES LOCATIONS SHALL BE VERIFIED, LOCATED AND IDENTIFIED BEFORE STARTING ANY WORK.
5. USE EXISTING PARK ACCESS FROM PARKING LOT DURING CONSTRUCTION. PARK ACCESS AND STAGING AREA SHALL BE RESTORED TO PRE-CONSTRUCTION CONDITION.

DESIGNED:	G. Trinidad	No.	DATE	REVISION	BY	APPROVED
DRAFTED:	G. Trinidad					
CHECKED:	J. Reilly					

STETSON ENGINEERS INC.

Stetson Engineers Inc.
2171 E. Francisco Blvd., Suite K
San Rafael, CA. 94901
(415) 457-0701

TOWN OF SAN ANSELMO PROPERTY ACQUISITION AND DEMOLITION OF BRIDGE BUILDING # 2 AND RIPARIAN RESTORATION PROJECT, MARIN COUNTY, CALIFORNIA

SITE PLAN VIEW

DATE: JUNE 10, 2014

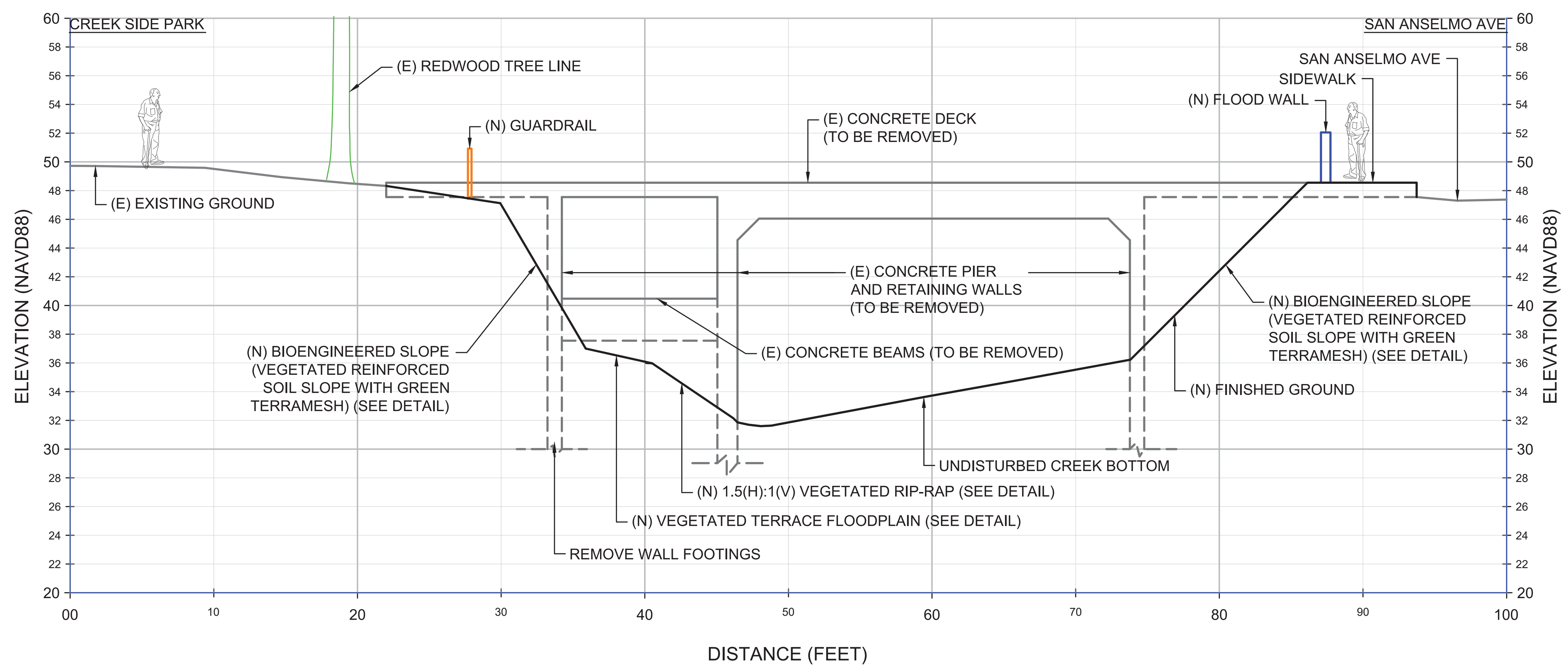
SCALE: 1" = 15'

PROJECT No.: 2482-02

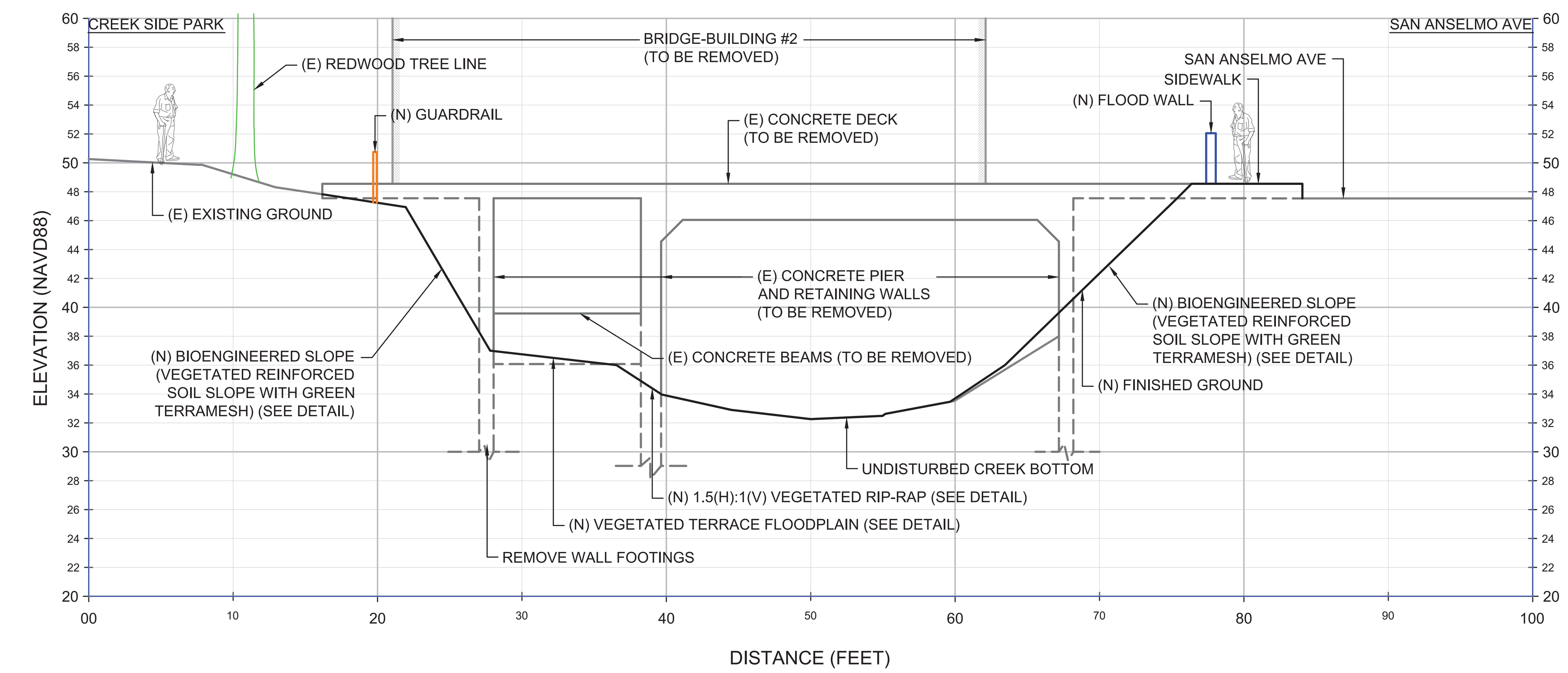
SHEET 2 OF 3

I:\DATA\2482\AutoCAD\Grant Application\Site PlanView & Sections(V1).dwg

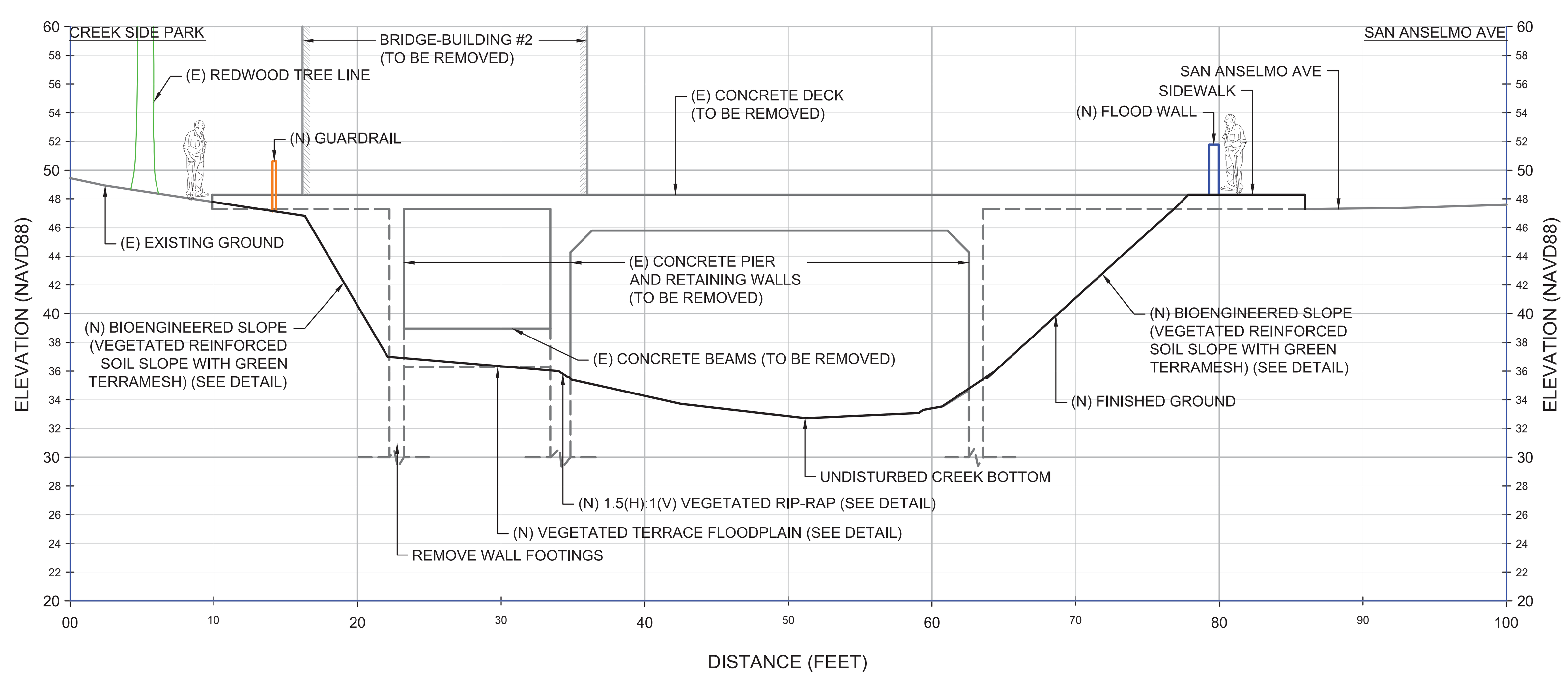
UPSTREAM FACE CROSS-SECTION



MIDDLE CROSS-SECTION

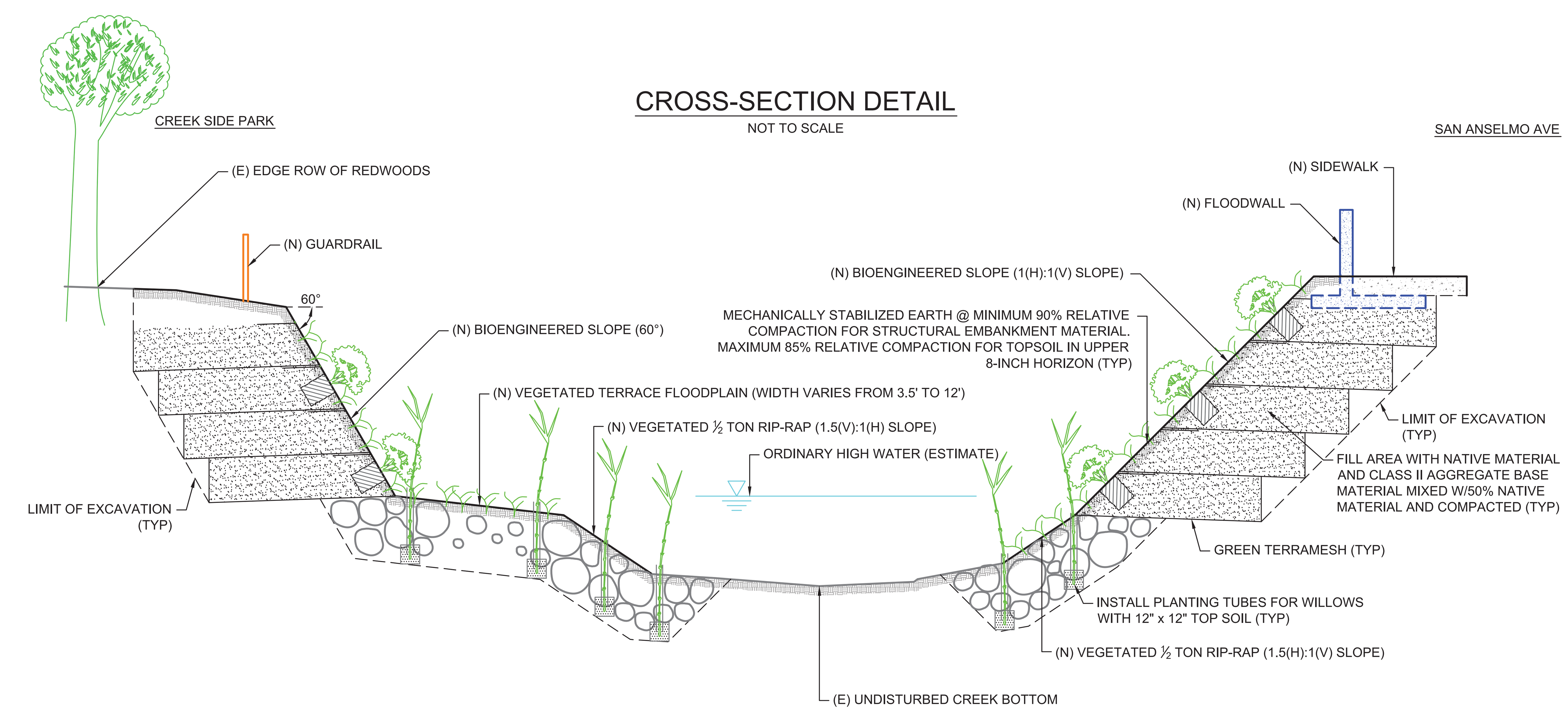


DOWNSTREAM FACE CROSS-SECTION



CROSS-SECTION DETAIL

NOT TO SCALE



NOTES:

1. VERTICAL DATUM NAVD88.
2. ALL CROSS-SECTIONS ARE LOOKING DOWNSTREAM.

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DESIGNED:	G. Trinidad	No.	DATE	REVISION	BY	APPROVED
DRAFTED:	G. Trinidad					
CHECKED:	J. Reilly					

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TOWN OF SAN ANSELMO PROPERTY ACQUISITION AND DEMOLITION OF BRIDGE BUILDING # 2 AND RIPARIAN RESTORATION PROJECT, MARIN COUNTY, CALIFORNIA

SITE CROSS-SECTIONS AND DETAIL

DATE: JUNE 10, 2014
SCALE: AS INDICATED
PROJECT No.: 2482-02

SHEET 3 OF 3

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D-4 Geomorphic and Scour Assessment Corte Madera Creek Flood Protection Project, Option 2A and 2A Plus

TECHNICAL MEMORANDUM

Geomorphic and Scour Assessment Corte Madera Creek Flood Protection Project, Option 2A and 2A Plus

PREPARED FOR:	Russ Eberwein, P.E. Senior Civil Engineer County of Marin Department of Public Works, Flood Control and Water Resources Division
PREPARED BY:	Mitchell Swanson, Geomorphologist, CH2M mitch.swanson@ch2m.com Jeremy Thomas, Geomorphologist, CH2M jeremy.thomas@ch2m.com
DATE:	December 4, 2017; revised January 15 and February 23, 2018

Introduction

The proposed Corte Madera Creek Flood Protection Project (proposed project) is located in Marin County, California, within Corte Madera Creek (CMC) and along the tributary streams of Fairfax Creek and San Anselmo Creek (Figure 1). This technical memorandum (TM) presents the results of a reconnaissance-level geomorphic assessment of two flood protection options proposed by the Marin County Flood Control and Water Conservation District (District) in the CMC watershed.

The two flood protection options are as follows:

Option 2A

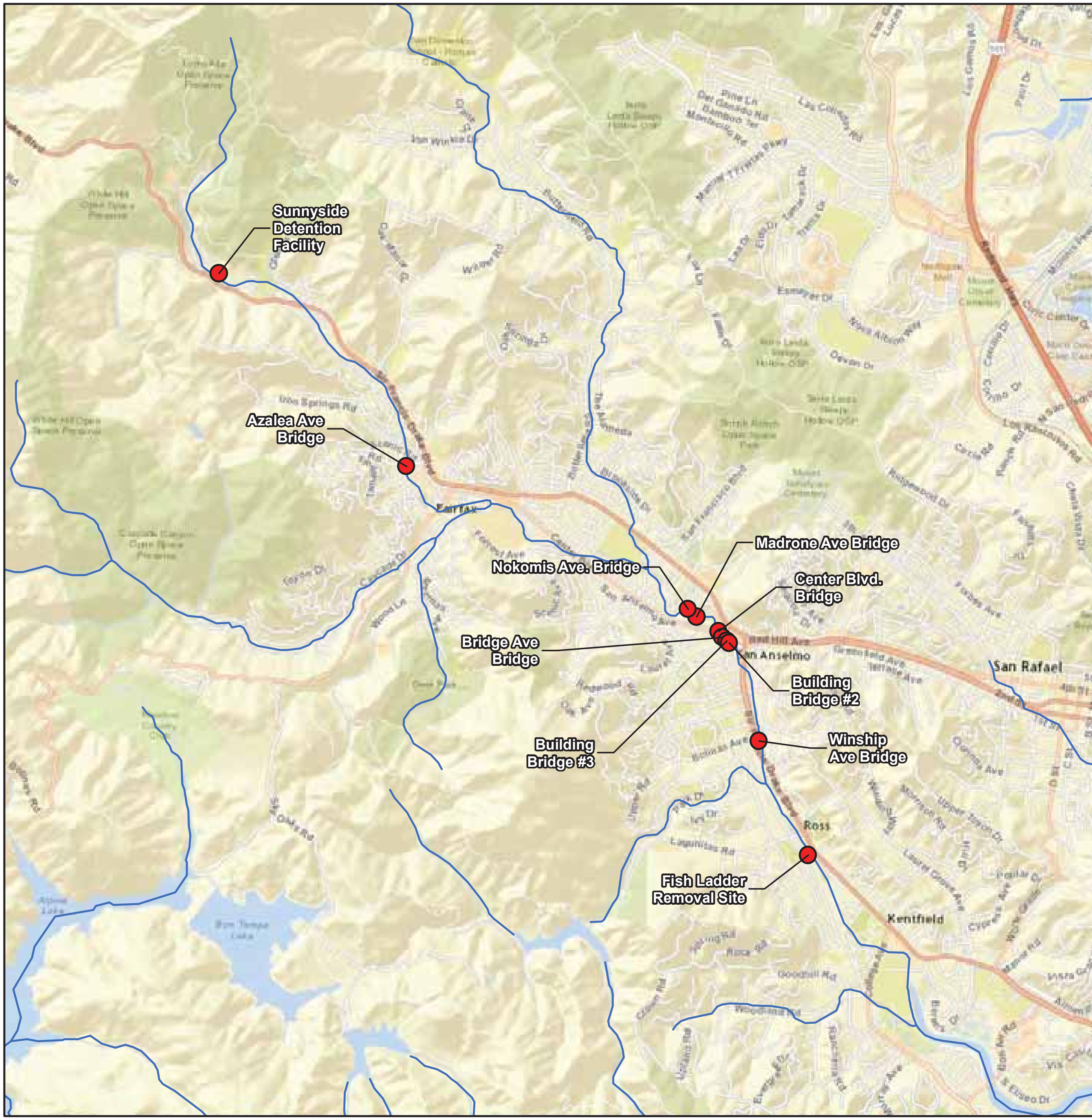
1. Construct a flood detention facility along Fairfax Creek at the former Sunnyside Nursery site.
2. Remove Building Bridge #2 (BB#2) from San Anselmo Creek channel in downtown San Anselmo.

Option 2A Plus Foreseeable Future Conditions (Option 2A Plus)

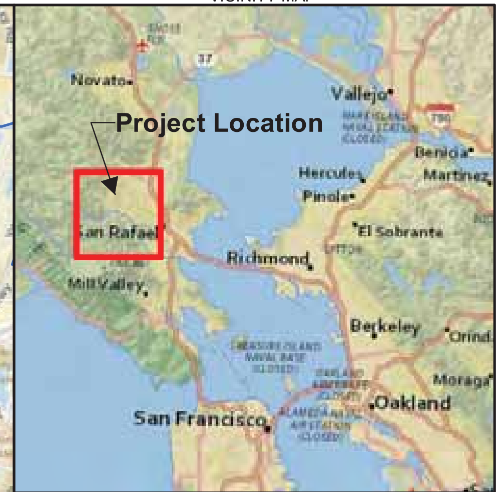
1. Features of Option 2A.
2. Remove and replace bridges at Azalea Avenue, Nokomis Avenue, Madrone Avenue, Center Boulevard, Bridge Boulevard, and Winship Avenue.
3. Remove the fish ladder in CMC at the head of the concrete channel in Ross.

CMC and several of its tributaries flow in densely urbanized commercial and residential areas that have been flooded numerous times in the recent past. The purpose of Options 2A and 2A Plus is to increase the hydraulic capacity of the CMC and detain floodwaters to lower the flood peak and reduce urban flood risk. The hydraulic changes associated with these improvements could potentially impact the movement of sediment, change erosional and depositional patterns in channels, and disrupt the geomorphic processes that govern channel stability.

The purpose of this TM is to characterize potential geomorphic changes and how the flood improvements might impact infrastructure. This characterization is necessary for a California Environmental Quality Act (CEQA) environmental review. The scope of this investigation is limited to sediment transport and scour effects of the proposed project; the changes in hydraulics associated with flood dynamics are addressed by Stetson Engineers, Inc. (Stetson) (Stetson, 2017a; 2017b).



VICINITY MAP



Legend

Project Location

Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community
Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

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FIGURE 1
Location Map
San Anselmo Flood Risk Reduction Project

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ch2m

Study Objectives

The objectives of this study are as follows:

1. Characterize the environmental setting of the CMC watershed as it affects geomorphic processes in Fairfax, San Anselmo, and Corte Madera creeks, including effects of historical and present land uses.
2. Gain an understanding of and document geomorphic and sediment transport conditions and processes at each of the eight sites identified above for Option 2A or Option 2A Plus where improvements are proposed.
3. Review hydraulic modeling output provided by the District and completed by others for on existing conditions, Option 2A, and Option 2A Plus to estimate the potential impacts at the eight improvement locations resulting from erosion, bed scour, bank erosion, and sedimentation that could damage infrastructure, impair flood operations and/or cause channel instability.
4. Identify feasible countermeasures, if practical, to offset potentially significant geomorphic impacts.

Methods

This study was conducted at a reconnaissance level; the analysis and results primarily rely on existing information and data with limited new data collection.

Existing data and information were collected and reviewed, including information about the CMC watershed geomorphology, flooding, sediment transport, and historical geomorphic and channel stability studies, most notably Stetson (Stetson, 2000), Marin County Watersheds[1], and the San Anselmo Historical Museum.[2]

Available project design documents and drawings were reviewed as listed below, and the features of each improvement were confirmed:

- A preliminary set of 10% complete design drawings (CH2M, 2017a)
- The U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center's River Analysis System (HEC-RAS) hydraulic modeling data (Stetson, 2017a; 2017b) for the Sunnyside Detention Basin
- BB#2 removal and channel bank reconstruction plans CH2M, 2017b)

The District provided CH2M HILL Engineers Inc. (CH2M) with HEC-RAS hydraulic modeling prepared by Stetson (Stetson, 2017a; 2017b) for existing conditions and Options 2A and 2A Plus for a projected 25-year flood event. CH2M used this modeling information and prepared appropriate graphs, plots, and tables for field work and an impact analysis. The HEC-RAS modeling information includes output of important hydraulic variables that are proxies for sediment transport, including flow velocity, mean shear stress, and stream power.

The impact analyses focused on changes in peak mean shear stress, comparing existing conditions with Option 2A and Option 2A Plus. Shear stress governs the sizes of sediment moved on a channel bed and is an indication of the potential for channel bed erosion. Scour is the short-term erosion and lowering of the channel bed during peak flow conditions and is a key factor for designing protection for infrastructure such as bridges (e.g. abutments, support piers), retaining walls and rock slope revetments.

For this assessment, CH2M compared the bed material sediment sizes at each site with HEC-RAS output and critical shear stress particle size mobility relations developed by the U.S. Geological Survey (USGS) (USGS, 2008). This comparison was used to determine whether a significant change in scour depth could occur at each site and, thus, produce a potentially significant impact.

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[1] http://www.marinwatersheds.org/rossvalleywatershed-org/index.html

[2] http://sananselmohistory.org/articles/flooding/

CH2M conducted field reconnaissance on November 1 and 2, 2017, to visit each site where improvements are proposed. Each site was documented via photographs and video with field notes, including evidence of current and past erosion, sediment deposition, and channel morphology changes. A general characterization of bed and bank materials and sizes was made at each site. To assess the potential mobility of a gravel/cobble bar under Building Bridge #3 (BB#3), pebble counts were taken and the raw data were reduced to grain-size cumulative frequency using standard techniques (Wolman, 1954). Key information was compiled into fact sheets for each site (Attachment A).

The CH2M geomorphology team coordinated through conference calls and emails with District staff and the project's CEQA consultant, Environmental Science Associates (ESA). Key information was exchanged and confirmed through these conversations, including the scope of this investigation, final proposed project features, the contents of this TM, and schedule.

Setting

The downtown commercial and residential properties affected by flooding are within the valley floor or floodplain communities of Fairfax, San Anselmo, and Ross. The CMC flows generally southeast, draining 28 square miles from the crest of the Coast Range (maximum elevation 2,571 feet) into Richardson Bay at sea level. The upper watershed and terrain surrounding the valley floors is steep with a mix of forest and grassland covers, and includes both open space and rural residential development. The valley floors are densely developed with residential and commercial cover, much of it impervious. Creek channels are highly modified and encroached by roads, narrow bridges, retaining walls, fill, pipelines, and buildings that span the creek as bridges or overhang the creek like balconies. Sir Francis Drake Boulevard is the main access road from Highway 101 to the upper watershed.

The CMC watershed experiences a Mediterranean climate that produces seasonal winter rains from October to April (averaging 40 inches per year), which periodically include intense storms that trigger hillslope erosion and landslides and cause widespread flooding and erosion. Recent damaging flood events include those occurring in 1986, 1995, 1997, 2005, and 2017. Geologically, the CMC watershed is underlain by highly sheared and deformed rock of the Mesozoic Franciscan Formation, including mélange units that have been identified with high sediment production. Combined with tectonic uplift and intense winter storms, the hillslopes of the CMC watershed produce rapidly peaking floods and an abundant volume of coarse and fine sediments through landslides and natural- and human-caused gully and sheet erosion.

Fairfax Creek, San Anselmo Creek, and the CMC flow within incised, single thread channels featuring gravel beds bounded by steep and erosive banks generally over 6 feet high. Human-caused hydro-modification of watershed land cover by roads, urban and agricultural development, logging and grazing, and channelization led to systemwide channel incision thought to be on the order of 4 or more feet by the early 1900s (Stetson, 2000). Creekside development was particularly aggressive in the early to mid-1900s, when channel banks were often filled and replaced with vertical walls or rock-slope revetments, or both, and the construction of several buildings that partially span or fully cover the stream channel within downtown San Anselmo. Numerous undersized public and private bridges form significant hydraulic constrictions. Many of these were constructed in the early 1900s with center support piers and narrow abutments that constrict channel flow area, in some cases, to 50 percent less than the adjoining reaches. Backwatering upstream of constricted bridges increases overbank flooding onto the developed floodplains and disrupts sediment transport. Many of the bridges have experienced damage by Historic channel bed erosion (degradation). It is generally believed that most of the channel bed incision ceased in the early 1900s as vertical erosion reached the depth of erosionally resistant bedrock (Stetson, 2000).

Hydraulic/Geomorphic Effects, Potential Impacts, and Potential Mitigations of Proposed Project Options 2A and 2A Plus

Options 2A and 2A Plus include strategic removal of constrictions to remove backwater effects, to increase channel flood capacity, and to reduce the frequency and extent of overbank flooding. Removal of constrictions can change the hydraulic forces governing erosion and sediment transport ridge removal, and replacements can increase flooding downstream due to an increase in-channel flows (i.e., rather than overbank flows). The proposed Sunnyside flood detention facility is designed to offset this impact. It includes a diversion dam across Fairfax Creek that would pond floodwaters in order to divert peak flow over an armored weir and into the detention basin. However, ponding and flow diversion out of the creek can affect sediment transport and geomorphic processes governing channel stability.

Generally speaking, where hydraulic forces increase, the channel bed and banks could erode. Of particular concern is the depth of scour or short-term lowering of the channel bed during peak flow, which could undermine channel banks, bridge abutments and support piers, pipelines, building structures, and retaining walls.

Conversely, a decrease in hydraulic force such as that resulting from the detention facility operation, could induce sediment deposition, fill the channel, reduce channel flood capacity, and increase overbank flooding. Channel filling can also cause abrupt lateral erosion and movement (i.e., avulsion) through adjacent floodplain properties.

Option 2A

Sunnyside Detention Facility

Figure 2 and the attached fact sheet (Attachment A) show the proposed layout and design of the Sunnyside detention facility and key features. A levee embankment will separate a proposed detention basin to the north from the Fairfax Creek channel to the south. A 13-foot high diversion dam would be constructed across Fairfax Creek to pond floodwater upstream and allow excess rising flows to spill over an armored lateral weir on the levee crest at the northern side of the channel into the adjacent detention basin. The detention basin would be constructed by excavating the floodplain bench north of Fairfax Creek and using fill to create berms up to 6 feet high on the eastern and southern sides of the detention basin, forming a detention-basin dam to the east and the aforementioned levee embankment between the detention basin and the creek to the south. A gravity flow culvert would drain the basin after storms and discharge back into Fairfax Creek, discharging just downstream of the Fairfax Creek diversion dam. The diversion dam would have a 6-foot wide by 4-foot high ungated opening to allow normal streamflows to pass through the structure without entering the detention basin (Figure 3). There would also be a second 10-foot wide by 5-foot high gated culvert in the diversion dam to control the diversion of the flow into the detention facility, and an armored emergency spillway across the diversion dam crest to pass excess flow without overtopping either the diversion dam embankment crest or the detention-basin eastern embankment crest when the detention facility is full.

Fairfax Creek at the former Sunnyside Nursery site (Attachment A) has a coarse gravel bed with vertical, sandy loam banks that are eroding along several sections just upstream of the diversion dam site. Bay laurel and other trees line the channel banks with soil-binding roots that increase erosional resistance; where trees are lost to erosion, the banks have retreated rapidly.

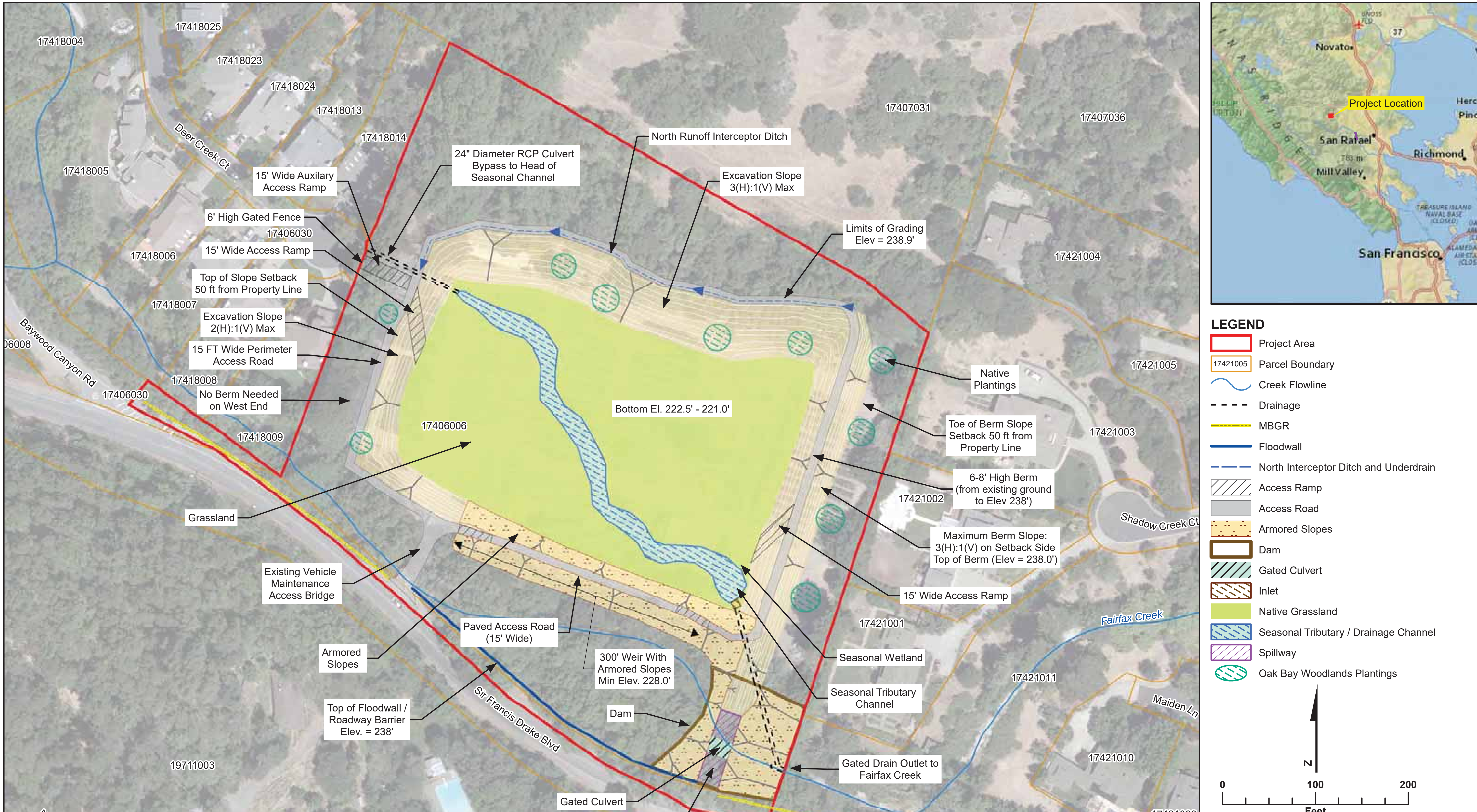

FIGURE 2
Sunnyside Nursery Flood Diversion and Storage Basin Site Plan
San Anselmo Flood Risk Reduction Project
Marin County, California

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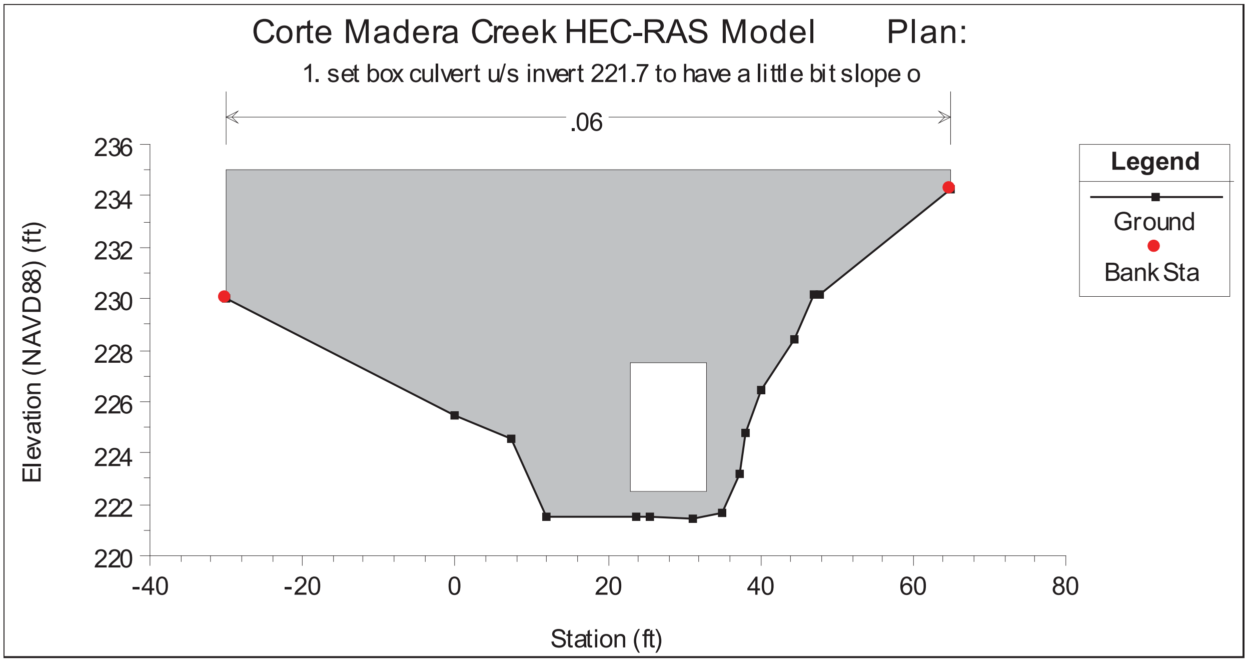


Figure 3. HEC-RAS Cross Section 10500 Showing Proposed Diversion Dam

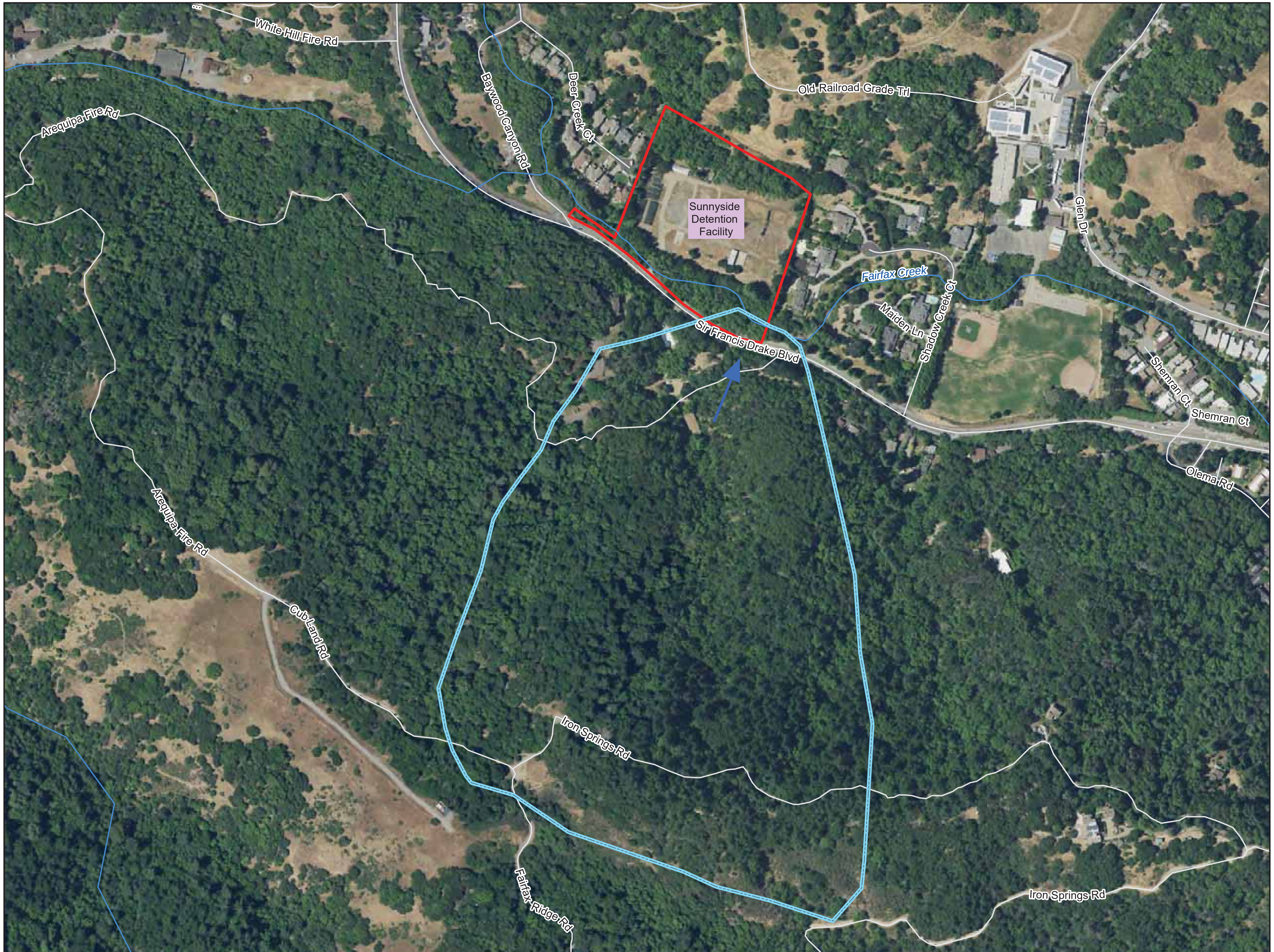
As of November 2017, the left bank (northern bank), where the proposed lateral weir is to be located, was actively eroding and undermining trees. This erosion appeared to be in response to a recently deposited gravel bar on the right side of the channel where an ephemeral tributary discharges into Fairfax Creek (Figure 4). The drainage area for this small tributary exhibits active landsliding and erosion, indicating a high rate of sediment production and delivery. This local source adds to the coarse sediment load flowing into the project site from upper Fairfax Creek.

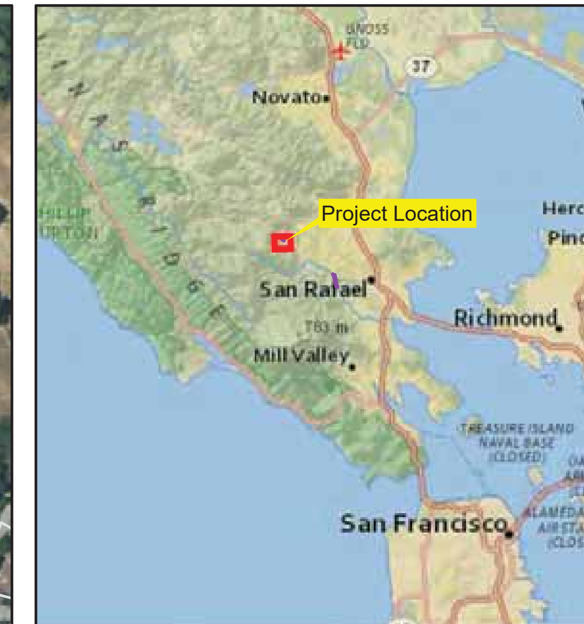
HEC-RAS modeling shows that operation of the detention facility creates a significant reduction in sediment transport capacity upstream of the diversion dam across Fairfax Creek during the peak 6-hour period of the 25-year design flood (Figure 5). Under existing conditions, flood flows are adequate to maintain the low flow and bankfull channel by moving the coarse gravel to small cobble-sized channel bed materials downstream (USGS, 2008). With the proposed facility operations and the gated outlet on diversion dam closed, the available shear stress in the Fairfax Creek above the diversion dam is reduced; Fairfax Creek will be able to transport only sand-sized particles, meaning that nearly all sediment flowing into the local reach under peak conditions would cease moving and deposit. These sediments could partially or substantially fill the channel over the long term or during a single large flood event. Channel filling by sedimentation could reduce hydraulic performance of the detention system by raising the water surface elevation and disrupting the timing of overbank spill over the weir. Flood reduction benefits could be reduced if the detention basin fills on the rising limb of the hydrograph because of sediment deposits in the channel. This could also cause more frequent spills over the diversion dam spillway (elevation 235 feet), upstream flooding, bank erosion, and possible channel avulsion northward into the detention basin or southward toward Sir Francis Drake Boulevard. Design of the downstream apron of the diversion dam spillway would need to account for the potential for increased spillway flows. If the bed elevation is raised to the lateral weir height (i.e., 228 feet), coarse sediments might be deposited in the detention basin, which would add to an unknown volume of fine suspended sediments already entrained in weir overflow.

Preliminary estimates of sediment deposition during operation indicate that the loss of channel flood capacity is potentially significant. Estimates using local bed load transport data are widely variable, but when the same estimates are made using sediment transport formulas, a mid-range estimate matches a bedload data set taken between 1980 and 1981. These mid-range results indicate the channel upstream of the diversion dam could be partially or fully filled with sediment during the 10- and 25- year design flood events.

Field inspection of older flood deposits in Fairfax Creek between the diversion dam and bridge indicate past episode(s) of channel filling up to elevation ±232 feet; however, these could be related to the extreme January 3-5 1982 flood event, which triggered numerous landslides and delivered large volumes of sediment from hillslopes to stream channels, particularly in Marin and Santa Cruz counties. In 1989, the USGS estimated that the 1982 event was a greater than 100-year peak flow on CMC near Ross, with over 14 inches of rain falling in 36 hours. The extreme rainfall rates (which induced hillslope erosion) in January 1982 were preceded by an unusually wet winter season, leaving saturated watersheds as the antecedent (i.e., pre-January 3) condition. Additional study is needed to calculate the frequency of events involving heightened sediment delivery from hillslopes to stream channels.

The hydraulic effects of detention facility operations and the potential for increased sediment deposition in Fairfax Creek could extend upstream of the District-owned property. Loss of coarse sediment transport and supply downstream of the diversion dam could cause enhanced erosion via sediment hungry water effects, a condition where hydraulic force increases as sediment load is lost to upstream deposition.





LEGEND

- Sunnyside Detention Facility
- Creek Flowline
- Approximate Watershed Area (54 acres) of tributary flowing into Fairfax Creek at Sunnyside Detention Facility Site

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FIGURE 4
Sunnyside Detention Facility
Fairfax Creek
San Anselmo Flood Risk Reduction Project
Marin County, California

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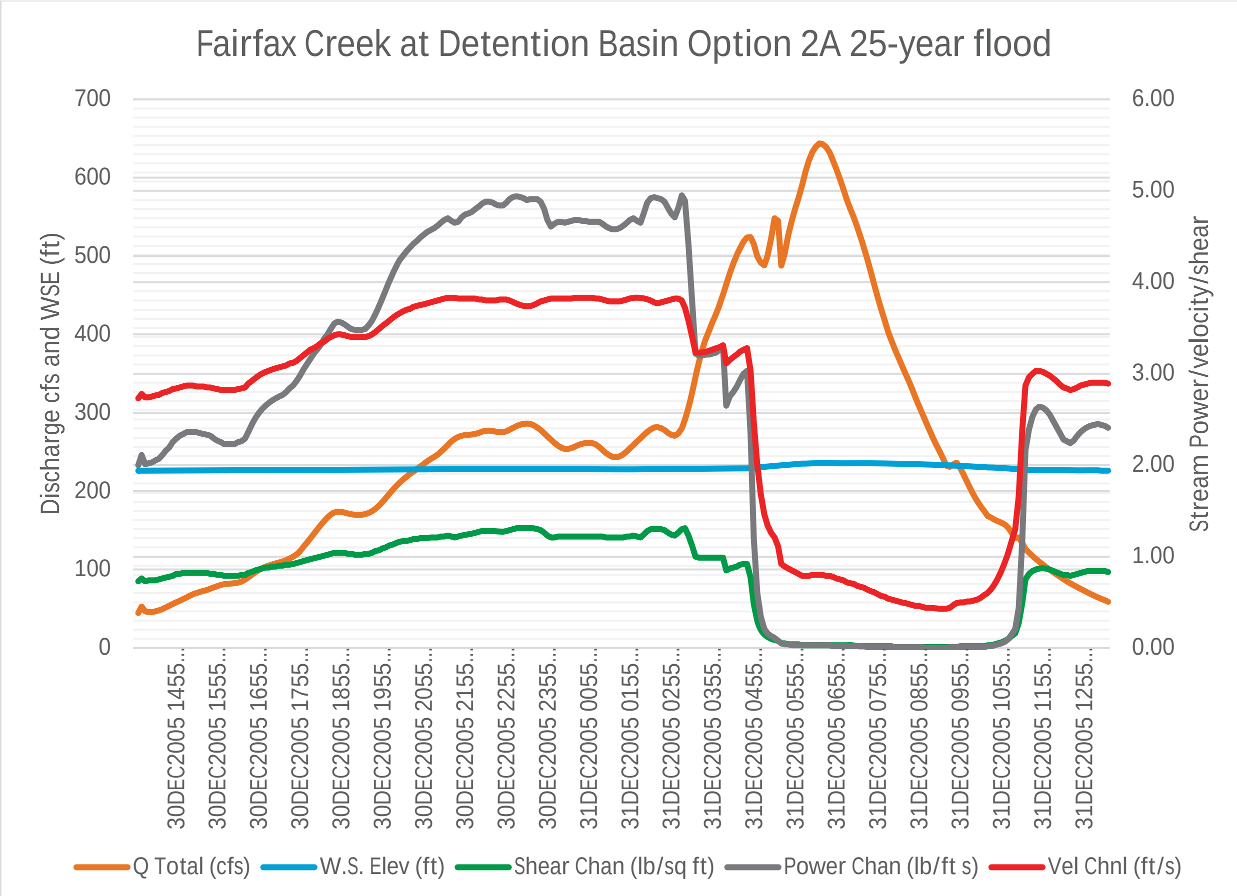

Figure 5. Hydraulic Output for HEC-RAS Cross Section 10745 for 25-Year Flood Event
With the gated opening on the diversion dam closed, storage of floodwater in Fairfax Creek upstream of the proposed diversion dam causes dramatic reductions in velocity, shear stress and stream power for the 6-hour peak flow period (0455 hours to 1055 hours).

There are countermeasures that could offset the sediment deposition effects; however, these require further investigation and HEC-RAS hydraulic modeling beyond the scope of this investigation. Candidate countermeasures would require estimating the locations, volumes, and rates of sediment deposition in Fairfax Creek during a single 25-year design event, and multiple flood events over long-term future conditions. Periodic maintenance dredging within the project property boundaries (and possibly upstream) could be effective if sediment deposition rates do not affect single flood operations. Estimating the volume and frequency of dredging requires further study. If it is found through further study that sediment deposition and channel filling during a single flood event would have a significant impact, modifying the design of the diversion dam outlet, emergency spillway or operations, or modifying a combination of the three, could flush sediment downstream. In addition, it might be possible to discharge the detention basin after the flood into Fairfax Creek upstream of the diversion dam and flush the stored sediments downstream. Other possible countermeasures could be revealed upon further study and analysis.

Periodic maintenance dredging and other countermeasures could involve additional costs and may have additional environmental impacts such as the following:

- Limited fish passage due to channel blockage
- Loss of riparian vegetation via sedimentation-induced erosion and avulsion
- Impact to long-term water quality due to discharge of fine sediments from erosion of channel banks

Removal of BB#2

Figure 6 shows the demolition and channel reconstruction plans for the BB#2 in San Anselmo Creek and the location of BB#3 immediately upstream. Option 2A includes removal of the BB#2 building as well as all of the underlying concrete walls and support piers that lay within the channel bed and banks. The proposed channel reconstruction plans shown on Figure 6 include bioengineered bank protection with a rock revetment and native riparian vegetation plantings.

San Anselmo Creek flows beneath BB#3, which is just upstream of the BB#2 removal site. Under BB#3, a 2- to 3-foot high (above low water) gravel/cobble bar has formed by sediment deposition in the hydraulic backwater area created by the BB#2 constriction during storm runoff events. The gravel bar and low-flow channel are bounded by the BB#3 foundation structure that includes support piers and retaining walls. This bar has a surface pavement of coarse gravels (i.e., greater than 16 millimeters [mm] mean diameter) and cobbles (great than 64 mm mean diameter) with underlying finer gravels and sands. The sediments are generally loosely consolidated except for the upstream head of the bar, where interlocking large cobbles and small boulders armor the bed.

Removal of the BB#2 structure would eliminate a hydraulic constriction and associated upstream backwatering under BB#3. This would increase local hydraulic forces and sediment transport capacity through BB#3 and for approximately 70 feet further upstream to the Bridge Avenue bridge, where a concrete-covered pipe forms a sill across the channel bed and functions as grade control.

To assess changes in sediment mobility upstream of BB#2 constriction, new bed material grain-size data were collected by pebble counts taken along three transects under BB#3 (Attachment B). Under existing conditions, and using the pebble count data (Attachment B) and the critical shear thresholds from USGS (USGS, 2008), over 80 percent of the grain sizes sampled are already mobile under the 25-year design event. Under Option 2A, the sizes and fraction of bed materials mobilized increases to nearly 90 percent. This indicates that scour could increase in the channel reach from BB#2 though BB#3 upstream to Bridge Avenue and the sill; this reach includes support piers and a retaining wall under BB#3, channel banks, and the concrete sill and pipeline at Bridge Avenue.

Based upon the information presented above, there is the potential for erosion and scour damage to the foundation of BB#3, the channel banks between BB#2 and BB#3 and the banks upstream of BB#3 to the concrete sill at Bridge Avenue. It is feasible to install scour protection countermeasures for these locations, including adding new rock revetment or extending the depth of existing rock revetments, and extending the foundations of vertical retaining walls using sheet pile or concrete. New bioengineered bank protection may be needed where protection is presently absent (i.e., between BB#2 and BB#3 and upstream of BB#3 to Bridge Avenue). The depth and design of the scour protection would be determined during engineering design and, if necessary, added to construction plans and specifications then implemented. The potential for environmental impacts of any countermeasures employed would need to be addressed (e.g., removal of natural channel bank or bed and vegetation and habitats).

FIGURE 6
Building Bridge #2 Demolition Plan and Building Bridge #3 and Underlying Gravel Bar
San Anselmo Flood Risk Reduction Project
Marin County, California

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Option 2A Plus Foreseeable Future Conditions

The following analysis of Option 2A Plus was prepared to the level of detail necessary for CEQA cumulative impact analysis per discussion with the District's CEQA consultant.

Option 2A Plus includes Option 2A (and the impacts and mitigations described above), as well as the following bridge removals and replacements:

- Azalea Avenue
- Madrone Avenue
- Nokomis Avenue
- Center Boulevard
- Bridge Avenue
- Winship Avenue
- Fish ladder structure located at the head of the concrete channel in CMC in Ross

The conditions at each of these sites are shown in the fact sheets in Attachment A. Each of the bridges to be removed and replaced is hydraulically constricted and HEC-RAS hydraulic modeling of the anticipated 25-year flood indicates potential changes in erosion, scour and sediment transport. Figure 7 shows the changes in grain sizes mobilized by changes in peak shear stress during a 25-year event. In general, the bed materials observed at each site are already mobile under existing conditions, and the changes are relatively minor. The notable exception is Madrone Street Bridge, where shear stress is lowered; however, based on field observations, it appears that most of the channel bed sediments will still be mobile, and no major changes in channel stability are anticipated.

HEC-RAS modeling indicates that the removal of the fish ladder in CMC Ross significantly increases peak shear stress upstream of the ladder from that moving cobble-sized (64-mm) sediment to that moving boulder-sized (256-mm and greater) sediment (Figure 7). Inspection of the reach from the fish ladder upstream to Lagunitas Road indicates a high degree of stability, with bank armoring by rock revetments and dense bank vegetation. Moreover, the potentially affected channel bed is protected against significant incision by the 5,000-foot long CMC concrete channel that begins just below the fish ladder structure.

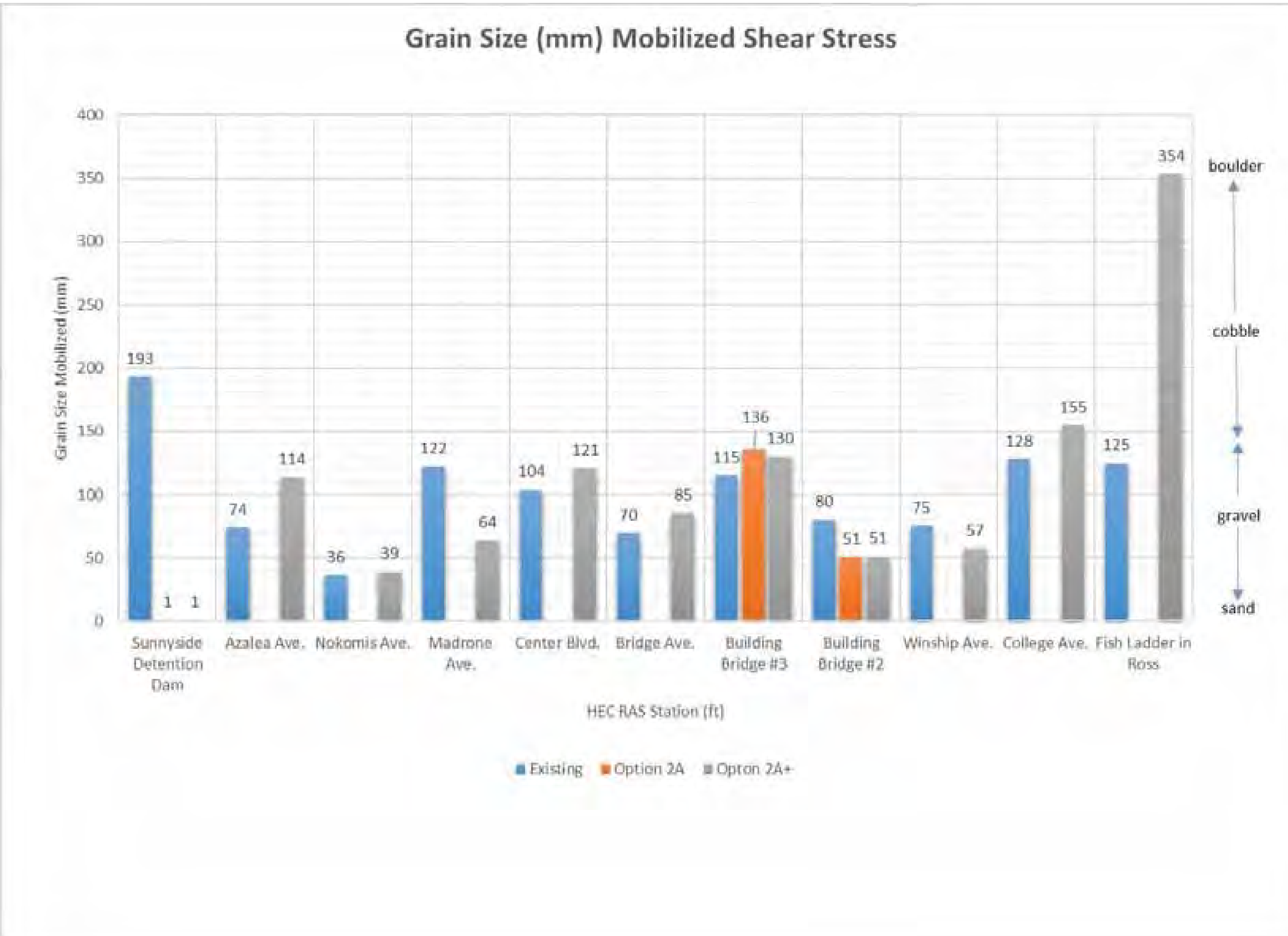

Figure 7. Changes in Maximum Grain Sizes Moved Under Existing Conditions

For Options 2A and 2A Plus at removal/replacement locations using HEC RAS critical shear stress output to particle size moved using USGS (2008)

All of the measures proposed for Option 2A Plus will undergo full engineering design, which will include geotechnical investigations and detailed hydraulic and structural engineering typical for bridge replacements. This would include accounting for potential hydraulic changes in the local reaches and protection of the existing channel, structures, and properties from scour. The scour protection countermeasures available include extending the depth of rock revetments, retaining walls, and bridge abutments and/or installing new erosion protection, as needed. The potential for environmental impacts of any countermeasures employed would need to be addressed (e.g., removal of natural channel bank or bed.

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Attachment A
Corte Madera Creek
Improvement Sites Fact Sheets

Fairfax Creek at Sunnyside Nursery Detention Basin Site (HEC-RAS Station 10400 to 11000)

Features Option 2A and 2A Plus: Detention basin, 300-foot-long armored lateral weir, and diversion dam across Fairfax Creek

Channel Dimensions: Flood Channel: 100 feet wide x 13 feet deep; Bankfull: 15 feet wide by 2 feet deep

Bed Slope: 0.005

Bed Materials: Maximum: Large cobble; Average: Medium gravel; Small: Sand

Bank Conditions: Left Bank (LB): eroding; Right bank (RB): aggraded with gravel bar at tributary confluence

Potential Impacts/Countermeasures:

Channel Sedimentation upstream of diversion dam would require periodic dredging; possible compromise in performance during flood

Bank Erosion along LB for entire length of weir requiring installation of rock revetment to depth below potential scour

Figure A-1. Fairfax Creek Looking Upstream
Looking along weir location showing active bank erosion and trees to be removed.

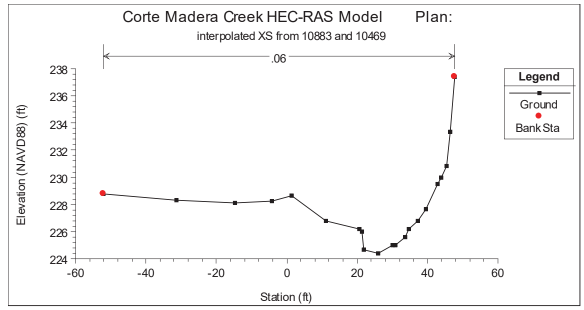


Figure A-2: Fairfax Creek HEC-RAS Cross Section
Looking downstream at proposed weir location.

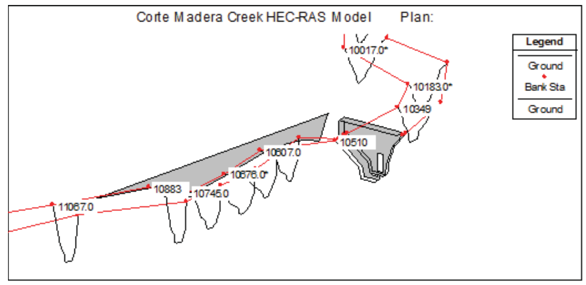


Figure A-3. HEC-RAS 3D Plot of Fairfax Creek
Plot is at Sunnyside Nursery
with proposed weir and diversion dam (in grey).

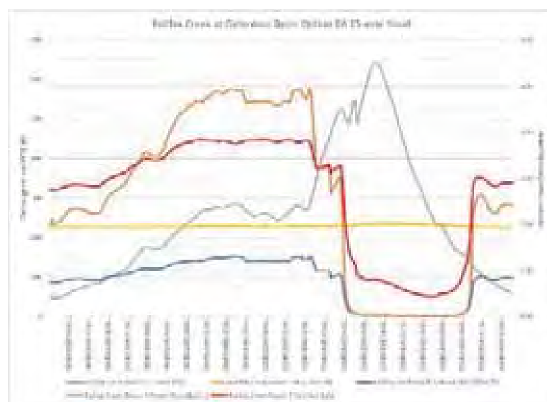


Figure A-4. HEC-RAS Output for 25-year Flood
Plot is for cross section at weir showing loss of sediment transport capacity
during 6-hour peak flow period.

Fairfax Creek at Azalea Street Bridge (HEC-RAS Station 2230)

Features Option 2A Plus: Remove and replace

Channel Dimensions: Flood Channel: 25 feet wide by 13 feet deep; Bankfull: 25 feet wide by 2 feet deep

Bed Slope: 0.005

Bed Materials: Maximum: Large cobble; Average: Medium gravel; Small: Muds

Bank Conditions: LB: armored; RB: armored

Potential Impacts/Countermeasures:

Channel Incision: Channel bed well armored less than significant

Bank Erosion: Potential bank toe erosion requiring scour protection to be determined during design

Figure A-5: Azalea Avenue Bridge Upstream View

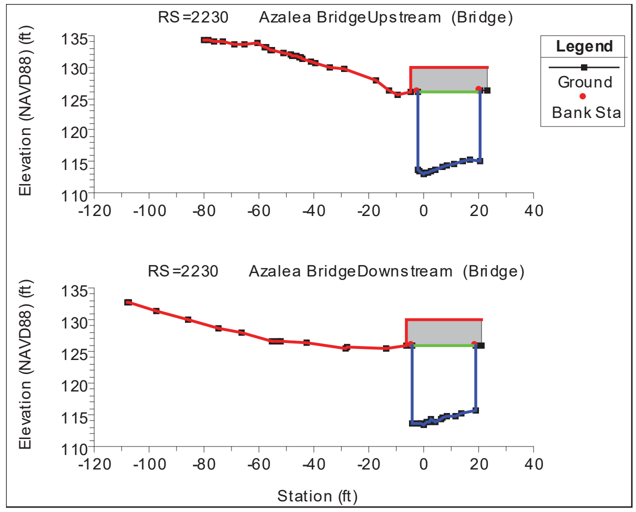


Figure A-6: HEC-RAS plot of Azalea Avenue Bridge

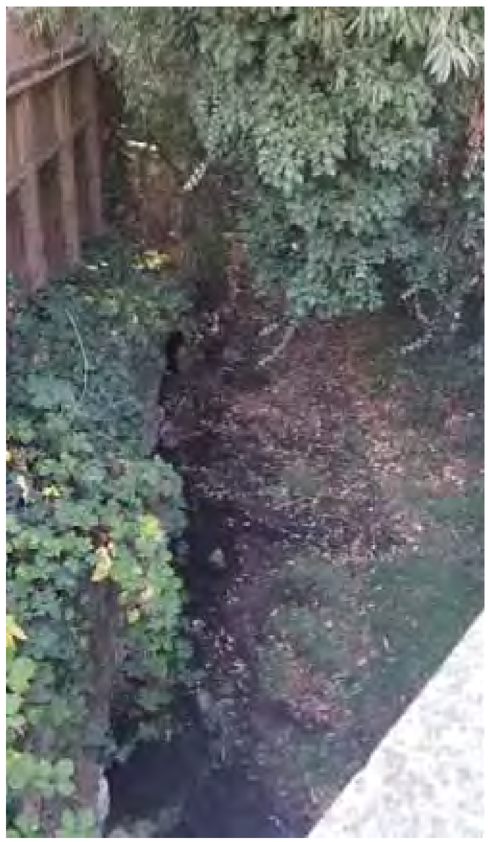


Figure A-7: Azalea Avenue Bridge Downstream Channel

San Anselmo Creek at Nokomis Avenue Bridge (HEC-RAS 455513)

Features Option 2A Plus: Remove and replace

Channel Dimensions: Flood Channel: 75 feet wide by 6 feet deep; Bankfull: 20 feet wide by 4 feet deep

Bed Slope: 0.006

Bed Materials: Maximum: Medium cobble; Average: Large to medium gravel; Small: Sands

Bank Conditions: LB: natural and riprap; RB: concrete wall and riprap

Potential Impacts/Countermeasures:

Mobilization of sediments around the bridge piers. A large bar deposit extending 70 feet upstream of the bridge down to the Sorich Creek confluence (90 feet downstream of the bridge) could be remobilized with bridge replacement.

Figure A-8: View of Upstream Face of Nokomis Bridge

Notice large gravel bar deposits underneath and in left bay of bridge.

Figure A-9: Composition of Gravel Bar at Nokomis Bridge

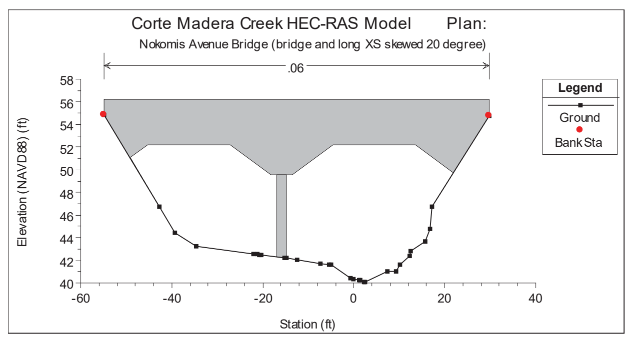


Figure A-10: HEC-RAS cross section at Nokomis Bridge

San Anselmo Creek at Madrone Avenue Bridge (HEC-RAS Station 44949)

Features Option 2A Plus: Remove and replace

Channel Dimensions: Flood Channel: 70 feet wide by 16 feet deep; Bankfull: 20 feet wide by 3 feet deep

Bed Slope: 0.0045

Bed Materials: Maximum: Bedrock / large gravel; Average: Medium gravel; Small: Sands and silts

Bank Conditions: LB: riprap; RB: rip rap and natural

Potential Impacts/Countermeasures:

Channel Incision: Localized mobilization of gravel bar under bridge, but channel bed generally well armored with no evidence of any recent channel adjustment - less than significant

Bank Erosion: Although the channel banks are well armored and seem stable, there is the potential for bank toe erosion requiring scour protection to be determined during design

Figure A-11: View of Channel Upstream of Madrone Avenue

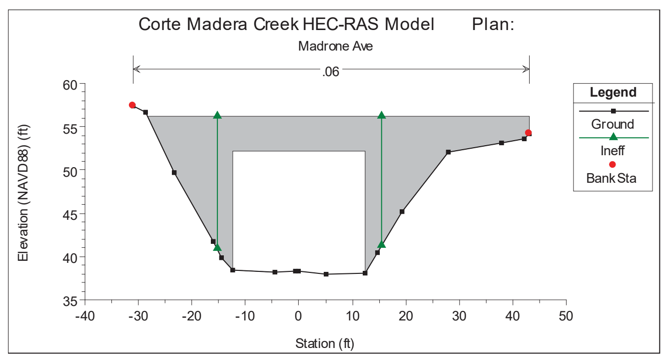


Figure A-12: HEC-RAS Cross Section at Madrone Avenue Bridge

San Anselmo Creek at Center Avenue Bridge (RM 44026)

Features Option 2A Plus: Remove and replace

Channel Dimensions: Flood Channel: 65 feet wide by 18 feet deep; Bankfull: 25 feet wide by 3 feet deep

Bed Slope: 0.004

Bed Materials: Maximum: Embedded large gravel; Average: Medium gravel; Small: Sands and silts

Bank Conditions: LB: riprap, concrete wall, bedrock, and natural; RB: riprap, concrete wall, bedrock, and natural

Potential Impacts/Countermeasures:

Channel Incision: Concrete sill under Bridge Street Bridge (just downstream) creates a backwater effect and controls potential incision - less than significant

Bank Erosion: Although the channel banks have structural control and seem stable, there is the potential for bank toe erosion requiring scour protection to be determined during design

Figure A-13: View of Channel Downstream of Center Avenue Bridge

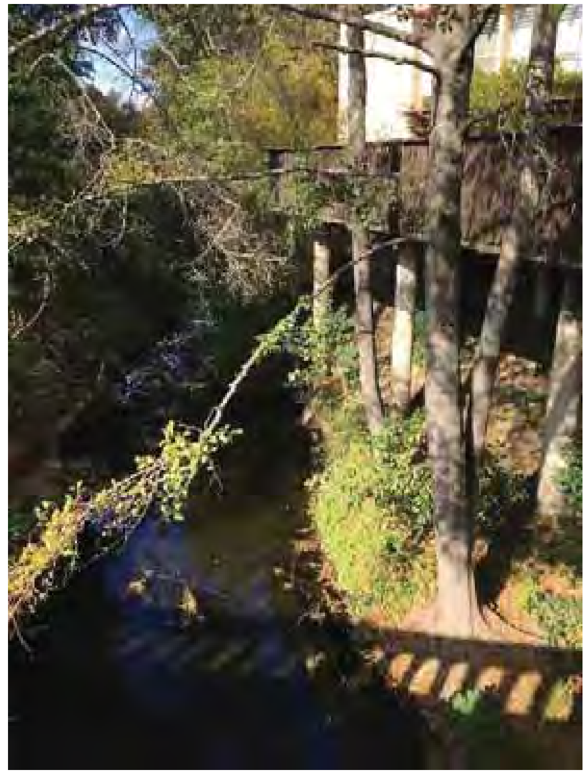


Figure A-14: View of Channel Upstream of Center Avenue Bridge

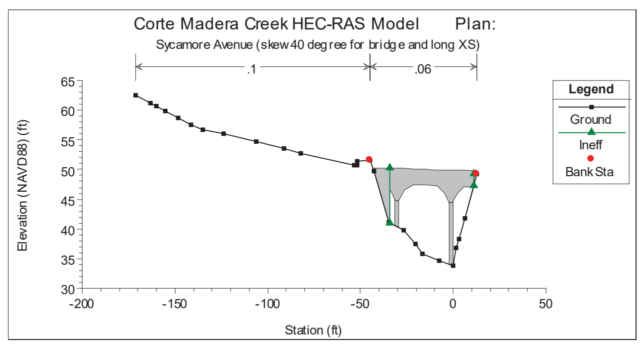


Figure A-15: HEC-RAS Plot at Center Avenue Bridge

San Anselmo Creek at Bridge Boulevard Bridge (HEC-RAS Station 44026)

Features Option 2A Plus: Remove and replace

Channel Dimensions: Flood Channel: 70 feet wide by 14 feet deep; Bankfull: 25 feet wide by 3 feet deep

Bed Slope: 0.004

Bed Materials: Maximum: Concrete sill across channel; Average: Medium to small gravel; Small: Sands and silts

Bank Conditions: LB: Concrete wall, bedrock, and natural; RB: concrete wall, bedrock, and natural

Potential Impacts/Countermeasures:

Channel Incision: Concrete sill under Bridge Street Bridge creates a backwater effect and controls potential incision - less than significant

Bank Erosion: Although the channel banks have structural control and seem stable, there is the potential for bank toe erosion requiring scour protection to be determined during design

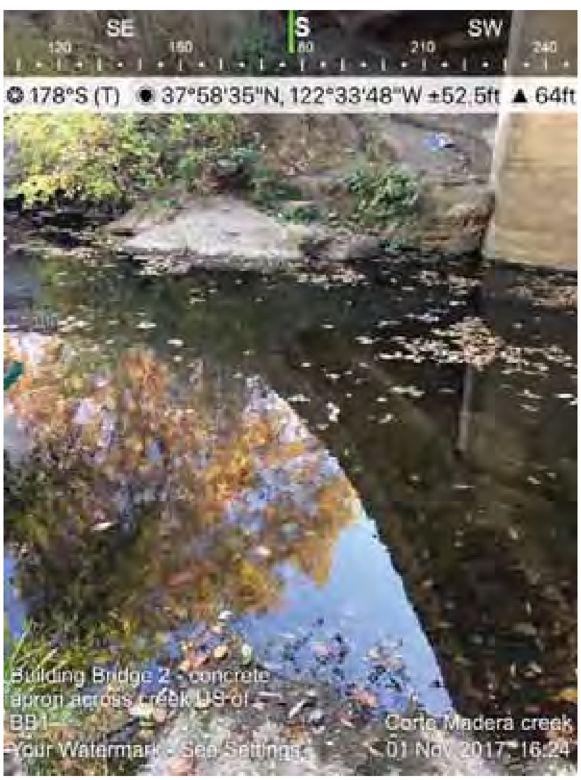


Figure A-16: Concrete Sill Extending across Channel on Downstream Face of Bridge Street Bridge

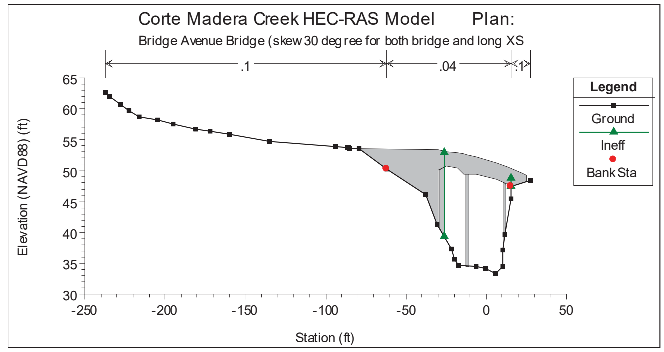


Figure A-17: HEC-RAS Cross Section Bridge Boulevard Bridge

San Anselmo Creek at Winship Avenue Bridge (HEC-RAS Station 40556)

Features Option 2A Plus: Remove and replace

Channel Dimensions: Flood Channel: 80 feet wide by 20 feet deep; Bankfull: 35 feet wide by 4 feet deep

Bed Slope: 0.004

Bed Materials: Maximum: Large cobble; Average: Large to medium gravel; Small: Sands and silts

Bank Conditions: LB: Concrete wall, natural; RB: Concrete wall, natural

Potential Impacts/Countermeasures:

Channel Incision: Potential for mobilization of small gravel bar under bridge and minor channel incision, but channel appears very stable in this reach - less than significant

Bank Erosion: Although the channel banks seem stable, there is the potential for bank toe erosion requiring scour protection to be determined during design

Figure A-18: Looking Upstream at Downstream Face of Winship Avenue Bridge

Figure A-19: Looking Upstream at Channel Upstream of Winship Avenue Bridge

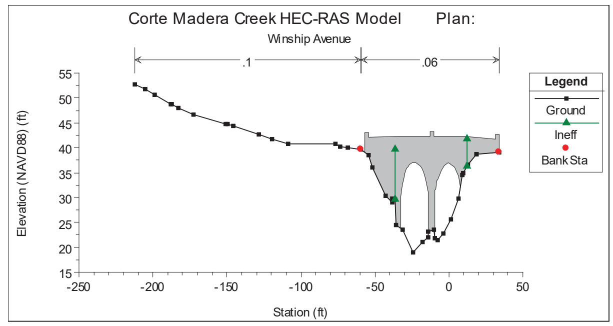


Figure A-20: HEC-RAS Cross Section at Winship Avenue Bridge

Attachment B
Grain Size Data Plot for Gravel Bar under Building Bridge #3 in San Anselmo Creek

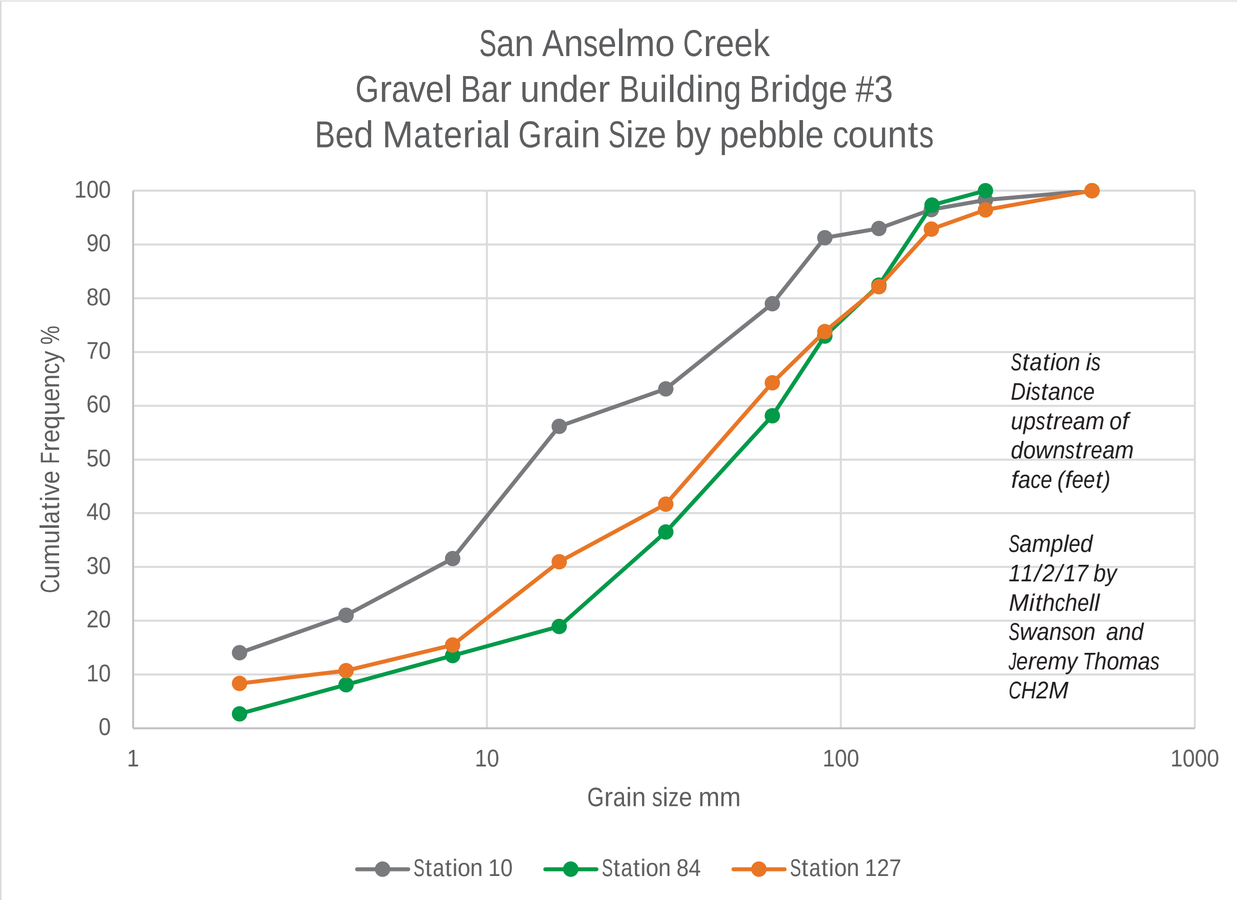


Figure B-1. Channel Bed Grain Size Distribution Sampled by Pebble Counts from Bar under BB#3.

D-5 Supplemental Information Regarding Project Impacts at the Nursery Basin Site

STETSON ENGINEERS INC.

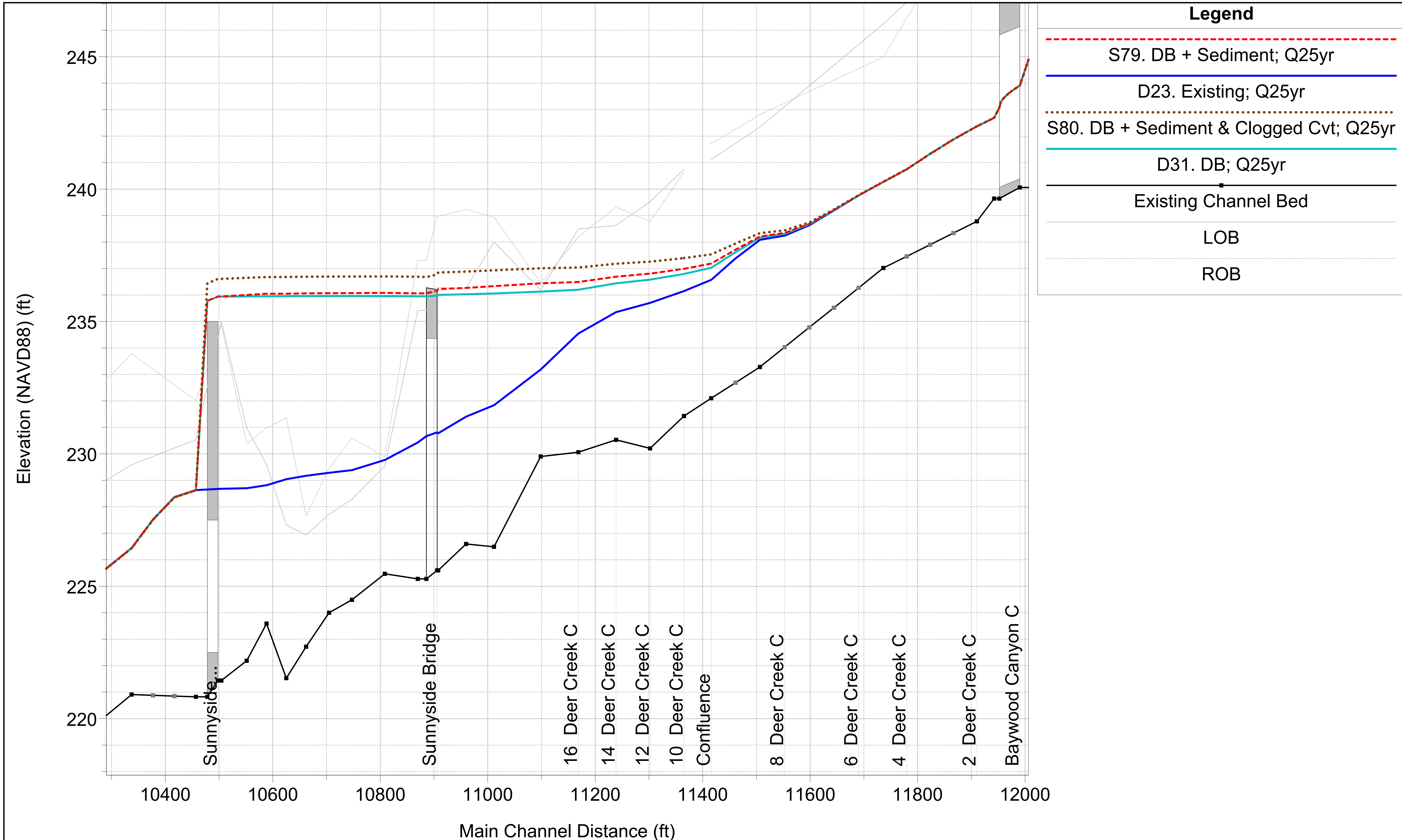
DRAFT

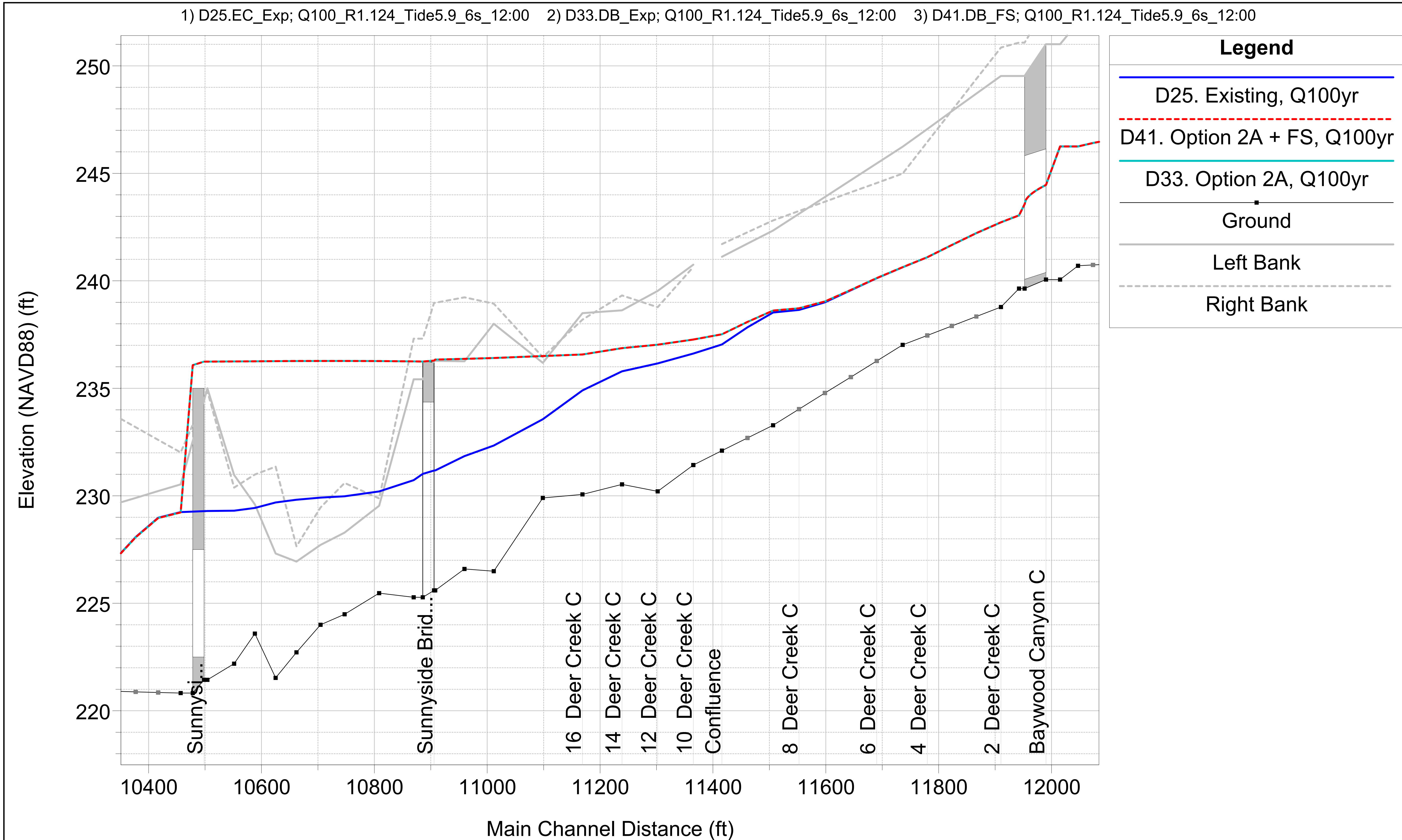
COMPARISON OF THE EXTENT OF INUNDATION BETWEEN EXISTING CONDITION AND OPTION 2A WITH SEDIMENT AND CLOGGING CONDITION – Q25YR EVENT

0 25 50 Feet

Aerial Image: 2014 (MarinMap)

Figure 3 Comparison of Simulated 25-Year Water Surface Elevation Profiles between Sunnyside DB Project, Project with Channel Bed Sedimentation, and Project with Channel Bed Sedimentation /Culvert Clogging Conditions





1) D25.EC_Exp; Q100_R1.124_Tide5.9_6s_12:00 2) D33.DB_Exp; Q100_R1.124_Tide5.9_6s_12:00 3) D41.DB_FS; Q100_R1.124_Tide5.9_6s_12:00
Legend
D25. Existing, Q100yr
D41. Option 2A + FS, Q100yr
D33. Option 2A, Q100yr
Ground
Left Bank
Right Bank
Elevation (NAVD88) (ft)
250
245
240
235
230
225
220
Sunnysi...
Sunnyside Brid...
16 Deer Creek C
14 Deer Creek C
12 Deer Creek C
10 Deer Creek C
Confluence
8 Deer Creek C
6 Deer Creek C
4 Deer Creek C
2 Deer Creek C
Baywood Canyon C
10400
10600
10800
11000
11200
11400
11600
11800
12000
Main Channel Distance (ft)

APPENDIX E
Mitigation Monitoring and Reporting Program

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Introduction

The Marin County Flood Control and Water Conservation District (Flood Control District) is the lead agency implementing the California Environmental Quality Act (CEQA) environmental document for the San Anselmo Flood Risk Reduction Project (Project). The primary goal of the Project is to substantially reduce the frequency and severity of flooding within portions of the San Anselmo Creek and Fairfax Creek subwatersheds in Ross Valley. The Flood Control District would meet this goal by implementing a project that would increase creek capacity by enlarging the San Anselmo Creek channel by removing existing obstructions to flow and reducing peak discharge by attenuating flows through use of a flood diversion and storage (FDS) basin. The Flood Control District prepared an environmental impact report (EIR) to evaluate the potential for the Project to result in significant adverse effects on the physical environment.

This Mitigation, Monitoring, and Reporting Program (MMRP) has been formulated based upon the findings of the EIR and lists the Project-level mitigation and minimization measures recommended in the Draft EIR.

This MMRP is designed to fulfill Section 21081.6(a) of the CEQA, which requires public agencies to adopt a reporting or monitoring program whenever a project or program is approved that includes mitigation measures identified in an environmental document for which the agency makes a finding pursuant to CEQA Section 21081(a)(1). Therefore, this MMRP must be adopted when the Flood Control District makes a final decision on the Project.

Table E-1 lists each of the EIR mitigation measures, and includes the following categories for monitoring and reporting.

1. **Implemented By**. The name of the entity responsible for implementing the mitigation measure.
2. **When Implemented**. Most measures are to be implemented prior to, during, or immediately after project construction.
3. **Monitored By**. The name of the person who is responsible for monitoring implementation of the mitigation measure. At this time, the field is blank – it will be completed during implementation.
4. **Verified By**. The signature of the responsible person and the date compliance is verified. At this time, the field is blank – it will be completed during implementation.

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TABLE E-1
MITIGATION, MONITORING, AND REPORTING PROGRAM

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
4.3 Air Quality and Greenhouse Gas Emissions					
Impact 4.3-1: Construction of the Project would generate criteria pollutant emissions that could exceed air quality standards or contribute substantially to an existing or projected air quality violation.	**Mitigation Measure 4.3-1: BAAQMD Basic Construction Measures** To limit dust, criteria pollutants, and precursor emissions associated with construction, the following BAAQMD-recommended Basic Construction Measures shall be implemented and included in all contract specifications for components constructed under the Project: 1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day. 2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered. 3. All 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. 4. All vehicle speeds on unpaved roads shall be limited to 15 mph. 5. 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. 6. 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 California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. 7. 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. 8. Post a publicly visible sign with the telephone number and person to contact at the Flood Control District regarding dust complaints. This person shall respond and take corrective action within 48 hours. The BAAQMD's phone number shall also be visible to ensure compliance with applicable regulations.	Marin County Flood Control and Water Conservation District (Flood Control District)/Contractor	During construction		
Impact 4.3-2: Construction of the Project would result in emissions that could conflict with the 2017 Clean Air Plan.	**See Mitigation Measure 4.3-1, above.**	Flood Control District/Contractor	During construction		
Impact 4.3-4: Construction of the Project could expose sensitive receptors to toxic air contaminants, including diesel particulate matter emissions.	**Mitigation Measure 4.3-4: Tier 4 Engines for Construction Equipment** All off-road equipment greater than 25 horsepower that operates for more than 20 total hours over the entire duration of construction activities shall have engines that meet the USEPA or CARB Tier 4 interim or Tier 4 Final off-road emission standards.	Flood Control District/ Contractor	During construction		
4.4 Energy, Mineral, Forest and Agricultural Resources					
Impact 4.4-1: Implementation of the Project could use energy, oil, or natural gas in an inefficient manner; encourage activities that would result in the use of large amounts of energy, oil, or natural gas; result in the energy supplier not having the capacity to supply the Project's energy needs with existing or planned supplies; or require the development of new energy resources.	**See Mitigation Measure 4.3-1, above.**	Flood Control District/ Contractor	During construction		
4.5 Biological Resources					
Impact 4.5-1: Project implementation could have substantial adverse effects on special-status aquatic species or habitats.	**Mitigation Measure 4.5-1a: Seasonal Avoidance of Sensitive Aquatic Species** In-water construction work, including activities on the banks that are expected to create turbidity or disturb the streambed, shall be conducted within resource agency-approved work windows intended to reduce potential impacts on salmonids (generally limiting work to the period between June 15 and October 15) with resource agency concurrence for the following exceptions: 1. Removal of debris, foundations or other manmade materials from the creek bed may continue year-round, in areas of the stream which are dry and where such activity shall not create turbidity. 2. Tree removal and invasive species removal may take place year-round, providing the area is free of nesting birds and roosting bats as provided under **Mitigation Measure 4.5-4.** 3. Revegetation activities may occur year-round.	Flood Control District/ Contractor	During construction		

TABLE E-1 (CONTINUED)
MITIGATION, MONITORING, AND REPORTING PROGRAM

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
4.5 Biological Resources (cont.)					
Impact 4.5-1 (cont.)	**Mitigation Measure 4.5-1b: Relocation of Special-Status Fish** If in-channel work requires dewatering, including for sediment removal maintenance activities, fish shall be captured and relocated downstream of the Project areas to avoid injury and mortality and minimize disturbance. The Flood Control District shall implement the measures below, or whatever more stringent species preservation and avoidance measures are imposed by resource agencies, including NMFS and CDFW, with jurisdiction over aquatic special-status species. 1. The name(s) and credentials of qualified biologist(s) to act as construction monitors shall be submitted to CDFW and NMFS for approval at least 15 days before construction work begins. 2. Prior to and during the initiation of construction activities, qualified fisheries biologist (i.e., approved by CDFW and/or NMFS) shall be present during installation and removal of creek diversion structures. 3. For sites that require flow diversion and exclusion, the work area shall be blocked by placing fine-meshed nets or screens above and below the work area to prevent salmonids from re-entering the work area. To minimize the potential for re-entry, mesh diameter shall not exceed 1/8 inch. The bottom edge of the net or screen shall be secured to the channel bed to prevent fish from passing under the screen. Exclusion screening shall be placed in low velocity areas to minimize fish impingement against the mesh. Screens shall be checked periodically and cleaned of debris to permit free flow of water. 4. Before removal and relocation on individual fish begins, a qualified fisheries biologist shall identify the most appropriate release location(s). In general, release locations should have water temperatures similar to (<3.6°F difference) the capture location and offer ample habitat (e.g., depth, velocity, cover, connectivity) for released fish, and should be selected to minimize the likelihood of reentering the work area or becoming impinged on exclusion nets or screens. 5. The means of capture shall depend on the nature of the work site, and shall be selected by a qualified fisheries biologist as authorized by CDFW and NMFS. Complex stream habitat may require the use of electrofishing equipment, whereas in outlet pools, fish and other aquatic species may be captured by pumping down the pool and then seining or dip netting. Electrofishing, if necessary, shall be conducted only by properly trained personnel holding current permits from CDFW and NMFS and following the most recent NMFS electrofishing guidelines (NMFS, 2000). 6. Initial fish relocation efforts shall be performed several days prior to the scheduled start of construction. Flow diversions and species relocation shall be performed during morning periods. The fisheries biologist shall survey the exclusion screening throughout the diversion effort to verify that no special-status fish, amphibians, or aquatic invertebrates are present. Afternoon pumping activities shall be limited and pumping shall be suspended when water temperatures exceed 18 degrees Celsius (64.5° F). Water temperatures shall be measured periodically, and flow diversion and species relocation shall be suspended if temperatures exceed the 18-degree limit under NMFS guidelines. Handling of fish shall be minimized. When handling is necessary, personnel shall wet hands or nets before touching them. 7. Prior to translocation, fish that are collected during surveys shall be temporarily held in cool, aerated, shaded water using a five-gallon container with a lid. Overcrowding in containers shall be avoided; at least two containers shall be used and no more than 25 fish shall be kept in each bucket. Aeration shall be provided with a battery-powered external bubbler. Fish shall be protected from jostling and noise, and shall not be removed from the container until the time of release. A thermometer shall be placed in each holding container and partial water changes shall be conducted as necessary to maintain a stable water temperature. Special-status fish shall not be held more than 30 minutes. If water temperature reaches or exceeds 18 degrees Celsius (USFWS 2012), the fish shall be released and relocation operations shall cease. 8. If fish are abundant, capture shall cease periodically to allow release and minimize the time fish spend in holding containers. 9. Fish shall not be anesthetized or measured. However, they shall be visually identified to species level, and year classes shall be estimated and recorded. 10. Reports on fish relocation activities shall be submitted to CDFW and NMFS in within one week.	Qualified Fisheries Biologist (construction monitoring; fish relocation); Qualified Fisheries Biologist (reporting)	Prior to and during construction; during construction		
	Mitigation Measure 4.5-1c: Contractor Environmental Awareness Training and Site Protection All construction personnel that are working in areas of potential endangered species habitat shall attend an environmental education program delivered by a qualified biologist prior to working on either Project site. The training shall include an explanation as how to best avoid the accidental take of special-status species, including salmonids and other fish species, western pond turtle, California red-legged frog, and listed birds. The training session shall be mandatory for contractors and all construction personnel. The field meeting shall include topics on species identification, life history, descriptions, and habitat requirements during various life stages. Emphasis shall be placed on the importance of the habitat and life stage requirements within the context of maps showing areas where minimization and avoidance measures are being implemented. The program shall include an explanation of appropriate federal and state laws protecting endangered species. The contractor shall provide closed garbage containers for the disposal of all trash items (e.g., wrappers, cans, bottles, food scraps). Work sites shall be cleaned of litter before closure each day, and placed in wildlife-proof garbage receptacles. Construction personnel shall not feed or otherwise attract any wildlife. No pets, excluding service animals, shall be allowed in construction areas.	Qualified Biologist/ Construction Monitor (training); Contractor (garbage containers, litter removal)	Prior to construction		

TABLE E-1 (CONTINUED)
MITIGATION, MONITORING, AND REPORTING PROGRAM

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
4.5 Biological Resources (cont.)					
Impact 4.5-2: Project implementation could have substantial adverse effects on special-status plants.	**Mitigation Measure 4.5-2: Avoid Impacts to Rare Plants** A qualified biologist shall conduct a pre-construction survey of each Project site for special-status plant species with the potential to occur within the area of disturbance. The survey shall be floristic in nature and shall follow the procedures outlined in the CDFW Publication *Protocols for Surveying and Evaluating Impacts to Special-status Native Plant Populations and Natural Commu*nities (CDFW, 2009). The survey shall be conducted between April and July in conjunction with the blooming seasons of those rare plants with moderate potential to occur in the Project area. If no special-status plants are observed during appropriately timed surveys by a qualified botanist, it is assumed the construction activity will have no impact on special-status plants and no further action is required. If special-status plants are identified within the Project area, the individuals or populations shall be mapped and quantified and reported to the CNDDB, and the project manager shall be notified so that potential impacts to these known occurrences shall be avoided, when feasible. Coordination with CDFW and/or USFWS staff shall be conducted to establish appropriate avoidance and minimization measures if the species is federally or State listed. Avoidance and minimization measures may include: 1. No-disturbance buffers. 2. Work windows for low impact activities that are compatible with the dormant phase of a special-status plant life cycle but that may kill living plants or severely alter their ability to reproduce. 3. Silt fencing or construction fencing to prevent vehicles, equipment, and personnel from accessing the occupied habitat. 4. Erosion control BMPs such as straw wattles made of rice straw, erosion control blankets, or hydroseeding with a native plant seed mix to prevent sedimentation from upslope construction activities. 5. Before the construction activity commences, special-status plant occurrences shall be marked with pin flags in the field, and all maintenance personnel shall be instructed as to the location and extent of the special-status plants or populations and the importance of avoiding impacts to the species and its habitat. 6. If needed a qualified biologist shall be present or on-call during construction activities to provide guidance on avoiding special-status plants, ensure that other avoidance measures (buffers, fencing, etc.) are observed, and to document the total impact of the maintenance activity, particularly if it is greater or less than anticipated. 7. In consultation with, and as authorized by, CDFW or USFWS, a qualified botanist may collect and spread seeds or relocate plants to appropriate locations.	Qualified Biologist	Prior to construction; during construction		
Impact 4.5-3: Project implementation could have substantial adverse effects on special-status amphibians.	**Mitigation Measure 4.5-3a: Install Wildlife Exclusion Fencing** The Flood Control District shall implement the measures below, or whatever more stringent California red-legged frogs (CRLF) and western pond turtle (WPT) preservation and avoidance measures are imposed by resource agencies with primary jurisdiction over special-status wildlife species, including USFWS and CDFW. 1. Before ground-disturbing activity occurs, the contractor shall install temporary exclusion/silt barrier fencing around the perimeter of the construction site. Fencing shall be installed to the extent necessary to exclude CRLF from the construction area (in areas with habitat), and minimize impacts to natural habitat. Fencing material shall provide for wildlife exclusion as well as maintenance of water quality. Construction personnel and construction activity shall avoid areas outside the fencing. The need for and exact location of the fencing shall be determined by a qualified biologist, with the goal of protecting sensitive biological habitat and water quality. The fencing shall be checked at regular intervals (e.g., weekly) and maintained until construction is complete at individual work sites. The fence shall contain exit funnels to allow any wildlife within the construction area to leave without human intervention while preventing entry into the construction zone. Exit funnels shall be placed at ground level no more than 100 feet apart along the fence, or as modified by a qualified biologist or as directed by resource agencies with primary jurisdiction over special-status wildlife species. 2. The fencing shall be monitored as prescribed in **Mitigation Measure 4.5-6.**	Flood Control District/ Contractor (installation); Qualified Biologist (fence inspection/monitoring)	Prior to construction; during construction		
	Mitigation Measure 4.5-3b: Avoid Impacts to California Red-legged Frog and Western Pond Turtle The name(s) and credentials of the qualified biologist(s) to act as construction monitors shall be submitted to the USFWS for approval at least 15 days before construction work begins. Prior to commencing work, an approved biologist shall survey the entire construction footprint for California red-legged frog and other special-status species with potential to be present, such as western pond turtle. At the beginning of each workday that includes initial ground disturbance, including grading, excavation, and vegetation-removal activities, an approved biologist shall conduct on-site monitoring for the presence of these species in the area where ground disturbance or vegetation removal is planned. If required by the USFWS or CDFW, perimeter fences shall be inspected to ensure they do not have any tears or holes, that the bottoms of the fences are still buried, and that no individuals have been trapped in the fence.	Qualified biologist (site surveying); Contractor (trench covering, temporary fencing)	Prior to construction; during construction		

TABLE E-1 (CONTINUED)
MITIGATION, MONITORING, AND REPORTING PROGRAM

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
4.5 Biological Resources (cont.)					
Impact 4.5-3 (cont.)	All excavated or deep-walled holes or trenches greater than 2 feet deep shall be covered at the end of each workday using plywood, steel plates, or similar materials, or escape ramps shall be constructed of earth fill or wooden planks to allow animals to exit. Before such holes are filled, they shall be thoroughly inspected for trapped animals. If a special-status species is present within the exclusion fence area during construction, work shall cease in the vicinity of the animal, and the animal shall be allowed to relocate of its own volition unless relocation is permitted by state and/or federal regulatory agencies. The contractor shall maintain the temporary fencing—both exclusion fencing and protective fencing (if installed)—until all construction activities are completed. No construction activities, parking, or staging shall occur beyond the fenced exclusion areas.				
Impact 4.5-4: Project implementation could have substantial adverse effects on nesting birds.	**Mitigation Measure 4.5-4: Avoid Impacts to Special-status and Nesting Birds, including Raptors and Northern Spotted Owls** Tree removal activities shall be avoided during the nesting season (February 1 to August 31). Prior to any tree removal or construction in nesting season, a qualified biologist shall conduct a spotted owl and general nesting bird survey in each Project site and areas within 1/2-mile. Any identified spotted owl nesting areas or activity centers shall be flagged and avoided with a buffer of 1/4-mile throughout the active nesting season. Other nesting birds with active nests in the vicinity of the construction area shall be avoided by a buffer of 50 feet, or as determined in coordination with USFWS and CDFW. Construction work may continue outside of the no-work buffer. Northern spotted owl nesting surveys shall be conducted in coordination with Marin County Parks and Point Blue Conservation Science (Point Blue, 2017).	Flood Control District/ Contractor (scheduling tree removal); Qualified biologist (surveys, monitoring)	Prior to construction; during construction		
Impact 4.5-5: Project implementation could have substantial adverse effects on Northern spotted owls.	**See Mitigation Measure 4.5-4, above.**	Flood Control District/ Contractor (scheduling tree removal); Qualified biologist (surveys, monitoring)	Prior to construction; during construction		
Impact 4.5-6: Project implementation could have substantial adverse effects on special-status bats.	**Mitigation Measure 4.5-6: Avoid Impacts to Special-status Bats** Prior to any construction, a qualified bat biologist shall conduct a pre-construction survey for roosting bats in trees to be removed or pruned and structures to be demolished. If no roosting bats are found, no further action is required. If a bat roost is found, the following measures shall be implemented to avoid impacts on roosting bats. If active maternity roosts are found in trees or structures that shall be removed or demolished as part of construction, tree removal or demolition of that structure shall commence before maternity colonies form (generally before March 1) or after young are flying (generally by July 31). Active maternal roosts shall not be disturbed. If a non-maternal roost of bats is found in a tree or structure to be removed or demolished as part of construction, the individuals shall be safely evicted, under the direction of a qualified bat biologist and with approval from CDFW. Removal of the tree or demolition of the structure should occur no sooner than two nights after the initial minor site modification (to alter airflow), under guidance of the qualified bat biologist. The modifications shall alter the bat habitat, causing bats to seek shelter elsewhere after they emerge for the night. On the following day, the tree or structure may be removed, in presence of the bat biologist. If any bat habitat is not removed, departure of bats from the construction area shall be confirmed with a follow-up survey prior to start of construction.	Qualified bat biologist	Prior to construction		
Impact 4.5-7: Project implementation could adversely affect sensitive natural communities.	**Mitigation Measure 4.5-7a: Vegetation Protection for Sensitive Natural Communities** Prior to start of construction of any Project element, the extent of sensitive natural communities within the work area shall be identified by a qualified botanist or ecologist experienced in the definition and recognition of these communities. The area of impact in sensitive natural communities shall be minimized by siting construction staging and access areas outside the limits of riparian vegetation (as determined during pre-construction surveys) and by utilizing previously-disturbed areas. Before construction begins, the Project engineer and a qualified biologist shall identify locations for equipment and personnel access and materials staging that will minimize riparian vegetation disturbance. When heavy equipment is required, unintentional soil compaction shall be minimized by using equipment with a greater reach, or using low-pressure equipment. Temporary impacts on sensitive natural communities shall be mitigated by revegetation with native species, as required by **Mitigation Measure 4.5-7b.**	Qualified botanist; Contractor/Engineer	Prior to construction; during construction		
	Mitigation Measure 4.5-7b: Habitat Restoration and Monitoring Plan The Flood Control District shall prepare a Habitat Restoration and Monitoring Plan for restoration following construction activities at both Project sites. The plan shall describe required salvage and replanting protocols prior to and after construction is complete and shall thereby reduce the long-term amount of losses of these natural communities. This plan shall include, but not be limited to, protocols for replanting of vegetation removed prior to or during construction, and management and monitoring of the plants to ensure replanting success pursuant to Marin County's Countywide Plan, Marin County Code, or Code requirements of the Town of San Anselmo, or by any more stringent requirements included in other permits issued for the Project. The plan shall specify monitoring and performance criteria for the species planted, invasive species control criteria, as well as the best time of year for seeding to occur, pursuant to requirements of permits from the various resource agencies with regulatory purview over the Project. Revegetated areas shall be monitored for a five-year period to track progress toward performance criteria.	Flood Control District (Habitat Restoration and Monitoring Plan); Contractor, Qualified Biologist (vegetation salvage)	Prior to construction; After construction		

TABLE E-1 (CONTINUED)
MITIGATION, MONITORING, AND REPORTING PROGRAM

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
4.5 Biological Resources (cont.)					
Impact 4.5-7 (cont.)	Native riparian vegetation that can be propagated by cuttings or easily transplanted such as rushes and sedges within the Project sites shall be salvaged prior to construction and replanted after construction is completed. Areas impacted by construction-related activity shall be replanted or reseeded with native trees, shrubs, and herbaceous perennials and annuals from the watershed under guidance from a qualified biologist. Local plant materials shall be used for revegetation of the disturbed area. The plant materials shall include local cuttings from the local watershed or from adjacent watersheds. This shall ensure that the seeds can be collected during the appropriate season and the container plants shall be of an appropriate size for out-planting. Using local cuttings can reduce the length of this phase. The Habitat Restoration and Monitoring Plan would also address restoration of jurisdictional wetlands and waters. Temporary impacts to wetlands shall be restored onsite with native wetland species under guidance from a qualified biologist. Permanent impacts to jurisdictional wetlands shall be mitigated for by replacement on- or off-site at an equal ratio or whatever more stringent requirements are included in the permits to be issued for the Project. The monitoring plan shall include annual monitoring of restored areas for at least 5 years. The plan shall contain vegetation management protocols, protocols for monitoring replanting success, and an adaptive management plan if success criteria are not being met. The adaptive management plan would include interim thresholds for replanting success and alternative management approaches, such as weed control or additional replanting, to undertake if thresholds are not met.				
	Mitigation Measure 4.5-7c: Avoid Spread of Invasive Species and Pathogens All vehicles and equipment entering each Project site shall be clean of noxious weeds. Noxious weeds could spread between sites as well as from outside the Project sites. All construction equipment shall be washed thoroughly to remove all dirt, plant, and other foreign material prior to entering the Project sites. Particular attention shall be shown to the under-carriage and any surface where soil containing exotic seeds may exist. Arrangements shall be made for inspections of each piece of equipment before entering each Project site to ensure all equipment has been properly washed. Equipment found operating on the Project that has not been i.e., properly washed shall be shut down and may be subject to citation. 1. Certified weed-free permanent and temporary erosion control measures shall be implemented to minimize erosion and sedimentation during and after construction. 2. The contractor shall conform to applicable federal, state, and local seed and noxious weed laws. 3. Nursery operations where plants are stored, propagated, or purchased must certify implementation of best management practices to reduce pest and pathogen contamination within their nursery. 4. Disturbed and decompacted areas outside the restoration area shall be revegetated with locally native vegetation. Revegetated areas shall be protected and tended, including watering when needed, until restoration criteria specified by regulatory agency-issued permits is complete. 5. All tree removal and pruning activities shall include measures to avoid the spread of the Sudden Oak Death (SOD) pathogen. Such measures may include, but are not limited to the following: i. As a precaution against spreading the pathogen, clean and disinfect pruning tools after use on confirmed or suspected infested trees or in known infested areas. Sanitize tools before pruning healthy trees or working in pathogen-free areas. Clean chippers and other vehicles of mud, dirt, leaves, organic material, and woody debris before leaving a site known to have SOD and before entering a site with susceptible hosts. ii. Inform crews about the arboricultural implications of SOD and sanitation practices when they are working in infested areas. iii. Provide crews with sanitation kits containing chlorine bleach, scrub brush, metal scraper, boot brush, and plastic gloves. iv. Sanitize shoes, pruning gear, and other equipment before working in an area with susceptible species. v. When possible, work on SOD-infected and susceptible species during the dry season (June-October). When working in wet conditions, keep equipment on paved, graveled, or dry surfaces and avoid mud. Work in disease-free areas before proceeding to infested areas. vi. If possible, do not collect soil or plant material (wood, brush, leaves, and litter) from host trees in the quarantine area. Within the quarantine area, host material (e.g., wood, bark, brush, chips, leaves, or firewood) from tree removals or pruning of symptomatic or non-symptomatic host plants should remain onsite to minimize pathogen spread. vii. Use all reasonable methods to sanitize personal gear and crew equipment before leaving a SOD infested site. Scrape, brush, and/or hose off accumulated soil and mud from clothing, gloves, boots, and shoes. Remove mud and plant debris by blowing out or power washing chipper trucks, chippers, bucket trucks, fertilization and soil aeration equipment, cranes, and other vehicles. Restrict the movement of soil and leaf litter under and around infected trees as spores may be found there. viii. Tools used in tree removal/pruning may become contaminated and should be disinfected with alcohol or chlorine bleach.	Contractor/ Flood Control District	During construction		

TABLE E-1 (CONTINUED)
MITIGATION, MONITORING, AND REPORTING PROGRAM

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
4.5 Biological Resources (cont.)					
Impact 4.5-8: Project activities could adversely affect wetlands and other waters.	**See Mitigation Measures 4.5-7a and 4.57b, above.**	4.5-7a. Qualified Botanist; Contractor/Engineer 4.57b. Flood Control District (Habitat Restoration and Monitoring Plan); Contractor, Qualified Biologist (vegetation salvage)	4.5-7a. Prior to construction; during construction 4.57b. Prior to construction; after construction		
Impact 4.5-9: Project construction could adversely affect riparian wildlife movement corridors.	**See Mitigation Measures 4.5-1a, 4.5-3b, 4.5-4, and 4.5-6, above.**	4.5-1a. Flood Control District/Contractor 4.5-3b. Qualified biologist (site surveying); Contractor (trench covering, temporary fencing) 4.5-4. Flood Control District/ Contractor (scheduling tree removal); Qualified biologist (surveys, monitoring) 4.5-6. Qualified bat biologist	4.5-1a. During construction 4.5-3b. Prior to and during construction; During construction 4.5-4. Prior to construction; during construction 4.5-6. Prior to construction		
Impact 4.5-10: Project construction would require tree removal.	**Mitigation Measure 4.5-10: Mitigation for Removal of Heritage or Protected Trees** During construction, as much understory brush and as many native trees as possible shall be retained, to maintain shade-producing and bank-stabilizing vegetation for the creeks. All trees to remain during construction within the grading area shall be protected and trimmed if necessary to ensure their trunks and/or limbs are not disturbed during construction. To mitigate for tree removal: For each tree to be removed, the Flood Control District shall plant a replacement tree of the same species or a suitable native species substitute, at a rate of one planting per tree removed or such other mitigation ratio requirements included in the LSAA to be obtained from CDFW (for riparian trees) or any applicable County and/or town recommendations (for heritage trees), and ensure that replacement trees are planted within or in the vicinity of the Project sites to the maximum extent practicable, as follows: 1. Trees shall be replaced within the first year after the completion of construction or as soon as possible after construction is completed. 2. Selection of replacement sites and installation of replacement plantings shall be supervised by an arborist or biologist with experience in restoration. Irrigation of tree plantings during the initial establishment period shall be provided as deemed necessary by an arborist or biologist, consistent with the site **Habitat Restoration and Monitoring Plan** (**Mitigation Measure 4.5-7b**).	Contractor/ Flood Control District	During construction; After construction		
4.8 Hazards and Hazardous Materials					
Impact 4.8-2: The Project could create a significant hazard to the public or the environment from the Project's location on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5.	**Mitigation Measure 4.8-2a: Check 700/750 Sir Francis Drake Boulevard Investigation Status** Prior to beginning construction activities, the contractor shall check the status of the 700/750 Sir Francis Drake Boulevard investigation available at the SWRCB GeoTracker website at: http://geotracker.waterboards.ca.gov/. Relevant information from the GeoTracker shall be used to inform the Health and Safety Plan and Soil Management Plan, described in subsequent mitigation measures.	Contractor	Prior to construction		
	Mitigation Measure 4.8-2b: Health and Safety Plan The construction contractor(s) shall prepare and implement a site-specific Health and Safety Plan in accordance with 29 CFR 1910.120 to protect construction workers and the public during all excavation and grading activities. The Health and Safety Plan shall include, but is not limited to, the following elements: 1. Designation of a trained, experienced site safety and health supervisor who has the responsibility and authority to develop and implement the site health and safety plan; 2. A summary of all potential risks to construction workers and maximum exposure limits for all known and reasonably foreseeable site chemicals based on the most recent reporting of the investigation at 700/750 Sir Francis Drake Boulevard site overseen by the Regional Water Quality Control Board; 3. Specified personal protective equipment and decontamination procedures, if needed; 4. Emergency procedures, including route to the nearest hospital; and 5. Procedures to be followed in the event that evidence of potential soil or groundwater contamination (such as soil staining, noxious odors, debris or buried storage containers) is encountered.	Contractor	Prior to construction		

TABLE E-1 (CONTINUED)
MITIGATION, MONITORING, AND REPORTING PROGRAM

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
4.8 Hazards and Hazardous Materials (cont.)					
Impact 4.8-2 (cont.)	These procedures shall be in accordance with hazardous waste operations regulations and specifically include, but are not limited to, the following: immediately stopping work in the vicinity of unknown discovered or suspected hazardous materials release and notifying the Marin County CUPA (415-473-7085). Mitigation Measure 4.8-2b applies to both the Nursery Basin and the Downtown San Anselmo sites.				
	Mitigation Measure 4.8-2c: Soil Management Plan For the Downtown San Anselmo site, the Flood Control District or its contractor shall develop and implement a Soil Management Plan that includes a materials disposal plan specifying how the construction contractor shall remove, handle, transport, and dispose of all excavated material in a safe, appropriate, and lawful manner. The plan shall identify protocols for training workers to recognize potential soil contamination (such as soil staining, noxious odors, debris or buried storage containers), soil testing and disposal by a qualified contractor in the event that contamination is identified, and identification of approved disposal sites (e.g., Redwood Landfill in Novato). Contract specifications shall mandate approval of the Soil Management Plan by the Flood Control District as well as full compliance with all applicable local, state, and federal regulations related to the identification, transportation, and disposal of hazardous materials.	Flood Control District/ Contractor	Prior to construction; during construction		
4.9 Hydrology and Water Quality					
Impact 4.9-1: Project construction could violate water quality standards and/or waste discharge requirements, provide substantial additional sources of polluted runoff, or otherwise substantially degrade water quality.	**Mitigation Measure 4.9-1: Implement Dewatering BMPs for In-Water Work** For in-water dewatering during sediment removal activities, the Flood Control District or its contractor(s) shall prepare a Dewatering Plan. The Dewatering Plan shall identify best management practices (BMPs) that ensure sediment removal activities meet water quality objectives. In-stream sediment removal shall follow approved and permitted dewatering practices for wet weather sediment removal during more infrequent flood events in Fairfax Creek. This work shall be timed to take place as flows are receding and only after instream measures to reduce downstream turbidity are in place. In addition, the Flood Control District shall implement the measures below, or whatever more stringent water quality protection measures are imposed by the RWQCB. 1. All work performed in-water shall be completed in a manner that meets the water quality objectives to ensure the protection of beneficial uses as specified in the Basin Plan 2. All dewatering and diversion methods shall be installed such that natural flow is maintained upstream and downstream of the project area. 3. Any temporary dams or diversion shall be installed such that the diversion does not cause sedimentation, siltation, or erosion upstream or downstream of the project area. 4. Screened pumps shall be used in accordance with CDFW's fish screening criteria and in accordance with the NMFS Fish Screening Criteria for Anadromous Salmonids and the Addendum for Juvenile Fish Screen Criteria for Pump Intakes 5. Cofferdams shall remain in place and functional throughout the in-stream construction or maintenance periods. 6. Disturbance of protected riparian vegetation shall be limited or avoided entirely.	Flood Control District/ Contractor	Prior to construction (Dewatering Plan); During construction (in-water work)		
Impact 4.9-3. The Project would alter existing drainage patterns, potentially causing new erosion or siltation.	**Mitigation Measure 4.9-3a. Prioritize Nursery Basin Reach for Stream Maintenance** The Stream Maintenance Program waste discharge requirements impose limits on the total volume of material allowed to be removed from all of the streams covered by that permit. In order to retain the design capacity of the Nursery Basin and the associated storage within the Fairfax Creek channel behind the diversion structure, the Flood Control District shall prioritize sediment removal at this site over other sites covered by the Stream Maintenance Program and shall remove all deposited sediment up to the maximum volume allowed under the existing permit (2,100 cubic yards). If deposited sediment still remains after removing the maximum volume, then this site shall be prioritized in subsequent years to remove the remaining sediment and any newly accumulated material, again up to the maximum allowed.	Flood Control District	After construction		
	Mitigation Measure 4.9-3b. Scour Analysis and Protection Measures Upstream of the Downtown San Anselmo Site Due to the dependence of erosion and sedimentation patterns on the bed-scale morphology of the new structures, measures to counter scour and sedimentation issues must be based on more advanced project design. To reduce Project impacts on erosion and sedimentation, the Flood Control District shall conduct a scour analysis for the San Anselmo Creek channel upstream of the Downtown San Anselmo site and then develop and implement appropriate scour countermeasures from the analysis into project design and operations. The analysis shall be based on at least 30 percent design and must evaluate the potential for scour and channel bank erosion including specifying the expected depth and lateral extent both immediately upstream and downstream of the Project site from 634-636 San Anselmo Avenue to Bridge Avenue bridge. The analysis shall recommend foundation designs and scour protection measures that protect structures to depths below potential scour, estimated using standard engineering methods. The Flood Control District shall implement the foundation designs and scour protection measures in final project design. Foundation design and scour protection measures commonly used to protect existing in-channel structures and banks and that could be implemented in this Project include but are not limited to: 1. Adding new rock revetment or extending the depth of existing rock revetments 2. Extending the foundations of vertical retaining walls using sheet pile or concrete	Flood Control District	Prior to construction		

TABLE E-1 (CONTINUED)
MITIGATION, MONITORING, AND REPORTING PROGRAM

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
4.9 Hydrology and Water Quality (cont.)					
Impact 4.9-4: The Project would substantially alter the existing drainage pattern of the watershed, altering patterns of flooding onsite and offsite.	**Mitigation Measure 4.9-4: Provide Flood Protection to Substantially Affected Areas** For areas upstream and downstream of the Winship Bridge (between Barber Avenue and the Sir Francis Drake Bridge): ~~If the Winship Bridge Replacement Project is not completed prior to construction of the Project, t~~The Flood Control District shall develop~~, fund,~~ and implement flood barriers on properties where existing habitable structures would experience new inundation in a 25-year event. The flood barriers shall be designed based on hydraulic modeling demonstrating that the flood barriers would protect existing habitable structures on any properties upstream of the Sir Francis Drake Bridge from new inundation during the 25-year event~~.~~ or to any higher degree of protection required for that particular type of measure by applicable building codes. Flood barriers include but are not limited to the following measures: • Elevation of structures above the 100-year flood elevations • Basement removal and construction of an addition to contain utilities removed from the basement • Wet flood proofing of structures, in which, with use of water resistant materials, floodwaters are allowed to enter a structure during a flood event • Dry flood proofing of structures • Berms or flood walls For areas immediately upstream of the Nursery Basin site: The Flood Control District shall develop~~, fund,~~ and implement flood barriers on properties where existing habitable structures would experience new inundation in a 25-year event. For both of those locations: The flood barriers would ensure that existing habitable structures would not be inundated by the 25-year event. Upon confirmation of permission by the property owners, the Flood Control District shall implement this measure, including implementing any measures identified in permits required from the California Department of Fish and Wildlife, Regional Water Quality Control Board, or other regulatory agencies. However, the potentially adversely affected parcels are privately owned, and the Flood Control District ~~cannot necessarily~~ is not proposing to require the installation or implementation of flood barriers ~~because~~ without the consent of the property owner(s), who may ~~specifically~~ request that such measures not be implemented. In that case, this Mitigation Measure ~~shall~~ would not be implemented, and the affected parcels may experience an increased level of flood inundation in a 25-year event or larger. The degree of flood protection provided to an individual property will vary depending on the specifics of the flood barrier selected. For most of the flood barriers, the Flood Control District shall provide protection from the 25-year event. However, pursuant to Marin County building code and associated permitting requirements, any increase in structure elevation must be to an elevation sufficient to raise the finished first floor above the elevation of the 100-year flood event. Therefore, property owners who accept that form of flood barrier would receive assistance to implement 100-year protection. ***Funding and Implementation Responsibility (Both Locations):*** For flood walls or berms at the top-of-bank of San Anselmo Creek or Fairfax Creek on privately owned parcels and with the property owners' permission, the Flood Control District shall fund, design, build, and maintain all aspects of those measures, including their possible future removal if implementation of other flood risk reduction projects renders these flood walls or berms unnecessary as determined by the Flood Control District. For a flood barrier that involves improvements or modifications to privately owned habitable structures covered by Mitigation Measure 4.9-4 (structure elevation, wet proofing, dry proofing, basement removal and construction of an addition to house water heaters, furnaces, and similar home appliances, etc.), the Flood Control District shall fully fund the design and provide funding to the property owner for implementation –that is proportional to the increased flood depth with the project. The funding would be provided to the property owner to implement these modifications or improvements. The property owner would be responsible for construction, implementation, and future maintenance of the structure and any associated flood mitigation measures or improvements.	Flood Control District	Prior to construction		
4.14 Parks and Recreation					
Impact 4.14-2: Construction and operation of the Project could include public access and recreational facilities or could require the construction or expansion of recreational facilities which could have an adverse physical effect on the environment.	**See Mitigation Measures 4.3-1 and 4.9-1, above.**	4.3-1. Flood Control District/ Contractor 4.9-1. Flood Control District/ Contractor	4.3-1. During construction 4.9-1. Prior to construction (Dewatering Plan); During construction (in-water work)		

TABLE E-1 (CONTINUED)
MITIGATION, MONITORING, AND REPORTING PROGRAM

Significant Environmental Impact	Mitigation Measure	Implemented By	When Implemented	Monitored By	Verified By (Date and Signature)
4.15 Transportation and Circulation					
Impact 4.15-1: Construction activity associated with the Project would temporarily generate increased traffic volumes in relation to the existing traffic load and capacity of the road system (potentially resulting in a substantial increase in traffic congestion affecting vehicle or transit circulation), and could conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system.	**Mitigation Measure 4.15-1: Traffic Management Plan** Prior to initiation of construction, the Project contractor(s) shall use a qualified traffic engineer to prepare a TMP. The TMP shall be developed during the design phase on the basis of detailed design plans for the approved Project. The TMP shall be reviewed and approved by the Flood Control District and agencies with jurisdiction over roadways affected by Project construction activities, prior to construction. Once approved, the TMP shall be incorporated into the contract documents specifications. The TMP shall include, but not necessarily be limited to, the elements listed below: 1. Develop truck access routes to minimize impacts on local street circulation. The route selection for movement of heavy equipment and truck traffic shall be coordinated with the Marin County Department of Public Works, Marin County Sheriff's Department, and Police Departments for applicable towns, cities, and unincorporated communities. Truck drivers shall be notified of, and required to use, the most direct route between the Project work sites and U.S. 101. 2. As needed to avoid unacceptably adverse impacts on traffic flow, schedule truck trips outside of peak morning and afternoon/evening traffic hours. 3. Control and monitor construction vehicle movements by enforcing standard construction specifications through periodic on-site inspections. 4. Install traffic control devices where traffic conditions warrant, as specified in the applicable jurisdiction's standards (e.g., the California Manual on Uniform Traffic Control Devices; Part 6: Temporary Traffic Control); flaggers would be used, when warranted, to control vehicle movements. 5. Implement a public information program to notify interested parties of the impending construction activities using means such as print media, radio, and/or web-based messages and information. 6. Comply with roadside safety protocols to reduce the risk of accidents. 7. Maintain access for emergency vehicles at all times. Provide advance notification to local police, fire, and emergency service providers of the timing, location, and duration of construction activities that could affect the movement of emergency vehicles on area roadways. 8. Store all equipment and materials in designated contractor staging areas on or adjacent to the worksite, in such a manner to minimize obstruction to traffic. 9. Identify locations for parking by construction workers (within the construction work site or at the designated construction staging areas, or, if needed, at a nearby location with transport provided between the parking location and the worksite). 10. Prior to Project construction, document road conditions for all routes that shall be used by Project-related vehicles. Roads damaged by construction shall be repaired to a structural condition equal to that which existed prior to construction activity. 11. Maintaining pedestrian and bicycle access and circulation during Project construction where safe to do so. If construction activities encroach on bicycle routes or multi-use paths, advance warning signs (e.g., "Bicyclists Allowed Use of Full Lane" and/or "Share the Road") shall be posted that indicate the presence of such users. During construction, an environmental compliance manager shall monitor and complete a construction monitor environmental inspection report checklist to ensure that the contractor implements the TMP measures included in the contract documents. Any noncompliance shall be documented and reported to the Flood Control District to ensure corrective action. A final compliance report shall be prepared post-construction.	Qualified Traffic Engineer/ Contractor/ Flood Control District; Construction Monitor (environmental inspection)	Prior to construction (TMP); During and after construction (construction monitor environmental inspection)		
Impact 4.15-2: Implementation of the Project could impede access to local streets or adjacent uses, including access for emergency vehicles.	**See Mitigation Measure 4.15-1, above.**	Qualified Traffic Engineer/ Contractor/ Flood Control District; Environmental compliance manager (construction monitor environmental inspection)	Prior to construction (TMP); During and after construction (construction monitor environmental inspection)		
Impact 4.15-3: Implementation of the Project could have an adverse effect on pedestrian and bicycle accessibility and safety.	**See Mitigation Measure 4.15-1, above.**	Qualified Traffic Engineer/ Contractor/ Flood Control District; Environmental compliance manager (construction monitor environmental inspection)	Prior to construction (TMP); During and after construction (construction monitor environmental inspection)		
Impact 4.15-4: Construction activity associated with the Project could temporarily increase traffic safety hazards due to incompatible uses (e.g., heavy truck traffic, and roadway wear-and-tear).	**See Mitigation Measure 4.15-1, above.**	Qualified Traffic Engineer/ Contractor/ Flood Control District; Environmental compliance manager (construction monitor environmental inspection)	Prior to construction (TMP); During and after construction (construction monitor environmental inspection)		