APPENDIX O
404 (b)(1) Analysis

US Army Corps of Engineers
Corte Madera Creek Flood Risk Management Project
October 2018

Corte Madera Creek

Flood Risk Management Project

Section 404(b)(1) Evaluation

U.S. Army Corps of Engineers
San Francisco District

Marin County Flood Control and
Water Conservation District

October 2018

CONTENTS

ACRONYMS

AEP	Annual Exceedance Probability
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
NMFS	National Marine Fisheries Service
Project	Corte Madera Creek Flood Risk Management Project
TSP	Tentatively Selected Plan
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service

1 INTRODUCTION

The U.S. Army Corps of Engineers (USACE) and Marin County Flood Control District (District) propose to reduce the risk of flooding to commercial, residential, and public infrastructure along Corte Madera Creek consistent with protecting the nation's environment, pursuant to national environmental statutes, applicable executive orders, and other federal planning requirements. This document presents the USACE 404(b)(1) evaluation for the study.

2 REGULATORY FRAMEWORK OF SECTION 404(B)(1) EVALUATION

Under the Clean Water Act (CWA), Congress generally prohibited any person from discharging any "pollutant" into "navigable waters" from a point source except in compliance with several statutory provisions, two of which establish permit programs (33 United States Code [U.S.C.] § 1311; see 33 U.S.C.§ 136). In section 404 of the CWA, Congress gave to the USACE the authority to permit discharges of two particular types of pollutants: dredged and fill materials (33 U.S.C. § 1342, 1344; 33, Code of Federal Regulation [C.F.R.] §§ 322.5, 323.6). Under section 404, the USACE regulates discharges of dredged or fill material into navigable waters (33 U.S.C. § 1344). Navigable waters is defined as waters of the United States (33 U.S.C. § 1362(7)). A permit from USACE is required prior to discharging dredged or fill material into waters of the United States, which are defined in 33 CFR Part 328.3(a) and include a range of wet environments such as lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds.

Section 404(b)(1) provides that the USACE must issue such permits "through the application of guidelines" developed by the United States Environmental Protection Agency (USEPA), found at 33 C.F.R. §§ 320.2(f), 320.4(a)(1), 320.4(b)(4), 323.6(a)). The USEPA issued final guidelines in 1980 (40 C.F.R. Part 230). These guidelines, referred to Section 404(b)(1) Guidelines establish various criteria to be considered by the USACE in evaluating permit applications, one of which calls for evaluation of alternatives to the proposed discharge. For proposed actions to be undertaken by USACE (as is the case for the Corte Madera Creek Flood Risk Management Project), the agency does not issue itself a permit but includes a 404 evaluation designed to demonstrate compliance with the 404(b)(1) Guidelines in the NEPA document prepared for the action.

3 PROJECT DESCRIPTION

3.1 Location

The proposed flood risk management project is located in the Corte Madera Creek watershed, also known as the Ross Valley watershed, in central-eastern Marin County, California. As described in detail in section 1.2.4 of the draft EIS/EIR, the Corte Madera Creek watershed, also known as the Ross Valley watershed, is located in central eastern Marin County, California (Figure 1-1 in the draft EIS/EIR). The watershed contains 42 linear miles of stream channels, and covers approximately 28 square miles, including areas of unincorporated Marin County and the towns of Corte Madera, Ross, San Anselmo, and Fairfax.

The study area covers a portion of Corte Madera Creek that extends from the Ross Creek confluence to approximately 1,500 feet downstream of College Avenue. The study area consists of Units 3 and 4 and the concrete-lined portion of Unit 2, along approximately 1.4 miles of Corte Madera Creek (Figure 1-2 in Chapter 1 of the Draft EIS/EIR). Unit 4 of Corte Madera extends approximately 0.4 mile downstream from Sir Francis Drake Boulevard and continues approximately 600 feet downstream of the Lagunitas Road Bridge before terminating at a Denil fish ladder. Unit 3 begins at the Denil fish ladder and the upstream end of the concrete channel and continues for approximately 0.67 mile to the College Avenue Bridge. The upper portion of Unit 2 consists of a concrete channel that extends approximately 0.33 mile downstream to 450 feet downstream of Stadium Avenue.

3.2 Authority and Purpose

3.2.1 Project Purpose

This is a single purpose flood risk management study. The basic project purpose is to manage the risk of flooding from Corte Madera Creek in the Town of Ross and the unincorporated community of Kentfield in Marin County. Overall the proposed action is intended to improve channel capacity in Unit 4 of Corte Madera Creek and to address any induced flooding downstream in Units 2 and 3. While the purpose of the action is flood risk management, an additional important project consideration was to improve fish passage for threatened and endangered fish species in Corte Madera Creek.

3.2.2 Authority

Congress authorized the evaluation of possible solutions to flooding along Corte Madera Creek under Section 11 of the Flood Control Act of 1944. The Corte Madera Flood Risk Control Project was authorized by Congress in the Flood Control Act of 1962 (Public Law [PL] 87-874, Section 203), and amended by Section 204 of PL 89-789, and the Water Resources Development Act in response to numerous flooding events in the Corte Madera Creek watershed in Marin County, California.

4 PROJECT ALTERNATIVES

The USACE has developed, in conjunction with the District, five action alternatives, and a no action alternative. Other than the no action alternative, all alternatives are intended to improve current channel capacity to convey flood flows through Units 2, 3, and 4. In addition, all action alternatives were developed in consideration of improving fish passage for threatened Central California Coastal (CCC) steelhead and endangered CCC coho salmon in Corte Madera Creek. Figures 3-1a through 3-5f in Chapter 3 of the draft EIS/EIR present overviews and more detailed plan views and channel cross section of Alternatives A, B, F, G and J.

The proposed project is based on a preliminary level of design, which the project delivery team used to complete hydraulic models (HEC-RAS) to estimate floodwall heights for all alternatives. Therefore, design elements (e.g. floodwall heights and footprints), may change during preconstruction engineering and design phase for the selected alternative. Alternatives would also be subject to refinement taking into account public and agency comments received on the draft EIS/EIR. Alternative summary descriptions are provided below and detailed descriptions are included in sections 3.2 through 3.7 of the draft EIS/EIR.

4.1 No Action Alternative

The no action alternative represents the expected future condition if none of the action alternatives are approved and there is no change from the current channel configuration. For the no action alternative, the current conditions with no flood control improvements would be retained at Units 2, 3, and 4, and flood capacity would remain unchanged. The existing capacity ranges from 3,300 cubic feet per second (cfs) in Unit 4 to greater than 6,900 cfs in Unit 1 (USACE 2010). Under these conditions, flood flows in excess of these capacities would continue to pass outside the channel onto a developed residential/urban floodplain. The Denil fish ladder would not be removed and fish passage would not be improved through Corte Madera Creek. Over time, the fish ladder would likely continue to degrade. Moreover, the transition point between the natural Unit 4 and concrete lined Unit 3 stream reaches would remain a pinch point (constricted section) or a flood flow breakout zone.

4.2 Offsite Locations

No offsite locations exist that would meet the purpose and need.

4.3 Onsite Alternatives

Alternative A: Top of Bank Floodwall

Alternative A would construct top-of-bank floodwalls along the length of the creek for the length of the project area (Figures 3-1a to 3-1f in Chapter 3 of the draft EIS/EIR). Setback floodwalls (floodwalls located away from channel) would be constructed around the Kent Middle School athletic fields. These floodwalls would tie into high ground so that floodwaters would not outflank and flow behind the walls. This alternative would require full purchase of 30 parcels. Purchase of residential parcels would require relocation of residents and the land would be purchased at fair market value. Permanent easements would total 13.62 acres and temporary easements would affect 3.14 acres. Permanent easements may be required for operations and maintenance roads, flowage (to flood or submerge), utility, and channel improvement, and temporary easements would be for access or staging during construction. Real estate costs (purchases and easements) were estimated to be $92,393,000. The need for real estate purchase results from the location of floodwalls on property and the requirement for clearance around floodwalls.

Alternative B: Top-of-bank Floodwall/Partial Sylvan Lane Setback/College of Marin Widening

Alternative B would utilize a combination of top-of-bank and setback floodwalls (Figures 3-2a to 3-2f in Chapter 3 of the draft EIS/EIR). For College of Marin Widening, 2,740 feet of concrete channel would be removed around the College of Marin and Kent Middle School, and replaced with features that replicate a natural tidal creek. Box culverts would be installed under College Avenue. This alternative would require purchase of 18 parcels. Permanent easements would total 13.54 acres and temporary easements would affect 3.07 acres. Real estate costs were estimated to be $75,794,000.

Alternative F: Bypass/Allen Park Riparian Corridor /College of Marin Widening

Alternative F would utilize a combination of top-of-bank and setback floodwalls, an underground bypass, Allen Park Riparian Corridor, and College of Marin Widening (Figures 3-3a to 3-3f in Chapter 3 of the Draft EIS/EIR). Alternative F would include an underground bypass culvert along Sir Francis Drake Boulevard to convey flow from the upstream portion of the project area downstream to the Allen Park Riparian Corridor downstream from the Denil fish ladder. The underground bypass would alleviate the need to construct any floodwalls in the natural channel upstream of Lagunitas Road Bridge. Downstream

of the Allen Park Riparian Corridor, the channel would be identical to Alternative B, including removal of 2,740 feet of concrete channel to restore natural features, construction of floodwalls, and construction of box culverts at College Avenue Bridge. Alternative F would also include replacement and improvement of the bicycle-pedestrian path adjacent to the creek. This alternative would not require purchase of any parcels. Permanent easements would total 12.18 acres and temporary easements would affect 3.17 acres. Real estate costs were estimated to be $22,318,000.

Alternative G: Floodwall/Allen Park Riparian Corridor/College of Marin Widening

Alternative G would utilize a combination of floodwalls, Allen Park Riparian Corridor, and College of Marin Widening (Figures 3-4a to 3-5f in Chapter 3 of the Draft EIS/EIR). This alternative is identical to Alternative F downstream of the fish ladder, but would construct floodwalls instead of a bypass upstream of Lagunitas Road Bridge. Top-of-bank floodwalls would be constructed similar to Alternative A. Construction would be identical to Alternative F downstream of the fish ladder. Alternative G would also include replacement and improvement of the bicycle-pedestrian path. This alternative would result in purchase of 18 parcels. Permanent easements would total 14.44 acres and temporary easements would affect 2.98 acres. Real estate costs were estimated to be $75,238,000.

Alternative J: Bypass/Allen Park Riparian Corridor/Floodwall

Alternative J would utilize a combination of an underground bypass, Allen Park Riparian Corridor, and floodwalls (Figures 3-5a to 3-5f in Chapter 3 of the Draft EIS/EIR). Alternative J would be identical to Alternative F upstream and include an underground bypass culvert along Sir Francis Drake Boulevard. Maximum floodwall height around Allen Park Corridor would be 2 feet. Downstream of the Allen Park Riparian Corridor, floodwalls would be constructed near the Granton Park neighborhood and adjacent to College Avenue. Alternative J would not include box culverts at College Avenue. This alternative would not require purchase of any parcels. Permanent easements would total 3.44 acres and temporary easements would affect 3.87 acres. Real estate costs were estimated to be $19,232,000.

5 ALTERNATIVE ANALYSIS FOR PRACTICABILITY AND ENVIROMENTAL IMPACTS

The five on-site alternatives were evaluated to determine the ability of the alternative to meet the overall Project purpose, to assess the practicability and cost of development, and to determine the potential for reduced environmental effects using the following screening criteria.

Achievement of Project Purpose

The purpose of the project is to manage flood risk from Corte Madera Creek associated with Unit 4, as currently authorized. Alternatives were evaluated on the achievement of the project objectives:

- Reduce the likelihood and consequences of flooding on human life and safety;
- Reduce the risk of flood damages, including critical infrastructure within the area;
- Develop and implement environmentally sustainable flood risk management features consistent with natural geomorphic processes and ecological functions of the project area; and
- Use environmentally sustainable designs and construction methodologies, which would minimize environmental impacts from future operation and maintenance actions in the project area.

Cost Practicability

Cost was analyzed in the context of the overall scope and cost of the project and whether it is unreasonably expensive. The primary costs considered were construction cost, real estate purchase, and mitigation cost (Table 1). Alternatives were evaluated on whether any one alternative has a substantially higher cost and if the additional cost is reasonable in relation to the amount of additional flood protection that could be achieved.

TABLE 1 BENEFIT-COST ANALYSIS OF FINAL ARRAY OF ALTERNATIVES

Economic Factor	Alternative A	Alternative B	Alternative F	Alternative G	Alternative J
Construction Cost	$57,000,000	$59,600,000	$72,800,000	$60,800,000	$26,882,000
Real Estate	$92,393,000	$75,794,000	$22,318,000	$75,238,000	$19,232,000
Mitigation	$1,789,000	$0*	$0*	$0*	$0*
Total First Cost	$151,183,000	$135,394,000	$95,118,000	$136,038,000	$46,114,000
Construction Period	25 months	26 months	28 months	28 months	$28 months
Interest During Construction (XX months construction, 2.75%)	$4,354,000	$4,058,000	$3,075,000	$4,398,000	$1,491,000
Total Investment	**$155,537,000**	**$139,452,000**	**$98,193,000**	**$140,436,000**	**$47,605,000**
Avg. Ann. Cost (2.75%, 50 yr. project life)	$5,761,000	$5,165,000	$3,637,000	$5,202,000	$1,763,000
Operations, Maintenance, Repair, Replacement, and Rehabilitation	$400,000	$400,000	$400,000	$400,000	$265,000
Total Avg. Annual Cost	$6,161,000	$5,565,000	$4,037,000	$5,602,000	$2,028,000
Equivalent Avg. Annual Benefits	$3,544,000	$3,276,000	$2,934,000	$3,220,000	$2,559.000
Benefit/Cost Ratio	0.60	0.62	0.73	0.57	1.26
Net Benefits	-$2,617,000	-$2,289,000	-$1,103,000	-$2,382,000	$531,000

* The construction of Alternatives B, F, and G include College of Marin widening. The construction of Alternatives F, G, and J include Allen Park Floodplain Riparian Corridor. College of Marin widening and Allen Park Floodplain Riparian Corridor provide both conveyance and environmental benefits (i.e. incidental environmental outputs), such that there are no additional mitigation costs (e.g. offsite real estate) to construct these alternatives.

Environmental Effects

The environmental impact of each alternative was analyzed in the draft EIS/EIR for the project. Areas of analysis included hydrology and hydraulics, water quality, geology, air quality, climate change, biological resources, cultural resources, aesthetics, recreation, land use, noise, health and safety, recreation, traffic, environmental justice, socioeconomics, and public services and utilities. This discussion of environmental impacts included those impacts that were deemed significant and unavoidable. Alternatives were compared to determine relative environmental damage of each action.

Alternative A

Achievement of Project Purpose

Alternative A would achieve a 4 percent annual exceedance probability along the creek from the upstream end of Unit 4 to the downstream end of the concrete-lined channel in Unit 2 by constructing

top-of-bank floodwalls along the full length of the creek and a setback floodwall at Kent Middle School. Alternative A would reduce the likelihood and consequences of flooding on human life and safety and the risk of flood damages, including commercial, residential, public, and critical infrastructure. Alternative A would achieve the project purpose.

Cost Practicability

As shown in Table 1, Alternative A would cost $155,537,000, including real estate, construction, mitigation, and interest. Alternative A would yield a benefit/cost ratio of 0.60. The cost of implementing Alternative A is unreasonable in that it is substantially more than the Tentatively Selected Plan (TSP) and does not offer substantial additional flood protection for the cost, as presented by the benefit/cost ratio.

Environmental Effects

Alternative A would have significant and unavoidable impacts to water quality, biological resources, aesthetics, noise, land use, and socioeconomics. These impacts are summarized in Table 2.

Alternative A would require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects. The current level of design for the action alternatives is not sufficient to predict accurately requirements for such facilities. Generally, construction of new or replacement storm drains and storm sewers would be likely to result in disturbance of soil and vegetation, potentially including streambanks and riparian vegetation; disturbance of built structures, including roadways and other infrastructure; and changes in land use to designate permanent or temporary pump stations. These changes and disruptions could cause significant impacts to biological resources (e.g. through removal of riparian vegetation); water quality (e.g, through release of pollutants during and after construction); traffic, which may be disrupted during construction; noise and air quality, which may be adversely affected during construction and also during operation of pump stations; and other resources. Many of these effects could likely be avoided by application of AMMs specified in Section 3.10.4, or mitigated to less than significant through application of commonly specified mitigation measures, such as traffic management plans that address construction-related disruptions to traffic. Until the design of the project progresses further, however, neither the extent of impacts nor the ability to avoid or mitigate them can be known. Therefore, this impact has the potential to remain significant and unavoidable.

Alternative A would convert 1.34 acres of riparian woodland to low herbaceous vegetation and open channel. The loss of existing shade would be permanent. Stream segments with reduced shade would likely result in increased water temperature, algae, and other aquatic plants. The impact to water temperature in Unit 4 and farther downstream to the SMN Bridge would be significant and unavoidable.

Alternative A Unit 4 floodwall construction would result in a significant and unavoidable effect to special-status species because of adversely altered habitat and higher stream temperatures. The increase in temperature is unknown, but is considered significant because stream temperatures already result in stressful conditions to salmonids. The areal disturbance within the riparian corridor would likely have a significant impact to already degraded habitat for salmonids. Loss of cover, food, and habitat diversity would contribute adverse effects. Impact to sensitive habitat would be significant and unavoidable because riparian woodland is a valuable, scarce habitat and its removal would adversely impact habitat that would require off-site mitigation that would not be effective for several decades. Impacts to wildlife movement would be significant and unavoidable because increased velocities would likely contribute adversely to fish passage despite improvements from fish ladder removal. Floodwalls

would decrease wildlife movement between the stream and upland and reduce connectivity of ecosystems.

Alternative A would result in construction of top-of-bank floodwalls with a maximum height of 11 feet that would restrict views of Corte Madera Creek in Unit 4. The construction of the floodwall would require removal of 1.34 acres of riparian woodland bordering the creek further impacting views. The alteration and loss of views of the creek and adjacent aesthetically pleasing vegetation would be significant and unavoidable.

Construction of Alternative A would contribute to short-term significant impacts to noise that would exceed the regulations set by Marin County and the Town of Ross. Mitigation would be implemented in the form of erecting noise barriers, installing mufflers on equipment, and restricting work hours, but impacts to noise would remain significant and unavoidable.

Implementation of Alternatives A would require purchase of 17 residential parcels that would displace residents and require relocation. Although the affected owners would be monetarily compensated at fair market values, impacts from land use change and displacement would still be considered significant and unavoidable.

Conclusion

Alternative A would not meet cost practicability and would have significant and unavoidable impacts to water quality, biological resources, aesthetics, noise, land use, and socioeconomics.

Alternative B

Achievement of Project Purpose

Alternative B would achieve a 4 percent AEP along the creek from the upstream end of Unit 4 to the downstream end of the concrete-lined channel in Unit 2 by constructing a combination of top-of-bank and setback floodwalls. Alternative B would reduce the likelihood and consequences of flooding on human life and safety and the risk of flood damages, including commercial, residential, public, and critical infrastructure. Alternative B would achieve the Project purpose.

Cost Practicability

As shown in Table 1, Alternative B would cost $139,452,000, including real estate, construction, mitigation, and interest. Alternative B would yield a benefit/cost ratio of 0.62. The cost of implementing Alternative B is unreasonable in that it is substantially more than the TSP and does not offer substantial additional flood protection for the cost, as presented by the benefit/cost ratio.

Environmental Effects

Alternative B would have significant and unavoidable impacts to water quality, biological resources, aesthetics, noise, land use, and socioeconomics. These impacts are summarized in Table 2.

Alternative B would convert 1.03 acres of riparian woodland to low herbaceous vegetation and open channel. The loss of existing shade would be permanent. Stream segments with reduced shade would likely result in increased water temperature, algae, and other aquatic plants. The impact to water temperature in Unit 4 and farther downstream to the SMN Bridge would be significant and unavoidable.

Alternative B would require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects. The current level of design for the action alternatives is not sufficient to predict accurately requirements

for such facilities. Generally, construction of new or replacement storm drains and storm sewers would be likely to result in disturbance of soil and vegetation, potentially including streambanks and riparian vegetation; disturbance of built structures, including roadways and other infrastructure; and changes in land use to designate permanent or temporary pump stations. These changes and disruptions could cause significant impacts to biological resources (e.g. through removal of riparian vegetation); water quality (e.g, through release of pollutants during and after construction); traffic, which may be disrupted during construction; noise and air quality, which may be adversely affected during construction and also during operation of pump stations; and other resources. Many of these effects could likely be avoided by application of AMMs specified in Section 3.10.4, or mitigated to less than significant through application of commonly specified mitigation measures, such as traffic management plans that address construction-related disruptions to traffic. Until the design of the project progresses further, however, neither the extent of impacts nor the ability to avoid or mitigate them can be known. Therefore, this impact has the potential to remain significant and unavoidable.

Alternative B Unit 4 floodwall construction would result in a significant and unavoidable effect to special-status species because of adversely altered habitat and higher stream temperatures. The increase in temperature is unknown, but is considered significant because stream temperatures already result in stressful conditions to salmonids. The areal disturbance within the riparian corridor would likely have a significant impact to already degraded habitat for salmonids. Loss of cover, food, and habitat diversity would contribute adverse effects. Impact to sensitive habitat would be significant and unavoidable because riparian woodland is a valuable, scarce habitat and its removal would adversely impact habitat that would require off-site mitigation that would not be effective for several decades. Impacts to wildlife movement would be significant and unavoidable because increased velocities would likely contribute adversely to fish passage despite improvements from fish ladder removal. Floodwalls would decrease wildlife movement between the stream and upland and reduce connectivity of ecosystems.

Alternative B would result in construction of top-of-bank floodwalls with a maximum height of 7 feet that would restrict views of Corte Madera Creek in Unit 4. The construction of the floodwall would require removal of 1.03 acres of riparian woodland bordering the creek further impacting views. The alteration and loss of views of the creek and adjacent aesthetically pleasing vegetation would be significant and unavoidable.

Construction of Alternative B would contribute to short-term significant impacts to noise that would exceed the regulations set by Marin County and the Town of Ross. Mitigation would be implemented in the form of erecting noise barriers, installation mufflers on equipment, and restricting work hours, but impacts to noise would remain significant and unavoidable.

Implementation of Alternatives B would require purchase of 18 residential parcels that would displace residents and require relocation. Although the affected owners would be monetarily compensated at fair market values, impacts from land use change and displacement would still be considered significant and unavoidable.

Conclusion

Alternative B would not meet cost practicability and would have significant and unavoidable impacts to water quality, biological resources, aesthetics, noise, land use, and socioeconomics.

Alternative F

Achievement of Project Purpose

Alternative F would achieve a 4 percent AEP along the creek from the upstream end of Unit 4 to the downstream end of the concrete-lined channel in Unit 2 by constructing a combination of top-of-bank and setback floodwalls, an underground bypass, and Allen Park Riparian Corridor. Alternative F would reduce the likelihood and consequences of flooding on human life and safety and the risk of flood damages, including commercial, residential, public, and critical infrastructure. Alternative F would achieve the Project purpose.

Cost Practicability

As shown in Table 1, Alternative F would cost $98,193,000, including real estate, construction, mitigation, and interest. Alternative F would yield a benefit/cost ratio of 0.73. The cost of implementing Alternative F is unreasonable in that it is substantially more than TSP and does not offer substantial additional flood protection for the cost, as presented by the benefit/cost ratio.

Environmental Effects

Alternative F would have significant and unavoidable impacts to water quality, noise, and traffic. These impacts are summarized in Table 2.

Construction of Alternative F would contribute to short-term significant impacts to noise that would exceed the regulations set by Marin County and the Town of Ross. For the construction of the underground bypass along Sir Francis Drake Boulevard in Alternative F, there is potential for night work to occur during culvert installation to avoid full closure of the road, which would cause significant noise. Mitigation would be implemented in the form of erecting noise barriers, installation mufflers on equipment, and restricting work hours, but impacts to noise would remain significant and unavoidable.

Alternative F would require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects. The current level of design for the action alternatives is not sufficient to predict accurately requirements for such facilities. Generally, construction of new or replacement storm drains and storm sewers would be likely to result in disturbance of soil and vegetation, potentially including streambanks and riparian vegetation; disturbance of built structures, including roadways and other infrastructure; and changes in land use to designate permanent or temporary pump stations. These changes and disruptions could cause significant impacts to biological resources (e.g. through removal of riparian vegetation); water quality (e.g, through release of pollutants during and after construction); traffic, which may be disrupted during construction; noise and air quality, which may be adversely affected during construction and also during operation of pump stations; and other resources. Many of these effects could likely be avoided by application of AMMs specified in Section 3.10.4, or mitigated to less than significant through application of commonly specified mitigation measures, such as traffic management plans that address construction-related disruptions to traffic. Until the design of the project progresses further, however, neither the extent of impacts nor the ability to avoid or mitigate them can be known. Therefore, this impact has the potential to remain significant and unavoidable.

The Alternative F bypass would be constructed beneath Sir Francis Drake Boulevard and would cause extensive traffic interference, contributing to traffic impacts. Bypass construction would involve road excavation, which would require closure or reduced lanes on part or all of Sir Francis Drake Boulevard. Detours would be established, potentially on Red Hill Avenue, Laurel Grove Avenue, or Wolfe Grade.

Partial and full road closure would cause traffic delays and congestion, resulting in substantial LOS reduction. A Traffic Control Plan would be implemented to reduce traffic impacts, but would not eliminate traffic impacts.

Traffic impacts could potentially be minimized by including night construction or using three smaller box culverts. By installing the box culverts at night, full closure of Sir Francis Drake Boulevard would only occur at night, minimizing impacts to traffic. Constructing three smaller box culverts would reduce the trench size needed, thereby reducing the amount of road requiring closure and eliminating the need for any full road closure and night work. This design element would be determined during pre-construction engineering design.

For all design and construction methods, partial closure would be necessary at a minimum, and significant traffic impacts would persist. Mitigation that requires coordination with the public during construction would be implemented to minimize delays and maximize safety during bypass installation. However, construction on Sir Francis Drake Boulevard could still cause congestion or reduced level of service for all action alternatives.

Conclusion

Alternative F would not meet cost practicability and would have significant and unavoidable impacts to water quality, noise, and traffic.

Alternative G

Achievement of Project Purpose

Alternative G would achieve a 4 percent AEP along the creek from the upstream end of Unit 4 to the downstream end of the concrete-lined channel in Unit 2 by constructing a combination of top-of-bank and setback floodwalls, and Allen Park Riparian Corridor. Alternative G would reduce the likelihood and consequences of flooding on human life and safety and the risk of flood damages, including commercial, residential, public, and critical infrastructure. Alternative G would achieve the Project purpose.

Cost Practicability

As shown in Table 1, Alternative G would cost $140,436,000, including real estate, construction, mitigation, and interest. Alternative G would yield a benefit/cost ratio of 0.57. The cost of implementing Alternative G is unreasonable in that it is substantially more than the TSP and does not offer substantial additional flood protection for the cost, as presented by the benefit/cost ratio.

Environmental Effects

Alternative G would have significant and unavoidable impacts to water quality, biological resources, aesthetics, noise, land use, and socioeconomics. These impacts are summarized in Table 2.

Alternative G would convert 0.647 acre of riparian woodland in Unit 4. However, Allen Park Riparian Corridor and College of Marin Widening would partially mitigate for the lost habitat. There would not be a significant impact to water temperature as in Alternatives A and B because of the creation of Allen Park Riparian Corridor.

Alternative G would require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects. The current level of design for the action alternatives is not sufficient to predict accurately requirements for such facilities. Generally, construction of new or replacement storm drains and storm sewers would

be likely to result in disturbance of soil and vegetation, potentially including streambanks and riparian vegetation; disturbance of built structures, including roadways and other infrastructure; and changes in land use to designate permanent or temporary pump stations. These changes and disruptions could cause significant impacts to biological resources (e.g. through removal of riparian vegetation); water quality (e.g, through release of pollutants during and after construction); traffic, which may be disrupted during construction; noise and air quality, which may be adversely affected during construction and also during operation of pump stations; and other resources. Many of these effects could likely be avoided by application of AMMs specified in Section 3.10.4, or mitigated to less than significant through application of commonly specified mitigation measures, such as traffic management plans that address construction-related disruptions to traffic. Until the design of the project progresses further, however, neither the extent of impacts nor the ability to avoid or mitigate them can be known. Therefore, this impact has the potential to remain significant and unavoidable.

Impacts to special-status species would be significant and unavoidable because of adversely altered habitat resulting in higher stream temperatures within Unit 4 and downstream in Units 2 and 3. The increase in temperature is unknown, but is considered significant because stream temperatures already result in stressful conditions to salmonids. Loss of cover, food, and habitat diversity would contribute to adverse effects. The areal disturbance within the riparian corridor would likely have a significant impact to already degraded habitat for salmonids. Impacts to sensitive habitat would be significant and unavoidable because riparian woodland is a valuable, scarce habitat and its removal would adversely impact habitat that would require off-site mitigation, which would not be effective for multiple decades. Impacts to wildlife movement would be significant and unavoidable because increased velocities would likely contribute adversely to fish passage, despite improvements from fish ladder removal. Floodwalls would decrease wildlife movement between the stream and upland and reduce connectivity of ecosystems.

Alternative G would result in construction of top-of-bank floodwalls with a maximum height of 6 feet that would restrict views of Corte Madera Creek in Unit 4. The construction of the floodwall would require removal of 1.03 acres of riparian woodland bordering the creek further impacting views. The alteration and loss of views of the creek and adjacent aesthetically pleasing vegetation would be significant and unavoidable.

Construction of Alternative G would contribute to short-term significant impacts to noise that would exceed the regulations set by Marin County and the Town of Ross. Mitigation would be implemented in the form of erecting noise barriers, installation mufflers on equipment, and restricting work hours, but impacts to noise would remain significant and unavoidable.

Implementation of Alternatives G would require purchase of 18 residential parcels that would displace residents and require relocation. Although the affected owners would be monetarily compensated at fair market values, impacts from land use change and displacement would still be considered significant and unavoidable.

Conclusion

Alternative G would not meet cost practicability and would have significant and unavoidable impacts to water quality, biological resources, aesthetics, noise, land use, and socioeconomics.

Alternative J

Achievement of Project Purpose

Alternative J would achieve a 4 percent AEP at the upstream end of the Project, Unit 4 to the end of Allen Park Riparian Corridor, and some flood protection downstream near Granton Park and the College of Marin. Alternative J would achieve flood protection by constructing a combination of an underground bypass, Allen Park Riparian Corridor, and isolated top-of-bank floodwalls. Alternative J would reduce the likelihood and consequences of flooding on human life and safety and the risk of flood damages, including commercial, residential, public, and critical infrastructure. Although it would provide less flood protection in Unit 2 than the other on-site alternatives, Alternative J would achieve the Project purpose.

Cost Practicability

As shown in Table 1, Alternative J would cost $47,605,000, including real estate, construction, mitigation, and interest. Alternative J would yield a benefit/cost ratio of 1.26. The cost of implementing Alternative J is reasonable and practicable.

Environmental Effects

Alternative J would have significant and unavoidable impacts to water quality, noise, and traffic. These impacts are summarized in Table 2.

Construction of Alternative J would contribute short-term significant impacts to noise that would exceed the regulations set by Marin County and the Town of Ross. For the construction of the underground bypass along Sir Francis Drake Boulevard in Alternative J, there is potential for night work to occur during culvert installation to avoid full closure of the road, which would cause significant noise impacts. Mitigation would be implemented in the form of erecting noise barriers, installation mufflers on equipment, and restricting work hours, but impacts to noise would remain significant and unavoidable.

Alternative J would require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects. The current level of design for the action alternatives is not sufficient to predict accurately requirements for such facilities. Generally, construction of new or replacement storm drains and storm sewers would be likely to result in disturbance of soil and vegetation, potentially including streambanks and riparian vegetation; disturbance of built structures, including roadways and other infrastructure; and changes in land use to designate permanent or temporary pump stations. These changes and disruptions could cause significant impacts to biological resources (e.g. through removal of riparian vegetation); water quality (e.g, through release of pollutants during and after construction); traffic, which may be disrupted during construction; noise and air quality, which may be adversely affected during construction and also during operation of pump stations; and other resources. Many of these effects could likely be avoided by application of AMMs specified in Section 3.10.4, or mitigated to less than significant through application of commonly specified mitigation measures, such as traffic management plans that address construction-related disruptions to traffic. Until the design of the project progresses further, however, neither the extent of impacts nor the ability to avoid or mitigate them can be known. Therefore, this impact has the potential to remain significant and unavoidable.

The Alternative J bypass would be constructed beneath Sir Francis Drake Boulevard and would cause extensive traffic interference, contributing to traffic impacts. Bypass construction would involve road excavation, which would require closure or reduced lanes on part or all of Sir Francis Drake Boulevard. Detours would be established, potentially on Red Hill Avenue, Laurel Grove Avenue, or Wolfe Grade.

Partial and full road closure would cause traffic delays and congestion, resulting in substantial level of service reduction. A Traffic Control Plan would be implemented to reduce traffic impacts, but would not eliminate them.

Traffic impacts could potentially be minimized by including night construction or using three smaller box culverts. By installing the box culverts at night, full closure of Sir Francis Drake Boulevard would only occur at night, minimizing impacts to traffic. Constructing three smaller box culverts would reduce the trench size needed, thereby reducing the amount of road requiring closure and eliminating the need for any full road closure and night work. This design element would be determined during pre-construction engineering design.

For all design and construction methods, partial closure would be necessary at a minimum, and significant traffic impacts would persist. Mitigation that requires coordination with the public during construction would be implemented to minimize delays and maximize safety during bypass installation. However, construction on Sir Francis Drake Boulevard could still cause congestion or reduced level of service for all action alternatives.

Conclusion

Alternative J would meet cost practicability, but would have significant and unavoidable impacts to water quality, noise, and traffic.

TABLE 2 SIGNIFICANT AND UNAVOIDABLE IMPACTS

Impact	Mitigation	Alternative				
		A	B	F	G	J
WQ-1: Violate any water quality standards or waste discharge requirements or otherwise substantially degrade water quality.	No Feasible Mitigation	●	●			
WQ-3: Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.	Not yet determined	●	●	●	●	●
AES-1: Substantially degrade the existing visual character or quality of the study area and its surroundings.	No Feasible Mitigation	●	●		●	
AES-2: Have a substantial adverse effect on a scenic vista.	No Feasible Mitigation	●	●		●	
BIO-1: Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the NMFS, USFWS, and CDFW.	No Feasible Mitigation	●	●		●	
BIO-2: Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the NMFS, USFWS, and CDFW.	No Feasible Mitigation	●	●		●	
BIO-4: Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.	No Feasible Mitigation	●	●		●	
LND-4: Result in permanent conversion of existing land uses	No Feasible Mitigation	●	●		●	

TABLE 2 SIGNIFICANT AND UNAVOIDABLE IMPACTS						
Impact	Mitigation	Alternative				
		A	B	F	G	J
NOI-1: Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.	**Mitigation NOI-1:** Erect sound barriers around work sites	●	●	●	●	●
NOI-2: A substantial temporary or periodic increase in ambient noise levels in the project vicinity, above levels existing without the project.	**Mitigation NOI-1:** Erect sound barriers around work sites	●	●	●	●	●
TRF-1: The project conflicts with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit.	**Mitigation TRF-1:** Coordinate with the public during construction			●		●
TRF-2: The project conflicts with an applicable congestion management program, including but not limited to level of service (LOS) standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways.	**Mitigation TRF-1:** Coordinate with the public during construction			●		●
SOC-2: Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere.	No Feasible Mitigation	●	●		●	
SOC-3: Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere.	No Feasible Mitigation	●	●		●	

5.1 Summary of Practicable Alternatives

Alternatives A, B, F, and G would not be practicable due to cost. Alternatives A, B, and G would have greater environmental damage than Alternatives F and J. Thus, Alternative J would be the least environmentally damaging practicable alternative. Alternative J is the only on-site alternative that would be practicable in terms of cost. Impacts to water quality, noise, and traffic would be significant for Alternative J, but these impacts would be minimized by mitigation measures (refer to Draft EIS/EIR for full discussion of mitigation).

6 PROPOSED ACTION (ALTERNATIVE J) AND WATERS OF THE UNITED STATES

6.1 Wetlands and Waters of the United States

A review of the National Wetland Inventory data for the study area identified several types of wetland features (e.g., emergent freshwater wetland, estuarine and marine wetland) located within the study area (portions of Unit 2) but outside of the project footprint (USFWS 2009). A reconnaissance level survey conducted in April 2010 and again in November of 2017 supported the likely absence of wetland features within the project footprint because no potential jurisdictional wetlands were observed. Although the upland boundary of a coastal brackish marsh that may be a wetland intersects

approximately 0.232 acre of the project area (but not the Project footprint) at the downstream end of Unit 2. Figures 4.6-8a to 4.6-8c in section 4.6 of the draft EIS/EIR present the existing habitat and permanent changes associated with the project. The concrete-lined channel has a uniform width of 33 feet whereas the width of the channel within Unit 4 was assumed to be 25 feet based on surveys conducted (A.A. Rich 2000).

A formal jurisdiction determination of waters of the U.S. was performed for the Lagunitas Road Bridge Replacement Project in 2007 (Town of Ross 2009). This determination included portions of Corte Madera Creek extending from approximately 17 linear feet upstream of the Lagunitas Road Bridge and 224 linear feet downstream, covering approximately 0.212 acre (9,228 square feet) of jurisdictional non-wetland waters of the U.S. (Town of Ross 2009). With the exception of this small area near the Lagunitas Road Bridge, the rest of the study area has not been subject to a formal jurisdictional determination for waters of the U.S.; however, all of Corte Madera Creek within the project and Kittle Creek, an intermittent drainage, intersecting the proposed bypass are considered to be waters of the U.S. in this analysis.

6.2 Description of Dredge or Fill Material

Characteristics of Material:

Excavation

Extensive excavation will occur primarily from features that include widening and deepening of the creek, and floodwall construction. Based on the preliminary site condition evaluation and geotechnical data, the recommended floodwall type for this project is an inverted “T”. As a result, the amount of excavation is much larger compared to other floodwall types such as overbank floodwalls and off-set floodwalls, which are anticipated to be shallow in depth and contribute less amount of excavated materials. Extensive excavation will also occur within the Allen Park Riparian Corridor on the right streambank to create a riparian woodland floodplain.

Concrete

Concrete quantities were estimated from preliminary conceptual alignments developed during alternative comparison. Wall heights were determined from preliminary water surface elevation the hydraulics and hydrology model hydraulic analysis. Additional 2 feet assurance was included for all floodwalls. The depth of concrete structures was based on preliminary analysis of underlying soil conditions, height of proposed floodwalls, and available real estate. Most top-of-bank floodwalls for the selected alternative are anticipated to be shallower than the existing channel wall bed. Further future refinement and recommendation based on geotechnical and structural factors is necessary to determine sufficiency of depths as well as integrity of the existing concrete structures.

Shoring Material

Use of shoring material is optional dependent of the depth and slope of excavation. Shoring will be used to ensure worker safety from unstable soil. Soil type and condition at the project site plays an important factor in determining the amount of shoring needed when the depth of excavation (5 feet) exceeds the maximum limit provided by OSHA for stable soil.

Formwork

Estimates were based on unit area of the formwork. Steel formwork and accessories will be utilized for erecting floodwalls.

Other Fill Materials

Quantification, sourcing, and location of rocks and boulders, biotechnical bank stabilization, and erosion protection fabrics will be included during the next design refinement. All materials will meet permit requirements.

Quantity and Source of Material: Estimated quantities of fill and excavation for the Project are included in Table 3 for most materials. Floodwalls along Granton Park and College of Marin will be installed above the ordinary high water mark. All fill material will be clean, come from state-approved and permitted sources, and will not pose a risk.

TABLE 3 MATERIAL QUANTITY ESTIMATES FOR THE SELECTED PLAN

Task	Quantity	Unit
Underground Reinforced Concrete Bypass		
Concrete Inlet Weir	10	CY
Concrete Inlet Headwall	18	CY
Traffic Re-route and Control	500,000	LS
Road Asphalt Demolition	7,333	SY
Shoring	99,000	SF
Excavation	36,667	CY
Double 12'X7' Underground Concrete Bypass	3,259	CY
Backfill	12,222	CY
Road Asphalt Pavement and Markings	66,000	SF
Concrete Outlet Headwall	18	CY
Reinforced Concrete Floodwalls		
Clearing & Grubbing	1.37	AC
Tree Removal	1.37	AC
Excavation	5,669	CY
Shoring	12,000	SF
Cast-in-place Concrete	2,493	CY
Form Work	44,445	SF
Backfill	3,067	CY
Hydro Seed	1.1	AC
Allen Park Riparian Corridor		
Clearing & Grubbing	1.7	AC
Tree Removal	1.7	AC
Demolish Pavement	3,319	SY
Demolish Concrete Channel	1,806	CY
Excavation(Area 1)	19,828	CY
Excavation (Area 2&3)	5,311	CY
Erosion Control Blanket	5,167	SY
Hydro Seed	1.7	AC

TABLE 3 MATERIAL QUANTITY ESTIMATES FOR THE SELECTED PLAN		
Task	**Quantity**	**Unit**
Fish Passage Transition Grading	270	CY
Fish Ladder		
Concrete/Gabion Demolition	49	CY
Excavation	114	CY
Erosion Mats (Jute Mesh)	110	SY
Hydro Seed	0.02	AC

AC = acre
CY = cubic yards
LS = lump sum
SF = square feet
SY = square yards

6.3 Description of Proposed Discharge Sites

Location: Excavation and fill will occur in waters of the U.S. in distinct locations shown on Figure 4.6-3e in section 4.6 of the Draft EIS/EIR. The high flow bypass will have an inflow in Unit 4 approximately 1,465 feet upstream of Lagunitas Road Bridge and will discharge into Corte Madera Creek at the Allen Riparian Creek Corridor. The bypass will be constructed underneath Sir Francis Drake Boulevard. One storm drain for an intermittent tributary will intersect the bypass. The exact design of this crossing will be completed during the preconstruction engineering design. The Denil fish ladder will be removed and the stream regraded for approximately 950 feet with little or no riparian vegetation removed. Fill deposited at the fish ladder will be excavated. As the channel is regraded, boulders and root wads may also be placed in the stream to create habitat diversity. At Allen Park Riparian Corridor, substantial excavation will occur to create riparian woodland floodplain. The right wall and channel bed of the concrete-lined channel will be excavated. Some of the concrete may be buried or left in the channel as hardened substrate. The top-of-bank floodwalls at Granton Park and College of Marin will be installed above the ordinary high water mark above the concrete channel walls; excavation will occur on the top of bank above, but not in waters of the U.S.

Size: Approximately 1.19 acres, equating to approximately 1,662 linear feet of Corte Madera Creek will be disturbed by the proposed action.

Type of Site: Fill and dredging is proposed in portions of Corte Madera Creek that include perennial stream with a natural channel bottom (in Unit 4), perennial stream with concrete-lined channel (in Unit 3), and intermittent stream areas.

Types of Habitat: Riparian woodland with a native material streambed, primarily pool riffle complex, and riverine concrete-lined channel.

Timing and Duration of Discharge: Construction would be expected to begin in 2020 and be completed within 5 years.

6.4 Description of Disposal Method

Construction activities resulting in dredge or fill in waters of the U.S. would be carried out by excavators and loaders. Construction of the bypass inflow and outflow would be constructed from land-side to the extent feasible. Regrading of the stream channel at the fish ladder and Allen Park Riparian Corridor would require in-channel work.

The construction window within Corte Madera Creek is between June 15 and October 15 in accordance with requirements to protect federally threatened steelhead trout (*Oncorhynchus mykiss*) and endangered coho salmon (*Oncorhynchus kisutch*). In-stream construction would be limited the dry season when salmonids are not likely to be present in the area. Work outside the channel would not be subject to these constraints.

6.5 Summary of Impacts to Waters of the United States

Table 4 displays both temporary and permanent impacts to areas within waters of the U.S. These impacts include construction of inflow and outflow for high flow bypass; removal and regrading and geotechnical stabilization to remove the hydraulic jump of the fish ladder; and removal of the right wall and bottom of the concrete-lined channel and excavation of the high right bank in Frederick Allen Park to create a widened floodplain. The channel width of the concrete channel is 33 feet, whereas the channel width of Corte Madera Creek in Unit 4 and Kittle Creek were assumed to be 25 feet and 20 feet, respectively.

TABLE 4 SUMMARY OF IMPACTS TO WATERS OF THE U.S. INCLUDING WETLANDS

Alternative	Non- Wetland Waters of the US				Wetlands			
	Permanent		Temporary		Permanent		Temporary	
	Acres	Linear Feet	Acres	Linear Feet	Acres	Linear Feet	Acres	Linear Feet
Alternative J	1.19	1,662	1.19	1,662	N/A	N/A	N/A	N/A

N/A = not applicable

7 FACTUAL DETERMINATIONS

This evaluation is an appendix to the draft EIS/EIR for the Corte Madera Creek Flood Risk Management Project, Marin County, California. Additional details and the full analysis of the effects of the proposed action (Alternative J) are described in the Draft EIS/EIR. The determinations herein are based on the analysis presented in the Draft EIS/EIR.

It should be noted that the proposed action is based on a preliminary level of design and the alternative and associated determinations may be subject to refinement taking into account public and agency comments received on the draft EIS/EIR.

7.1 Physical Substrate Determinations

Substrate Elevation and Slope: Overall channel slope would not change; however, the sudden hydraulic jump created by the fish ladder would be smoothed to the natural slope of the channel.

Sediment Type: Sediment gradations would not change. There would be no effect.

Dredged/Fill Material Movement: It is anticipated that the excavation activity during grading for the Allen Park Riparian Corridor, construction of floodwalls, and installation of the underground bypass will generate a large amount of earthen material. A portion of the excavated earthen material needed for reuse as either a bank stabilization or treatment fill, will be stored near the project site in one of the staging areas identified for the project. Excess clean material will be hauled off to receiving agencies within the proximity of the project to minimize cost. No hazardous material requiring special handling or disposal is anticipated on project site. It is anticipated that miscellaneous debris including concrete rubble or other unwanted material may be encountered during construction. These materials will disposed of at an appropriate landfill or other waste receiving agencies.

Physical Effects on Benthos (burial, changes in sediment type, etc.): Approximately 1,612 linear feet of Corte Madera Creek will experience disturbance as a result of the project. Approximately 909 feet of concrete-lined channel bottom will be removed and replaced with natural substrate.

Actions Taken to Minimize Impacts: Relevant AMMs are identified in Table 5.

7.2 Water Circulation, Fluctuation and Salinity Determinations

Water

- Salinity: No effect.
- Water Chemistry (pH, etc.): There may be minor changes to water chemistry as a result of suspended sediment during construction. Long-term changes to water chemistry are not expected.
- Clarity: Water clarity in Corte Madera Creek may be slightly impacted during construction, especially during installation and removal of cofferdams, if the stream is dewatered. Long-term changes to water clarity are not expected.
- Color: Minor impacts associated with increased turbidity may affect water color temporarily during construction. Erosion and sediment control would be implemented in accordance with AMMs that will reduce impacts.
- Taste: Not applicable because Corte Madera Creek is not a drinking water supply.
- Dissolved Gas Levels: Dissolved oxygen levels could experience minor temporary effects during construction. Long-term effects could result in slight increased levels of dissolved oxygen because of anticipated lowering of water temperature during low flow conditions.
- Nutrients: Corte Madera Creek experiences concerns with nutrients, and there could be an incremental increase to nutrients in the water column because of increased suspended sediments during construction. Long-term effects are not expected.
- Eutrophication: No effect.

Current Patterns and Circulation

- Current Patterns and Flow: No effect on current pattern and flow during dry seasons. During flood events the flow rate in the Unit 4 reach would be reduced due to the bypass culvert diversion. This would occur for short duration expected to be less than one day.
- Velocity: No effect during dry seasons. During flood events, flow velocity in the Unit 4 reach could be reduced by up to 0.3 feet per second due to the bypass culvert diversion.

- Stratification: No effect.
- Hydrologic Regime: Corte Madera Creek is currently described as a perennial creek with intermittent surface flow during the dry summer months. Removal of the concrete-lined channel at Allen Park Riparian Corridor is expected to increase groundwater movement into Corte Madera Creek and may increase baseflow.

Normal Water Level Fluctuations: Removal of the concrete-lined channel at Allen Park Riparian Corridor is expected to increase groundwater movement into Corte Madera Creek and may increase baseflow, but would not alter daily normal water fluctuations. The proposed action is not expected to have an effect on normal tidal fluctuations.

Salinity Gradients: No effect.

7.3 Suspended Particulate/Turbidity Determinations

Expected changes in suspended particulates and turbidity levels in vicinity of disposal site: Corte Madera Creek is a perennial stream that is usually dry in intermittent reaches upstream of tidal influence during dry summer months. Dewatering may need to occur prior to in-channel construction. Construction could result in temporary increase of suspended particulates and turbidity.

Effects (degree and duration on chemical and physical properties of the water column):

- Light Penetration: Minor reduction of light penetration could result from increased suspended sediments during construction. Long-term impacts are not expected.
- Dissolved Oxygen: Dissolved oxygen levels could experience minor temporary reduction during construction due to increased nutrient load from suspended sediments. Long-term effects could result in slight increased levels of dissolved oxygen because of anticipated lowering of water temperature during low flow conditions.
- Toxic Metals and Organics: Nutrient loading is a known issue within Corte Madera Creek consequently a temporary increase in organics could occur during construction from increased suspended solids.
- Pathogens: Pathogens of concern are Enterococcus (in Corte Madera Creek), and E. coli (in the tributaries) (Friends of Corte Madera Creek Watershed 2006). Temporary spikes in these bacteria could occur during construction from increased suspended solids. These waters are not used for contact recreation or drinking water supply.
- Aesthetics: A temporary increase in turbidity could occur during construction. Long-term adverse impacts to aesthetics in the water column would not occur.
- Others as Appropriate: Not applicable.

Effects on Biota:

- Primary Production, Photosynthesis: Removal of vegetation from streambanks may slightly reduce the amount of organic matter that aquatic species use for food. Because the vegetation occurs above the concrete walls of the channel, this vegetation does not provide cover or spawning opportunities. In the long-term, food, cover, and spawning habitat will be improved by replacing the fish ladder, removing portions of the concrete-lined channel bottom, and vegetating the right bank with native species.

- Suspension/Filter Feeders: No effect.
- Sight Feeders: No effect.

7.4 Contaminant Determinations:

Review of the Cortese list did not identify any facilities or sites within the study area. The study area has no mineral resources and therefore, no mine waste. All fill material will be clean, come from state-approved and permitted sources and will not pose a risk. The study area is surrounded by residential and associated urban uses such as parks, commercial/retail development, public uses, schools (including the College of Marin and Kent Middle School), and health care facilities. Review of the USEPA's Envirofacts online database identified three facilities that generate hazardous waste regulated by federal and state laws and regulations: Kentfield Hospital, Kent Middle School, and the Kentfield Fire Protection District (USEPA 2017). The hazardous waste management functions at these sites do not involve activities expected to pose a hazardous, toxic, and radioactive waste hazard to the study area.

The results of an environmental site assessment indicated one recognized environmental condition that would be applicable to the study area: soils could have been affected by diesel spills and airborne contaminants including lead, copper, and diesel fuel from the railroad track that formerly paralleled Corte Madera Creek (Town of Ross 2009, as cited in the 2010 Corte Madera Creek Flood Control Study Baseline Report).

7.5 Aquatic Ecosystem and Organism Determinations

Effects on Plankton: An increase from sediment and nutrients during construction may increase some plankton species such as algae. These effects would be short term. Long-term effects may result in decreased algal growth because of increased stream shade.

Effects on Benthos: Mortality of benthic species within the immediate footprint of Alternative J is expected during construction. Recruitment of benthic species from undisturbed area of Corte Madera Creek is would restore the community after construction. Within Allen Park Riparian Corridor, the benthic species composition will shift to more desirable species because of the restored native channel.

Effects on Nekton: Mobile aquatic species are expected to move away from the area during construction and would not be affected.

Effects on Aquatic Food Web: The project may have a temporary impact on the food web as a result of turbidity during construction. Corte Madera Creek is disturbed from human development, and the food web is limited within the concrete-lined channel at Allen Park Riparian Corridor. Effects will be minor and temporary.

Effects on Special Aquatic Sites:

- Sanctuaries and Refuges: Not applicable as they are not present in the project area.
- Wetlands: Not applicable as they are not present in the project area.
- Mud Flats: Not applicable as they are not present in the project area.
- Vegetated Shallows: Not applicable as they are not present in the project area.
- Coral Reefs: Not applicable.

- Riffle and Pool Complexes: The length of riffle and pool complexes would be increased by approximately 950 feet from removal of the fish ladder and concrete-lined channel. Corte Madera Creek is also designated critical habitat for Central California Coast steelhead and Central California Coast coho salmon. The Project would improve habitat that would benefit the species and improve fish passage.

Threatened and Endangered Species: Central California Coast steelhead are the only federally listed species likely to be present in the project area. Central California coho salmon are considered extirpated from the area; however, the project is within designated critical habitat and essential fish habitat for coho salmon. The construction window within Corte Madera Creek is between June 15 and October 15 in accordance with requirements to protect federally threatened steelhead trout (*Oncorhynchus mykiss*) and endangered coho salmon (*Oncorhynchus kisutch*). In-stream construction would be limited the dry season when salmonids are not likely to be present in the area. Work outside the channel would not be subject to these constraints. Although construction is proposed when salmonids are not expected to be present in the project area, during in-channel construction, fish biologists will conduct salmonid monitoring in accordance with avoidance and minimization measure BIO6: Salmonid Monitoring. Salmonid monitoring may require fish capture and removal. This activity is necessary, but is considered take under the Endangered Species Act, because handling listed salmonids is a form of harassment and mortality can occur from electrofishing.

The USACE has determined that construction of the proposed action may affect, and is likely to adversely affect, threatened Central California Coast steelhead and endangered Central California Coast coho salmon; however, would not jeopardize the continued existence of either species. Once the project is complete and riparian habitat reestablishes in the upstream areas, the project would have a beneficial effect on Central California Coast steelhead and Central California Coast coho salmon, compared to the existing conditions of the channel.

Pursuant to Section 7 of the Endangered Species Act, USACE will be consulting with the National Marine Fisheries Service regarding the proposed project. This evaluation will be revised to include conservation recommendations or reasonable prudent alternatives formulated by the NMFS, should they be provided.

Other Wildlife: The project could have temporary adverse impacts to wildlife. Minor adverse impacts to wildlife could occur from removal of mature vegetation used for nesting, shelter, and foraging. Removal of occupied nesting habitat will only occur between August 1 and November 30 to comply with the Migratory Bird Treaty Act to protect these species. All in-water work will occur between June 15 through October 15 to protect Central California Coast steelhead and Central California Coast coho salmon.

7.6 Proposed Disposal Site Determinations

Mixing Zone Determination: Not applicable

Determination of compliance with applicable water quality standards: This project will implement a Stormwater Pollution Prevention Plan and water quality plans required by the county to comply with water quality standards.

Potential effects on human use characteristic:

- Municipal and Private water supply: Corte Madera Creek is not used for water supply, therefore there would be no effect.
- Recreational and commercial fisheries: Corte Madera Creek does not support recreational or commercial fisheries. No significant effect is expected.
- Water related recreation: Water related recreation does not occur within the Project area, therefore, there will be no effect.
- Aesthetics: Aesthetics will improve in Allen Park Riparian Corridor and upstream where the stream will be regraded after removal of the fish ladder.
- Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and similar preserves: Not applicable.

Determination of Cumulative Effects on the Aquatic Ecosystem: The project will have negligible cumulative impacts on the aquatic ecosystem. Mitigation measures included as part of the Project design will minimize cumulative impacts.

Determination of Secondary Effects on the Aquatic Ecosystem: No secondary impacts are expected from this project.

8 FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE

- No significant adaptation of the Section 404(b)(1) guidelines was made relative to this evaluation.
- The objective of flood risk management intended to improve channel capacity in Unit 4 of Corte Madera Creek and to address any induced flooding downstream in Units 2 and 3 necessitates the removal and replacement of the Denil fish ladder, construction of a flood bypass under Sir Francis Drake Boulevard, and floodwalls on Corte Madera Creek near Granton Park and College of Marin, and creation of Allen Park Riparian Corridor.
- The proposed activity will not violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.
- Construction of the proposed project may affect, and is likely to adversely affect threatened CCC steelhead and endangered CCC coho salmon protected under the Endangered Species Act of 1973 However, the project is not expected to result in adverse modification to critical habitat nor jeopardize the continued existence of these species.
- The proposed discharge of fill material will not result in significance adverse effects on human health and welfare, including municipal and private water supplies, recreational and

commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and other wildlife will not be significantly affected.

- Appropriate steps to minimize potential adverse impacts of the discharge of fill material include the implementation of avoidance and minimization measures and best management practices.

Evaluation of Availability of Practicable Alternatives to the Proposed Discharge site which would have less adverse impact on the aquatic ecosystem:

Alternatives evaluated are discussed in section 4. As discussed, four additional action alternatives were analyzed in detail. With the exception of Alternative J, all other action alternatives are considered infeasible because their benefit to cost ration is below 1.0 and, therefore, it is not likely that those alternatives would be construct6ed.

Compliance with applicable State Water Quality Standards:

The USACE will obtain a Water Quality Certification prior to the start of construction activities.

Compliance with applicable toxic effluent standard or prohibition under Section 307 of the Clean Water Act:

Not applicable.

Compliance with Endangered Species Act of 1973:

Pursuant to Section 7 of the Endangered Species Act, USACE will formally consult with the NMFS regarding the proposed project and ensure compliance prior to construction.

Compliance with specified protection measures for marine sanctuaries designated by the Marine Protection, Research and Sanctuaries Act of 1972:

Not Applicable.

Evaluation of Extent of Degradation of the Waters of the United States:

Significant adverse effects on human health and welfare

- Municipal and private water supplies: There are no municipal or private water supplies in or downstream of the project area, therefore, there will be no effect.
- Recreation and commercial fisheries: Corte Madera Creek in the project area does not support a recreational or commercial fisheries, therefore, there will be no effect.
- Plankton: There could be minor and temporary increases to plankton such as algae. There will be no significant adverse effects.
- Fish: Central California Coast steelhead are the only federally listed species likely to be present in the project area. Central California coho salmon are considered extirpated from the area; however, the project is within designated critical habitat and essential fish habitat for coho salmon. The USACE has determined that construction of the proposed action may affect, and is likely to adversely affect, threatened Central California Coast steelhead and endangered Central California Coast coho salmon. Once the project is complete and riparian

habitat reestablishes in the upstream areas, the project would have a beneficial effect on Central California Coast steelhead and Central California Coast coho salmon, compared to the existing conditions of the channel.

- Shellfish: No significant adverse impacts.
- Wildlife: No significant adverse impacts.
- Special Aquatic sites: No significant adverse impacts.

Significant adverse effects on life stages of aquatic life and other wildlife dependent on aquatic ecosystems: No significant adverse impacts expected.

Significant adverse effects on aquatic ecosystem diversity, productivity and stability: No significant adverse impacts.

Significant adverse effects on recreational, aesthetic, and economic values: No significant adverse impacts.

Appropriate and practicable steps taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem:

See the avoidance and minimization measures described in Section 3.9.4 of the draft EIS/EIR that are referenced in Table 5.

TABLE 5 AVOIDANCE AND MINIMIZATION MEASURES

Number	Avoidance and Minimization Measure
WQ-1	Staging Area
WQ-2	Fuel Management Plan
WQ-3	Turbidity Management Plan
WQ-4	Construction Timing
WQ-5	Hazardous Spill Plan
WQ-6	In-stream Sediment Control
WQ-7	Minimize In-water Construction
WQ-8	Turbidity Control
WQ-9	Stormwater Runoff Control
WQ-10	Stormwater Management Plan
WQ-11	Prepare SWPPP
WQ-12	Clear Area Sediment Control on Both Sides of Floodwalls
BIO-1	Conduct Preconstruction Surveys
BIO-2	Seasonal Restrictions
BIO-3	Minimize Disturbance to Existing Vegetation
BIO-4	Minimize Footprint
BIO-5	Site Restoration
BIO-6	Biological Construction Monitoring for non-Salmonids
BIO-7	Environmental Awareness Training
BIO-8	Signing
BIO-9	Cleaning of Equipment and Vehicles
BIO-10	Project Site Maintenance
BIO-11	Vehicle Staging and Fueling
BIO-12	Vehicle and Equipment

TABLE 5 AVOIDANCE AND MINIMIZATION MEASURES	
Number	**Avoidance and Minimization Measure**
BIO-13	Hazardous Materials Management/Fuel Spill Containment Plan
BIO-14	Salmonid Monitoring
BIO-15	Night Lighting During Construction
NOI-1	Work Hours
NOI-2	Noise Best Management Practices

9 DETERMINATION

On the basis of the determinations herein, the proposed discharge of dredged or fill material is specified as complying with the requirements of the Clean Water Act Section 404(b)(1) guidelines.

10 REFERENCES

A. A. Rich and Associates. 2000. Fishery Resources Conditions of the Corte Madera Creek Watershed, Marin County, California. Prepared for Friends of Corte Madera Creek Watershed, San Anselmo, CA. November.

Town of Ross. 2009. Lagunitas Road Bridge Replacement Project Draft Environmental Impact Report, January.

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