US Army Corps of Engineers ®
San Francisco District

PAJARO RIVER FLOOD RISK MANAGEMENT PROJECT
SANTA CRUZ AND MONTEREY COUNTIES
CALIFORNIA

ECONOMICS
APPENDIX J JANUARY 2019

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This report includes four main parts:

1) ***Part I** includes Section 1 and provides an overview of the study and summarizes the Recommended Plan that was approved at the Agency Decision Milestone (ADM) Conference held in January 2018. The values presented in Part I reflect an October 2017 price level and a current Federal discount rate of 2.75%.*

2) ***Part II** covers Sections 2 through 3 and presents the basis of the economic analyses, which is applicable to both Parts II and III. The values presented in Part II reflect an October 2016 price level, consistent with when the analysis was performed (October 2016 to September 2017).*

3) ***Part III** covers Sections 4 through 7 and presents the net benefit and benefit-to-cost (BCR) analyses which were completed for the Draft Report; the Draft Report was released to the public in October of 2017. The benefits and costs presented in Part III reflect an October 2016 price level and a Federal discount rate of 2.875%, which were the prevailing price level and rate at the time of the analysis (October 2016 to September 2017).*

4) ***Part IV** includes Section 8 and presents the updated net benefit and BCR analyses, completed after the release of the Draft Report, and which formed the basis for the Recommended Plan. The benefits and costs presented in Part IV reflect October 2017 price levels and a current Federal discount rate of 2.75%, consistent with the timeframe of the analysis (October 2017 to January 2018).*

For this report, a chronological format was implemented to document the process used to determine the Recommended Plan. This format was selected in order to best convey the scope and preserve the nuances of the multiple iterations of the analyses performed, all of which were integral in selecting the Recommended Plan. The chronological format is straightforward and logical and allows the reader to clearly see how the data, assumptions, and methodologies of the analysis evolved over the course of the study; it also allows the reader to more easily compare, within a single document, the results of the analysis completed for the Draft Report to the results of the updated analysis completed for the Final Report. Finally, the chronological format provides for more transparency, lucidity (in terms of why things were done the way they were done), and context than other formats that simply update (i.e., overwrite or revise) outdated information.

PART I – STUDY SUMMARY & RECOMMENDED PLAN

1.1 OVERVIEW

Flood risk reduction for the communities of Pajaro and Watsonville in California began in 1944, nearly three-quarters of a century ago, when Congress authorized the first project on the Pajaro River and its tributaries (Corralitos and Salsipuedes Creeks). In 1949, just five years after it was authorized, that initial project was completed. However, subsequent severe flooding in 1955 and in 1958 led to a recommendation by the Corps of Engineers to build a second flood risk reduction project in order to decrease flood risk in the area; this second project, the Pajaro River Flood Control Project, was authorized by Congress in Section 203 of the Flood Control Act of 1966, but was ultimately never constructed. Since the 1966 congressional authorization, there have been several other legislative actions (Water Resources Development Acts [WRDA] of 1986 and 1990) which have enabled the USACE and its local partners to continue to develop a project that reduces flood risk in the most efficient and effective way. This report documents the current (2017) reevaluation of the economics related to the flood risk management of the Pajaro River and its tributaries.

1.1.1 Study Area

The communities of Pajaro and Watsonville are located on the central coast of California (Figure 1), less than a 3-hour drive (or about 173 miles) from the state capital of Sacramento, less than a 2-hour drive (or about 88 miles) from San Francisco, and less than an hour drive (or about 47 miles) from Silicon Valley. The economy of the two coastal communities is centered predominantly in the agricultural industry, and the area benefits from an ideal climate (i.e., average high temperature of about 60° F to 70° F throughout the year) in which to grow its world-famous strawberries.

Figure 1. State-Wide Aerial View of the Study Area Location (Inset) and Study Area Close-Up View.

Both the town of Pajaro and the city of Watsonville are located in the Pajaro Valley, but each belongs to a different county – with Pajaro in Monterey County and Watsonville in Santa Cruz County. The two are just a short drive away from the beach community of Santa Cruz (just north of the study area) and the world-renown golf courses of Pebble Beach (just south of the study area).

The study area is located in southern Santa Cruz County and northern Monterey County in California, and encompasses an area of approximately 10,000 acres. The city of Watsonville is located in Santa Cruz County north of the Pajaro River on the right bank and the town of Pajaro is located in Monterey County south of the Pajaro River on the left bank; the Pajaro River forms the geographic boundary between the two counties. The town of Pajaro and downtown Watsonville are connected by the Main Street Bridge, which crosses over the Pajaro River. In addition to the relatively large number of residential, commercial, and industrial buildings located in the study area, there is also a significant amount of high-value crops, most notably strawberries, grown throughout the area. In fact, Watsonville is home to an annual Strawberry Festival that takes place every summer.

While just a "stone's throw" away from one another, Pajaro and Watsonville could also be described as a "tale of two cities," to some degree. For the most part, the city of Watsonville falls right in line with the state and national averages when it comes to socioeconomic statistics such as median household income and the percentage of people living below the poverty level. The town of Pajaro, however, falls well below the national averages with regard to these same socioeconomic measures. In fact, the median household income in the town of Pajaro ($33,200) is about 38% lower than the national average's ($53,900); the percentage of people living below the poverty level in the town of Pajaro (31.9%) is about twice the national average (15.5%).

The Pajaro Watershed covers approximately 1,300 square miles in Santa Clara, San Benito, Santa Cruz, and Monterey Counties. The Pajaro River runs in a roughly east to west direction, with the main stem beginning in the upper watershed just west of San Felipe Lake (also known as Upper Soap Lake), which lies just east of the city of Gilroy at the foot of the Diablo Range. From there the Pajaro River meanders for about thirty miles west through the lower watershed, passing the city of Watsonville and the town of Pajaro in Santa Cruz and Monterey Counties, respectively, and then finally flowing into the Monterey Bay.

Corralitos Creek flows from the western slope of the Santa Cruz Mountains and runs in a southerly direction until it joins with Salsipuedes Creek near the northernmost part of the city of Watsonville. Salsipuedes Creek then joins the Pajaro River adjacent to a residential neighborhood in Watsonville near Coolidge Avenue. Salsipuedes Creek is the lowest tributary of the Pajaro River.

The Corralitos and Salsipuedes Creeks and Pajaro River systems have a history of flooding. Prior to the construction of federal levees in 1949, the area flooded, on average, once every six years. In 1955, only six years after the completion of the levee system, a major flood event breached the levees, causing significant flooding and damages. Another levee breach on the Pajaro River in 1995 caused significant flooding and damages, which were estimated to be between fifty and ninety-five million dollars by local community officials. Still another levee breach on the north bank of the Pajaro River just downstream of Highway 1 caused significant flooding to prime agricultural land in 1998. The 1995 flood is estimated to have been a 6.5% annual chance exceedance (ACE) event (15-year event), while the 1998 flood is estimated to have been a 3.5% ACE event (29-year event). In addition to the bigger flood events of 1955, 1995, and 1998, the area sustained flooding from the Pajaro River in 1963, 1982, 1986, and 1997.

Figure 2 displays the extent of the 1995 and 1998 flood events, while Figure 3 shows the actual flooding from the 1995 event. The 1995 flood event inundated the entire town of Pajaro and the surrounding agricultural areas.

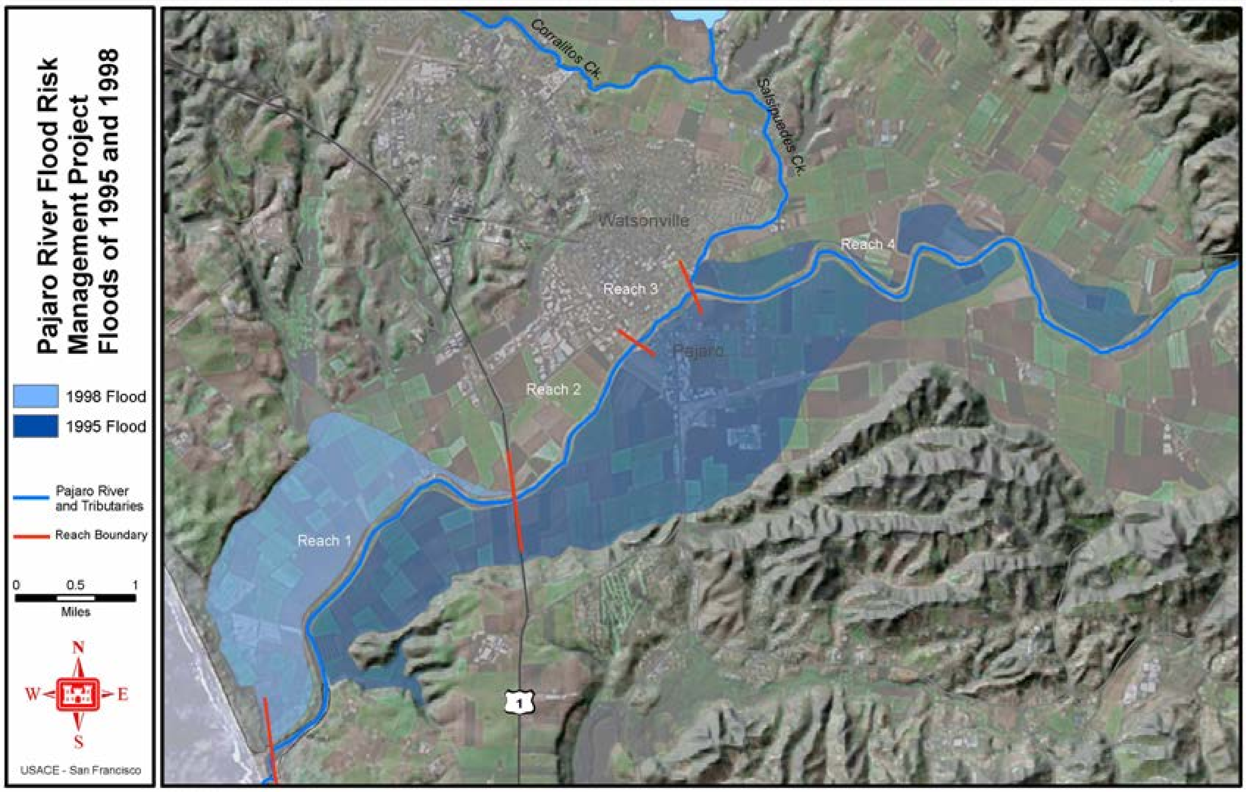

Figure 2. Historical Flood Extents: 1995 and 1998 Events.

Since 1949, parts of the city of Watsonville have flooded due to overflow from Corralitos Creek. This type of flooding has been documented to have occurred in 1955, 1982, and 1986. In the 1955 flood event, twenty-nine city blocks were inundated by as much as two feet of water as flows overtopped the south bank of Corralitos Creek between Green Valley Road and Highway 152.This event was estimated by local officials to have caused the evacuation of as many as one-thousand residents and caused more than one million dollars in property damage.

Figure 3. Flooding in town of Pajaro, 1995.

1.1.2 Purpose

The main purposes of this Economic Appendix are to:

1) Describe the flood risk faced by the communities of Pajaro in Monterey County, CA and Watsonville in Santa Cruz County, CA under the future without-project condition. Flood risk will be quantitatively characterized by examining the chance of flooding (i.e., how often the area can be expected to flood) and the consequences of flooding (i.e., who and what are expected to be impacted).

2) Explain the economic analysis which led to a Main Stem alternative and a Tributary alternative that reasonably maximize net benefits. These alternatives combine to form what is now identified as the Recommended Plan (i.e., the National Economic Development Plan, or NED Plan).

3) Discuss the outputs and the effectiveness of the Recommended Plan in reducing flood risk in the study area and document the residual flood risk under the with-project condition (i.e., after the Recommended Plan has been constructed).

1.1.3 The Recommended Plan (NED Plan)

The Recommended Plan is composed of flood risk management (FRM) features on the Pajaro River and on Corralitos & Salsipuedes Creeks. The Plan reduces the risk of flooding to the city of Watsonville, the town of Pajaro and to some of the high-value agricultural crops grown in the area such as strawberries and lettuce, and to the Orchard Park neighborhood which sits along the left bank of Corralitos and Salsipuedes Creeks. The main features of the Recommended Plan are shown in Figure 4 and include:

- New levee along the right bank of Corralitos Creek, and levee improvements to existing levees along Salsipuedes Creeks
- New setback levee along the left bank of Corralitos Creek and a new floodwall along a portion of the left bank of Salsipuedes Creek
- Setback levee/floodwall along the right bank of the Main Stem Pajaro River from the confluence of Salsipuedes Creek to Highway 1
- Setback levee/floodwall along the left bank of the Main Stem Pajaro River from Highway 1 and upstream past the confluence with Salsipuedes Creek; new levee then goes south through agricultural land until it ties-in to higher ground

Table 1 presents the average annual benefits, average annual costs, net benefits, and benefit-to-cost ratio (BCR) of the Recommended Plan (NED Plan). For the Watsonville and Pajaro consequence areas, the plan was based on flood risk management (FRM) features being able to pass the 1% annual chance exceedance (ACE) event with a target of 90% assurance (i.e., the ability to pass the 1% ACE event 90% of the time); for the Orchard Park neighborhood, the plan was based on FRM features being able to pass the 4% ACE event with a target of 90% assurance.

Table 1. Net Benefit and Benefit-to-Cost Analyses of Recommended Plan (October 2017 Price Level, 2.75% Discount Rate, 50-Year Period of Analysis)

Plan	Average Annual Benefits (AAB)	Average Annual Costs (AAC)	Net Benefits	BCR
Plan based on 1% ACE WSEL[1]	17,339	13,078	4,261	1.3

[1]Orchard Park improvements based on the 4% ACE WSEL

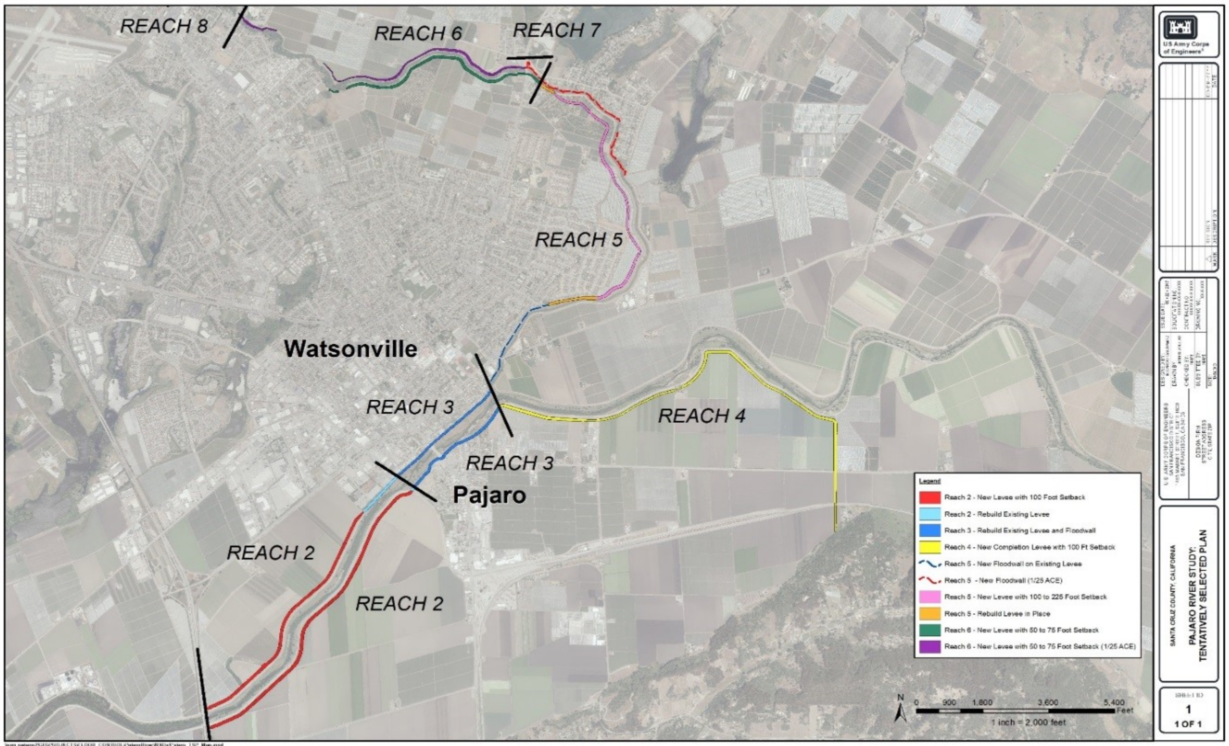

Figure 4. Scope of Recommended Plan.

PART II – BASIS OF ECONOMIC ANALYSIS

2.1 ECONOMIC FRAMEWORK

The economic analysis was performed using standard procedures and guidance published by the U.S. Army Corps of Engineers (USACE). The analytical framework used to describe the future without-project condition, evaluate and compare a final array of alternatives, and identify a plan that reasonably maximizes net benefits, is summarized in the following subsections.

2.1.1 Methodology and References

The economic analysis was performed using the most current regulations, policies, guidance, and information published in the following references:

Engineer Regulation (ER) 1105-2-100, *Planning Guidance Notebook*, USACE, 2000.

ER 1105-2-101, *Risk Analysis for Flood Damage Reduction Studies*, USACE, 2006.

ER 1105-2-101, *Risk Assessment for Flood Risk Management Studies*, USACE, 2017.

Engineering Manual (EM) 1110-2-1619, *Risk-Based Analysis for Flood Damage Reduction Studies*, USACE, 1996.

Economic Guidance Memorandum (EGM) 09-04, *Generic Depth-Damage Relationships for Vehicles*, USACE, 2004.

EGM 04-01, *Generic Depth-Damage Relationships*, USACE, 2003.

Depth-Damage Relationships for Structures, Contents, and Vehicles and Content-to-Structure Value Ratios in Support of Jefferson and Orleans Flood Control Feasibility Studies, New Orleans District, USACE, 1996.

Memorandum for Record, Pajaro Future Without-Project Condition (FWOP) – Flood Depth – Summary of Methods, USACE, San Francisco District (CESPN-ET-EW), 2016.

Memorandum for Record, Pajaro River Levees Performance, USACE, San Francisco District (CESPN-ET-EG), 2016.

Sutter Basin Pilot Feasibility Report – Appendix A – Economics – Attachment 3 (Clean-Up and Emergency Costs), USACE, Sacramento District (CESPK-PC-WE), 2013.

California's Flood Future Recommendations for Managing the State's Flood Risk, California Department of Water Resources (CA DWR), 2013.

Historical Flooding, www.mcwra.co.monterey.ca.us, 2017.

USDA National Organic Program (NOP) Standards Manual, CCOF Certification Services, LLC, June 2017.

2.1.2 Key Economic Assumptions[1]

The following assumptions were used in the analysis:

- FY 2017 federal discount rate of 2.875%.
- An October 2016 price level.
- A 50-year period of analysis.
- The study area was assumed to be built-out; benefits associated with any potential future development were not included.
- A construction period of 11 months (Pajaro River improvements) and 8 months (Tributary improvements) were used to evaluate the Tentatively Selected Plan (TSP)

2.1.3 Economic Impact Areas (EIA)

In FRM studies, economic impact areas (EIA) are used to describe the consequences (e.g., damages and benefits) of flooding in a smaller subarea of the larger study area. They are typically delineated by factoring in the source(s) of its flooding, land use within the area, physical barriers/borders (e.g., railroad tracks, roads, levees, etc.) that might cause one area to flood differently than another, and also political/legal boundaries that may require a separate reporting of the results. Economic impact areas help to facilitate data collection, and enable a more detailed risk assessment of specific locations within the study area in terms of the chance and consequences of flooding. Finally, estimating damages and benefits by EIAs allows for a more complete incremental analysis, which aids in the identification of a plan that reasonably maximizes net economic benefits.

The Main Stem Pajaro River and Corallitos/Salsipuedes Creeks (Tributaries) are the major sources of flooding in this study. The EIAs were delineated based on flooding from these sources, physical barriers (levees), and land use. These factors are described in Table 2 and displayed in Figure 5.

[1] These were the assumptions used to identify the Tentatively Selected Plan (TSP), as described in Part III of this report. Key assumptions were revisited and updated per post-Draft GRR reviews (DQC/ATR/SPD/HQUSACE) and are described in Part IV, Section 8.1.1 (Changes to Engineering Data, Assumptions, and Analysis) and Section 8.1.2 (Changes to Economic Data, Assumptions, and Analysis) of this report.

Table 2. Description of Economic Impact Areas (EIA), Main Stem Pajaro River & Tributaries

Source of Flooding	Economic Impact Area (EIA)	Bank	Primary Land Use
Pajaro River	[A] Downstream of HWY 1	Left	Agricultural
Pajaro River or Tributaries	[B] Downstream of HWI 1	Right	Agricultural
Pajaro River	[C] Upstream of HWY 1	Left	Urban (town of Pajaro); agricultural
Pajaro River or Tributaries	[D] Upstream of HWY 1	Right	Urban (city of Watsonville); agricultural
Pajaro River or Tributaries	[E] Area between Salsipuedes Creek and Pajaro River	Right	Agricultural
Tributaries	[F] North of Lakeview Road	Left	Urban (residential neighborhoods); agricultural

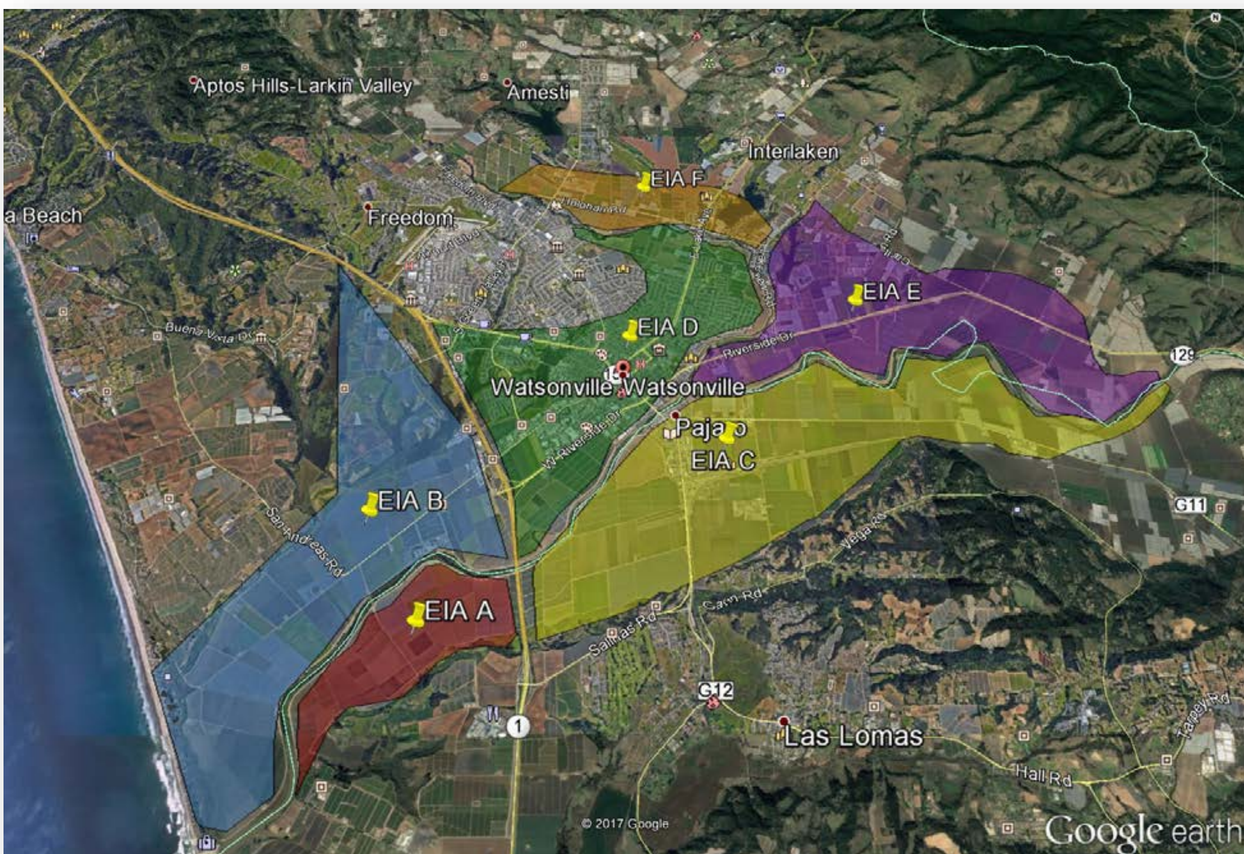

Figure 5. Economic Impact Areas (EIA)

Table 2 indicates that EIA D, EIA B, and EIA E all have the potential to be flooded from either the Pajaro River or from Corralitos/Salsipuedes Creeeks (i.e., Tributaries). Multiple-source flooding into a single consequence area introduces additional complexity when estimating damages and benefits. When developing inputs (engineering) and estimating outputs (economic damages and benefits) in areas where there could be comingling floodplains, it is crucial for the economic (risk) analysis and the engineering (hydrology and hydraulic) analyses to be guided by the same underlying assumptions. This helps to ensure that the flood risk in the study area has been characterized as accurately as possible.

In the economic analysis leading up to the TSP Milestone, the Pajaro River and Tributaries were assumed to be perfectly independent (uncorrelated) in terms of their hydrology/hydraulics. Operating under this assumption meant that flooding from each source into the Watsonville consequence area at the same time is unlikely to occur. Therefore, separate economic analyses were performed for the Watsonville consequence area based on the risk of flooding from each source, and damages and benefits estimated for each source were simply added together to derive total damages and benefits for the Watsonville consequence area (EIA D). (The analysis, which assumed uncorrelated streams and which simply summed EAD, is presented in Part III of this report. It should be noted that this approach to account for damages and benefits was not used in the final formulation of plans.)

During DQC review, it was pointed out that, based on prior hydrology reports, the Pajaro River and Corralitos/Salsipuedes Creeks cannot be considered perfectly independent, and are actually moderately (but probably not perfectly) correlated. Changing assumptions in regard to uncorrelated/correlated streams required a new approach to accounting for damages and benefits in the Watsonville consequence area in order to ensure that double counting was avoided. In this approach, the right bank of Corralitos/Salsipuedes Creeks and the Pajaro River are thought of as one continuous stream, where benefits are accrued incrementally as FRM improvements are made along this continuous stream. This approach estimates total damages in the Watsonville consequence area based on the highest EAD from either the Creeks or the Pajaro River (in this case the highest EAD is from Corralitos Creek - Index Point 7) instead of based on the sum of the highest EAD from each source (as described in Part III of this report). Likewise, residual EAD is based on the highest residual EAD from either Corralitos Creek or the Pajaro River and not the sum of the highest residual EAD from each source. The new approach used to estimate damages, residual damages, and benefits are presented in Part IV of this report.

2.1.4 Index Points

In-channel hydrologic and hydraulic data in the form of exceedance probability-stage curves (or exceedance probability-discharge and stage-discharge curves) are developed for specific locations along a waterway or hydraulic reach. These locations, or index points, are assumed to be representative of a reach or waterway, and are used to relate the engineering relationships to the economic stage-damage relationship of an economic impact area/floodplain.

Index points are typically selected based on a comprehensive assessment of several factors, including geotechnical conditions (levee performance, height of existing levee), hydrologic/hydraulic considerations (depth and extent of flooding at specific locations), and preliminary estimates of economic consequences (damages). Index points are also selected based on potential locations of FRM alternatives. Expected annual damages and benefits, as well as engineering performance, for each EIA are computed using these representative index points.

The index points used in the economic analysis are listed in Table 3 and displayed in Figure 6. The corresponding hydraulic reach (see Figure 4) that each index point is located in is also identified in Table 3.

Table 3. Index Points (and Hydraulic Reach), Main Stem Pajaro River and Tributaries

Index Point/Hydraulic Reach	Source of Flooding	Bank	EIA
1 (Hydraulic Reach 1)	Pajaro River	Left	Downstream of HWY 1 [A]
2 (Hydraulic Reach 1)	Pajaro River	Right	Downstream of HWY 1 [B]
3 (Hydraulic Reach 3)	Pajaro River	Right	Upstream of HWY 1 [D]
4 (Hydraulic Reach 4)	Pajaro River	Right	Area between Salsipuedes Creek and Pajaro River [E]
5 (Hydraulic Reach 4)	Pajaro River	Left	Upstream of HWY 1 [C]
8 (Hydraulic Reach 3)	Pajaro River	Left	Upstream of HWY 1 [C]
7L (Hydraulic Reach 6)	Corralitos Creek	Left	North of Lakeview Road [F]
7R (Hydraulic Reach 6)	Corralitos Creek	Right	Upstream and Downstream of HWY 1 [B, D]
10 (Hydraulic Reach 5)	Salsipuedes Creek	Left	Area between Salsipuedes Creek and Pajaro River [E]

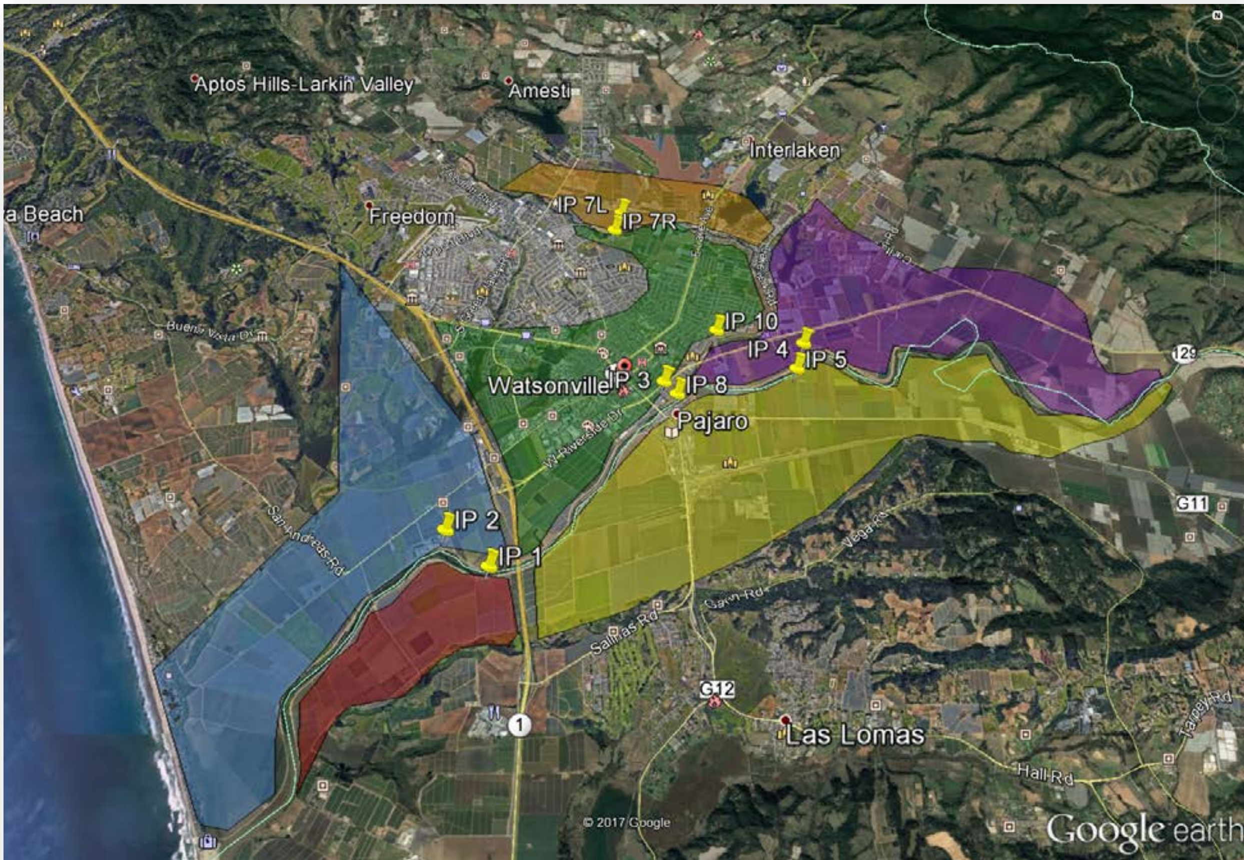

Figure 6. Index Point Locations.

2.1.5 Engineering Inputs for Economic Modeling

The engineering data used in the economic modeling are described briefly in the following sections. Complete sets of input data, including exceedance probability-discharge curves, equivalent record lengths, stage-discharge (rating) curves, and geotechnical levee fragility curves for each index point are presented in Attachments 6 and 8.

In general, the economic model combines the hydrologic and hydraulic relationships in order to generate an exceedance probability-discharge curve. This curve is then combined with the economic stage-damage curve and the geotechnical levee fragility curve (if applicable) to generate an exceedance probability-damage curve. Integration of the exceedance probability-damage curve produces expected annual damages (EAD), which represents the annual damages that could be expected to occur in any given year when computed over a long time horizon (e.g., 50-year period of analysis). This process is completed for both the without-project and with-project conditions.

2.1.5.1 Hydrologic Engineering

Hydrologic data used in the HEC-FDA modeling include equivalent record lengths (ERL) and graphical exceedance probability-discharge curves for each index point location/reach and for each condition being evaluated. The ERL is used in HEC-FDA to compute the uncertainty in discharges for a full range of exceedance probability events given a specific exceedance probability-discharge curve.

2.1.5.2 Hydraulic Engineering

The HEC-RAS model was used to determine stages in the channel, to model levee breakout locations, and to develop breakout hydrographs. A 2-dimensional (2D) model was then used to generate suites of floodplains for the without-project and with-project conditions. Additional information regarding the HEC-RAS and 2D modeling efforts can be found in the Hydraulic Engineering Appendix.

Hydraulic data used in the economic modeling include:

- Discharge-stage (rating) curves with uncertainty
- Suites of floodplains (i.e., water surface profiles)

2.1.5.3 Floodplains

Floodplains were developed for a suite of annual chance exceedance (ACE) events (50%, 20%, 10%, 4%, 2%, 1%, 0.4%, and 0.2%) at each index point under both the without-project and with-project conditions. A geographic information system (GIS) was used to assign depths of flooding associated with each ACE event to structures in the study area located within the 0.2% ACE event floodplain. This process was completed for each index point, generating nine sets of floodplains for each condition. Additional information about this process can be found in Attachment 5, *Memorandum for Record, Pajaro Future Without-Project Condition (FWOP) – Flood Depth – Summary of Methods*. Full suite of floodplain graphics are presented in the Hydraulic Engineering Appendix.

The floodplains/water surface profiles were then properly formatted for input into the economic flood damage analysis model (HEC-FDA, see *Assessment Tools* below.)

2.1.5.4 Geotechnical Engineering

A geotechnical levee fragility curve shows the probabilities of failure at a range of water surface elevations against a levee (from its toe to its crest). Fragility curves are a main component of the economic modeling as well as in determining the engineering performance of a project, which is often described in terms of annual exceedance probability (AEP) - or the chance of flooding in any given year.

A without-project geotechnical levee fragility curve was developed for each index point located on an existing levee (i.e., Index Points 1, 2, 3, 4, 5, 8, and 10). Since there aren't any levees on Corralitos Creek, fragility curves were not developed for Index Points 7L or 7R. The levee fragility curves can be found in Attachment 8; the curves were generated from information in a USACE-SPN Geotechnical Engineering Memorandum for Record (MFR), listed in the *Methodology & Reference* section above and which can be found in Attachment 7. Per guidance from USACE-SPN Geotechnical Engineering and through discussion with the PDT, the curves labeled "Upper Bound" were used in the economic analysis (future without-project condition) as these curves were judged to best represent the fragility of the levees.

Under the with-project condition, it was assumed that levee failure would not occur until overtopping, therefore with-project fragility curves were not required in the economic modeling.

2.1.5.5 Engineering Uncertainty

Engineering uncertainty used in the economic modeling is located in Attachment 6 and can also be found in the HEC-FDA models. The two main engineering uncertainties are:

- In-channel discharge uncertainty, which was computed in HEC-FDA using equivalent record length (ERL) information provided by USACE engineers. The HEC-FDA program uses the ERL to compute uncertainty in discharge for a range of exceedance probability events. The ERL, which is the number of years of a systematic record of peak discharges at a specific stream gage, is 100 years[2] for all index points on the Main Stem Pajaro River and Tributaries. Longer ERLs imply less uncertainty in discharge.

- Uncertainty in stages (in-channel) was captured in the hydraulic rating curves. For all rating curves, a uniform standard deviation of 0.9[3] feet was applied.

2.1.6 Economic Data

The economic data used in the analysis are described below. Complete datasets not presented below, such as depth-percent damage curves, are presented in Attachment 9.

2.1.6.1 Structure Inventory

A complete structure inventory of the study area was developed by USACE-San Francisco District prior to 2014, updated in 2015, carried forward to the current analysis. The inventory is based on assessor parcel information from Santa Cruz and Monterey Counties, and includes detailed information on county land use, recording date, construction year, improvement value, and site address. Land uses were verified, and additional data such as number of stories,

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[2] The ERL used in the analysis leading up to the TSP (as described in Part III of this document) was 100 years for all waterways. The ERLs used in the updated analysis leading up the selection of the Recommended Plan (as described in Part IV of this document) were 57 years, 40 years, and 30 years for the Pajaro River, Corralitos Creek, and Salsipuedes Creek, respectively.

[3] The stage uncertainty used in the analysis leading up to the TSP was 0.9 feet; the stage uncertainty used in the updated analysis leading up to the selection of the Recommended Plan was 0.7 feet.

foundation height, depreciation, and occupancy type, were collected during field visits to the study area.

Importantly, the structure inventory was verified for compliance with WRDA 1990, Section 308, which limits structures built or substantially improved after July 1, 1991 in designated floodplains not elevated to 100-yr flood levels from being included in the benefit base. The structure inventory was verified for compliance by noting the year built for each structure using assessor parcel data. Many of the residential neighborhoods in the floodplain were developed at around the same time ("cookie cutter" homes) prior to 1991; all of the structures included in the damage/benefit analysis were constructed prior to 1991.

In addition to categorizing a structure by one of the four main damage categories – residential, commercial, industrial, or public – each structure was also assigned an occupancy type. Occupancy types allow for the estimation of content value through the use of content-to-structure value ratios (CSVR), which are discussed below, and for the estimation of structure and content damages through the use of occupancy type-specific depth-percent damage curves (also discussed below).

The number of structures by damage category and economic impact area (EIA) are listed in Table 4.

Table 4. Structure Inventory by Economic Impact Area (EIA) and Damage Category

EIA	Residential	Commercial	Industrial	Public	Total
A	3	0	0	0	3
B	311	11	28	0	350
C	244	41	49	8	342
D	2,060	85	92	12	2,249
E	23	0	19	0	42
F	190	4	6	1	201
Total	2,831	141	194	21	3,187

2.1.6.2 Content-to-Structure Value Ratios (CSVR) for Non-Residential Occupancy Types

For commercial, industrial, and public structures, content value for each structure was estimated by applying a content-to-structure value ratio (CSVR) to the structure's estimated depreciated replacement value. CSVRs for various occupancy types were published in a USACE study by the New Orleans District called, *Depth-Damage Relationships for Structures, Contents, and Vehicles and Content-to-Structure Value Ratios in Support of Jefferson and Orleans Flood Control Feasibility Studies*, and used in prior Pajaro River FRM analyses; these curves were carried forward to this analysis. The values from the New Orleans report were used because of the detailed account of the methodology and results, allowing for a relatively straightforward determination of the relevance and applicability of the results to this study.

The majority of non-residential structures in the Pajaro study area include those that are typically found in other urban areas across the country (e.g., convenience stores, gas stations, office buildings, warehouses, etc.). Additionally, the lower ends of the depth-percent damage curves are the parts of the curves that are most applicable to the Pajaro study, since depth of flooding in the Watsonville/Pajaro areas (3 feet of flooding or less in most of the urban areas; 6 feet of flooding or less in smaller areas closer to the Pajaro River) is relatively shallow as compared to New Orleans flooding; the lower end of the New Orleans curves were compared to the other non-residential depth-percent damage curves used in the South Pacific Division (i.e., Sacramento District) FRM studies and were found to be consistent with these curves. The CSVRs used in this analysis are presented in Attachment 9, and can also be found in the economic model (HEC-FDA).

The EGM 04-01 residential depth-percent damage curves (contents) were used in this analysis, making the use of CSVRs unnecessary in the estimation of residential content values or in the computation of content damages. Since the percentages in the EGM 01-03 content depth-percent damage curves are developed based on structure values rather than content values, structure values are used as the basis for estimating content damages when using the EGM 04-01 curves.

2.1.6.3 Total Value of Damageable Property

Depreciated replacement value (DRV) of structures were originally determined prior to 2014 and updated in 2015 using county assessor improvement values in conjunction with the Marshall & Swift Valuation cost manual (M&S), which is an authoritative appraisal guide to estimating depreciated replacement value of structures. For those structures without building square footage information, county assessor improvement values were used; for those structures with building square footage information, DRVs were estimated using the square foot methodology:

DRV = Building Square Footage x $/SF x Local Multiplier x (1-Depreciation Factor)

The dollar-per-square-foot ($/SF) values were pulled from the M&S cost manual and are based on occupancy type (e.g., supermarket, hotel, office building, etc.) and construction quality (e.g., poor, average, good, excellent, etc.). The local multiplier, which reflects cost differences by locality area/region, is also pulled from the M&S manual, and the depreciation factor is based on the condition of the structure as determined through field visits and guidelines set forth in the M&S manual. For the majority of the structures in the study area, construction quality was evaluated as “average” and condition was evaluated as either “average” or “good.” The corresponding M&S dollar-per-square foot value (per occupancy type) and depreciation factors (e.g., 28% for structures in “average” condition and 15% for those in “good” condition) were applied to the structure square footage in order to derive a depreciated replacement value for each structure.

The structure values estimated in 2015 were updated to current price levels by direct application of an update factor to the structure inventory in the economic models; the update factor was calculated using the Gross Domestic Product (GDP) Implicit Price Deflator calculated by the Federal Reserve Bank of St. Louis. A factor of 1.007 was used to update to an October 2016 price level across all structure types.

Tables 5, 6, and 7 display the value of damageable property for structures, contents, and for both structures and contents, respectively.

Table 5. Value of Damageable Property – Structures (October 2016 Price Level, In $1,000s)

EIA	Residential	Commercial	Industrial	Public	Total
A	331	0	0	0	331
B	52,722	10,880	13,421	0	77,023
C	41,043	19,643	36,266	4,142	101,094
D	262,564	59,747	78,315	4.376	405,002
E	4,603	0	4,891	0	9,494
F	25,827	891	438	776	27,932
Total	387,090	91,161	133,331	9,294	620,876

Table 6. Value of Damageable Property – Contents (October 2016 Price Level, In $1,000s)

EIA	Residential	Commercial	Industrial	Public	Total
A	166	0	0	0	166
B	26,361	5,359	27,376	0	59,096
C	20,521	25,968	72,778	4,691	123,958
D	131,282	52,084	154,833	4,989	343,188
E	2,302	0	8,326	0	10,628
F	12,913	979	692	884	15,468
Total	193,545	84,390	264,005	10,564	552,504

Table 7. Total Value of Damageable Property – Structures and Contents (October 2016 Price Level, In $1,000s)

EIA	Residential	Commercial	Industrial	Public	Total
A	497	0	0	0	497
B	79,083	16,239	40,797	0	136,119
C	61,564	45,611	109,044	8,833	225,052
D	393,846	111,831	233,148	9,365	748,190
E	6,905	0	13,217	0	20,122
F	38,740	1,870	1,130	1,660	43,400
Total	580,635	175,551	397,336	19,858	1,173,380

2.1.6.4 First Floor Elevations and Flood Depths

For structure and content damages, depth of flooding relative to the structure's first-floor elevation is the primary factor in determining the magnitude of damages. The process of assigning flood depths to structures entailed using GIS databases containing spatially-referenced polygons for each parcel in the study area, and floodplains/water surface profiles composed of depth data for a suite of eight ACE events (50%, 20%, 10%, 4%, 2%, 1%, 0.4%, and 0.2%). Depths of flooding at each parcel/structure were determined by calculating centroids for each parcel and extracting depths at each centroid. Attachment 5, *Memorandum for Record, Pajaro Future Without-Project Condition (FWOP) – Flood Depth – Summary of Methods*, provides additional details about assigning depths of flooding to each structure.

Foundation heights were observed in the field and estimated for each structure in the floodplain through multiple field visits. Since structures in a particular residential neighborhood are relatively uniform in terms of construction quality and type (e,g., slab foundation), structure foundation heights within a particular neighborhood are also relatively uniform. Google Earth Pro was also used to verify occupancy types and foundation heights.

The economic model uses ground elevation data and foundation height information to determine first-floor elevation, and then compares first-floor elevation to depth of flooding to determine inundation above the first floor at each structure and for each of the eight ACE events. The foundation heights assigned to structures in the study area varied between 0.5 and 3 feet. The majority of structures in the residential areas have concrete slab foundations with minimal (0.5 foot) foundation heights.

2.1.6.5 Depth-Percent Damage Functions

Depth-percent damage curves were used to determine damages to structures, contents, and automobiles, as well as to estimate emergency costs losses. These curves assign loss as a percentage of depreciated replacement value for each structure - the deeper the relative depth, the greater the percentage of value damaged.

The curves differed depending on damage category/occupancy type. Residential depth-percent damage curves (structures and contents) were taken from Economic Guidance Memorandum (EGM) 01-03, *Generic Depth-Damage Relationships,* for use on both single-family and multi-family residential structures. Non-residential curves for structures were taken from the New Orleans District study referenced in the section describing non-residential content-to-structure value ratios. Depth-percent damage functions for automobiles were taken from EGM 09-04, *Generic Depth-Damage Relationships for Vehicles*.

The depth-percent damage curves used in the analysis can be found in the HEC-FDA models and in Attachment 9.

2.1.6.6 Economic Uncertainty

Many of the factors that determine flood damages can be represented by a range of values instead of a single number. Errors in measurement and variation in classification and judgment can lead to differences in values. In accordance with Engineering Manual (EM) 1110-2-1619, uncertainties in the following parameters were considered in the damage estimation:

- Structure value (dollar per square foot, square footage, depreciation)
- Content-to-structure value ratio
- First-floor elevation
- Depth-damage percentage

For the inventory developed in 2015, structure values were determined using the square foot methodology or estimated based on improvement values listed in the county assessor rolls. Applying uncertainty to structure value helps to account for errors in judgment and for the lack of information used in the DRV estimation. Based on an assessment of the changes to structure value in relation to changes in structure classification, a uniform standard error of 15% was assigned to all structure values.

A standard deviation of 0.5 feet for first-floor elevation was used for all structures, which is common practice in many USACE studies. Ucertainty in damage percentages at specific depths was taken from the EGM 01-03 curves (residential) and the USACE New Orleans District curves (non-residential). CSVR uncertainties were also taken from the USACE New Orleans District study.

Uncertainties for each of the four variables were used for all occupancy types modeled in HEC-FDA, and are reflected in the HEC-FDA stage-damage and EAD computations. The uncertainties can be found in in the HEC-FDA models and in Attachment 9 to this report.

2.1.6.7 Urban Stage-Damage Curves

Stage-damage curves were computed in the economic model (HEC-FDA, described in Section 3.1) using a suite of floodplains and the imported structure inventory. The water surface profiles, which were developed using the hydraulic 2D modeling output and GIS (to connect depths of flooding to individual structures/parcels), contained flood depths for each structure and for each of the eight annual chance exceedance (ACE) events. The water surface profiles were then imported into HEC-FDA.
Within HEC-FDA, in-channel stages from the hydraulic rating curves (per index point) were used to link stages in the river to depths of flooding (at each structure and for each ACE event) in the floodplain. This linkage was made by inserting a row of data representing the stages from the rating curve (at a specific index point) into the water surface profile. HEC-FDA uses index points to aggregate damages.

2.1.7 Other Damage Categories

Other flood-related costs not captured in the estimate of structure and content damages were included in this analysis. These additional damage categories include:

- Automobiles
- Clean-up costs
- Temporary evacuation, relocation and housing assistance (TERHA) costs
- Prevention of flood fighting costs
- Agriculture

2.1.7.1 Automobiles

A depreciated replacement value of automobiles was based on average used car prices from a study conducted by Edmunds.com, which is an online resource for automotive information. An Edmunds research article[4] reports an average used car value of approximately \$18,800 (2015 price level). This value is reasonable for the study area, and so was updated to October 2016 prices (\$18,900) and used in this analysis. To estimate the number of vehicles flooded, the analysis assumed that there are approximately two vehicles per residential unit, but that one vehicle would be able to evacuate from the floodplain, resulting in one vehicle per unit potentially getting flooded, which is consistent with EGM 09-04 (see Section 2.1.1). The average number of vehicles per structure/unit/household of two was based on the above average number of people per household in both the city of Watsonville (3.75 people per household) and the town of Pajaro (4.91 people per household), as estimated by the U.S. Census Bureau. The average number of people per household in the town of Pajaro and the city of Watsonville are above both the national and state averages, lending support to the assumption of two vehicles per residential unit.

2.1.7.2 Clean-Up and TERHA Costs

The assessment methods used to estimate clean-up and TERHA costs follow the same ones used in the Sutter Basin Feasibility Study and the American River Common Features General Reevaluation Report (GRR). Both of these studies concluded with a recommended FRM project that was approved by the Secretary of the Army and authorized by Congress.

Flood waters leave debris, sediment, salts and the dangers of diseases throughout flooded structures, making the cleaning of these structures a necessary post-flood activity. Clean-up costs for the extraction of flood waters, dry-out, and decontamination vary significantly based upon various factors, including depth of flooding. Studies conducted by both Sacramento and New Orleans Districts indicate a maximum value of \$10/ft^2 for such clean-up costs. This maximum value covers costs associated with mold and mildew abatement, which involves the professional application of fans, chemicals, and other techniques to eliminate mold and mildew in the areas that were flooded. The maximum clean-up cost of \$10/ft^2 was used for this assessment and was applied to flood depths equal to and exceeding five feet, with damage percentages scaled down for depths between zero and five feet. Clean-up costs were not claimed for structures where depth of flooding (above the first floor) was below zero. For example, a structure could sustain a half-foot of flooding but also may have a foundation height of one foot. In this case no clean-up costs would be incurred.

Clean-up costs are calculated based on the depth of flooding at the structure, the square footage of a structure, an estimated maximum value (\$/ft^2) of clean-up expense, and a depth-percent damage curve. Figure 7 below displays dollar-per-square foot clean-up costs as a function of flood depths; Figure 8 displays the depth-percent damage curve used in the HEC-FDA analysis.

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[4] *http://www.edmunds.com/about/press/used-car-prices-increase-nearly-8-percent-to-hit-record-high-in-q2-2015-says-edmundscom.html*

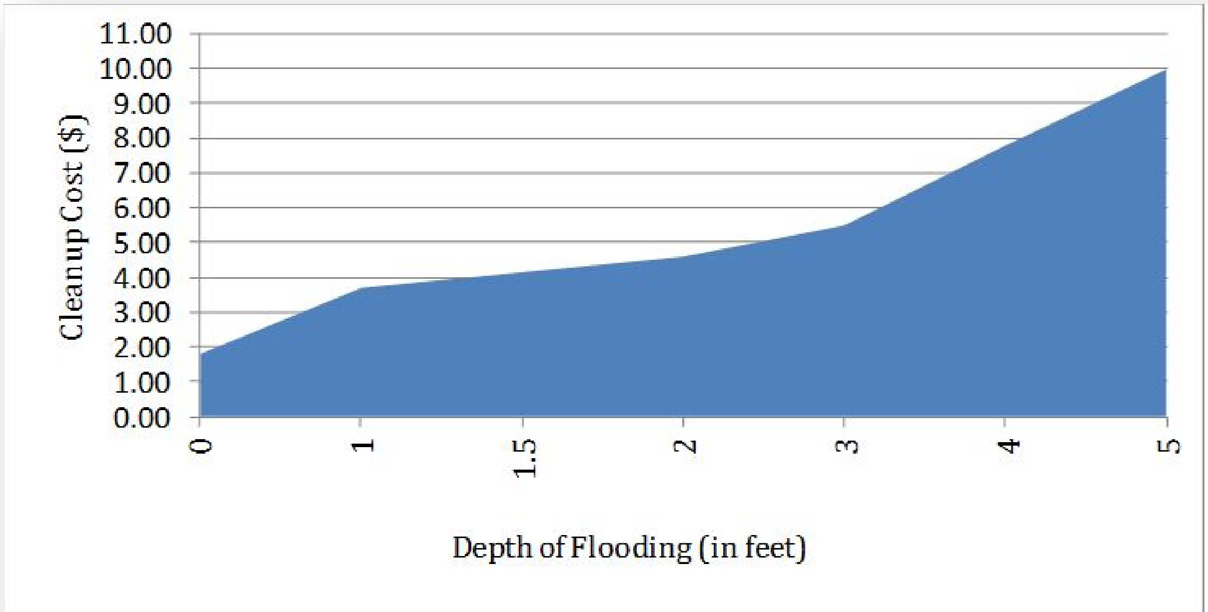


Figure 7. Dollar-Per-Square Foot Clean-Up Costs as a Function of Depth of Flooding

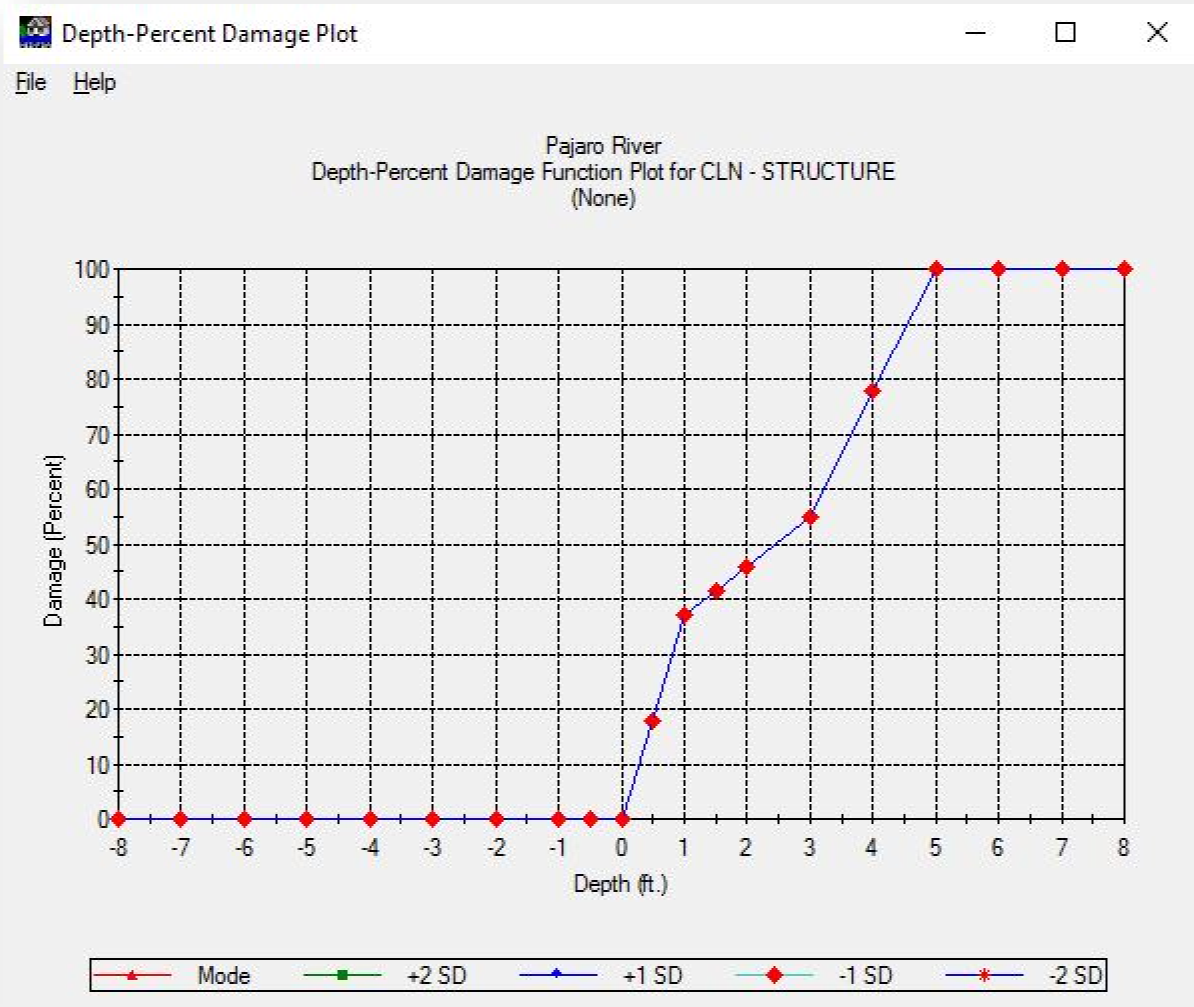


Figure 8. Depth-Percent Damage Curve for Clean-Up Costs Used in HEC-FDA Analysis

Temporary Evacuation, Relocation, and Housing Assistance (TERHA) is alluded to in ER 1105-2-100, which says, "Flood damages are classified as physical damages or losses, income losses, and emergency costs." The guidance then defines emergency costs as, "…those expenses resulting from a flood that what would not otherwise be incurred." It further requires that emergency costs should not be estimated by applying an arbitrary percentage to the physical damage estimates.

The Federal Emergency Management Agency (FEMA) provides grants to assist individuals and families to find suitable housing when they are displaced in cases of federally-declared disasters. The program assures that people have a safe place to live until their homes can be repaired. This assistance is directly attributable to the disaster, since it is an expenditure that is only undertaken when a disaster occurs. Therefore, it falls under the emergency cost guidance of ER 1105-2-100, and the funds expended by FEMA for temporary evacuation, relocation, and housing assistance (TERHA) in the event of a flood is a legitimate flood damage category under the NED account.

Cost estimates for the relocation and emergency services provided to floodplain residents displaced during peak flood events and post-flood structural renovations were based on FEMA's methodology for evaluating TERHA costs. This methodology relates TERHA costs to relocation costs, structure damage percentages, and the number of days residents spend displaced from their homes. A maximum TERHA cost of $23,940 was used in this analysis and is equivalent to one year of FEMA evacuation, relocation and/or housing assistance costs. This maximum cost is based on the average rent of a two bedroom apartment ($1,995/month) in the Gilroy, Santa Cruz, Salinas, and Hollister areas, all of which are in relative close proximity to the study area. Average rents for these areas were obtained from the website, *www.rentjungle.com*. The maximum cost was applied to structures sustaining at least fifty percent damage, with scaled down costs being computed for less damaging flood events. Figure 11 below shows percent of maximum TERHA damages as a function of the depth of flooding. The depth-percent damage relationship for a one-story single family residential (SFR) structure is also shown as a point of reference; however, unique depth-percent damage relationships for one-story residential, two-story residential, and mobile homes were applied in HEC-FDA to derive TERHA-related damages and benefits.

The analysis assumes that the maximum TERHA costs would be incurred with depths of flooding at or above five feet, meaning that residents would be displaced for a year. For shallower flood depths, the assumed duration of displacement is much shorter, per the depth-percent damage curve shown in Figure 9. For example, one foot of flooding above the first floor would result in four to five months of displacement and three feet of flooding above the first floor would result in about six to seven months of displacement.

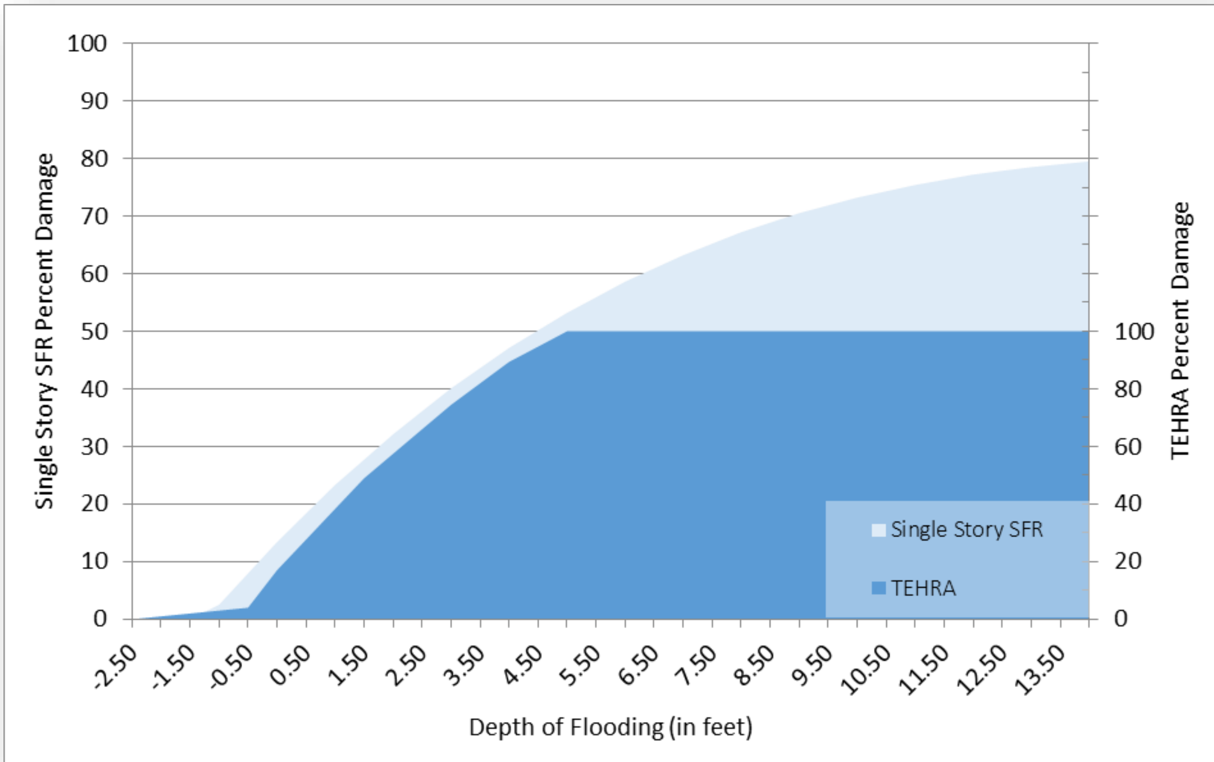


Figure 9. Depth-Percent Damage Curve for TERHA Overlaid onto Depth-Percent Damage Curve for One-Story Residential. (Depth of flooding is relative to first-floor elevation.)

2.1.7.3 Flood Fighting Costs

The Pajaro and Watsonville communities have experienced numerous flood threats requiring significant flood fighting efforts over the past 35 years. Well-known events include those in 1982, 1986, 1993, 1995, 1996, 1998, 2006, 2011, and as recently as 2017. These flood fighting efforts are extremely costly, and people familiar with past efforts, including local flood control managers and SPN engineering professionals, estimate that each episode can cost in the millions of dollars.

A project that reduces flood risk to the town of Pajaro and the city of Watsonville would prevent the need for frequent flood fighting. Estimates of flood fighting costs per episode and the number of episodes expected over the 50-year planning time horizon were made in order to compute average annual benefits of preventing flood fighting costs.

There has been on-going discussion by the vertical team (Division, Headquarter, and Office of Water & Policy Review economists) about the prevention of flood fighting costs as a legitimate National Economic Development (NED) benefit category. While an estimate of benefits associated with this category is presented in Section 7.1.4 and was included in the net benefit analysis leading up to the selection of the Tentatively Selected Plan (TSP) as described in Part III of this report, these benefits were not included in the net benefits analysis leading up to the Recommended Plan as described in Part IV of this report.

2.1.7.4 Agriculture

The USACE Planning Guidance Notebook (ER 1105-2-100) and the Institute for Water Resources (IWR) Report 87-R-10 (Agricultural Flood Damage) provide guidance related to the evaluation of agricultural crop damages for flood risk management studies. Engineering Regulation (ER) 1105-2-100 (Appendix E) provides specific guidance for studies where the primary damages occur to agricultural crops. This evaluation focuses on crop damage/income losses, loss of stored crops, and agricultural clean-up costs.

Not only is the study area's agricultural industry an important part of the local and state economies, but it is the backbone of Pajaro and Watsonville, employing as much as one-third of the workforce in the town of Pajaro. Further, agriculture is a critical part of the local community's identity, and a temporary or permanent loss of farmland due to flooding could have significant adverse impacts on many families and businesses.

The study area contains approximately 8,500 acres of crops that are subject to flooding. The agricultural land use in the Pajaro River floodplain is characterized by very intensive cropping. A high percentage of the land is devoted to growing high-value strawberry crops, and the study area is known for having some of the most productive, highest quality strawberry farming in the world. Other major crops include lettuce as well as other vegetable and fruit crops such as cauliflower, broccoli, and raspberries. Table 8 displays the approximate number of agricultural acres flooded in each EIA and for each ACE event.

Table 8. Agricultural Acreage by Economic Impact Area (EIA)

EIA	Number of Acres by Annual Chance Exceedance (ACE) Event							
	50%	**20%**	**10%**	**4%**	**2%**	**1%**	**0.4%**	**0.2%**
A	0	593	777	792	804	806	807	809
B	0	682	1,972	2,157	2,243	2,328	2,345	2,350
C	1	80	870	1,419	2,449	2,639	2,725	2,830
D	0	312	512	565	617	689	699	707
E	157	168	208	283	1,298	1,385	1,428	1,486
F	24	56	81	88	117	310	327	327
TOTAL	183	1,892	4,421	5,304	7,527	8,158	8,331	8,510

An agricultural spreadsheet model, which is described in the next section, was used to estimate without-project agricultural damages for various ACE events. These ACE event damages (commonly referred to as single-event damages) were linked to the exterior (in-channel) stages corresponding to specific ACE events to derive stage-damage curves, which were then entered into a second economic model (HEC-FDA, also described below). Without-project expected annual agricultural damages and with-project residual damages were computed using HEC-FDA and are presented in subsequent sections of this report.

A prior agricultural damage analysis and report was completed by the USACE San Francisco District through a contract with Noble Consultants in February of 2016. Both the damage analysis and report were updated to reflect current price levels and is presented in Attachment 1, which discusses in detail the methodology, assumptions, and data used in the agricultural damage and benefit analyses.

3.1 ASSESSMENT TOOLS

Two assessment tools were used in the economic analysis.

The Hydrologic Engineering Center’s Flood Damage Analysis (HEC-FDA) software, version 1.4.1, was used to develop economic models of the study area. Engineering and economic input data, described previously, were entered into the models and used to estimate flood risk in the study area under both without-project and with-project conditions. HEC-FDA uses a risk-based platform to incorporate uncertainty in the main engineering and economic relationships when it computes without-project EAD and with-project damages reduced (benefits); HEC-FDA also computes engineering performance statistics, such as annual exceedance probabilities. The HEC-FDA results are used as inputs into the net benefit, incremental, and benefit-to-cost analyses, all of which are performed outside of HEC-FDA. More information about the HEC-FDA software can be found at *http://www.hec.usace.army.mil/software/*.

A Microsoft (MS) Excel spreadsheet model that incorporates risk analysis was used to estimate agricultural-related damages, including crop damages, income losses, and clean-up costs. The spreadsheet model uses an add-in software called @Risk, which is developed by the Palisade Corporation. The @Risk software, by way of probability distributions, allowed for the inclusion of uncertainty in key agricultural variables used in the spreadsheet model. Just like in HEC-FDA, the @Risk software uses Monte Carlo simulation to generate a range of possible outcomes (i.e., agricultural damages) and informs on how likely these outcomes are to occur. For this study, the primary outputs from the agricultural spreadsheet model were annual chance exceedance (ACE) event damages (commonly called single-event damages), which were then used to construct stage-damage curves. The stage-damage curves were entered directly into HEC-FDA to compute EAD and benefits for agriculture.

The HEC-FDA software is nationally-certified; the agricultural spreadsheet model was approved for use (December 2017) for the Pajaro River FRM study. More information about the agricultural spreadsheet model can be found in Attachment 2; more information about the @Risk software can be found at *https://www.palisade.com/risk/*.

PART III – ECONOMIC ANALYSIS PRESENTED IN DRAFT REPORT

4.1 FLOOD RISK: FUTURE WITHOUT-PROJECT CONDITION

Risk can be described in terms of the chance of some undesirable event occurring and the potential consequences should that undesirable event occur. In FRM NED analysis, risk is described in terms of the chance of flooding (the undesirable event) and the potential damages (consequences) from flooding. Annual chance exceedance event damages, expected annual damages (EAD), and engineering project performance, which are standard metrics used to describe flood risk in USACE studies, are presented in the following subsections for the without-project condition. The without-project results serve as the baseline against which the with-project alternatives are measured.

4.1.1 Annual Chance Exceedance (ACE) Event Damages (Urban and Agriculture)

Annual chance exceedance event damages, sometimes referred to as single-event damages, were computed in HEC-FDA. Single-event damages assume that a breach from a specific probability flow event occurs; it does not take into account the likelihood of this event actually happening. Single-event damages are useful in that they show the magnitude of consequences, within a particular impact area, should a specific flood event occur in that area. Tables 9 (urban) and 10 (agricultural) below show the damages that may occur from flooding from each index point for the eight ACE events modeled. The urban damages includes structures, contents, clean-up, emergency costs, and automobiles.

Table 9. ACE Event Damages by Index Point – Urban (October 2016 Price Level, In $1,000s)

Index Point	Source[1]	EIA[2]	Damages by ACE Event							
			50%	20%	10%	4%	2%	1%	0.4%	0.2%
1	P	A	0	255	311	376	403	457	487	534
2	P	B	0	672	1,220	3,051	4,412	8,895	15,351	37,972
3	P	D	0	9,208	26,075	47,825	55,884	65,506	72,165	89,493
4	P	E	0	0	0	0	3,841	4,156	4,337	4,593
8	P	C	0	418	10,986	30,965	43,422	58,464	69,129	86,814
7R	C	B&D	0	3,420	25,139	55,748	74,116	158,469	183,184	187,103
7L	C	F	0	3,214	9,420	13,465	15,038	22,561	24,183	25,427
10L	S	E	1,355	1,358	1,421	2,392	3,842	4,172	4,348	4,606

[1]P = Pajaro River, C = Corralitos Creek, S = Salsipuedes Creek; [2]Associated EIA.

Table 10. ACE Event Damages by Index Point – Agricultural (October 2016 Price Level, In $1,000s)

Index Point	Source[1]	EIA[2]	Damages by ACE Event							
			50%	20%	10%	4%	2%	1%	0.4%	0.2%
1	P	A	2	10,038	13,163	13,416	13,616	13,660	13,676	13,712
2	P	B	0	6,878	12,970	19,397	20,360	21,830	22,662	23,233
3	P	D	0	2,802	3,978	4,357	4,430	4,505	4,539	4,598
4	P	E	0	185	808	1,050	21,912	23,385	24,117	25,186
5	P	C	17	1,360	14,740	24,032	41,481	44,712	46,166	47,944
7R	C	B&D	3	8,619	24,551	26,902	28,414	30,148	30,422	30,508
7L	C	F	280	643	935	1,016	1,339	3,564	3,755	3,755
10L	S	E	2,663	2,851	3,530	4,791	21,995	23,464	24,185	25,180

[1]P = Pajaro River, C = Corralitos Creek, S = Salsipuedes Creek; [2]Associated EIA.

4.1.2 Expected Annual Damages (EAD)

Expected annual damage (EAD) is the metric used to describe the consequences of flooding on an annual basis considering a full range of flood events – from high frequency/small events to low frequency/large events over a relatively long time horizon (many years). It is the main economic statistic used to describe the flooding problem in the study area; it is also used as the baseline to measure potential benefits from proposed alternatives. It is estimated that total without-project EAD is approximately $30.3 million (Main Stem Pajaro EAD of $12.8 million; Tributaries EAD of $17.5 million). Table 11 summarizes the EAD results by system (Main Stem Pajaro River or Tributaries), impact area, and damage category.

Table 11. Without-Project Expected Annual Damages (EAD) (October 2016 Price Level, 50-Year Period of Analysis, In $1,000s)

System	EIA	Damage Category[1]								
		AG	Autos	CLN	COM	HA	IND	PUB	RES	TOT
PAJARO RIVER	**A**	1,096	2	4	0	4	0	0	20	1,126
	B	1,295	19	67	47	33	266	0	222	1,949
	C	1,972	74	143	574	131	769	20	812	4,495
	D	351	77	238	684	158	2,093	23	815	4,439
	E	728	7	15	0	10	5	0	75	840
	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TOT	**5,442**	**179**	**467**	**1,305**	**336**	**3,133**	**43**	**1,944**	**12,849**
TRIBUTARIES	**A**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B	4,209	11	56	34	20	197	0	127	4,654
	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D	398	333	489	826	726	2,505	54	3,277	8,608
	E	1,434	25	40	0	40	6	0	296	1,841
	F	362	118	127	38	229	2	228	1,258	2,362
	TOT	**6,403**	**487**	**712**	**898**	**1,015**	**2,710**	**282**	**4,958**	**17,465**
GRAND TOT		**11,845**	**666**	**1,179**	**2,203**	**1,351**	**5,843**	**325**	**6,902**	**30,314**

[1]AG = Agriculture, Autos = Automobiles, CLN = Clean-Up Costs, COM = Commercial, HA = Housing Assistance, IND = Industrial, PUB = Public, RES = Residential

4.1.3 Engineering Performance Statistics

The three main metrics used to describe engineering performance include annual exceedance probability (AEP), long-term risk, and assurance. A description of the engineering performance statistics and the results for the without-project condition are described below and summarized in Table 12.

- Annual exceedance probability (AEP) is a statistic used to describe the chance of flooding in any given year within a designated area. Annual exceedance probability is computed in HEC-FDA using engineering data at an index point. The engineering data inputs used to calculate AEP include exceedance probability-discharge curves, stage-discharge (rating) curves, geotechnical levee fragility curves, equivalent record lengths, and top of levee/bank elevation data.

- Long-term risk describes the chance of flooding over a given time period, such as 30 years. The HEC-FDA program computes long-term risk statistics for 10-, 30-, and 50-year periods.

- Assurance, formerly described as conditional non-exceedance probability (CNP), describes the likelihood of a stream/river being able to pass a specific flow event, for example the 1% ACE event flow. The without-project assurance statistics provide relevant information to decision makers in that it helps describe how well the flood system performs under current conditions.

Table 12. Engineering Performance Statistics, Without-Project Condition

System	EIA	Engineering Performance Statistics								
		AEP	Long-Term Risk			Assurance				
			10	30	50	10%	4%	2%	1%	0.2%
PAJARO RIVER	A	8.5%	59%	93%	99%	72%	31%	11%	3%	1%
	B	7.3%	53%	90%	98%	78%	37%	14%	4%	1%
	C	6.4%	48%	86%	96%	83%	38%	13%	3%	1%
	D	8.6%	59%	93%	99%	72%	28%	8%	2%	1%
	E	5.9%	45%	84%	95%	87%	39%	12%	3%	1%
	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRIBUTARIES	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B	23%	93%	99%	99%	4%	1%	1%	1%	1%
	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D	23%	93%	99%	99%	4%	1%	1%	1%	1%
	E	25%	94%	99%	99%	58%	28%	14%	6%	1%
	F	46%	99%	99%	99%	1%	1%	1%	1%	1%

Importantly, the town of Pajaro and the city of Watsonville have about a 1 in 15 and about a 1 in 12 chance of flooding in any given year from the Pajaro River, respectively. In addition, the city of Watsonville has about a 1 in 5 chance of flooding in any given year from the Tributaries

(Corralitos Creek). As several flood events in the past have proven, the chance of flooding in the area is relatively high.

It is also important to note that the chance of the Main Stem Pajaro River passing relatively frequent (smaller) ACE flow events, such as the 10% (10-year) and 4% (25-year) events, is low. The Pajaro River has about a 72% chance of passing the 10% ACE event and about a 28% chance of passing the 4% ACE event.

The chance of Corralitos and Salsipuedes Creeks passing relatively frequent events is also low, with Corralitos Creek having only a 4% chance of passing the 10% ACE event and Salsipuedes Creek having about a 59% chance of passing the 10% ACE event.

5.1 WITH-PROJECT CONDITION: FINAL ARRAY OF ALTERNATIVES

Several Main Stem Pajaro River and Tributary alternatives were carried forward from prior assessments and evaluated for the final array. Each alternative is composed of FRM features that provide flood risk reduction from the 1% ACE event for the urban areas of Pajaro and Watsonville, and lesser flood risk reduction (either from the 4% or 2% ACE events) for the primarily agricultural area (EIA E) between Salsipuedes Creek and the Pajaro River. None of the Final Array alternatives reduces flood risk in the agricultural areas downstream of Highway 1 along the left and right banks of the Pajaro River (EIAs A and B)[5].

5.1.1 Description of Alternatives in Final Array

The project delivery team (PDT) evaluated four alternatives each for the Main Stem Pajaro River and Tributaries for the Final Array. A more detailed description and map of each alternative in the Final Array is presented in Chapter 3 of the main planning document.

Main Stem Alternatives (former name in parentheses):

- **Alternative 1** (Alternative 9D Revised + Completion Levee) **–** Reduces flood risk in the town of Pajaro, the city of Watsonville, and agricultural EIA E; project size is based on passing the 1% annual chance exceedance (ACE) event with a target of 90% assurance (Watsonville and Pajaro) or based on passing the 4% ACE event with a target of 90% assurance (agricultural EIA E)

- **Alternative 2** (Pajaro Ring Levee) **–** Reduces flood risk in the town of Pajaro and the city of Watsonville; project size is based on passing the 1% annual chance exceedance (ACE) event with a target of 90% assurance

[5] No agricultural benefits were claimed in EIA B for any of the alternatives during the TSP phase of the analysis, as described herein (Part III) of this report. However, agricultural benefits were claimed in EIA B in the reevaluation of benefits that led up to the selection of the Recommended Plan, as described in Part IV of this report.

- **Alternative 3** (9D Revised + Optimized Channel Migration Zone [CMZ]) – Reduces flood risk in the town of Pajaro, the city of Watsonville, and agricultural EIA E; project size is based on passing the 1% annual chance exceedance (ACE) event with a target of 90% assurance (Watsonville and Pajaro) or based on passing the 4% ACE event with a target of 90% assurance (agricultural EIA E)

- **Alternative 4** (9D Revised) – Reduces flood risk in the town of Pajaro, the city of Watsonville, and agricultural EIA E; project size is based on passing the 1% annual chance exceedance (ACE) event with a target of 90% assurance (Watsonville and Pajaro) or based on passing the 2% ACE event with a target of 90% assurance (agricultural EIA E)

Tributary Alternatives (former name in parentheses):

- **Alternative 5** (T3/T4 – Variable 225-Foot Setback Levees and Orchard Park Ring Levee) – Reduces flood risk in the city of Watsonville, in the Orchard Park neighborhood, and in agricultural EIAs D, E, and F; project size is based on passing the 1% ACE event with a target of 90% assurance

- **Alternative 6** (T5 – Urban 100-Foot Setback and Orchard Park Ring Levee) – Reduces flood risk in the city of Watsonville, in the Orchard Park neighborhood, and in agricultural EIAs D and E; project size is based on passing the 1% ACE event with a target of 90% assurance

- **Alternative 7** (Optimized Channel Migration Zone [CMZ] with Corralitos Creek Left Bank Levee) – Reduces flood risk in the city of Watsonville, in the Orchard Park neighborhood, and in agricultural EIAs D, E, and F; project size is based on passing the 1% ACE event with a target of 90% assurance

- **Alternative 8** (Optimized CMZ with Orchard Park Ring Levee or Relocations along Corralitos Creek Left Bank) – Reduces flood risk in the city of Watsonville, in the Orchard Park neighborhood, and in agricultural EIAs D and E; project size is based on passing the 1% ACE event with a target of 90% assurance

5.1.2 Summary of Net Benefit and Benefit-to-Cost Analyses: Final Array of Alternatives

Initial net benefit and benefit-to-cost analyses for each of the eight Main Stem Pajaro River and Tributaries alternatives were performed in order to identify the two alternatives (one each for the Pajaro River and Tributaries) that reasonably maximizes net benefits.

5.1.2.1 With-Project Expected Annual Damages (EAD) and Benefits

The eight alternatives were modeled in HEC-FDA to estimate residual EAD and damages reduced (benefits).

To ensure an "apples to apples" comparison between each alternative, each was modeled to reliably pass the 1% annual chance exceedance (ACE) flow in the urban areas, as described previously. "Reliably," from the stand point of the benefits assessment, was defined as being able to pass the 1% ACE flow with "high assurance," which in turn was defined as 90% assurance. This was modeled in HEC-FDA by initially setting the top of levee elevation to the 100-year water surface and adding height (3 feet in this case) to the levee, and then adjusted to achieve the 90% assurance level through trial and error runs in HEC-FDA. (Following the identification of the alternatives that reasonably maximize net benefits, another round of analysis was completed to help determine the optimal scale for the alternatives. This analysis is presented in the following sections.)

In EIA E, which is primarily agricultural, two of the Main Stem Pajaro River alternatives were designed to pass ACE flows smaller than the 1% ACE flow. Depending on the alternative, the top of levee elevation was set in HEC-FDA to heights whereby either the 4% ACE flow could pass with 90% assurance (Alternative 1 - 9D Revised + Completion Levee) or the 2% ACE flow could pass with 90% assurance (Alternative 4 - 9D + Local Preference of 2% ACE in Reach 4).

Tables 13 and 14 display a summary of the without-project EAD, with-project residual EAD, and the average annual benefits (AAB) for each alternative on the Main Stem and Tributaries, respectively.

Table 13. Main Stem Pajaro River, Without-Project EAD, With-Project EAD, and Damages Reduced (Benefits) (October 2016 Price Level, 50-Year Period of Analysis, In $1,000s)

Alternative	Without-Project EAD	With-Project EAD	Damages Reduced (Benefits)
Alternative 1	12,849	5,325	7,524
Alternative 2		6,979	5,870
Alternative 3		5,400	7,449
Alternative 4		5,108	7,741

Table 14. Tributaries, Without-Project EAD, With-Project EAD, and Damages Reduced (Benefits) (October 2016 Price Level, 50-Year Period of Analysis, In $1,000s)

Alternative	Without-Project EAD	With-Project EAD	Damages Reduced (Benefits)
Alternative 5	17,465	5,579	11,886
Alternative 6		6,698	10,767
Alternative 7		5,579	11,886
Alternative 8		6,511	10,954

5.1.2.2 Cost Estimates

Cost estimates for each alternative were provided by the San Francisco District's (SPN) Cost Engineering Section, organized by reach and by bank. The District also provided construction period estimates, in months, for each alternative. The construction periods were used in the calculation of interest during construction (IDC) using the Institute for Water Resources (IWR)-Plan software program. An estimate of total economic costs (i.e., project first costs plus IDC) was made, and then converted to average annual costs. Operation, maintenance, Repair, Replacement, and Rehabilitation (OMRRR) costs, documented in previous project economic reports, were added to average annual costs to derive an estimate of total average annual cost for each alternative. Total average annual costs were used to calculate net benefits and benefit-to-cost ratios (BCR).

Tables 15 and 16 display the project first costs, IDC, total economic costs, average annual costs, OMRRR costs, and total average annual costs for each Main Stem Pajaro River and Tributary alternative, respectively.

Table 15. Main Stem Pajaro River Alternatives - Project First Costs, IDC, and Average Annual Costs (October 2016 Price Level, 2.875% Discount Rate, 50-Year Period of Analysis, In $1,000s)

Cost Category	**Main Stem Pajaro River Alternative**			
	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
Project First Costs	126,648	133,491	151,479	132,135
IDC	2,414	2,393	3,082	2,849
Total Economic Costs	129,062	135,884	154,561	134,984
Average Annual Costs	4,898	5,157	5,866	5,123
OMRRR[1]	100	100	100	100
Total Average Annual Costs	4,998	5,257	5,966	5,223

[1]OMRRR = Operations, Maintenance, Repair, Replacement, and Rehabilitation

Table 16. Tributary Alternatives - Project First Costs, IDC, and Average Annual Costs (October 2016 Price Level, 2.875% Discount Rate, 50-Year Period of Analysis, In $1,000s)

Cost Category	Tributary Alternative			
	Alternative 5	Alternative 6	Alternative 7	Alternative 8
Project First Costs	246,791	182,331	246,838	225,978
IDC	4,126	2,828	3,532	3,233
Total Economic Costs	250,917	185,159	250,370	299,211
Average Annual Costs	9,522	7,027	9,502	8,699
OMRRR	100	100	100	100
Total Average Annual Costs	9,622	7,127	9,602	8,799

[1]OMRRR = Operations, Maintenance, Repair, Replacement, and Rehabilitation

5.1.2.3 Net Benefits and Benefit-to-Cost Ratios

Total average annual benefits are compared to total average annual costs to calculate net benefits and BCRs as displayed in Table 17.

Table 17. Net Benefit Analysis (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Main Stem Pajaro River						
Alternative	Without-Project EAD	With-Project EAD	Average Annual Benefits	Average Annual Costs	Net Benefits	BCR
1	12,849	5,325	7,524	4,998	2,526	1.5
2		6,979	5,870	5,257	618	1.1
3		5,400	7,449	5,966	1,483	1.2
4		5,108	7,741	5,223	2,518	1.5
Tributaries						
Alternative	Without-Project EAD	With-Project EAD	Average Annual Benefits	Average Annual Costs	Net Benefits	BCR
5	17,465	5,579	11,886	9,622	2,264	1.2
6		6,698	10,767	7,127	3,640	1.5
7		5,579	11,886	9,602	2,284	1.2
8		6,511	10,954	8,799	2,155	1.2

The initial net benefit analysis summarized above allowed for the identification of the two plans that produce the most net benefits. These plans, Alternative 1 on the Main Stem Pajaro River and Alternative 6 on the Tributaries, were carried forward to the next stage of the analysis, which addressed refinements to the plans in terms of costs, optimization (scale), and incremental analysis (separate elements) of each plan.

It is important to note that Alternative 1 on the Main Stem Pajaro River has the same FRM features as Alternative 4 except for the size of the right bank levee along EIA E (the agricultural area between Salsipuedes Creek and the Pajaro River upstream of the their confluence). In Alterative 4 this levee is designed to reduce flood risk from the 2% ACE event (with a target of 90% assurance) whereas in Alternative 1 it is designed to reduce flood risk from a smaller 4% ACE event (with a target of 90% assurance). In either case, incremental analyses indicate that EIA E is not economically justified. Further discussion of EIA E is provided in the next section.

6.1 OPTIMIZATION AND INCREMENTAL ANALYSES OF ALTERNATIVES 1 & 6

Scope refinements to Alternatives 1 and 6 were made based on optimization and incremental net benefit/BCR analyses. Optimization and incremental net benefit analyses ensure that the plans reasonably maximize net benefits in terms of scale and also ensure that separate elements of each plan are economically justified, respectively.

6.1.1 Optimization

Alternatives 1 and 6 are both designed to reduce risk to the urban areas of Pajaro and Watsonville from the 1% ACE flood event with approximately 90% assurance. A smaller scale design (ability to pass the 2% ACE flow with 90% assurance) and a larger scale design (ability to pass the 0.4% ACE flow with 90% assurance) that reduce flood risk to the urban areas were evaluated for Alternative 1 on the Main Stem Pajaro River; similarly, a smaller scale design (ability to pass the 2% ACE flow) and a larger scale design (ability to pass the 0.2% ACE flow) that reduces flood risk to the urban areas were evaluated for Alternative 6 on the Tributaries.

6.1.1.1 Cost Estimates

Cost estimates for the 2% ACE plan (Alternatives 1 and 6), 0.4% ACE plan (Alternative 1), and 0.2% ACE plan (Alternative 6) were developed parametrically by the San Francisco District (SPN) Cost Engineering Section with input from the SPN Civil Design Section and the Sacramento District (SPK) Hydraulic Design Section. The cost estimates for the various plans are presented in Tables 18 and 19. Also note that the cost estimates for the 1% ACE plans for the Main Stem Pajaro River and the Tributaries, first presented in Tables 15 and 16, respectively, are presented again in Tables 18 and 19.

Table 18. Main Stem Pajaro River, Alternative 1 -Cost Estimates for 2%, 1% and 0.4% ACE Plans (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Cost Category	Plan Scale – Alternative 1		
	2% ACE Plan (Urban Areas)	1% ACE Plan (Urban Areas)	0.4% ACE Plan (Urban Areas)
Total Project First Costs	125,670	126,648	135,713
IDC	2,405	2,414	2,597
Total Economic Costs	128,075	129,062	138,310
Average Annual Costs	4,860	4,898	5,249
OMRRR[1]	100	100	100
Total Average Annual Costs	4,960	4,998	5,349

[1]OMRRR = Operations, Maintenance, Repair, Replacement, and Rehabilitation

Table 19. Tributaries, Alternative 6 - Cost Estimates for 2%, 1% and 0.2% ACE Plans (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Cost Category	Plan Scale – Alternative 6		
	2% ACE Plan (Urban Areas)	1% ACE Plan (Urban Areas)	0.2% ACE Plan (Urban Areas)
Total Project First Costs	177,558	182,331	193,629
IDC	2,754	2,828	3,004
Total Economic Costs	180,312	185,159	196,633
Average Annual Costs	6,843	7,027	7,462
OMRRR[1]	100	100	100
Total Average Annual Costs	6,943	7,127	7,562

[1]OMRRR = Operations, Maintenance, Repair, Replacement, and Rehabilitation

6.1.1.2 Average Annual Benefits

Average annual benefits for the 2% ACE and 0.4% ACE plans (Alternative 1) and the 2% ACE and 0.2% ACE plans (Alternative 6) were estimated in HEC-FDA. Each plan was modeled in HEC-FDA assuming a 90% assurance, which is the same approach used to estimate the 1% ACE plans for each alternative. Tables 20 and 21 present the average annual benefits for each plan. Average annual benefits increase as the project size increases, as expected.

Table 20. Main Stem Pajaro River, Alternative 1 - Average Annual Benefits for 2%, 1%, and 0.4% ACE Plans (October 2016 Price Level, 50-Year Period of Analysis, In $1,000s)

Plan Scale	Without-Project EAD	With-Project EAD	Damages Reduced (Benefits)
2% ACE Plan	12,849	6,280	6,569
1% ACE Plan		5,325	7,524
0.4% ACE Plan		4,540	8,309

Table 21. Tributaries, Alternative 6 - Average Annual Benefits for 2%, 1%, and 0.2% ACE Plans (October 2016 Price Level, 50-Year Period of Analysis, In $1,000s)

Plan Scale	Without-Project EAD	With-Project EAD	Damages Reduced (Benefits)
2% ACE Plan	17,465	8,044	9,421
1% ACE Plan		6,698	10,767
0.2% ACE Plan		6,266	11,199

6.1.1.3 Net Benefit Analysis: Different Scales of Alternatives 1 & 6

For both Alternative 1 and Alternative 6, a curve was constructed comparing the net benefits of each scale; this net benefit curve was composed of three points and is shown in Tables 22 (Main Stem Pajaro River) and 23 (Tributaries), and displayed graphically in Figure 10 and Figure 11. The graphical representation of the net benefit curves indicates that net benefits are reasonably maximized, for both alternatives, at around the 1% ACE event scale.

It should be noted that net benefits continue to increase above the 1% ACE Plan for Alternative 1; however, this increase in net benefits is happening at a decreasing rate – i.e., the curve begins to flatten out above the 1% ACE Plan. Additionally, net benefits for the larger plan on the curve (0.4% ACE plan) are based on a cost estimate that is indirectly derived from the 1% ACE plan cost estimate. For these reasons – a flattening net benefit curve and an indirectly derived cost estimate for the 0.4% ACE plan, there is greater confidence (and less uncertainty) that the 1% ACE plan rather than larger plans maximizes net benefits. The 1% ACE plans for Alternative 1 and Alternative 6 were considered to be the plans that reasonably maximized net benefits and were the ones carried forward to the incremental analysis.

Table 22. Main Stem Pajaro River, Alternative 1 - Net Benefits and Benefit-to-Cost Analysis for 2%, 1%, and 0.4% ACE Plans (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Plan Scale	Without-Project EAD	With-Project EAD	Average Annual Benefits (AAB)	Average Annual Costs (AAC)	Net Benefits
2% ACE Plan	12,849	6,280	6,569	4,960	1,609
1% ACE Plan		5,325	7,524	4,998	2,526
0.4% ACE Plan		4,540	8,309	5,349	2,960

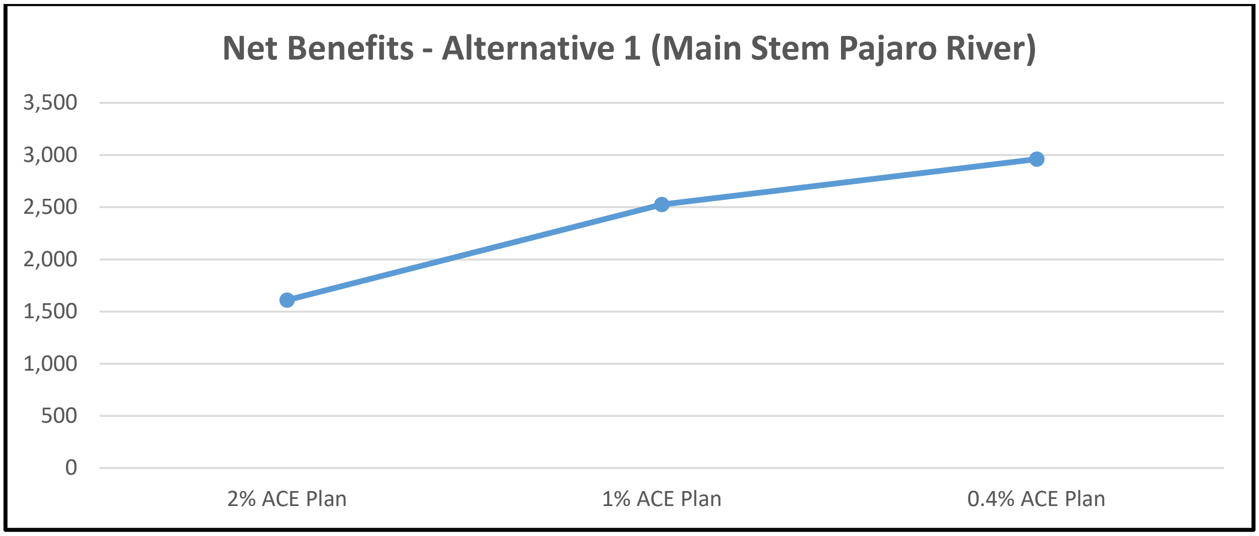


Figure 10. Net Benefit Curve for Alternative 1 (Main Stem Pajaro River).

Table 23. Tributaries, Alternative 6 - Net Benefits and Benefit-to-Cost Analysis for 2%, 1%, and 0.2% ACE Plans (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Plan Scale	Without-Project EAD	With-Project EAD	Average Annual Benefits (AAB)	Average Annual Costs (AAC)	Net Benefits
2% ACE Plan	17,465	8,044	9,421	6,943	2,478
1% ACE Plan		6,698	10,767	7,127	3,640
0.2% ACE Plan		6,266	11,199	7,562	3,637

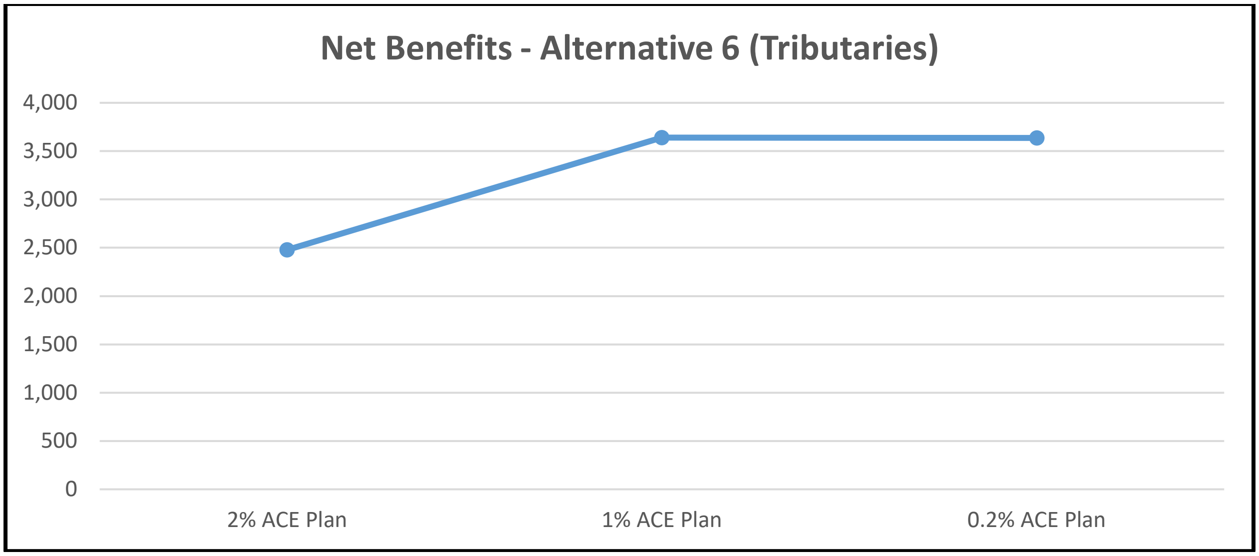


Figure 11. Net Benefit Curve for Alternative 6 (Tributaries).

6.1.1.4 Incremental Analysis

An incremental analysis that evaluates separable elements of each alternative was also performed in order to assess the economic feasibility of each element. Aggregating net benefits without analyzing each element on its own may sometimes mask the subsidizing of net benefits by one element over another. This is especially common in locations where urban areas (relatively high benefit areas) are mixed in with large swaths of agricultural areas (relatively low benefit areas), such as in the Pajaro study area.

Tables 24 and 25 display the results of the incremental analysis by separable element for Alternative 1 (Main Stem Pajaro River) and Alternative 6 (Tributaries).

For the Main Stem Pajaro River, the benefits are greater than the costs of the left bank levee improvements that help to reduce flood risk in the town of Pajaro and the surrounding agricultural area (EIA C); the benefit-to-cost ratio (BCR) of these improvements is 1.1, indicating that this element is economically justified. Additionally, the benefits are greater than the costs of the improvements to the right bank levee improvements that help to reduce flood risk in the city of Watsonville and adjacent agricultural area (EIA D); the BCR of these improvements is 4.2, also indicating that this element is economically justified. Finally, benefits are less than the costs for the right bank levee improvements that help to reduce flood risk in the agricultural area east of the confluence (EIA E); the BCR of these improvements is 0.2, indicating that this feature is not economically justified.

For the Tributaries, the benefits are greater than the costs of the right bank levee improvements that help to reduce flood risk in the city of Watsonville and the surrounding agricultural area (EIA D); the BCR of these improvements is 3.1. Additionally, the benefits are less than the costs of the ring levee and the left bank levee improvements that help to reduce risk in the Orchard Park neighborhood and the agricultural area just upstream of the confluence between Salsipuedes

Creek and the Pajaro River (EIA F and EIA E, respectively); the BCR of these improvements is 0.6, indicating that this element is not economically justified.

Table 24. Main Stem Pajaro River, Alternative 1 - Incremental Net Benefit and BCR Analyses (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Hydraulic Reach	EIA	AAB	AAC	Net Benefits	BCR
Left Bank Reaches 2, 3, and 4	Town of Pajaro and surrounding agricultural area (EIA C)	3,505	3,280	225	1.1
Right Bank Reaches 2 and 3	City of Watsonville and adjacent agricultural area east of HWY 1 (EIA D)	3,872	928	2,944	4.2
Right Bank Reach 4	Agricultural area upstream of confluence (EIA E)	147	690	(543)	0.2

Table 25. Tributaries, Alternative 6 - Incremental Net Benefit and BCR Analyses (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Hydraulic Reach	EIA	AAB	AAC	Net Benefits	BCR
Right Bank Reaches 5 and 6	City of Watsonville and surrounding agricultural area (EIA D)	7,896	2,519	5,377	3.1
Left Bank Reaches 5, 6, and 7	Orchard Park neighborhood and agricultural area upstream of confluence (EIA F and EIA E)	2,872	4,508	(1,636)	0.6

6.1.1.5 Reduced Scope of Alternative 1 and Alternative 6

The incremental analyses of Alternative 1 and Alternative 6 resulted in removing those elements identified as not economically justified from each plan. Tables 26 and 27 summarize the remaining components of Alternative 1 and Alternative 6.

Table 26. Main Stem Pajaro River, Reduced Scope of Alternative 1 (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Hydraulic Reach	EIA	AAB	AAC	Net Benefits	BCR
Left Bank Reaches 2, 3, and 4	Town of Pajaro and surrounding agricultural area (EIA C)	3,505	3,280	225	1.1
Right Bank Reaches 2 and 3	City of Watsonville and adjacent agricultural area east of HWY 1 (EIA D)	3,872	928	2,944	4.2

Table 27. Tributaries, Reduced Scope of Alternative 6 (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Hydraulic Reach	EIA	AAB	AAC	Net Benefits	BCR
Right Bank Reaches 5 and 6	City of Watsonville and surrounding agricultural area (EIA D)	7,896	2,519	5,377	3.1

7.1 REFINEMENTS TO TENTATIVELY SELECTED PLAN (TSP)

Several changes to the economic analysis took place following the Tentatively Selected Plan (TSP) Milestone Conference held in August of 2017. These include changes to the scope of features proposed for the Tributaries, updated cost estimates, and an update to the damage/benefit analyses. These changes are described in more detail in the following sections.

7.1.1 Scope of Features – Tributaries

Flood risk management (FRM) features were originally proposed for the left bank of the Tributaries but were ultimately screened out due to economic infeasibility. Additional hydraulic analysis, however, indicated that constructing FRM features only on the right bank of the Tributaries would negatively impact the residents of the Orchard Park neighborhood located on the left bank by inducing flooding during relatively high-frequency events. To mitigate for these negative impacts, FRM features for the left bank were reintroduced, but on a smaller scale. These smaller scale features were found to be economically justified. The proposed FRM features include a levee along Corrolitos Creek in hydraulic Reach 6, and a floodwall along both Corralitos and Salsipuedes Creeks that extends from hydraulic Reach 6 to a point within hydraulic Reach 5 along Salsipuedes Creek. The levee and floodwall would provide additional (incremental) FRM benefits by reducing the flood risk in the Orchard Park neighborhood and the area north of Lakeview Road. The improvements would allow a 4% ACE flow event to pass (with a target of 90% assurance). Table 28 presents the updated scope of the FRM project on the Tributaries.

Table 28. Tributaries, Revised Scope of Alternative 6

Hydraulic Reach	EIA
Right Bank Reaches 5 and 6	City of Watsonville and surrounding agricultural area (EIA D)
Left Bank Reaches 5 and 6	Orchard Park neighborhood (EIA F)

7.1.2 Updated Cost Estimates

Updated cost estimates for the FRM features on the Main Stem Pajaro River and Tributaries are displayed in Table 29 by hydraulic reach/EIA and in Table 30 by system (Pajaro River and Tributaries).

Table 29. NED Costs by Hydraulic Reach/EIA (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

	Hydraulic Reach/EIA			
Cost Category	**RB Pajaro River – Hydraulic Reaches 2 and 3; city of Watsonville *(EIA D)***	**LB Pajaro River – Hydraulic Reaches 2, 3, and 4; town of Pajaro *(EIA C)***	**RB Corralitos and Salsipuedes Creeks – Hydraulic Reaches 5 and 6; city of Watsonville *(EIA D)***	**LB Corralitos and Salsipuedes Creeks – Hydraulic Reaches 5 and 6; Orchard Park neighborhood *(EIA F)***
Project First Costs	23,990	84,819	107,338	29,409
Interest During Construction	314	1,112	1,014	286
Total Economic Costs	24,304	85,931	108,352	29,695
Average Annual Costs	922	3,261	4,112	1,127
OMRRR[1] Costs	50	50	50	50
Total Average Annual Costs	**972**	**3,311**	**4,162**	**1,177**

[1]OMRRR = Operations, Maintenance, Repair, Replacement, and Rehabilitation

Table 30. NED Costs by System (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Cost Category	SYSTEM		
	Pajaro River	Tributaries	All Systems
Project First Costs	108,809	136,747	245,556
Interest During Construction	1,426	1,300	2,726
Total Economic Costs	110,235	138,047	248,282
Average Annual Costs	4,183	5,239	9,422
OMRRR[1] Costs	100	100	200
Total Average Annual Costs	**4,283**	**5,339**	**9,622**

[1]OMRRR = Operations, Maintenance, Repair, Replacement, and Rehabilitation

7.1.3 Updated Without-Project EAD and Benefits

The damage and benefit analyses were updated to account for agricultural price level changes (October 2015 to October 2016 price level) and the addition of benefits provided by the proposed FRM features located on the left bank of the tributaries that would help to reduce flood risk in the Orchard Park neighborhood as well as the agricultural area just adjacent to these residential areas from a 4% ACE event. Table 31 presents the updated ACE event damages for agriculture, which are the basis for the updated EAD for agriculture; Tables 32, 33 and 34 present the updated without-project EAD, with-project EAD, and damages reduced (benefits), respectively, for all damage categories.

Table 31. Updated ACE Event Damages by Index Point – Agricultural (October 2016 Price Level, In $1,000s)

Index Point	Source[1]	EIA[2]	Damages by ACE Event							
			50%	20%	10%	4%	2%	1%	0.4%	0.2%
1	P	A	2	10,201	13,377	13,634	13,837	13,882	13,898	13,935
2	P	B	0	6,984	13,168	19,694	20,671	22,163	23,008	23,587
3	P	D	0	2,845	4,039	4,423	4,498	4,573	4,608	4,669
4	P	E	0	188	821	1,067	22,267	23,765	24,509	25,595
5	P	C	18	1,382	14,980	24,422	42,155	45,438	46,916	48,723
7R	C	B&D	3	8,750	24,926	27,313	28,848	30,609	30,887	30,974
7L	C	F	284	653	950	1,032	1,359	3,619	3,813	3,813
10L	S	E	2,706	2,898	3,588	4,868	22,352	23,845	24,578	25,589

[1]P = Pajaro River, C = Corralitos Creek, S = Salsipuedes Creek; [2]Associated EIA.

Table 32. Without-Project Expected Annual Damages (EAD) by EIA and Damage Category (October 2016 Price Level, 50-Year Period of Analysis, In $1,000s)

System	EIA	Damage Category[1]								
		AG	**Autos**	**CLN**	**COM**	**HA**	**IND**	**PUB**	**RES**	**TOT**
PAJARO RIVER	**A**	1,114	2	4	0	4	0	0	20	1,144
	B	1,314	19	67	47	33	266	0	222	1,968
	C	2,001	74	143	574	131	769	20	812	4,524
	D	356	77	238	684	158	2,093	23	815	4,444
	E	740	7	15	0	10	5	0	75	852
	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TOT	**5,525**	**179**	**467**	**1,305**	**336**	**3,133**	**43**	**1,944**	**12,932**
TRIBUTARIES	**A**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B	4,274	11	56	34	20	197	0	127	4,719
	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D	404	333	489	826	726	2,505	54	3,277	8,614
	E	1,594	25	40	0	40	6	0	296	2,001
	F	367	118	127	38	229	2	228	1,258	2,367
	TOT	**6,639**	**487**	**712**	**898**	**1,015**	**2,710**	**282**	**4,958**	**17,701**
GRAND TOT		**12,164**	**666**	**1,179**	**2,203**	**1,351**	**5,843**	**325**	**6,902**	**30,633**

[1]AG = Agriculture, Autos = Automobiles, CLN = Clean-Up Costs, COM = Commercial, HA = Housing Assistance, IND = Industrial, PUB = Public, RES = Residential

Table 33. With-Project Expected Annual Damages (EAD) by EIA and Damage Category (October 2016 Price Level, 50-Year Period of Analysis, In $1,000s)

System	EIA	Damage Category[1]								
		AG	**Autos**	**CLN**	**COM**	**HA**	**IND**	**PUB**	**RES**	**TOT**
PAJARO RIVER	**A**	1,114	2	4	0	4	0	0	20	1,144
	B	1,314	19	67	47	33	266	0	222	1,968
	C	569	13	27	93	20	155	8	115	1,000
	D	22	15	32	86	28	253	4	128	568
	E	740	7	15	0	10	5	0	75	852
	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TOT	**3,759**	**56**	**145**	**226**	**95**	**679**	**12**	**560**	**5,532**
TRIBUTARIES	**A**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B	4,274	11	56	34	20	197	0	127	4,719
	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D	11	43	45	67	72	189	4	281	712
	E	1,594	25	40	0	40	6	0	296	2,001
	F	367	16	17	9	26	1	21	127	584
	TOT	**6,246**	**95**	**158**	**110**	**158**	**393**	**25**	**831**	**8,016**
GRAND TOT		**10,005**	**151**	**303**	**336**	**253**	**1,072**	**37**	**1,391**	**13,548**

[1]AG = Agriculture, Autos = Automobiles, CLN = Clean-Up Costs, COM = Commercial, HA = Housing Assistance, IND = Industrial, PUB = Public, RES = Residential

Table 34. Damages Reduced (Benefits) by EIA and Damage Category (October 2016 Price Level, 50-Year Period of Analysis, In $1,000s)

System	EIA	Damage Category[1]								
		AG	Autos	CLN	COM	HA	IND	PUB	RES	TOT
PAJARO RIVER	A	0	0	0	0	0	0	0	0	0
	B	0	0	0	0	0	0	0	0	0
	C	1,432	61	116	481	111	614	12	697	3,524
	D	334	62	206	598	130	1,840	19	687	3,876
	E	0	0	0	0	0	0	0	0	0
	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TOT	**1,766**	**123**	**322**	**1,079**	**241**	**2,454**	**31**	**1,384**	**7,400**
TRIBUTARIES	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B	0	0	0	0	0	0	0	0	0
	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D	393	290	444	759	654	2,316	50	2,996	7,902
	E	0	0	0	0	0	0	0	0	0
	F	0	102	110	29	203	1	207	1,131	1,783
	TOT	**393**	**392**	**554**	**788**	**857**	**2,317**	**257**	**4,127**	**9,685**
GRAND TOT		**2,159**	**515**	**876**	**1,867**	**1,098**	**4,771**	**288**	**5,511**	**17,085**

[1]AG = Agriculture, Autos = Automobiles, CLN = Clean-Up Costs, COM = Commercial, HA = Housing Assistance, IND = Industrial, PUB = Public, RES = Residential

7.1.4 Summary of Average Annual Benefits: Tentatively Selected Plan (TSP)

Tables 35 and 36 summarize the average annual benefits of the TSP with and without the inclusion of the benefits associated with the prevention of flood fighting costs, respectively. The inclusion of the prevention of flood fighting costs as a legitimate benefit category is still being discussed by the vertical team (i.e., Division, Headquarter, and Office of Water & Policy Review economists), therefore two sets of average annual benefits, net benefits, and benefit-to-cost ratios (BCR) are reported in this report – one that includes flood fighting benefits and one that does not.

The communities of Pajaro and Watsonville have incurred significant flood fighting costs over the past 35 years. An FRM project would likely prevent some of these costs. An estimate of benefits was derived by using information from the PDT and the non-federal partners, and assumes that each flood fighting episode costs approximately $4 million ($2 million each for Santa Cruz County and Monterey County). Based on the record of flood fighting episodes over the past 35 years, it was estimated that flood fighting efforts occur about every four years (i.e., 9 episodes over a 35-year period). Using this information, it was estimated that over the 50-year period of analysis, approximately 12 flood fighting episodes could be expected (without a project in place). The cost of each episode ($4 million) was then multiplied by the 12 episodes and annualized over the 50-year period of analysis using a discount rate of 2.875%. The average annual cost of flood fighting is estimated to be about $1.8 million. It was also assumed that some of these flood fighting efforts would occur at locations outside of the project area (i.e., in areas that would not be improved by either Alternative 1 or Alternative 6), and so a portion of these flood fighting costs would still be incurred even with a project in place. It was assumed that one-half of the estimated total average annual flood fighting costs (or about $900,000) would be prevented by Alternatives 1 (Main Stem) and 6 (Tributaries). The approximately $900,000 in average annual benefits were allotted to each of the main sources of flooding/urban economic impact areas, with EIA C (LB Pajaro River flood fighting), EIA D (RB Pajaro River flood fighting), EIA D (RB Tributary flooding fighting), and EIA F (LB Tributary flood fighting) each receiving a quarter of the benefits, or $225,000.

Table 35. Summary of Average Annual Benefits – Including Flood Fighting Benefits (October 2016 Price Level, 50-Year Period of Analysis, In $1,000s)

Benefit Category	EIA				Total
	RB Pajaro River (EIA D)	LB Pajaro River (EIA C)	RB Tributaries (EIA D)	LB Tributaries (EIA F)	
Urban	3,542	2,092	7,509	1,783	14,926
Agriculture	334	1,432	393	0	2,159
Flood Fighting	225	225	225	225	900
TOTAL	4,101	3,749	8,127	2,008	17,985

Table 36. Summary of Average Annual Benefits – Excluding Flood Fighting Benefits (October 2016 Price Level, 50-Year Period of Analysis, In $1,000s)

Benefit Category	EIA				Total
	RB Pajaro River (EIA D)	LB Pajaro River (EIA C)	RB Tributaries (EIA D)	LB Tributaries (EIA F)	
Urban	3,542	2,092	7,509	1,783	14,926
Agriculture	334	1,432	393	0	2,159
TOTAL	3,876	3,524	7,902	1,783	17,085

7.1.5 Engineering Performance: Tentatively Selected Plan (TSP)

The TSP reduces flood risk in the urban Pajaro and Watsonville areas (EIA C and EIA D, respectively) and in the Orchard Park neighborhood along the left bank of Corralitos and Salsipuedes Creeks, north of Lakeview Road. The TSP also reduces flood risk in the agricultural areas located within EIAs C and D. The TSP does not reduce flood risk in the primarily agricultural areas of EIA A and EIA E; in EIA B, the TSP reduces flood risk from the Tributaries but does not reduce flood risk from the Pajaro River. Table 37 displays the with-project engineering performance statistics by EIA. Note that the with-project engineering performance statistics for EIA A and EIA E (Table 37) do not differ from the without-project engineering performance statistics for those respective areas (Table 12), indicating that the TSP does not reduce the chance of flooding in these locations.

Table 37. Tentatively Selected Plan (TSP) - Engineering Performance Statistics

System	EIA[1]	Engineering Performance Statistics								
		AEP	Long-Term Risk			Assurance				
			10	30	50	10%	4%	2%	1%	0.2%
PAJARO RIVER	A	8.5%	59%	93%	99%	72%	31%	11%	3%	1%
	B	7.3%	53%	90%	98%	78%	37%	14%	4%	1%
	C	0.4%	4%	12%	20%	99%	99%	97%	87%	43%
	D	0.5%	5%	13%	21%	99%	99%	97%	86%	40%
	E	5.9%	45%	84%	95%	87%	39%	12%	3%	1%
	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRIBUTARIES	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B[2]	7.3%	53%	90%	98%	78%	37%	14%	4%	1%
	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D	0.3%	3%	9%	15%	99%	99%	99%	89%	61%
	E	25%	94%	99%	99%	58%	28%	14%	6%	1%
	F	2%	18%	45%	63%	99%	90%	63%	30%	4%

[1]Economic impact areas (EIA) affected by the TSP are shaded grey.
[2]The flood risk from the Tributaries is reduced; however, with the TSP in place, the greatest risk to EIA B comes from potential Pajaro River flooding, and is reflected in the engineering performance statistics reported in this table.

7.1.6 Net Benefits and Benefit-to-Cost Ratio (BCR)

Tables 38 and 39 present the net benefits and benefit-to-cost ratios by increment/EIA. Table 38 includes benefits associated with the prevention of flood fighting costs while Table 39 does not.

Table 38. Net Benefit and BCR Analyses - Including Flood Fighting Benefits (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Category	EIA				Total
	RB Pajaro River (EIA D)	LB Pajaro River (EIA C)	RB Tributaries (EIA D)	LB Tributaries (EIA F)	
AAB	4,101	3,749	8,127	2,008	17,985
AAC	972	3,311	4,162	1,177	9,622
Net Benefits	3,129	438	3,965	831	8,363
BCR	4.2	1.1	2.0	1.7	1.9

Table 39. Net Benefit and BCR Analyses – Excluding Flood Fighting Benefits (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Category	EIA				Total
	RB Pajaro River (EIA D)	LB Pajaro River (EIA C)	RB Tributaries (EIA D)	LB Tributaries (EIA F)	
AAB	3,876	3,524	7,902	1,783	17,085
AAC	972	3,311	4,162	1,177	9,622
Net Benefits	2,904	213	3,740	606	7,463
BCR	4.0	1.1	1.9	1.5	1.8

PART IV – UPDATED ECONOMIC ANALYSIS FOR FINAL REPORT

8.1 REFINEMENTS TO OPTIMIZATION, NET BENEFIT, AND BCR ANALYSES

Refinements were made to the analysis based on comments received during the District Quality Control (DQC) review, Agency Technical Review (ATR), South Pacific Division (SPD) review, and Headquarters (HQ) review. These refinements were made between the release of the Draft Report in October 2017 and the Agency Decision Milestone (ADM) Conference in January 2018. The major revisions are reflected in this part of the Economic Appendix, while relatively minor revisions are reflected in Parts I, II and III of the Economic Appendix.

8.1.1 Changes to Engineering Data, Assumptions, and Analysis

The DQC review and ATR of the hydrologic/hydraulic design engineering analyses highlighted several key engineering assumptions and modeling refinements that would have to be made. These refinements have direct impact on the economic analysis, and include:

- The hydrologic equivalent record lengths (ERL) were updated from 100 years for each source of flooding to 57 years for the Pajaro River, 40 years for Corralitos Creek, and 30 years for Salsipuedes Creek. The updated ERLs are based on the date stream gauges were first used on each waterway and the hydrologic data/report (1997 Hydrologic Report) used to perform the analysis for this study.

- A stage uncertainty of 0.9 feet was originally indicated by the hydraulic engineering analysis. Further analyses indicated a stage uncertainty of 0.7 feet.

- The DQC of the hydraulic design engineering models found that interior (in-channel) flows and stages for the with-project condition where levees are set back were underestimated, causing project alternatives to be undersized. Changes to the with-project hydraulic design models resulted in updated water surface elevations (WSEL) and rating curves, prompting updates to the Civil Design engineering quantities and project cost estimates.

- The initial hydrologic/hydraulic engineering analyses assumed that Corralitos/ Salsipuedes Creeks and the main stem Pajaro River were uncorrelated. Further analyses indicates that the two waterways are correlated.

8.1.2 Changes to Economic Data, Assumptions, and Analysis

Engineering and economic reviews (DQC, ATR, SPD, and HQ) of the Draft GRR (post-TSP) led to several changes to the economic analysis. These changes include:

- FY 2018 Federal discount rate of 2.75%.

- October 2017 price level.

- Equivalent record lengths of 57 years, 40 years, and 30 years for the Pajaro River, Corralitos Creek, and Salsipuedes Creek, respectively, were used in the HEC-FDA analysis. The HEC-FDA software uses the ERLs to compute discharge uncertainty. This change did not have a significant impact on the economic analysis.

- Stage uncertainty of 0.7 feet, based on the hydraulic engineering analysis, was used (uniformly for each exceedance probability event) in the HEC-FDA models. This change did not have a significant impact on the economic analysis.

- Stage-discharge rating curves for the with-project alternatives were updated in the HEC-FDA models. The rating curves were also used as the basis to set the with-project top of levee (TOL) elevation in HEC-FDA at each index point location/hydraulic reach used in the economic analysis. This change resulted in significant impacts to the with-project benefits and engineering performance for the plan previously identified as the Tentatively Selected Plan (TSP) (see Section 7.1 of this report).

- Net benefits and BCRs were calculated separately for the consequence areas consisting of the city of Watsonville (right bank Pajaro River) and the town of Pajaro (left bank Pajaro River); a composite (system-wide) calculation of net benefits was also performed, which is consistent with the non-separate element determination (Pajaro River main stem hydraulic reaches and economic impact areas) confirmed at the ADM in light of the significant flood damage consequences and life safety concerns for the heavily populated areas of Watsonville and Pajaro.

- Assumptions used in the economic risk analysis should be consistent with those used in the hydrologic/hydraulic engineering analysis. The initial hydrologic/hydraulic engineering analyses assumed that Corralitos/Salsipuedes Creeks and the main stem Pajaro River were uncorrelated; the economic analysis also made this assumption. Consistent with this assumption, expected annual damages (EAD) and benefits for the

Watsonville impact area, which can be flooded from both the Creeks and the Pajaro River, were calculated separately and simply added together. This approach likely overstated benefits for the Watsonville impact area since there is a chance of flooding from both sources at the same time (i.e., during the same year), leading to the double counting of damages and benefits.

The updated approach accounts for damages and benefits in a more dynamic way by using the highest EAD from either source of flooding, and then accumulating benefits incrementally as improvements are made to each source. Using this approach resulted in a decrease in benefits for the Watsonville impact area.

- The agricultural damage analysis was updated to reflect a higher composition of organic strawberries grown in the study area, from about 15% to about 23% of total acreage. The increase in organically-grown strawberries is based on information from county crop budget reports, which are published annually by the Agricultural Commissioner's Office.

  Additionally, the updated agricultural damage analysis incorporated multi-year net income losses associated with flooding to organic crops. In order to keep its organic certification, businesses would have to comply with the land requirements outlined in the USDA organic regulations as set forth in the Federal Code of Regulations (CFR) in Title 7, Part 205.202, which stipulates that "any field or farm parcel from which harvested crops are intended to be sold, labeled, or represented as "organic" must have had no prohibited substances applied to it for a period of 3 years immediately preceding harvest of the crop." When a flood event occurs, it is practically impossible to prevent "prohibited substances" from seeping into the fields that grow organic crops, and businesses interested in maintaining its organic certification would likely have to fallow the affected fields for three years.

  The adjustment to the composition of organic crops in conjunction with the inclusion of multi-year net income losses associated with organic strawberries resulted in an increase in agricultural damages and benefits.

- The flood risk to the agricultural area downstream of Highway 1 would be reduced when FRM improvements to Corralitos and Salsipuedes Creeks are completed. The agricultural benefits in this area were limited to the difference between the without-project EAD associated with Index Point 7 (Corralitos Creek) and either the without-project EAD associated with Index Point 2 (Pajaro River) or the with-project residual EAD associated with Index Point 7 (Corralitos Creek), whichever was higher. The ceiling on the amount of benefits that could be claimed for this agricultural area was established since no FRM improvements are being proposed for the adjacent levees in hydraulic reach 1 (Index Point), which leaves the area vulnerable to flooding as indicated by a relatively high without-project annual exceedance probability (AEP) of 7.4%.

- The prevention of flood fighting costs was determined by the USACE senior economists to be a non-legitimate benefit category. Hence, the benefits associated with this category were removed from the economic analysis. This change resulted in a decrease in benefits.

- The construction duration used to compute interest during construction (IDC) was updated from 8-12 months to 4 years (2 years each for the construction of FRM improvements on Corralitos/Salsipuedes Creeks and the Pajaro River). This change resulted in an increase in NED costs.

8.2 RESULTS OF UPDATED ECONOMIC ANALYSIS

Refinements to the economic analysis were made based on the changes to the engineering and economic data and assumptions outlined in the previous sections. The results of the updated analysis are presented in the following sections.

8.2.1 Update Agricultural Annual Chance Exceedance (ACE) Event Damages

Refinements to the agricultural damage analysis resulted in an increase in ACE damages for EIAs A, C, and E, as displayed in Table 40. Flood risk management improvements are being proposed for EIA C (town of Pajaro and adjacent agricultural area) but not for either EIA A or E.

Table 40. Updated ACE Event Damages by Index Point – Agricultural (October 2017 Price Level, In $1,000s)

Index Point	Source[1]	EIA[2]	Damages by ACE Event							
			50%	20%	10%	4%	2%	1%	0.4%	0.2%
1	P	A	3	13,922	18,257	18,608	18,885	18,946	18,968	19,018
2	P	B	0	6,984	13,168	19,694	20,671	22,163	23,008	23,587
3	P	D	0	2,845	4,039	4,423	4,498	4,573	4,608	4,669
4	P	E	0	256	1,1120	1,456	30,391	32,434	33,450	34,933
5	P	C	0	439	17,910	30,510	44,146	47,176	48,228	49,252
7R	C	B&D	3	8,750	24,926	27,313	28,848	30,609	30,887	30,974
7L	C	F	284	653	950	1,032	1,359	3,619	3,813	3,813
10L	S	E	3,693	3,955	4,896	6,644	30,507	32,544	33,544	34,923

[1]P = Pajaro River, C = Corralitos Creek, S = Salsipuedes Creek; [2]Associated EIA.

8.2.2 Without-Project EAD and Engineering Performance

Without-project EADs and engineering performance statistics shown for each index point in Tables 41 and 42 reflect updated engineering and economic data, as described in Sections 8.1.1 and 8.1.2 of this report.

It is important to note that total without-project EAD (Pajaro River and Tributaries) decreased from prior analyses due to the change in the way damages for the Watsonville impact area and the primarily agricultural area downstream of Highway 1were estimated. Instead of adding EADs from each source of flooding, the highest EAD from either source was used to characterize the consequence risk for the Watsonville area (EIA D) and the area downstream of Highway 1 (EIA B). This approach to accounting for damages is standard practice in areas where a single impact area is prone to flooding from multiple sources that are hydraulically correlated.

(Note: EIA E, which is the agricultural area located upstream of the confluence of Salsipuedes Creek and the Pajaro River, can also be flooded from both sources. However, the risk from each source of flooding was considered independent from one another and therefore EADs from each source were included in the Total EAD value. No FRM improvements in reaches on either source of flooding where flooding to EIA E can occur are included in the Recommended Plan.)

Table 41. Without-Project Expected Annual Damages (EAD) by EIA and Damage Category (October 2017 Price Level, 50-Year Period of Analysis, In $1,000s)

System	EIA	Damage Category[1]								
		AG	**Autos**	**CLN**	**COM**	**HA**	**IND**	**PUB**	**RES**	**TOT**
PAJARO RIVER	**A**	1,528	3	4	0	5	0	0	20	1,560
	B	1,308	16	52	37	26	225	0	178	1,842
	C	2,790	77	149	597	136	805	21	841	5,416
	D	353	80	242	711	162	2,177	25	850	4,600
	E	1,057	7	17	0	10	5	0	82	1,178
	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRIBUTARIES	**A**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B	4,011	13	60	35	21	208	0	136	4,484
	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D	378	344	500	858	746	2,601	56	3,451	8,934
	E	1,916	24	38	0	37	6	0	284	2,305
	F	325	122	130	40	235	2	235	1,324	2,413
TOTAL EAD		**12,005**	**593**	**898**	**1,532**	**1,195**	**3,644**	**312**	**6,180**	**26,359**

[1]AG = Agriculture, Autos = Automobiles, CLN = Clean-Up Costs, COM = Commercial, HA = Housing Assistance, IND = Industrial, PUB = Public, RES = Residential; highlighted values indicate those EADs that are used to derive the "TOTAL EAD" values.

Table 42. Engineering Performance Statistics, Without-Project Condition

System	EIA	Engineering Performance Statistics								
		AEP	**Long-Term Risk**			**Assurance**				
			10	**30**	**50**	**10%**	**4%**	**2%**	**1%**	**0.2%**
PAJARO RIVER	**A**	8.6%	59%	93%	99%	71%	32%	14%	5%	1%
	B	7.4%	54%	90%	98%	77%	37%	17%	6%	1%
	C	6.5%	49%	87%	96%	81%	39%	17%	6%	1%
	D	8.6%	59%	93%	99%	71%	30%	12%	4%	1%
	E	5.9%	46%	84%	95%	85%	40%	17%	6%	1%
	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRIBUTARIES	**A**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B	20%	89%	99%	99%	10%	2%	1%	1%	1%
	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D	20%	89%	99%	99%	10%	2%	1%	1%	1%
	E	18%	87%	99%	99%	58%	29%	17%	12%	4%
	F	37%	99%	99%	99%	1%	1%	1%	1%	1%

8.2.3 Plans Evaluated for the Agency Decision Milestone (ADM) and Final Report

At the TSP Milestone held in August 2017, a Tentatively Selected Plan (TSP) that included Alternative 1 (Pajaro River) and Alternative 6 (Tributaries) was proposed. Together, Alternatives 1 and 6 were determined to reasonably maximize net benefits and thus were selected from eight alternatives in the Final Array (four on the Pajaro River and four on the Tributaries), each composed of different FRM features. After identification of Alternatives 1 and 6, an optimization/scaling analysis of the alternatives was completed, leading to the identification of the NED Plan (TSP). A description of the eight alternatives and the optimization/scaling process was presented in Part III of this report.

Following the release of the Draft Report in October 2017, an updated optimization/scaling analysis based on Alternatives 1 and 6 was completed using updated hydrology and hydraulic engineering data. Four plans of varying scales, all derived from Alternatives 1 and 6, were evaluated and presented at the ADM Conference held in January 2018. The plans are listed in Table 43.

Table 43. Plans Evaluated and Presented at the Agency Decision Milestone (ADM) Conference

Plan	Description
Original TSP (Identified at TSP Milestone Conference)	The original TSP described in the Draft Report included improvements to Reach 2 (left and right banks), Reach 3 (left and right banks), Reach 4 (left bank) as well as a levee extending to the south to high ground, Reach 5 (right bank and part of the left bank), and Reach 6 (left and right banks); a re-evaluation of this plan using updated hydrology/hydraulic engineering data in HEC-FDA indicates that the annual exceedance probability (AEP), which represents the chance of flooding in any given year, for the city of Watsonville, the town of Pajaro, and the Orchard Park neighborhood is approximately 0.020, 0.014, and 0.059, respectively; with this plan, approximate setback levee/floodwall heights at specific index points used in the economic analysis are approximately: 0' at Index Points 3 and 8 (Reach 3 Right and Left Banks), 8.1' at Index Point 5 (Reach 4 Left Bank), 8.9' at Index Point 7 (Reach 6 Right Bank), and 3.7' at Index Point 7 (Reach 6 Left Bank). (It should be noted that these levee/floodwall heights pertain to specific index point locations and may vary within a reach. Please see the Civil Design appendix for greater detail about this plan.)
Plan based on 2% annual chance exceedance (ACE) water surface elevation (WSEL) by adding height to levee/floodwall to target goal of 90% assurance	The scope of this plan is the same as the original TSP but the size (e.g., floodwall/setback levee heights) is based on refinements to the hydraulic design models that were precipitated by technical reviews (DQC and ATR); this alternative was sized based on the 2% annual chance exceedance (ACE) water surface elevation (WSEL) with a target of 90% assurance; the AEP for the city of Watsonville, the town of Pajaro, and the Orchard Park neighborhood is approximately 0.0100, 0.0094, and 0.0083, respectively; overall, there is about an 83% assurance of passing the 2% ACE event (city of Watsonville and town of Pajaro) and about a 99% assurance of passing the 4% ACE event (Orchard Park) with this project in place; with this plan, approximate setback levee/floodwall heights at specific index points used in the economic analysis are approximately: 1.6' at Index Points 3 and 8 (Reach 3 Right and Left Banks), 12.4' at Index Point 5 (Reach 4 Left Bank), 9.0' at Index Point 7 (Reach 6 Right Bank), and 11.2' at Index Point 7 (Reach 6 Left Bank). (It should be noted that these levee/floodwall heights pertain to specific index point locations and may vary within a reach. Please see the Civil Design appendix for greater detail about this plan.)
Plan based on 1% annual chance exceedance (ACE) water surface elevation (WSEL) by adding height to levee/floodwall to target goal of 90% assurance	The scope of this plan is the same as the original TSP but the size (e.g., floodwall/setback levee heights) is based on refinements to the hydraulic design models that were precipitated by technical reviews (DQC and ATR); this alternative was sized based on the 1% annual chance exceedance (ACE) water surface elevation (WSEL) with a target of 90% assurance; the AEP for the city of Watsonville, the town of Pajaro, and the Orchard Park neighborhood is approximately 0.0052, 0.0052, and 0.0083, respectively; overall, there is about an 82% assurance of passing the 1% ACE event (city of Watsonville and town of Pajaro) and about a 99% assurance of passing the 4% ACE event (Orchard Park) with this project in place; with this plan, approximate setback levee/floodwall heights at specific index points used in the economic analysis are approximately: 3.5' at Index Points 3 and 8

	(Reach 3 Right and Left Banks), 14.5' at Index Point 5 (Reach 4 Left Bank), 10.4' at Index Point 7 (Reach 6 Right Bank), and 11.2' at Index Point 7 (Reach 6 Left Bank). (It should be noted that these levee/floodwall heights pertain to specific index point locations and may vary within a reach. Please see the Civil Design appendix for greater detail about this plan.)
Plan based on 0.4% annual chance exceedance (ACE) water surface elevation (WSEL) by adding height to levee/floodwall to target goal of 90% assurance	The scope of this plan is the same as the original TSP but the size (e.g., floodwall/setback levee heights) is based on refinements to the hydraulic design models that were precipitated by technical reviews (DQC and ATR); this alternative was sized based on the 0.4% annual chance exceedance (ACE) water surface elevation (WSEL) with a target of 90% assurance; the AEP for the city of Watsonville, the town of Pajaro, and the Orchard Park neighborhood is approximately 0.0010, 0.0012, and 0.0083, respectively; overall, there is about an 94% assurance of passing the 0.4% ACE event (city of Watsonville and town of Pajaro) and about a 99% assurance of passing the 4% ACE event (Orchard Park) with this project in place; with this plan, approximate setback levee/floodwall heights at specific index points used in the economic analysis are approximately: 5.0' at Index Points 3 and 8 (Reach 3 Right and Left Banks), 16.0' at Index Point 5 (Reach 4 Left Bank), 11.3' at Index Point 7 (Reach 6 Right Bank), and 11.2' at Index Point 7 (Reach 6 Left Bank). (It should be noted that these levee/floodwall heights pertain to specific index point locations and may vary within a reach. Please see the Civil Design appendix for greater detail about this plan.)

The four plans were used to develop the net benefit curve, identify the plan that reasonably maximizes net benefits (i.e., the NED Plan), and ultimately recommend a plan (i.e., the Recommended Plan) that best fulfills the criteria of each planning account (National Economic Development [NED], Other Social Effects [OSE], Regional Economic Development [RED], and Environmental Quality [EQ]).

8.2.4 With-Project EAD, Damages Reduced (Benefits), and Engineering Performance

Tables 44 through 51 present the with-project residual EAD, damages reduced (benefits), and engineering performance results for each plan by economic impact area; Tables 52 and 53 consolidate the information from Tables 44 through 51 and display the benefits of each plan by category (Table 53) and the benefits of each plan by economic impact area (consequence area).

Table 44. With-Project Residual Expected Annual Damages (EAD) by EIA and Damage Category (October 2017 Price Level, 50-Year Period of Analysis, In $1,000s), Original TSP

System	EIA	Damage Category[1]								
		AG	Autos	CLN	COM	HA	IND	PUB	RES	TOT
PAJARO RIVER	A	1,528	3	4	0	5	0	0	20	1,560
	B	1,308	16	52	37	26	225	0	178	1,842
	C	1,192	24	45	182	40	244	7	253	1,987
	D	91	28	79	239	57	697	9	285	1,485
	E	1,057	7	17	0	10	5	0	82	1,178
	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRIBUTARIES	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B	131	2	6	4	3	15	0	21	182
	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D	17	53	57	88	93	252	6	380	946
	E	1,916	24	38	0	37	6	0	284	2,305
	F	325	72	72	31	126	2	76	657	1,361
TOTAL EAD		**7,417**	**199**	**307**	**489**	**337**	**1,179**	**92**	**1,854**	**11,874**

[1]AG = Agriculture, Autos = Automobiles, CLN = Clean-Up Costs, COM = Commercial, HA = Housing Assistance, IND = Industrial, PUB = Public, RES = Residential; highlighted values indicate those EADs that are used to derive the "TOTAL EAD" values.

Table 45. Engineering Performance Statistics, With-Project, Original TSP

System	EIA	Engineering Performance Statistics								
		AEP	Long-Term Risk			Assurance				
			10	30	50	10%	4%	2%	1%	0.2%
PAJARO RIVER	A	8.6%	59%	93%	99%	71%	32%	14%	5%	1%
	B	7.4%	54%	90%	98%	77%	37%	17%	6%	1%
	C	1.4%	13%	34%	50%	99%	94%	73%	49%	13%
	D	2.0%	19%	46%	64%	99%	86%	57%	32%	6%
	E	5.9%	46%	84%	95%	85%	40%	17%	6%	1%
	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRIBUTARIES	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B	0.5%	5%	14%	22%	99%	99%	93%	79%	58%
	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D	0.5%	5%	14%	22%	99%	99%	93%	79%	58%
	E	18%	87%	99%	99%	58%	29%	17%	12%	4%
	F	5.9%	46%	84%	95%	80%	45%	26%	16%	4%

Table 46. With-Project Residual Expected Annual Damages (EAD) by EIA and Damage Category (October 2017 Price Level, 50-Year Period of Analysis, In $1,000s), Plan based on 2% ACE WSEL

System	EIA	Damage Category[1]								
		AG	Autos	CLN	COM	HA	IND	PUB	RES	TOT
PAJARO RIVER	A	1,528	3	4	0	5	0	0	20	1,560
	B	1,308	16	52	37	26	225	0	178	1,842
	C	996	18	32	135	29	187	6	182	1,585
	D	45	16	43	129	32	378	5	156	804
	E	1,057	7	17	0	10	5	0	82	1,178
	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRIBUTARIES	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B	108	2	5	3	3	13	0	17	131
	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D	14	45	48	74	78	211	5	318	793
	E	1,916	24	38	0	37	6	0	284	2,305
	F	325	17	16	9	26	1	12	131	537
TOTAL EAD		**7,175**	**130**	**207**	**310**	**211**	**802**	**23**	**1,195**	**10,053**

[1]AG = Agriculture, Autos = Automobiles, CLN = Clean-Up Costs, COM = Commercial, HA = Housing Assistance, IND = Industrial, PUB = Public, RES = Residential; highlighted values indicate those EADs that are used to derive the "TOTAL EAD" values.

Table 47. Engineering Performance Statistics, With-Project, Plan based on 2% ACE WSEL

System	EIA	Engineering Performance Statistics								
		AEP	Long-Term Risk			Assurance				
			10	30	50	10%	4%	2%	1%	0.2%
PAJARO RIVER	A	8.6%	59%	93%	99%	71%	32%	14%	5%	1%
	B	7.4%	54%	90%	98%	77%	37%	17%	6%	1%
	C	0.9%	9%	25%	38%	99%	98%	84%	65%	24%
	D	1.0%	10%	26%	39%	99%	97%	83%	63%	22%
	E	5.9%	46%	84%	95%	85%	40%	17%	6%	1%
	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRIBUTARIES	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B	0.4%	4%	11%	18%	99%	99%	95%	83%	65%
	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D	0.4%	4%	11%	18%	99%	99%	95%	83%	65%
	E	18%	87%	99%	99%	58%	29%	17%	12%	4%
	F[1]	0.8%	8%	22%	34%	99%	99%	86%	65%	36%

[1]Improvements to the left bank of the Tributaries are based on the 4% ACE WSEL.

Table 48. With-Project Residual Expected Annual Damages (EAD) by EIA and Damage Category (October 2017 Price Level, 50-Year Period of Analysis, In $1,000s), Plan based on 1% ACE WSEL

System	EIA	Damage Category[1]								
		AG	Autos	CLN	COM	HA	IND	PUB	RES	TOT
PAJARO RIVER	A	1,528	3	4	0	5	0	0	20	1,560
	B	1,308	16	52	37	26	225	0	178	1,842
	C	802	11	19	80	17	116	4	106	1,155
	D	24	9	24	70	18	208	3	87	443
	E	1,057	7	17	0	10	5	0	82	1,178
	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRIBUTARIES	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B	7	0	0	0	0	1	0	1	9
	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D	1	4	4	6	7	18	0	26	66
	E	1,916	24	38	0	37	6	0	284	2,305
	F	325	17	16	9	26	1	12	131	537
TOTAL EAD		**6,960**	**87**	**170**	**196**	**139**	**561**	**19**	**888**	**9,020**

[1]AG = Agriculture, Autos = Automobiles, CLN = Clean-Up Costs, COM = Commercial, HA = Housing Assistance, IND = Industrial, PUB = Public, RES = Residential; highlighted values indicate those EADs that are used to derive the "TOTAL EAD" values.

Table 49. Engineering Performance Statistics, With-Project, Plan based on 1% ACE WSEL

System	EIA	Engineering Performance Statistics								
		AEP	Long-Term Risk			Assurance				
			10	30	50	10%	4%	2%	1%	0.2%
PAJARO RIVER	A	8.6%	59%	93%	99%	71%	32%	14%	5%	1%
	B	7.4%	54%	90%	98%	77%	37%	17%	6%	1%
	C	0.5%	5%	14%	23%	99%	99%	94%	83%	48%
	D	0.5%	5%	15%	23%	99%	99%	94%	82%	48%
	E	5.9%	46%	84%	95%	85%	40%	17%	6%	1%
	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRIBUTARIES	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B	0.1%	0.3%	1%	2%	99%	99%	99%	99%	98%
	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D	0.1%	0.3%	1%	2%	99%	99%	99%	99%	98%
	E	18%	87%	99%	99%	58%	29%	17%	12%	4%
	F[1]	0.8%	8%	22%	34%	99%	99%	86%	65%	36%

[1]Improvements to the left bank of the Tributaries are based on the 4% ACE WSEL.

Table 50. With-Project Residual Expected Annual Damages (EAD) by EIA and Damage Category (October 2017 Price Level, 50-Year Period of Analysis, In $1,000s), Plan based on 0.4% ACE WSEL

System	EIA	Damage Category[1]								
		AG	Autos	CLN	COM	HA	IND	PUB	RES	TOT
PAJARO RIVER	A	1,528	3	4	0	5	0	0	20	1,560
	B	1,308	16	52	37	26	225	0	178	1,842
	C	607	3	4	18	4	28	1	24	689
	D	4	2	4	13	3	39	1	16	82
	E	1,057	7	17	0	10	5	0	82	1,178
	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRIBUTARIES	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B	1	0	0	0	0	0	0	0	1
	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D	1	0	0	0	0	1	0	1	3
	E	1,916	24	38	0	37	6	0	284	2,305
	F	325	17	16	9	26	1	12	131	537
TOTAL EAD		**6,745**	**72**	**135**	**77**	**111**	**304**	**14**	**735**	**8,193**

[1]AG = Agriculture, Autos = Automobiles, CLN = Clean-Up Costs, COM = Commercial, HA = Housing Assistance, IND = Industrial, PUB = Public, RES = Residential; highlighted values indicate those EADs that are used to derive the "TOTAL EAD" values.

Table 51. Engineering Performance Statistics, With-Project, Plan based on 0.4% ACE WSEL

System	EIA	Engineering Performance Statistics								
		AEP	Long-Term Risk			Assurance				
			10	30	50	10%	4%	2%	1%	0.2%
PAJARO RIVER	A	8.6%	59%	93%	99%	71%	32%	14%	5%	1%
	B	7.4%	54%	90%	98%	77%	37%	17%	6%	1%
	C	0.1%	1%	3%	6%	99%	99%	99%	97%	88%
	D	0.1%	1%	3%	5%	99%	99%	99%	97%	90%
	E	5.9%	46%	84%	95%	85%	40%	17%	6%	1%
	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRIBUTARIES	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B	0.1%	0.1%	0.3%	0.5%	99%	99%	99%	99%	99%
	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D	0.1%	0.1%	0.3%	0.5%	99%	99%	99%	99%	99%
	E	18%	87%	99%	99%	58%	29%	17%	12%	4%
	F[1]	0.8%	8%	22%	34%	99%	99%	86%	65%	36%

[1] Improvements to the left bank of the Tributaries are based on the 4% ACE WSEL.

Table 52. Benefits by Plan Scale and Benefit Category – All Economic Impact Areas (October 2017 Price Level, 50-Year Period of Analysis, In $1,000s)

PLAN	Benefit Category[1]								
	AG	Autos	CLN	COM	HA	IND	PUB	RES	TOT
Original TSP	4,588	394	591	1,043	858	2,465	220	4,326	14,485
2%	4,830	463	691	1,222	984	2,842	289	4,985	16,306
1%	5,045	506	728	1,336	1,056	3,083	293	5,292	17,339
0.4%	5,260	521	763	1,455	1,084	3,340	298	5,445	18,166

[1]AG = Agriculture, Autos = Automobiles, CLN = Clean-Up Costs, COM = Commercial, HA = Housing Assistance, IND = Industrial, PUB = Public, RES = Residential

Table 53. Benefits by Plan Scale and EIA/Consequence Area (October 2017 Price Level, 50-Year Period of Analysis, In $1,000s)

PLAN	EIA/Consequence Area		
	City of Watsonville	Town of Pajaro	Orchard Park[1]
Original TSP	10,004	3,429	1,052
2%	10,599	3,831	1,876
1%	11,202	4,261	
0.4%	11,563	4,727	

[1]Only the Original TSP and an updated plan based on the 4% ACE WSEL were evaluated for the Orchard Park neighborhood; for Orchard Park, only the plan based on the 4% ACE WSEL was economically justified.

8.2.5 NED Cost Estimates

The project first costs used in the net benefit/BCR analyses were developed by the USACE Cost Engineering Section (San Francisco District, SPN). Detailed project first costs are presented in Attachment 10 to this appendix. Tabled 54, 56, 58, and 60 summarize the NED costs of each plan by hydraulic reach/source of flooding; Tables 55, 57, 59, and 61 summarize the NED costs of each plan from a systems perspective by allocating costs of FRM improvements to the associated consequence area (EIA).

Table 54. NED Costs by Hydraulic Reach and EIA/Consequence Area (October 2017 Price Level, 50-Year Period of Analysis, 2.75% Discount Rate, In $1,000s), Original TSP

Original TSP (Draft Report)				
Cost Category	**Hydraulic Reach/EIA (Consequence Area)**			
	RB Pajaro River – Hydraulic Reaches 2 and 3; city of Watsonville ***(EIA D)***	**LB Pajaro River – Hydraulic Reaches 2, 3, and 4; town of Pajaro** ***(EIA C)***	**RB Corralitos and Salsipuedes Creeks – Hydraulic Reaches 5 and 6; city of Watsonville** ***(EIA D)***	**LB Corralitos and Salsipuedes Creeks – Hydraulic Reaches 5 and 6; Orchard Park neighborhood** ***(EIA F)***
Project First Costs	23,990	84,819	124,726	29,409
Interest During Construction	661	2,345	3,449	809
Total Economic Costs	24,651	87,164	128,175	30,218
Average Annual Costs	913	3,229	4,748	1,119
OMRRR[1] Costs	100	100	100	100
Total Average Annual Costs	**1,013**	**3,329**	**4,848**	**1,219**

[1]OMRRR = Operations, Maintenance, Repair, Replacement, and Rehabilitation

Table 55. NED Costs by EIA/Consequence Area Only (October 2017 Price Level, 50-Year Period of Analysis, 2.75% Discount Rate, In $1,000s), Original TSP

Original TSP (Draft Report)			
Cost Category	**EIA (Consequence Area)**		
	City of Watsonville (EIA D)	**Orchard Park (EIA F)**	**Town of Pajaro (EIA C)**
Project First Costs	148,716	29,409	84,819
Interest During Construction	4,110	809	2,345
Total Economic Costs	152,826	30,218	87,164
Average Annual Costs	5,661	1,119	3,229
OMRRR[1] Costs	200	100	100
Total Average Annual Costs	**5,861**	**1,219**	**3,329**

[1]OMRRR = Operations, Maintenance, Repair, Replacement, and Rehabilitation

Table 56. NED Costs by Hydraulic Reach and EIA/Consequence Area (October 2017 Price Level, 50-Year Period of Analysis, 2.75% Discount Rate, In $1,000s), Plan based on 2% ACE WSEL

Plan Based on 2% ACE Water Surface Elevation (WSEL)				
Cost Category	Hydraulic Reach/EIA (Consequence Area)			
	RB Pajaro River – Hydraulic Reaches 2 and 3; city of Watsonville *(EIA D)*	LB Pajaro River – Hydraulic Reaches 2, 3, and 4; town of Pajaro *(EIA C)*	RB Corralitos and Salsipuedes Creeks – Hydraulic Reaches 5 and 6; city of Watsonville *(EIA D)*	LB Corralitos and Salsipuedes Creeks – Hydraulic Reaches 5 and 6; Orchard Park neighborhood *(EIA F)*
Project First Costs	30,515	108,212	128,935	39,260
Interest During Construction	843	2,989	3,578	1,069
Total Economic Costs	31,358	111,201	132,513	40,329
Average Annual Costs	1,162	4,119	4,908	1,494
OMRRR[1] Costs	100	100	100	100
Total Average Annual Costs	**1,262**	**4,219**	**5,008**	**1,594**

[1]OMRRR = Operations, Maintenance, Repair, Replacement, and Rehabilitation

Table 57. NED Costs by EIA/Consequence Area Only (October 2017 Price Level, 50-Year Period of Analysis, 2.75% Discount Rate, In $1,000s), Plan based on 2% ACE WSEL

Plan Based on 2% ACE WSEL			
Cost Category	EIA/Consequence Area		
	City of Watsonville (EIA D)	Orchard Park (EIA F)	Town of Pajaro (EIA C)
Project First Costs	159,450	39,260	108,212
Interest During Construction	4,421	1,069	2,989
Total Economic Costs	163,871	40,329	111,201
Average Annual Costs	6,070	1,494	4,119
OMRRR[1] Costs	200	100	100
Total Average Annual Costs	**6,270**	**1,594**	**4,219**

[1]OMRRR = Operations, Maintenance, Repair, Replacement, and Rehabilitation

Table 58. NED Costs by Hydraulic Reach and EIA/Consequence Area (October 2017 Price Level, 50-Year Period of Analysis, 2.75% Discount Rate, In $1,000s), Plan based on 1% ACE WSEL

Plan Based on 1% ACE Water Surface Elevation (WSEL) - Recommended Plan (NED Plan)				
Cost Category	**Hydraulic Reach/EIA (Consequence Area)**			
	RB Pajaro River – Hydraulic Reaches 2 and 3; city of Watsonville ***(EIA D)***	**LB Pajaro River – Hydraulic Reaches 2, 3, and 4; town of Pajaro** ***(EIA C)***	**RB Corralitos and Salsipuedes Creeks – Hydraulic Reaches 5 and 6; city of Watsonville** ***(EIA D)***	**LB Corralitos and Salsipuedes Creeks – Hydraulic Reaches 5 and 6; Orchard Park neighborhood** ***(EIA F)***
Project First Costs	35,871	125,816	132,129	39,260
Interest During Construction	983	3,484	3,646	1,089
Total Economic Costs	36,854	129,300	135,775	40,349
Average Annual Costs	1,365	4,789	5,029	1,495
OMRRR[1] Costs	100	100	100	100
Total Average Annual Costs	**1,465**	**4,889**	**5,129**	**1,594**

[1]OMRRR = Operations, Maintenance, Repair, Replacement, and Rehabilitation

Table 59. NED Costs by EIA/Consequence Area Only (October 2017 Price Level, 50-Year Period of Analysis, 2.75% Discount Rate, In $1,000s), Plan based on 1% ACE WSEL

Plan Based on 1% ACE WSEL – Recommended Plan (NED Plan)			
Cost Category	**EIA/Consequence Area**		
	City of Watsonville (EIA D)	**Orchard Park (EIA F)**	**Town of Pajaro (EIA C)**
Project First Costs	168,000	39,260	125,816
Interest During Construction	4,629	1,089	3,484
Total Economic Costs	172,629	40,349	129,300
Average Annual Costs	6,394	1,495	4,789
OMRRR[1] Costs	200	100	100
Total Average Annual Costs	**6,594**	**1,594**	**4,889**

[1]OMRRR = Operations, Maintenance, Repair, Replacement, and Rehabilitation

Table 60. NED Costs by Hydraulic Reach and EIA/Consequence Area (October 2017 Price Level, 50-Year Period of Analysis, 2.75% Discount Rate, In $1,000s), Plan based on 0.4% ACE WSEL

Plan Based on 0.4% ACE Water Surface Elevation (WSEL)				
Cost Category	Hydraulic Reach/EIA (Consequence Area)			
	RB Pajaro River – Hydraulic Reaches 2 and 3; city of Watsonville *(EIA D)*	LB Pajaro River – Hydraulic Reaches 2, 3, and 4; town of Pajaro *(EIA C)*	RB Corralitos and Salsipuedes Creeks – Hydraulic Reaches 5 and 6; city of Watsonville *(EIA D)*	LB Corralitos and Salsipuedes Creeks – Hydraulic Reaches 5 and 6; Orchard Park neighborhood *(EIA F)*
Project First Costs	39,696	135,165	139,257	39,260
Interest During Construction	1,401	3,430	3,847	1,085
Total Economic Costs	41,097	138,595	143,104	40,345
Average Annual Costs	1,522	5,134	5,301	1,494
OMRRR[1] Costs	100	100	100	100
Total Average Annual Costs	**1,622**	**5,234**	**5,401**	**1,594**

[1]OMRRR = Operations, Maintenance, Repair, Replacement, and Rehabilitation

Table 61. NED Costs by EIA/Consequence Area Only (October 2017 Price Level, 50-Year Period of Analysis, 2.75% Discount Rate, In $1,000s), Plan based on 0.4% ACE WSEL

Plan Based on 0.4% ACE WSEL			
Cost Category	EIA/Consequence Area		
	City of Watsonville (EIA D)	Orchard Park (EIA F)	Town of Pajaro (EIA C)
Project First Costs	178,953	39,260	135,165
Interest During Construction	5,248	1,085	3,430
Total Economic Costs	184,201	40,345	138,595
Average Annual Costs	6,823	1,494	5,134
OMRRR[1] Costs	200	100	100
Total Average Annual Costs	**7,023**	**1,594**	**5,234**

[1]OMRRR = Operations, Maintenance, Repair, Replacement, and Rehabilitation

8.2.6 Net Benefit Analysis by EIA/Consequence Area

The information in Tables 44 through 61 (Sections 8.2.4 and 8.2.5) were used to perform net benefit and BCR analyses for each consequence area and to identify the plan that reasonably maximizes net benefits (if treated as a separate element), commonly referred to in the Corps of Engineers as the National Economic Development (NED) Plan. Tables 62 through 65 and Figures 12 through 15 present the results of the analyses in tabular and graphic form.

The analysis indicates that for the Watsonville consequence area, the plan that maximizes net benefits is the one based on the 1% ACE WSEL. With this plan in place, the overall annual chance exceedance probability (AEP), or the chance of flooding in any given year, for the city of Watsonville would be approximately 0.5%. There would be about an 82% chance of passing the 1% ACE flow event with these FRM improvements in place.

Table 62. Net Benefits - Watsonville Consequence Area

Plan	Average Annual Benefits (AAB)	Average Annual Costs (AAC)	Net Benefits
Original TSP (Identified at TSP Milestone)	10,004	5,861	4,143
Plan based on 2% ACE WSEL	10,599	6,270	4,329
Plan based on 1% ACE WSEL	11,202	6,594	4,608
Plan based on 0.4% ACE WSEL	11,563	7,023	4,540

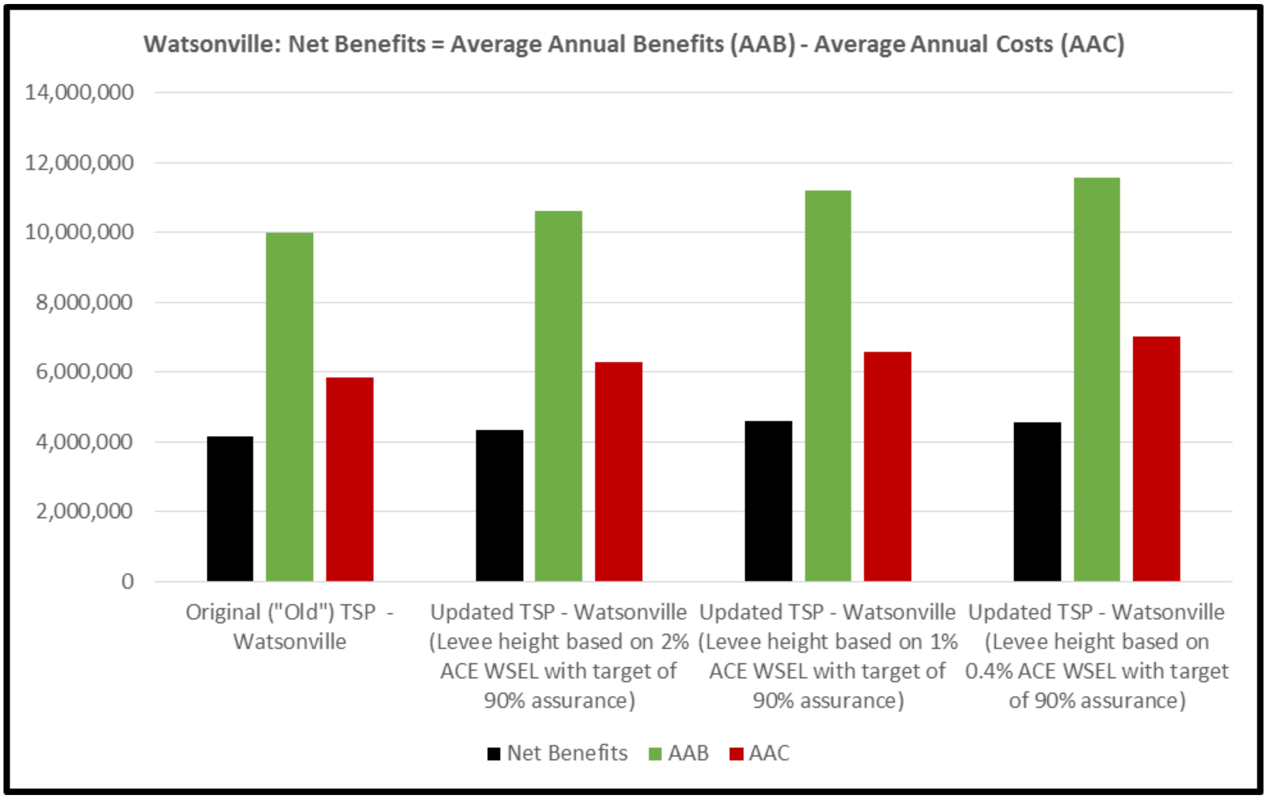


Figure 12. Comparison of Benefits and Costs - Watsonville Consequence Area.

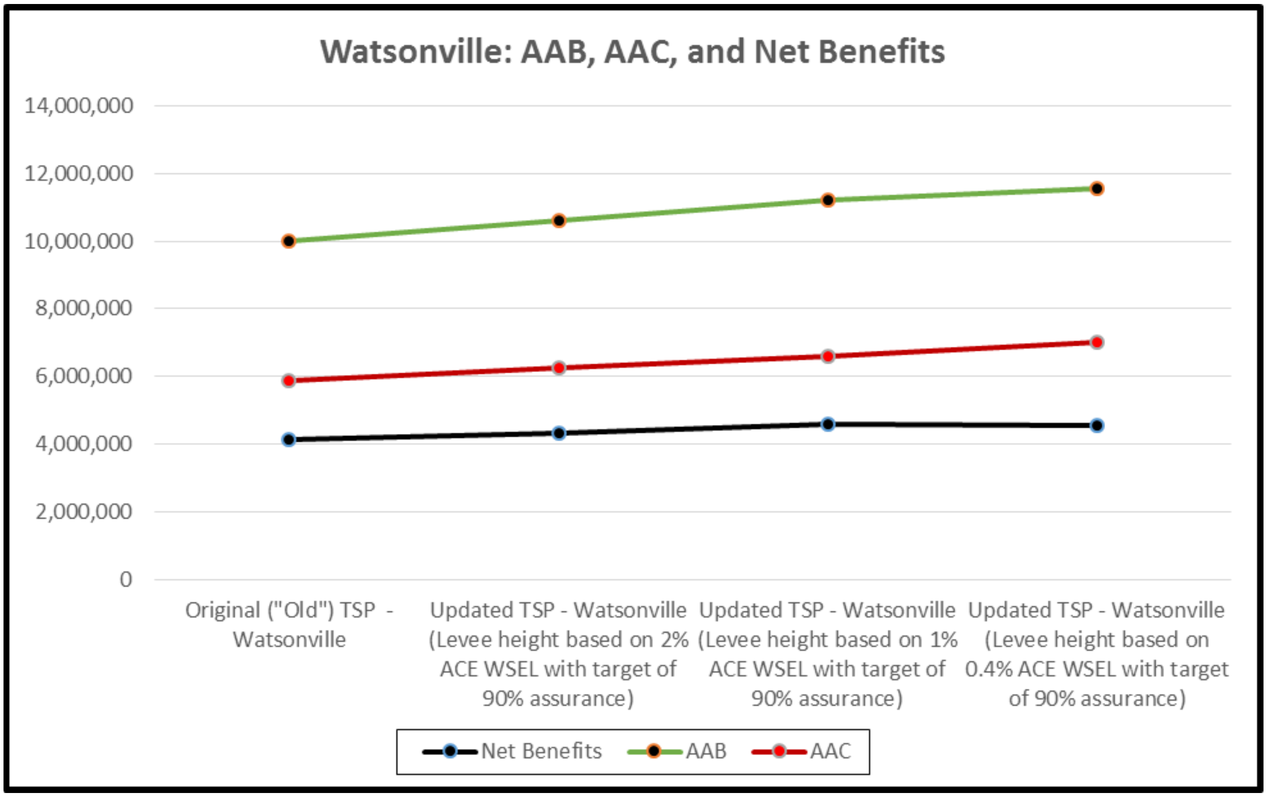


Figure 13. Net Benefit Curve – Watsonville Consequence Area.

The plan that maximizes net benefits for the consequence area that includes the town of Pajaro is the original TSP plan presented at the TSP milestone. In fact, of the four plans evaluated, this is the only one that has a positive BCR. With this plan in place, the overall AEP for the town of Pajaro would be approximately 1.4%. There would be about a 94% chance of passing the 4% ACE flow event with these FRM improvements in place.

Table 63. Net Benefits - Pajaro Consequence Area

Plan	Average Annual Benefits (AAB)	Average Annual Costs (AAC)	Net Benefits
Original TSP (Identified at TSP Milestone)	3,429	3,329	100
Plan based on 2% ACE WSEL	3,831	4,219	(388)
Plan based on 1% ACE WSEL	4,261	4,889	(628)
Plan based on 0.4% ACE WSEL	4,727	5,234	(507)

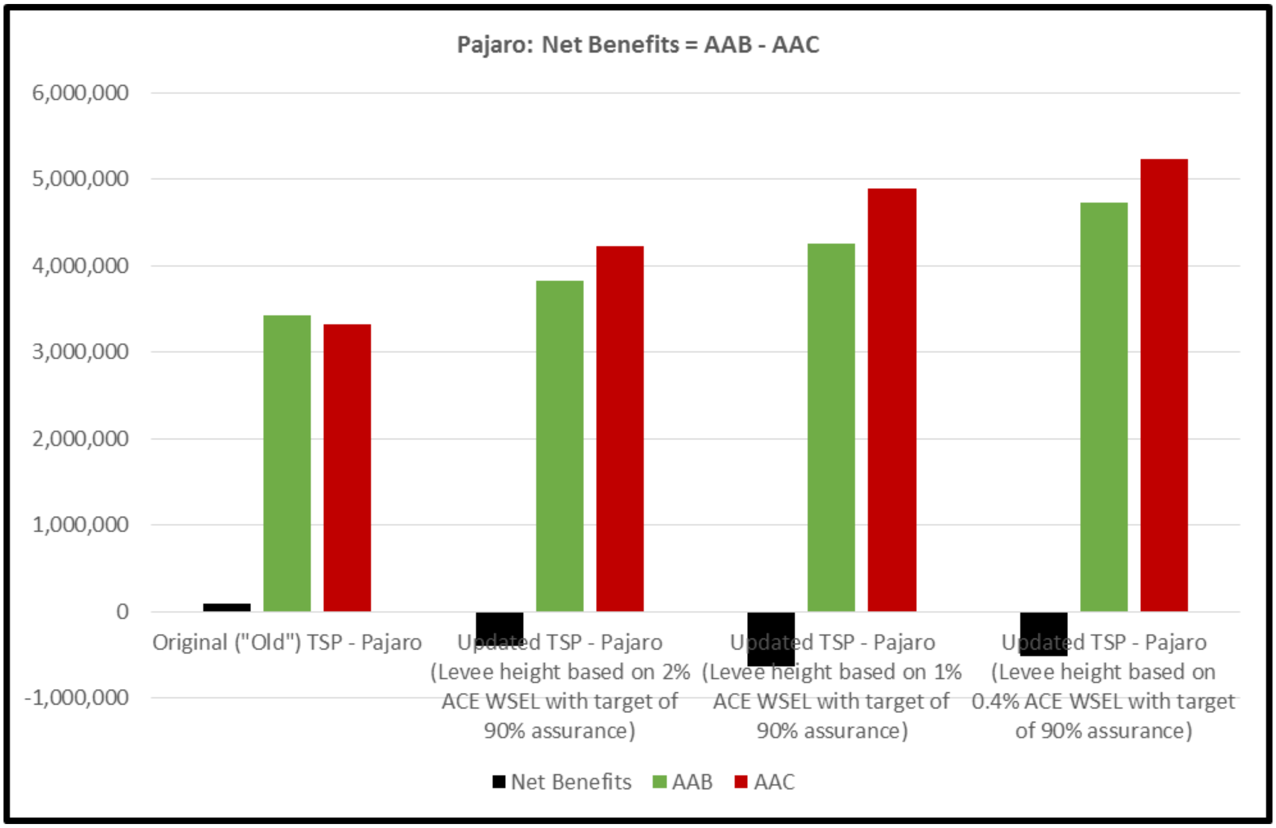


Figure 14. Comparison of Benefits and Costs – Pajaro Consequence Area.

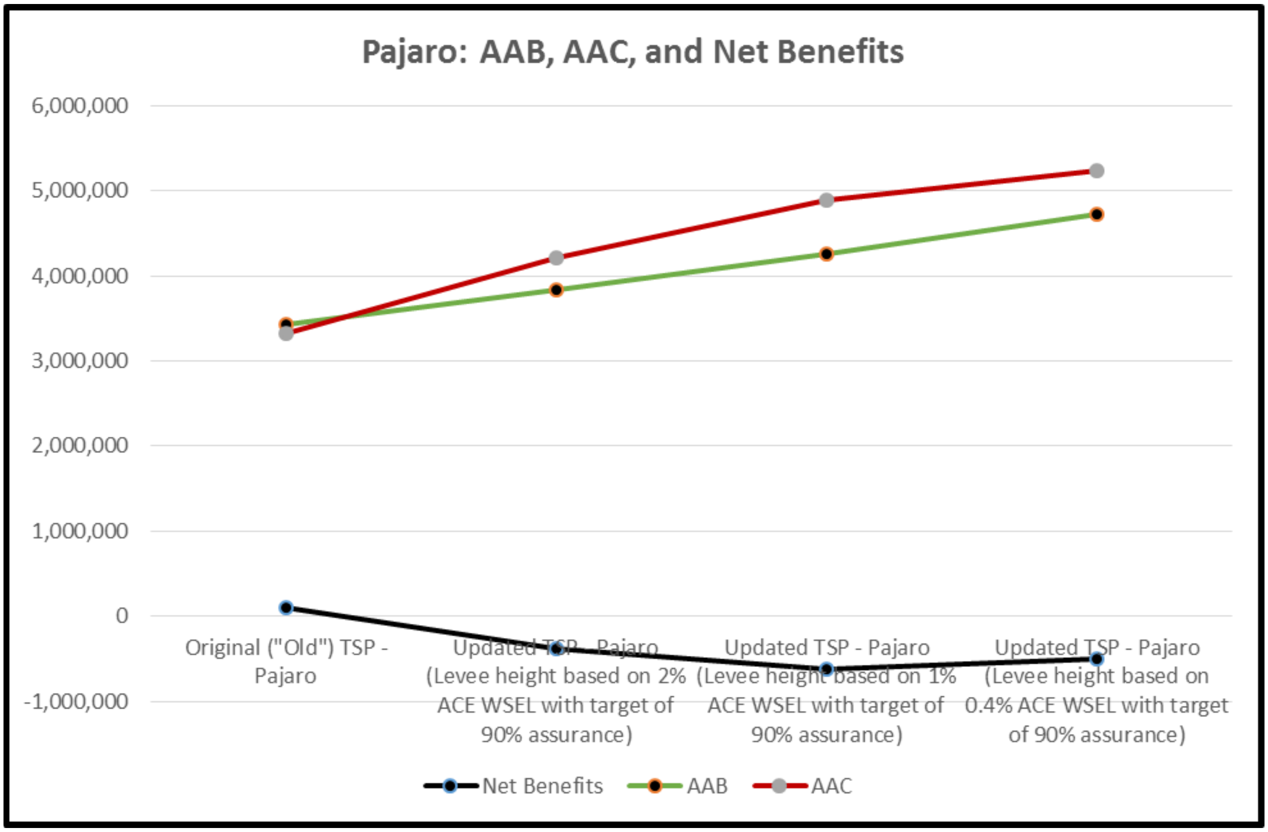


Figure 15. Net Benefit Curve – Pajaro Consequence Area.

For the Orchard Park neighborhood, a plan that was thought to be based on the 4% ACE WSEL was evaluated and identified as part of the TSP. The size of this plan was selected because of the fact that it would be able to pass the 4% ACE event, consistent with the performance of the existing levees in Reach 6 (left bank). Technical review of the hydraulic design models, however, indicated that the TSP plan originally identified at the TSP Milestone was in fact a smaller plan that would not be able to pass the 4% ACE WSEL with high assurance.

Following the TSP Milestone, two plans for the Orchard Park neighborhood were re-evaluated/evaluated: 1) the TSP plan originally identified at the TSP Milestone and 2) a new plan based on an updated 4% ACE WSEL. The re-evaluation indicates that the AEP for the Orchard Park neighborhood is approximately 0.06 (original TSP) and 0.0083 (new plan based on an updated 4% ACE WSEL). The BCR for the original TSP is below unity (i.e., not economically justified), while the BCR for the newly updated plan based on the 4% ACE WSEL is 1.2 (i.e., economically justified).

Table 64. Net Benefits - Orchard Park Consequence Area

Plan	Average Annual Benefits (AAB)	Average Annual Costs (AAC)	Net Benefits
Original TSP (Identified at TSP Milestone)	1,052	1,219	(167)
Plan based on 4% ACE WSEL	1,876	1,595	281

Using the information from Tables 62, 63, and 64 above, net benefits were also estimated for combination of plans composed of a mixture of consequence areas and scales. These plans, in addition to the ones already presented in the Tables 62, 63, and 64 are listed in Table 65 below.

Table 65. Combination of Consequence Areas

Plan	Average Annual Benefits (AAB)	Average Annual Costs (AAC)	Net Benefits
Original TSP (All Areas)	14,485	10,409	4,076
Plan based on 2% ACE WSEL[1]	16,306	12,083	4,223
Plan based on 1% ACE WSEL[1]	17,339	13,078	4,261
Plan based on 0.4% ACE WSEL[1]	18,166	13,851	4,315
Original TSP (Pajaro) + 1% (Watsonville) + 4% (Orchard Park)	16,507	11,517	4,990
Original TSP (Watsonville) + 4% (Orchard Park)	11,880	7,455	4,425
Original TSP (Pajaro and Watsonville) + 4% (Orchard Park)	15,309	10,784	4,525
Original TSP (Pajaro) + 4% (Orchard Park)	5,305	4,923	382
Original TSP (Watsonville)	10,004	5,861	4,143
1% (Watsonville) + 4% (Orchard Park)	13,078	8,189	4,889
Original TSP (Pajaro) + 1% (Watsonville)	14,631	9,923	4,708
1 % (Watsonville)	11,202	6,594	4,608
4% (Orchard Park)	1,876	1,595	281
Original TSP (Pajaro)	3,429	3,329	100
1% (Watsonville and Pajaro)	15,463	11,483	3,980

[1]Orchard Park improvements based on the 4% ACE WSEL

8.2.7 Net Benefits from a Systems Perspective

Although a net benefit analysis was performed for each economic impact area and presented in the previous tables, a plan that reduces flood risk to both the city of Watsonville and the town of Pajaro is likely the only viable way to adequately address the flooding problem in the study area. Both Watsonville and Pajaro are relatively densely populated areas that contain a significant amount of infrastructure, including industrial and commercial businesses which are vital to the local agricultural-based economy. A plan that includes FRM improvements for only one of the urban areas (i.e., only one side of the river) would be a plan that is incomplete as it would leave the study area with relatively high residual risk; an FRM plan for only one side would also be cause for concern as the chance of flooding on the side without FRM improvements may increase, especially during larger flood events. In the light of these factors, the hydraulic reaches and associated EIAs, which include the city of Watsonville and the town of Pajaro, are considered to be non-separable elements of the main stem Pajaro River. This determination of non-separable elements was confirmed at the ADM held in January 2018.

Presenting the economic analysis and results from a systems perspective is important in order to accurately portray the flood risk in the study area; likewise, formulating solutions that address the flooding problem from a systems perspective is equally as important in order to adequately reduce the flood risk in the study area. Table 66 (via a strikeout through the plan name), shows the plans that treat the main stem reaches associated with the Watsonville and Pajaro consequence areas as separable elements and which do not include FRM improvements that help to reduce flood risk, on an equivalent basis (i.e., equivalent flood risk reduction), to both the city of Watsonville and the town of Pajaro; the remaining plans (i.e., those not eliminated in Table 66) that do address flood risk, on an equivalent basis, in both urban areas are displayed in Table 67.

Table 66. Eliminating Plans that Exclude Both Watsonville and Pajaro Consequence Areas

Plan	Average Annual Benefits (AAB)	Average Annual Costs (AAC)	Net Benefits
~~Original TSP (All Areas)~~	~~14,485~~	~~10,409~~	~~4,076~~
Plan based on 2% ACE WSEL[1]	16,306	12,083	4,223
Plan based on 1% ACE WSEL[1]	17,339	13,077	4,262
Plan based on 0.4% ACE WSEL[1]	18,166	13,851	4,315
~~Original TSP (Pajaro) + 1% (Watsonville) + 4% (Orchard Park)~~	~~16,507~~	~~11,517~~	~~4,990~~
~~Original TSP (Watsonville) + 4% (Orchard Park)~~	~~11,880~~	~~7,455~~	~~4,425~~
~~Original TSP (Pajaro and Watsonville) + 4% (Orchard Park)~~	~~15,309~~	~~10,784~~	~~4,525~~
~~Original TSP (Pajaro) + 4% (Orchard Park)~~	~~5,305~~	~~4,923~~	~~382~~
~~Original TSP (Watsonville)~~	~~10,004~~	~~5,861~~	~~4,143~~
~~1% (Watsonville) + 4% (Orchard Park)~~	~~13,078~~	~~8,189~~	~~4,889~~
~~Original TSP (Pajaro) + 1% (Watsonville)~~	~~14,631~~	~~9,923~~	~~4,708~~
~~1 % (Watsonville)~~	~~11,202~~	~~6,594~~	~~4,608~~
~~4% (Orchard Park)~~	~~1,876~~	~~1,595~~	~~281~~
~~Original TSP (Pajaro)~~	~~3,429~~	~~3,329~~	~~100~~
1% (Watsonville and Pajaro)	15,463	11,483	3,980

[1]Orchard Park improvements based on the 4% ACE WSEL

Table 67. Remaining Plans that Include Both Watsonville and Pajaro Consequence Areas

Plan	Average Annual Benefits (AAB)	Average Annual Costs (AAC)	Net Benefits	BCR
Plan based on 2% ACE WSEL[1]	16,306	12,083	4,223	1.3
Plan based on 1% ACE WSEL[1]	17,339	13,077	4,262	1.3
Plan based on 0.4% ACE WSEL[1]	18,166	13,851	4,315	1.3
1% (Watsonville and Pajaro)	15,463	11,483	3,980	1.3

[1]Orchard Park improvements based on the 4% ACE WSEL

8.3 RECOMMENDED PLAN & REFINEMENTS TO NET BENEFIT ANALYSIS

The economic analysis indicates that the plan that reasonable maximizes net benefits for the left bank of the Pajaro River (town of Pajaro) is the original plan identified at the TSP Milestone and is estimated to be able to pass an approximate 4% ACE flow event with 90% assurance. The economic analysis also indicates that the NED plan for the right bank of the Pajaro River (city of

Watsonville) is able to pass an approximate 1% ACE flow event with close to 90% assurance. Based on a system-wide perspective and the determination of non-separable elements for the hydraulic reaches/urban EIAs along the main stem Pajaro River, the Recommended Plan, which is also considered the NED Plan and which was confirmed at the ADM, is one that provides the same degree of flood protection on either side of the Pajaro River after taking into consideration significant flood damage consequences, life safety concerns for the urbanized areas, other social effects, levee parity, and potential impacts from induced flooding.

While the analysis indicates that any of the four scales evaluated (targeted 4% ACE WSEL, 2% ACE WSEL, 1% ACE WSEL, and 0.4% ACE WSEL) could be considered as the plan that reasonably maximizes net benefits (i.e., the range of net benefits between the 4% and 0.4% plans is only about 5%-6%), the degree of protection afforded to the Watsonville consequence area was chosen as the driving criteria in determining the NED Plan given its economic significance to the study area as a whole.

Table 68 displays the Recommended Plan based on a project cost estimate completed in December 2017.

Table 68. Recommended Plan (October 2017 Price Level, 50-Year Period of Analysis, 2.75% Discount Rate)

Plan	Average Annual Benefits (AAB)	Average Annual Costs (AAC)	Net Benefits	BCR
Plan based on 1% ACE WSEL[1]	17,339	13,077	4,262	1.3

[1]Orchard Park improvements based on the 4% ACE WSEL

Following the ADM conference in January 2018, a Cost Schedule Risk Analysis (CSRA) was conducted (March 2018), the results of which were used to update the cost estimate for the Recommended Plan (NED Plan). The updated, certified estimate of project first costs is presented in Table 69. Table 70 displays the net benefits and BCR of the Recommended Plan (NED Plan).

Table 69. Updated Costs Estimate (October 2017 Price Level, 50-Year Period of Analysis, 2.75% Discount Rate)

Cost Category	Recommended Plan
Project First Costs	397,002
Interest During Construction (IDC)[1]	33,441
Total Economic Costs	430,443
Average Annual Costs (AAC)	15,944
OMRRR[2] Costs	400
Total AAC	16,344

[1]The construction schedule was updated for the Cost Schedule Risk Analysis (CSRA); IDC is based on a 69-month construction schedule
[2]OMRRR = Operations, Maintenance, Repair, Replacement, and Rehabilitation

Table 70. Recommended Plan (October 2017 Price Level, 50-Year Period of Analysis, 2.75% Discount Rate)

Plan	Average Annual Benefits (AAB)	Average Annual Costs (AAC)	Net Benefits	BCR
Plan based on 1% ACE WSEL[1]	17,339	16,344	995[2]	1.1[2]

[1]Orchard Park improvements based on the 4% ACE WSEL
[2]See discussion below regarding future refinements to the net benefit analysis

Refinements to Net Benefit Analysis based on HQUSACE Policy Compliance Review and ATR comment. Table 71 displays the updated net benefit analysis. The refinements are described in more detail in the sections that follow.

Table 71. Updated Net Benefit Analysis (In $1,000s, October 2018 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate)

Benefit Category	Average Annual Benefits (AAB)
Structures/Contents/Autos/Clean-Up/Agriculture	17,634
Temporary Evacuation, Relocation, and Housing Assistance (i.e., displacement costs)	(1,074)
Savings in Flood Fighting Costs	950
Savings in Emergency Repair (PL 84-99) Costs	416
Agriculture Benefit Adjustment – Organic Strawberries	(22)
Total Average Annual Benefits (AAB)	17,904
Cost Category	**Costs**
First Costs	406,023
Interest During Construction (IDC)	35,302
Total Economic Costs	441,325
Average Annual Costs (AAC)	16,747
OMRRR Costs	400
Total AAC	17,147
Net Benefit Analysis	
Net Benefits	757
Benefit-to-Cost Ratio (BCR)	1.0

The updated net benefit analysis accounts for:

1. The removal of benefits associated with displacement costs.
2. The inclusion of benefits associated with savings in flood fighting costs.
3. The inclusion of benefits associated with savings in emergency repair costs (PL 84-99 costs), which include repairs to levees that have been damaged by a flood event.
4. The reduction in benefits associated with multi-year (three-year) net income losses (organic strawberries) resulting from a three-year fallow period.

5. The use of the current price level (October 2018) and federal discount rate (2.875%) to update benefits and costs.

The removal of benefits associated with displacement costs: While several recently-authorized Corps of Engineers FRM projects have included the savings in temporary relocation and housing costs (i.e., displacement costs) as a national economic development (NED) benefit category, Engineering Regulation (ER) 1105-2-100 (Appendix D) states that displacement is considered an other social effect (OSE). Benefits associated with the savings in displacement costs were removed from the NED account (i.e., net benefit analysis) to be consistent with the guidance in ER 1105-2-100. Additional background information, methodology, and an estimate of benefits related to the savings in displacement costs are presented in Section 2.1.7.2 and Table 52 (Housing Assistance, $1,056,000, October 2017 price level) of the Economic Appendix (dated October 2018). Approximately $1,074,000 in benefits (updated to October 2018 price level) associated with displacement costs were subtracted from total average annual benefits, and are shown in Table 71 above.

The inclusion of benefits associated with savings in flood fighting costs: The benefits associated with savings in flood fighting costs were included as a National Economic Development (NED) benefit category in earlier iterations of the economic analysis but were removed from the final analysis of the Recommended Plan. Per recent (October 2018) vertical team guidance, savings in flood fighting costs can now be included as an NED benefit category, and therefore benefits associated with this category were added to the average annual benefit estimate. Additional background information, methodology, and a prior estimate of benefits related to the savings in flood fighting costs are presented in Section 2.1.7.3, Section 7.1.4, and Table 35, respectively, of the Economic Appendix.

A current derivation of benefits associated with savings in flood fighting costs is presented in Figures 16 and 17. Benefits were calculated as the difference between the without-project average annual damages and the with-project average annual damages. Damages were derived by integrating exceedance probability-damage curves using an Excel spreadsheet; the exceedance probability-damage curves were constructed using actual flood fighting costs incurred by the non-federal sponsor (NFS), displayed in Table 72, for the 1995 and 2017 storm events in conjunction with estimates of exceedance probabilities as reported in PL 84-99 project information reports (PIR) and other Pajaro planning documents. (It should be noted that flood fighting costs have been incurred in many other years besides 1995 and 2017 but were not included in the assessment due to the lack of readily available data.) Without-project damages are approximately $1.9 million (Figure 16); with-project damages are approximately $950,000 (Figure 17); the difference between the without-project and with-project damage estimates are the benefits associated with the savings in flood fighting costs, which are approximately $1.7 million (Table 71).

Table 72. Flood Fighting Costs – Santa Cruz and Monterey Counties, CA, for 1995 and 1997.

Flood Fight and Emergency Response costs, Pajaro River and Salsipuedes/Corralitos Creeks, Santa Cruz and Monterey Counties, for 1995 and 2017

	Debris removal[1]	Bench Grading[1]	Sediment removal[1]	Protective Measures[1]	Permanent Repairs[1]	Emergency Ops[2,3]	Total[4]	2018 dollars[5]
Santa Cruz County								
1995	$398,284.84	$105,581.16	$2,143,797.77	$0.00	$0.00	n/a	$2,647,663.77	$4,454,786.78
2017	$363,246.00	$0.00	$0.00	$442,794.00	$261,365.00	$60,000.00	$1,127,405.00	$1,111,562.45
Monterey County								
1995	n/a	n/a	n/a	n/a	n/a	n/a	$2,647,663.77	$4,454,786.78
2017	n/a	n/a	n/a	n/a	n/a	n/a	$1,127,405.00	$1,111,562.45
							Total Combined Costs 1995:	**$8,909,573.56**
							Total Combined Costs 2017:	**$2,223,124.90**

Notes:

[1] Costs are independent of PL84-99 repair costs, and are compiled from FEMA DSRs 21980, 15298, 75169, and 75170 for 1995 and FEMA DRs 4301 and 4308 for 2017.

[2] Costs for 2017 represent 5 activations plus estimated costs associated with emergency responders and shelter prep.

[3] Emergency costs from Santa Cruz County were not available from 1995, but were likely much higher than costs estimated for 2017 due to widespread evacuations, emergency operations, and sheltering due to the levee breaches and widespread flooding.

[4] Total flood fight costs for Monterey County were unavailable for both 1995 and 2017 events. Here we applied Santa Cruz County's costs to Monterey, which likely underestimates costs for 1995 because the levee breach in 1995 caused more damage and evacuations on the Monterey County side.

[5] Total costs reflect dollar values for the designated years. Costs were adjusted for inflation to 2018 dollars using the Bureau of Labor Statistics CPI Inflation Calculator.

The 1995 flood event is estimated to be about a 15-year event while the 2017 storm event is estimated to be about a 4-year event. The flood fighting costs incurred for each event are estimated to be approximately $2.3 million (2017) and $8.9 million (1995). To construct the without-project and with-project exceedance probability-damage curves, several assumptions were used:

Without-project condition assumptions:

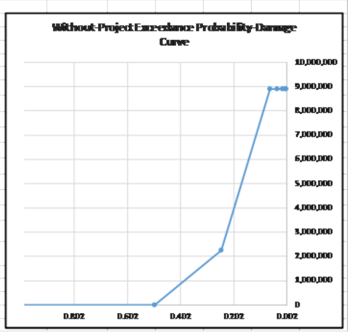
1. An event smaller than the 4-year event (2017) would incur minimal to zero flood fighting costs.
2. An event between a 4-yr event (2017) and a 15-year event (1995) would incur between $2.2 million and $8.9 million in flood fighting costs.
3. An event above a 15-year event (1995) would incur $8.9 million in flood fighting costs (i.e., costs held constant for events larger than a 15-year)

Figure 16. Without-Project Exceedance Probability-Damage Curve – Flood Fighting Costs (October 2018 Price Level)

Project:	Pajaro River FRM Study
Waterway:	Pajaro River, Corralitos & Salsipuedes Creeks
Benefit Category	Prevention of Flood Fighting Costs
Date:	Nov-18

Enter data in yellow cells; use drop-down list for probabilities; see comments in individual cells for additional guidance.

Without-Project Condition	
Exceedance Probability	**Damages**
0.999	0
0.5	0
0.25	2,254,810
0.067	8,909,574
0.04	8,909,574
0.02	8,909,574
0.01	8,909,574
0.005	8,909,574
0.002	8,909,574



Exceedance Probability	Difference	Damages	Midpoint	Expected Annual Damages (EAD)
0		8,909,574		
	0.002		8,909,574	17,819
0.002		8,909,574		
	0.003		8,909,574	26,729
0.005		8,909,574		
	0.005		8,909,574	44,548
0.01		8,909,574		
	0.01		8,909,574	89,096
0.02		8,909,574		
	0.02		8,909,574	178,191
0.04		8,909,574		
	0.027		8,909,574	240,558
0.067		8,909,574		
	0.183		5,582,192	1,021,541
0.25		2,254,810		
	0.25		1,127,405	281,851
0.5		0		
	0.499		0	0
0.999		0		
Total EAD				1,900,334

With-project condition assumptions:

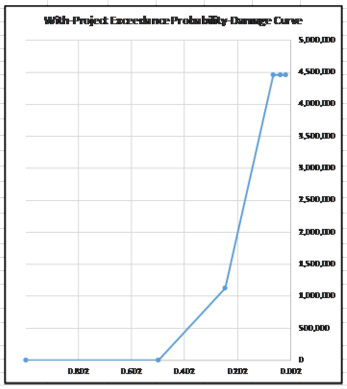
1. With the Recommended Plan in place there would be no more flood fighting costs in approximately 50% of the area (since approximately 50% of the levees in the study area

are being improved). This is captured in the with-project exceedance probability-damage curve as a 50% reduction in without-project costs across all frequency events.

Figure 17. With-Project Exceedance Probability-Damage Curve – Flood Fighting Costs (October 2018 Price Level)

Enter data in yellow cells; use drop-down list for probabilities; see comments in individual cells for additional guidance.

With-Project Condition	
Exceedance Probability	Damages
0.999	0
0.5	0
0.25	1,127,405
0.067	4,454,787
0.04	4,454,787
0.02	4,454,787
0.01	4,454,787
0.005	4,454,787
0.002	4,454,787



Exceedance Probability	Difference	Damages	Midpoint	Expected Annual Damages (EAD)
0		4,454,787		
	0.002		4,454,787	8,910
0.002		4,454,787		
	0.003		4,454,787	13,364
0.005		4,454,787		
	0.005		4,454,787	22,274
0.01		4,454,787		
	0.01		4,454,787	44,548
0.02		4,454,787		
	0.02		4,454,787	89,096
0.04		4,454,787		
	0.027		4,454,787	120,279
0.067		4,454,787		
	0.183		2,791,096	510,771
0.25		1,127,405		
	0.25		563,703	140,926
0.5		0		
	0.499		0	0
0.999		0		
Total EAD				950,167

<u>The inclusion of benefits associated with savings in emergency repair costs (PL 84-99 costs)</u>: A list of PL 84-99 emergency repair costs for levees in the study area incurred by the Corps of Engineers is provided in Table 73 below. Emergency repair costs incurred over the last few decades were used as the basis to estimate potential benefits of building the Recommended Plan. Benefits were calculated as the difference between the without-project average annual damages and the with-project average annual damages. Damages were derived by integrating exceedance probability-damage curves using an Excel spreadsheet; the exceedance probability-damage curves were constructed using PL 84-99 cost information and estimates of exceedance probabilities as reported in the PL 84-99 project information reports (PIR) and other Pajaro planning documents. Without-project damages are approximately $832,000 (Figure 18); with-project damages are approximately $416,000 (Figure 19); the difference between the without-project and with-project damage estimates are the benefits associated with savings in PL 84-99 emergency repair costs, which are approximately $655,000 (Table 71).

Table 73. PL 84-99 Costs Incurred by Year (October 2018 Price Level)

Year	PL 84-99 Costs
1956	7,698,000
1958	7,698,000
1982	405,200
1986	658,450
1993	69,897
1995	3,292,250
1997	992,740
1998	9,927,400
2017	10,206,380

The 1995, 1997, and 1998 flood events were used to help define the exceedance probability-damage curves. These events are estimated to be about a 15-year (1995), 10-year (1997), and 28-year (1998). The PL 84-99 costs incurred for the 1995, 1997, and 1998 events are estimated to be approximately $3.3 million, $993,000, and $9.9 million, respectively. To construct the without-project and with-project exceedance probability-damage curves, several assumptions were used:

Without-project condition assumptions:

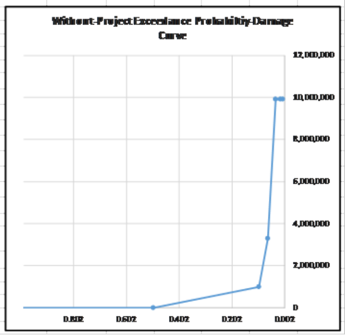
1. An event smaller than the 10-year event (1997) would incur minimal to zero PL 84-99 costs.
2. An event between a 10-yr event (1997) and a 15-year event (1995) would incur between $993,000 and $3.3 million in PL 84-99 costs.
3. An event between a 15-year (1995) and a 28-year (1998) event would incur between $3.3 million and $9.9 million in PL 84-99 costs.
4. An event above a 28-year event (1998) would incur $9.9 million in PL 84-99 costs (i.e., costs held constant for events larger than a 28-year).

Figure 18. Without-Project Exceedance Probability-Damage Curve – PL 84-99 Costs (October 2018 Price Level)

Project:	Pajaro River FRM Study
Waterway:	Pajaro River, Corralitos & Salsipuedes Creeks
Benefit Category	Prevention of PL 84-99 Costs
Date:	Nov-18

Enter data in yellow cells; use drop-down list for probabilities; see comments in individual cells for additional guidance.

Without-Project Condition	
Exceedance Probability	**Damages**
0.999	0
0.5	0
0.1	992,740
0.067	3,292,250
0.036	9,927,400
0.02	9,927,400
0.01	9,927,400
0.005	9,927,400
0.002	9,927,400



Exceedance Probability	Difference	Damages	Midpoint	Expected Annual Damages (EAD)
0		9,927,400		
	0.002		9,927,400	19,855
0.002		9,927,400		
	0.003		9,927,400	29,782
0.005		9,927,400		
	0.005		9,927,400	49,637
0.01		9,927,400		
	0.01		9,927,400	99,274
0.02		9,927,400		
	0.016		9,927,400	158,838
0.036		9,927,400		
	0.031		6,609,825	204,905
0.067		3,292,250		
	0.033		2,142,495	70,702
0.1		992,740		
	0.4		496,370	198,548
0.5		0		
	0.499		0	0
0.999		0		
Total EAD				831,541

Without-Project Average Annual Damages (Integrated from 1-yr to 500-yr Frequency Event) =

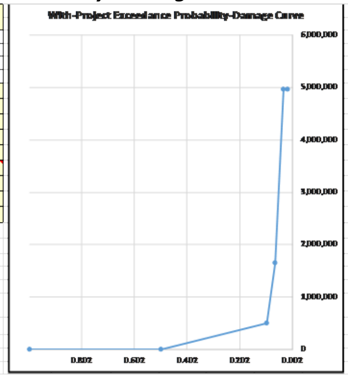
With-project condition assumptions:

1. With the Recommended Plan in place there would be no more PL 84-99 costs in approximately 50% of the area (since approximately 50% of the levees in the study area are being improved). This is captured in the with-project exceedance probability-damage curve as a 50% reduction in without-project costs across all frequency events.

Figure 19. With-Project Exceedance Probability-Damage Curve – PL 84-99 Costs (October 2018 Price Level)

Enter data in yellow cells; use drop-down list for probabilities; see comments in individual cells for additional guidance.

With-Project Condition	
Exceedance Probability	Damages
0.999	0
0.5	0
0.1	496,370
0.067	1,646,125
0.036	4,963,700
0.02	4,963,700
0.01	4,963,700
0.005	4,963,700
0.002	4,963,700



Exceedance Probability	Difference	Damages	Midpoint	Expected Annual Damages (EAD)
0		4,963,700		
	0.002		4,963,700	9,927
0.002		4,963,700		
	0.003		4,963,700	14,891
0.005		4,963,700		
	0.005		4,963,700	24,819
0.01		4,963,700		
	0.01		4,963,700	49,637
0.02		4,963,700		
	0.016		4,963,700	79,419
0.036		4,963,700		
	0.031		3,304,913	102,452
0.067		1,646,125		
	0.033		1,071,248	35,351
0.1		496,370		
	0.4		248,185	99,274
0.5		0		
	0.499		0	0
0.999		0		
Total EAD				415,771

With-Project Average Annual Damages (Integrated from 1-yr to 500-yr Frequency Event) =

<u>The reduction in benefits associated with multi-year (three-year) net income losses (organic strawberries) resulting from a three-year fallow period</u>: In the original economic analysis, multi-year net income losses for organic strawberries were estimated based on a simplifying assumption that land devoted to this crop would have to be fallowed for three years following a flood event; this fallow period, it was assumed, was necessary in order for a producer to be able to adequately comply with current land requirements surrounding organic certification. The United States Department of Agriculture (USDA) organic regulations, as set forth in the Federal Code of Regulations, was the basis for this assumption. Additional background information related to multi-year net income losses for organic strawberries are presented in Section 8.1.2 and Attachment 1 of the Economic Appendix.

Upon recommendation of the ATR team member, and after closer reading of the regulations, the assumption regarding the three-year fallow period was replaced with a more reasonable assumption. Instead of assuming a three-year fallow period following a flood event, it was assumed that a producer would plant an alternative crop for three years using transitional methods, which would allow her to earn an income and at the same time retain her organic certification once the three-year transition period is up. Importantly, this action would result in a partial loss of net income rather than a complete loss of net income. For this assessment, it was assumed that a producer would plant cauliflower/broccoli over the three-year transition period, since both of these crops are grown in the study area and are also less pesticide-intensive than other crops grown in the area, including conventionally-grown strawberries.

The incremental benefit associated with fallowing land for three years following a flood event is approximately $556,000 (average annual) for organic strawberries. Net income loss per acre for organic strawberries is approximately $17,004; net income loss per acre for cauliflower/broccoli (i.e., non-organic) is approximately $1,015. The opportunity cost of planting cauliflower/broccoli instead of organic strawberries over the three-year transition period is a net income loss per acre of approximately $48,982 (i.e., a net income loss of $17,004/acre in the first year and a net income loss of $15,989/acre in the second and third years), which represents about a 4% reduction in net income loss overall as compared to the original analysis (i.e., $48,982 versus $51,012). This percentage was used to estimate the reduction in incremental benefits associated with organic strawberries. Approximately $22,240 (i.e., $556,000 x 0.04) in benefits (October 2018 price level) were subtracted from total average annual benefits, and are shown in Table 71.

<u>The use of the current price level (October 2018) and federal discount rate (2.875%) to update benefits and costs:</u> Price level and discount rate updates are reflected in the net benefit analysis displayed in Table 71. Project first costs were updated to October 2018 prices by CESPN-ET-PC (Cost Engineering); interest during construction (IDC) was re-calculated by CESPK-PDW-E (Economics) using the IWR (Institute for Water Resources)-Plan software.

8.4 INDUCED FLOODING & THE RECOMMENDED PLAN

Further hydraulic analyses indicated that induced flooding may be an effect of the Recommended Plan. Tributary FRM improvements in Reaches 5 and 6 along Corralitos/Salsipuedes Creeks may cause additional flooding to economic impact area (EIA) E (primarily agricultural area) and potentially EIA F (Orchard Park community).

Flooding into EIA E, which is the “fish head” area immediately upstream of the confluence of Salsipuedes Creek and the Pajaro River, from the 4% ACE event occurs as flood flows exit the creek on the left side of the channel where the right bank set back levee merges into the existing levee alignment in Reach 5. Induced flooding from the 4% ACE event occurs on the left bank since the capacity of the lower section of Salsipuedes Creek and the left bank of Corralitos Creek are reduced with the Recommended Plan in place. There is no induced flooding into EIA E from the 10% ACE event or smaller. Additional evaluations and design refinements will be investigated during the Planning Engineering and Design (PED) phase in order to 1) verify the level of induced flooding and associated impacts to the left bank areas of Salsipuedes Creek (“fish head” area) and Corralitos Creek (Orchard Park community) and 2) evaluate cost-effective measures to avoid or reduce potential induced flooding and associated impacts.

ATTACHMENT 1

Agricultural Damage Analysis

Without-Project Flood Risk Analysis - Agriculture

Pajaro River Feasibility Study

March 2018

Contents

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1. INTRODUCTION

1.1. Purpose

Historical flood events in the study area have caused significant economic losses to residents and farmers, and future flooding is expected to do the same. This agricultural flood damage analysis describes the methods and results of the analysis of potential National Economic Development (NED) impacts to agriculture of these future flood events under a future scenario in which no new flood risk reduction project is implemented. This scenario is termed the "future without-project condition." The purpose of making a distinction between "with" and "without" conditions is to isolate the changes that are expected to occur as a result of a plan or project, from those that would occur if the plan or project were not undertaken.

The results of this without-project analysis are flood exceedance-probability damage functions for each of the major crops in the area, and for each of the designated agricultural impact areas in the floodplains of both the Pajaro River and its tributaries in the study area. These "functions" are simply a relationship between two variables – in this case the probability of a flood event of a certain magnitude and the resulting economic damage.

These functions will be used as inputs to an HEC-FDA model that will be used to determine the expected annual damage (EAD) to crops in the study area when considering the prevailing hydrologic and hydraulic conditions in the study area, as well as the geotechnical properties of the earthen levees along the Pajaro River and its tributaries in the study area. The estimate of EAD is an important part of the benefit-cost analysis that is being completed for potential projects to reduce the risk of flooding in the study area.

1.2. What is NED?

As the above section explains, this damage analysis is focused on National Economic Development impacts. The USACE Planning Guidance Notebook (ER 1105-2-100) defines National Economic Development, or NED, impacts as follows:

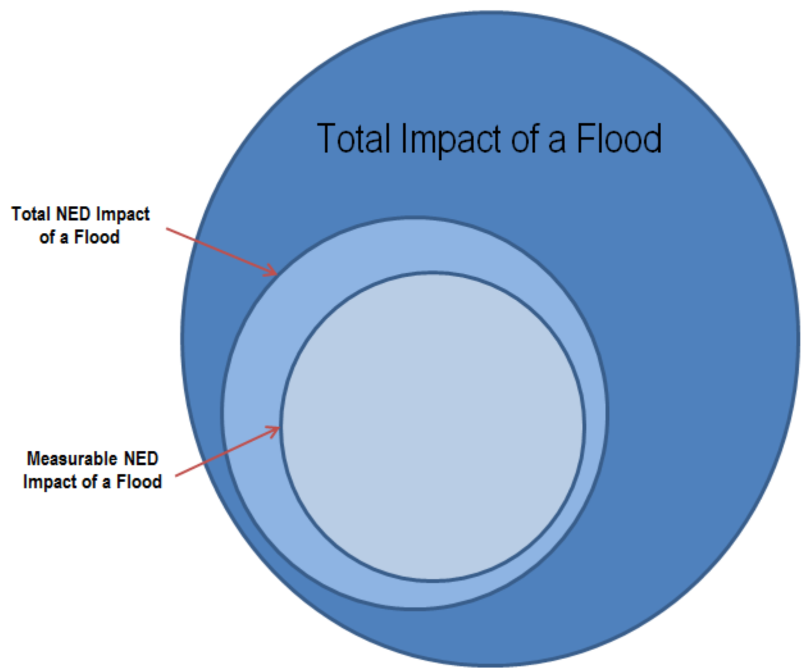
> *"Contributions to national economic development (NED) are increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct net benefits that accrue in the planning area and the rest of the Nation. Contributions to NED include increases in the net value of those goods and services that are marketed, and also of those that may not be marketed."*

For this analysis, the NED impacts to agriculture of a flood event are losses in net income to the growers of crops in the floodplain. The loss in net income is assumed to be equivalent to the amount that affected farmers would be willing to pay to avoid the flood event in the first place. This concept of "willingness to pay" is central to USACE policies related to the estimation of NED impacts from flooding. More on this concept and its importance can be found in USACE planning guidance reports.

The principles and general procedures guiding the agricultural flood damage analysis are based on the Institute for Water Resources Report 87-R-10, *National Economic Development Procedures Manual – Agricultural Flood Damage*.

According to the IWR Report,

"Flood damage to crops, whether caused by the direct physical contact of floodwater on the crop or by other related factors, such as delayed planting, erosion, sedimentation, or weed infestation, will always translate into lower net income for the affected producer. This is a loss to the Nation as well, because it cannot be recovered from the other sectors of the economy."



It is important to note that the NED impact (the loss of net income) is a subset of the total impact of any flood event. There are a myriad of adverse impacts from flooding – both economic and non-economic. Flooding can cause job losses, a loss in regional economic output, a loss in local tax revenues, and other financial impacts. Flooding also endangers human health and safety, disrupts lives and communities, and can cause adverse environmental impacts. By policy though, USACE benefit-cost analyses only consider those impacts that can be classified as affecting NED. Furthermore, the NED impact that can actually be measured with some degree of confidence by economists and planners is nearly always a subset (less than) of the actual NED impact of a flood. For example, the value of a homeowner's time spent cleaning up after a flood event is a valid NED impact, but the difficulty in measuring and estimating both the amount and the value of each person's time means that the estimated total value is likely to be lower than the actual NED value.

1.3. The Study Area

The study area includes the city of Watsonville in Santa Cruz County, the town of Pajaro in Monterey County, and approximately 8,500 acres of agricultural land. The agricultural land use in the Pajaro River floodplain is characterized by very intensive cropping. A high percentage of the land is devoted to growing high-value strawberry crops, and the study area is known for having some of the most productive, highest quality strawberry farming in the world. According to the County Agricultural Commissioners of Santa Cruz and Montery, an increase in the demand for organic fruits and vegetables has meant that the total acreage in the floodplain devoted to organic strawberries has increased over the last several years; a trend that seems likely to continue into the future. The California Strawberry Commission (California Strawberry Commission, 2015) reports that the combined Watsonville/Salinas district produces nearly 80% of the State's organic strawberries (Salinas is approximately 17 miles south of Watsonville as the crow flies, and is not in the study area). The total acreage in this area devoted to organic strawberries has increased from 1,219 in 2011 to 2,052 in 2015. Organic strawberries account for approximately 15% of the total strawberry crop in the Watsonville/Salinas district, compared to 9% for the State of California. Besides strawberries, other major crops in the floodplain include head and leaf lettuce, and other vegetable and fruit crops such as cauliflower, broccoli, and raspberries.

1.4. Historical Flooding in the Study Area

Prior to the construction of Federal levees along the Pajaro River and its tributaries in 1949, flooding in the area occurred, on average, once every six years. In 1955, only six years after the completion of the levee system, a major flood event breached the levees causing significant flooding and damages. Additional flood events have taken place in 1955, 1958, 1982, 1986, 1995 and 1998. The 1995 breach of the Pajaro River caused significant flooding and damages – estimated at between $50 million and $95 million[1]. Figure 1 is an aerial view of the flooding from the 1995 event. It shows that the town of Pajaro (center top) and the surrounding agricultural areas were completely inundated.

[1] www.pajarofloodprotection.org

Figure 1: Aerial View of 1995 Flood Event

1.4.1. Pajaro River

Four major flood events have occurred on the Pajaro River since construction of the 1949 USACE project. While all of the storms caused breaching and/or overtopping of the Pajaro River levees to some extent, the March 1995 storm was by far the most damaging. Floodwaters inundated the entire town of Pajaro as well as several hundred acres of agricultural land, estimated by some to have caused millions of dollars in flood damages. While the town of Watsonville was threatened, it only sustained minor flood damages. Flood waters ponded behind the left (south) bank levee at the State Highway 1 Bridge, requiring it to be breached in order to drain the large amount of accumulated water. Ponding also occurred at the confluence of Salsipuedes Creek and the Pajaro River (northeast corner). Based on recent hydrologic analysis, the Annual Exceedence Probability (AEP) of the March 1995 flood was about 0.065, or a 6.5 percent event.

Floodwaters from the February 1998 storm, which is now the flood of record, caused a major levee breach along the north bank of the Pajaro River at about River Mile (RM) 3.35, approximately 1,500 feet downstream of Highway 1. Flooding was mainly limited to agricultural land. Scour and erosion damage to the project itself and the surrounding area was extensive. According to the counties, costs for emergency repair work alone totaled nearly $9 million, while rehabilitation-type work was expected to be at least as costly. The AEP for the February 1998 flood event was about 0.035, or 3.5 percent. The March 1995 storm and February 1998 storm floodplains are shown in Figure 2.

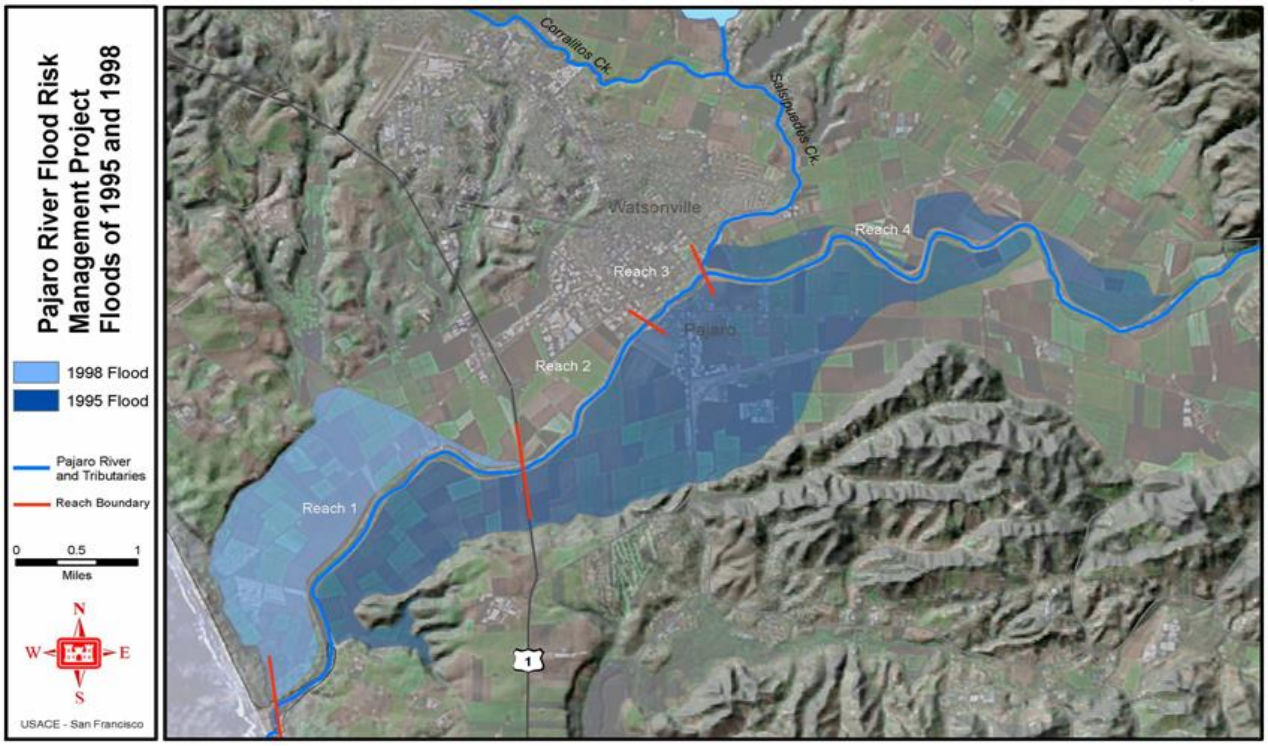


Figure 2: Historical Flood Extents – 1995 & 1998 Events
Source: USACE San Francisco

1.4.2. *Corralitos and Salsipuedes Creeks*

Since the 1949 construction of levees along Pajaro River and Salsipuedes Creek, documented flooding in the City of Watsonville area has been limited to overflow from Corralitos Creek, which occurred in 1955, 1982 and 1986. The worst flooding occurred in 1955, when 29 city blocks were flooded to a maximum depth of 2 feet due to floodwaters escaping over the south bank of Corralitos Creek between Green Valley Road and Highway 152. No lives were lost in the storm, but 972 people were evacuated and over $1 million in damages were reported.

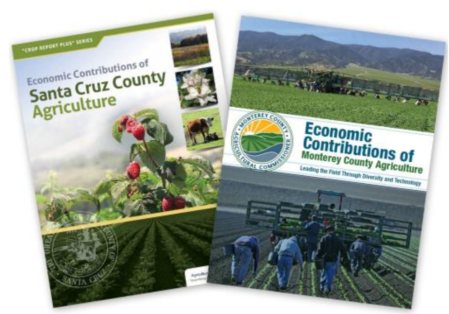
Some flooding occurred along the southeastern perimeter of Watsonville on January 4, 1982. The flooding resulted from the overflow of Corralitos Creek and produced shallow flooding in a 200 to 1,000 foot wide strip along Bridge Street and Riverside Drive. Several homes were damaged as a result of this overflow. According to stream gauge records for Corralitos Creek at Freedom, the January 1982 event is the flood of record.

Flooding was reported to have occurred in February 1986 along Corralitos Creek between the community of Freedom and Highway 152, as well as further upstream along Eureka Canyon Road. Locals estimate that several million dollars of flood damage resulted. It was also reported that overtopping of the USACE levees occurred along Salsipuedes Creek between Highway 152 and the Pajaro River during the same storm. While there are no documented flood damages from flooding from the Salsipuedes Creek during the 1986 storm, the levees along the creek had to be repaired at three locations due to overtopping or channel bank erosion.

During the January 1997 flood the channel capacity on Corralitos Creek was exceeded, with minor flooding upstream of the Highway 152 bridge. There are no levees along Corralitos Creek. During the high flows of February 1998, backwater from the Pajaro River caused overtopping of the left (east) bank levee in the lower reach of Salsipuedes Creek, just upstream of the Highway 129 bridge crossing. However, no flood damages were reported. Levee seepage was evident along the right (west) bank of the Salsipuedes Creek levee, just upstream of Highway 152, which could have easily led to severe flooding throughout Watsonville had not the USACE reacted quickly with emergency repair work.

1.5. The Importance of Agriculture in the Study Area

The agricultural industry in the study area is a very important part of the local and state economies. For the towns of Watsonville and Pajaro, the agricultural industry is the backbone of the economy, employing as much as one-third of the workforce in Pajaro. Agriculture is a critical part of the local community's identity, and a temporary or permanent loss of farmland in the floodplain could have significant adverse impacts on many families and businesses.



Two reports produced in recent years by the consulting firm Agricultural Impact Associates speak to the importance of agriculture in the counties of Santa Cruz and Monterey. According to the report "Economic Contributions of Monterey County Agriculture" (Agricultural Impact Associates, 2014), agriculture accounts for approximately 20% of the total direct economic output of Monterey County, and approximately 25% of the direct employment. For the County of Santa Cruz the proportion of total County output and employment are each about 5% (Agricultural Impact Associates, 2013). Table 1 summarizes some of the important findings of the two economic impact reports.

Table 1: Importance of Agriculture to the Regional Economy

County	Category	Value of Production ($ Millions)*		Employment (# Jobs)	
		Direct	Total Including Indirect & Induced	Direct	Total Including Indirect & Induced
Monterey County (2014)	All Agriculture	$4,888.5	$6,969.4	53,550	71,349
	Fruit	$1,097	$1,625	N/A	N/A
	Strawberry	$869	N/A	N/A	N/A
Santa Cruz County (2011)	All Agriculture	$565	$980	5,378	9,078
	Fruit	$338	$647	N/A	N/A
	Strawberry	$198	N/A	N/A	N/A

*does not include the processing sector

Source: Agricultural Impact Associates LLC

For both counties, strawberries are one of the most important crops in terms of production value. Strawberries account for around 35% of the total direct agricultural production value in the Santa Cruz County, and for around 18% in Monterey County. In both counties the importance of strawberries has grown sharply over the last ten or so years; in Monterey County strawberry production value increased 174% between 2004 and 2013. In both counties total agricultural production value (in real, inflation-adjusted terms) has grown steadily over the last decade.

1.6. Overview of Methodology for Estimating Flood Risk to Crops

Flood damage is one component of flood risk. Understanding the risk of something undesirable happening (in this case a flood event) requires an understanding of the likelihood of the event happening as well as the potential magnitude of the impacts. The purpose of characterizing flood risk is to support decisions related to reducing the risk to people and property in the floodplain. Figure 3 shows four questions that are critical to answer when evaluating flood risk.

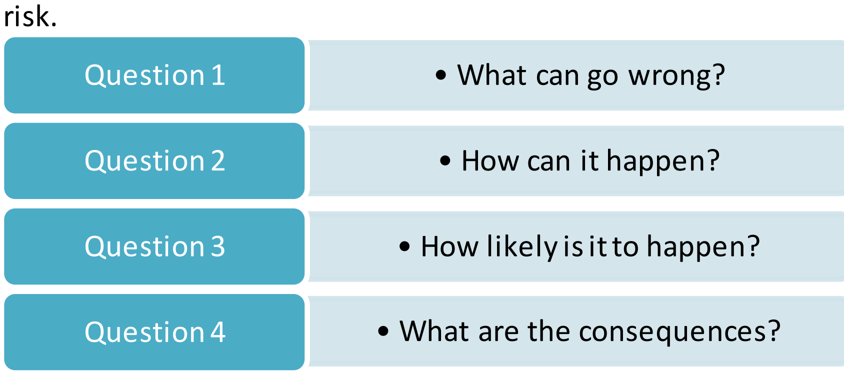


Figure 3: Characterizing Flood Risk – 4 Key Questions

Questions 1 and 2 can be answered without a significant level of analysis. What can go wrong in the study area is that water can inundate people and property. It can happen by either an overtopping or breaching of the existing levees in the study area. Questions 3 and 4, however, require detailed and thorough analyses to answer. The question of likelihood (Q3) has been addressed by a detailed engineering analysis that combines hydrology, hydraulics, and geotechnical analysis, and the question of consequences (Q4) (to agriculture in this case) is the subject of this report.

Only by integrating the estimated damages across a broad spectrum of event probabilities, and by considering changes over time, can a clear enough depiction of the flood risk be developed so that a well-informed investment decision can be made.

In order to fully understand risk from flooding, the likelihood and consequences of the full range of possible flood events must be understood. That is, knowing the consequences of a single large, low annual probability flood event is not enough information. You must also understand the consequences of more likely (smaller) storm and flood events. Many reports and studies focus on the consequences of a single, large storm event. Most often they estimate the damage to homes and businesses from the 1% ACE storm event. Such estimates can be useful, but do not provide enough information to determine whether and to what extent an investment in risk reduction measures is warranted from an economics standpoint. Only by integrating the estimated damages across a broad spectrum of event probabilities, and by considering changes over time, can a clear enough depiction of the flood risk be developed so that a well-informed investment decision can be made.

Estimating the flood risk to agriculture is more complicated than estimating the risk to structures like homes and businesses. Unlike an urban structure inventory that does not typically change significantly year-on-year (the number of structures and the depreciated replacement value of the structures is generally pretty stable year to year over the period of analysis), many of the factors important to the agricultural damage analysis can and do change significantly over short periods of time.

A structure inventory can be done for a single point in time and can reasonably be assumed to be generally representative of the inventory into the foreseeable future. There is, however, variability in cropping patterns, yields, and prices. There is also an important seasonal component to agricultural flood risk. For a home, whether a flood happens in November or March matters very little to the value of damage caused by the flood, but for a farmer growing an acre of strawberries, the difference in flood damage between the two months can be significant. For example, a flood of an acre of strawberries in November and a flood in February will have different financial impacts. By February more investment will have been made in the crop, which means a greater financial impact to the affected grower. Adding to the complexity of the damage estimate is the fact that there are some scenarios that, while of relatively low probability, could have very significant adverse impacts to the ability to grow crops and serious long-term impacts to the community and region.

For example, local growers have stated that the impact of previous floods varied widely across the floodplain, and depended on factors such as the amount of sedimentation left on the land, the degree of scouring caused by flood waters, and whether or not contaminants or viruses were deposited on the land as a result of the flood. Many of these factors are challenging to incorporate into the damage model because very little is understood about the overall likelihood of each of them occurring. Likewise, the actual consequences are rather uncertain.

> *Historical cost, yield, price, and return data will be used to estimate the average production cost and income expected over the period of analysis.*

According to the IWR Report (Institute for Water Resources, 1987), the first step in an evaluation such as this is the identification of land use and cropping patterns with and without implementation of the alternative plan being considered. The floodplain is currently dominated by high-value strawberry crop, and has been for many years. It is reasonable to assume that this crop will continue to dominate under both with and without project conditions in the future. The IWR Report states that in cases when the cropping patterns are not expected to change, the project benefit is determined using farm budget analysis. Any increase in net income attributable to a project over and above what is expected without a project is the project NED benefits.

Figure 4 summarizes, at a broad level, the information required to quantify the flood risk to agriculture in the study area.

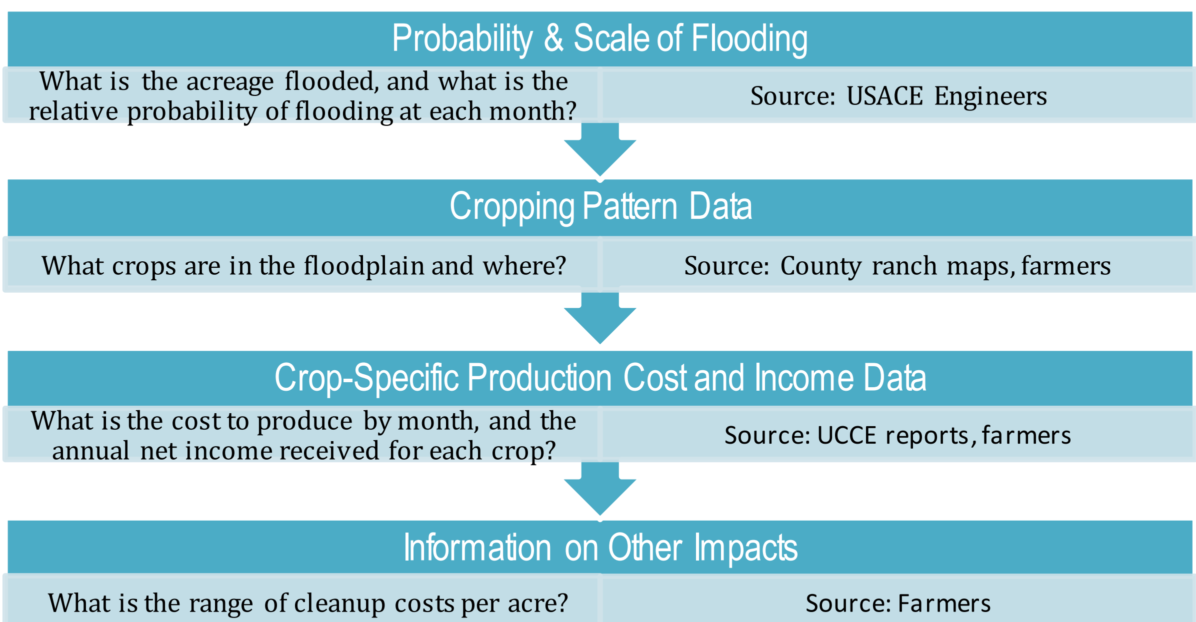


Figure 4: Overview of Information Required – Agricultural Flood Damage

Because of the complexities and the vast number of uncertainties, it is important and necessary to include both quantitative and qualitative analysis of flood damage to agriculture. It was necessary to develop a spreadsheet model that could incorporate the numerous factors determining total flood damage, and that would provide a risk-based estimate of flood damage that could then be incorporated into the study's broader FDA model. To this end, a spreadsheet model was created with MS Excel, which uses the @Risk program produced by Palisade, Inc. to run simulations that incorporate the uncertainty as defined by the specified distributions. The spreadsheet model has been reviewed for computational accuracy and policy compliance in accordance with Engineering Circular (EC) 1105-2-209 and has been approved for use for this study. The results of the spreadsheet model will then be used as inputs to the HEC-FDA model, which uses the aggregated exceedance-probability damage relationship developed in the spreadsheet model to calculate expected annual damages after considering the hydrologic and hydraulic characteristics of the Pajaro River and its tributaries in the study area. More on this spreadsheet model is included in Section 7 of this report.

2. Without-Project Flood Risk

2.1. Probability & Scale of Flooding

Along the main stem of the Pajaro River, there are approximately 3,600 acres of agricultural land in Monterey County, and approximately 4,900 acres in Santa Cruz County. In order to more accurately incorporate in the model variables such as the different cropping patterns across the floodplain, the broader economic impact and planning areas were further subdivided into what are termed here as "agricultural impact areas." For the main stem of the Pajaro River, a total of 14 agricultural impact areas were delineated, while for the tributaries a total of 4 areas were delineated. In addition to taking into account cropping patterns, the delineation of these areas was based on several factors, including hydraulic independence, left bank versus right bank, and other natural or manmade features such as roads. Figure 5 shows the location of the main stem impact areas.

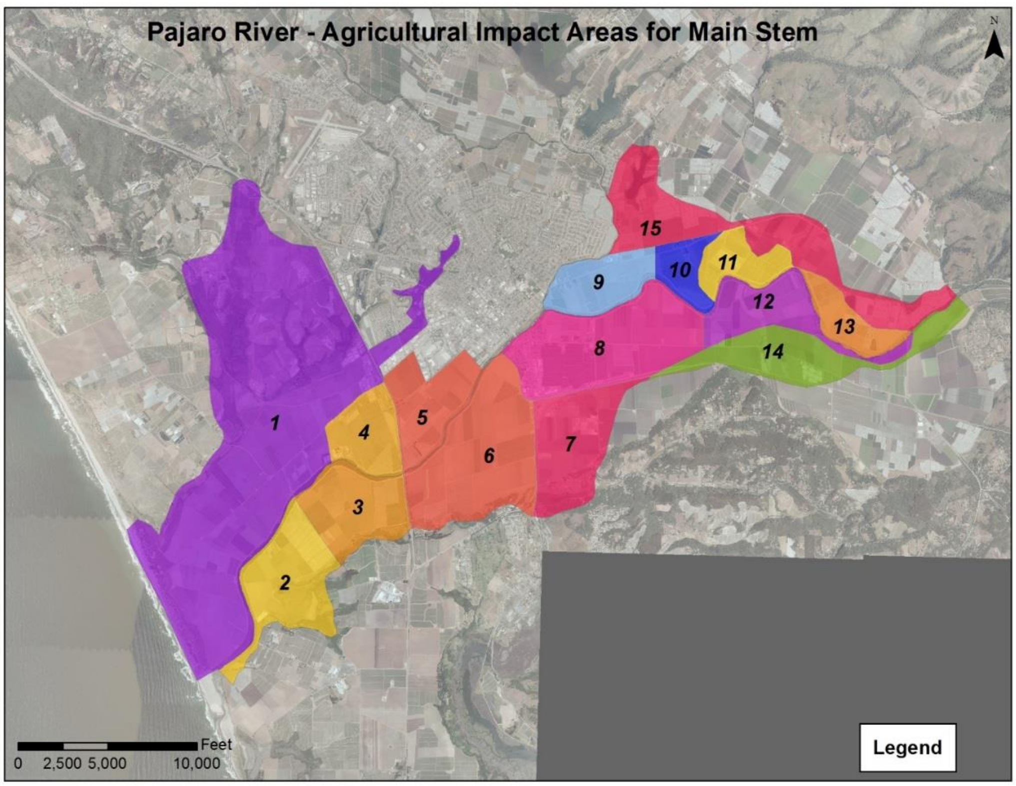


Figure 5: Agricultural Impact Areas – Main Stem Pajaro River

Only crops in Santa Cruz County are at risk of flooding from the tributaries. The areas are identified in Figure 6. Areas 2 and 4, respectively, fully and partially overlap with the floodplain of the Pajaro Main Stem.

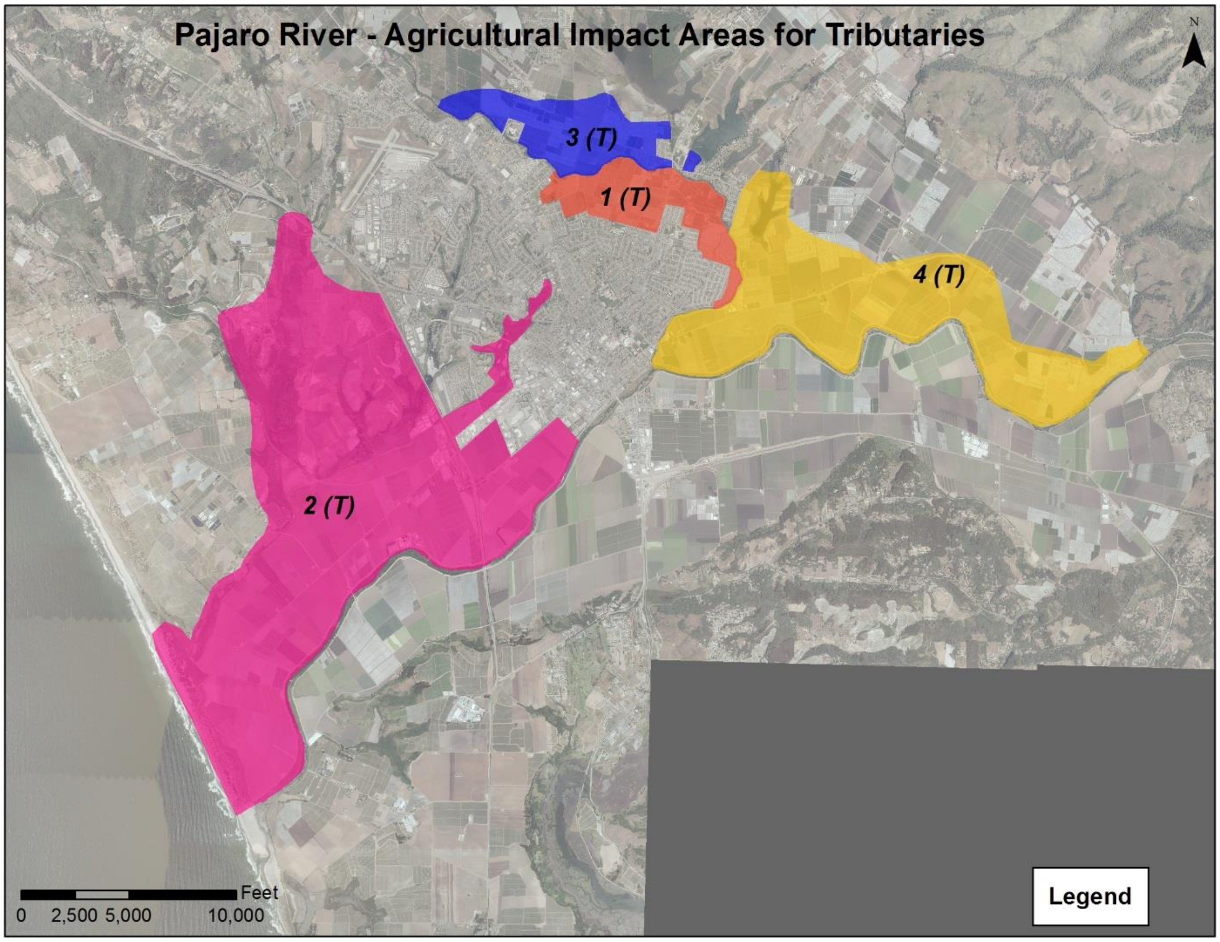


Figure 6: Agricultural Impact Areas – Tributary Reaches

The acreage flooded within each area was calculated within the ArcGIS program, and the results are shown in the Table 2. These are the total acreages inundated, and not only the cultivated/planted acreages. As described in more detail below, it is assumed that some portion of the agricultural land is uncultivated at any one time.

Table 2: Number of Flooded Acres by Event and Agricultural Reach – Pajaro River

Ag Area	Number of Acres Inundated by ACE Event				
	10%	4%	2%	1%	0.20%
1	1,004	1,521	1,595	1,680	1,714
2	390	392	394	395	397
3	387	399	410	412	412
4	125	168	178	221	309
5	346	379	386	392	400
6	624	875	891	892	894
7	38	261	306	338	391
8	100	162	682	778	811
9	3	3	313	318	321

10	2	2	156	167	174
11	3	4	238	239	240
12	54	61	390	399	407
13	7	10	210	211	211
14	54	60	180	232	327
15	34	43	376	446	541
Total	**3,171**	**4,341**	**6,704**	**7,119**	**7,549**

Source: USACE Engineering

Flooding from the Corralitos and Salsipuedes Creeks is expected to cause agricultural damage to approximately 4,500 acres of farmland on the Santa Cruz side of the study area for the 0.2% ACE flood event.

As with the Main Stem impact areas, the acreage flooded within each area was calculated within the ArcGIS program, and the results are shown in Table 3.

Table 3: Number of Flooded Acres by Event and Agricultural Reach – Tributaries

Ag Area	Number of Acres Inundated by ACE Event				
	10%	4%	2%	1%	0.20%
1 (Rt. Corralitos and Salsip.)	166	185	231	297	306
2 (Rt Wats. and DS HWY 1)	1,972	2,157	2,243	2,328	2,350
3 (Left Bank Cor/C. Lake)	81	88	117	310	327
4 (Left Bank Sals)	208	283	1,298	1,385	1,486
Total	**2,428**	**2,714**	**3,889**	**4,321**	**4,470**

Source: USACE Engineering

As explained previously, it is important to consider the seasonality of each crop, and its relationship to the likelihood of flooding throughout the year. This is because the loss of production investment depends on the timing of the flood – that is, a flood in January results in less damage than a flood in April because of the different amounts of investment in the land up to that point in the growing season. Thus, the risk-based model must incorporate this variable in order to more accurately estimate the production investment loss for each of the crops.

Relative probabilities of flooding by month were estimated by the USACE San Francisco District's Water Resources Section. Probabilities were determined by examining peak annual flow records for the Pajaro River for the past 56 years. It was assumed that if flooding were to occur, it would be precipitated by a peak annual flow; 39% of these peak annual flows occurred during February, 20% during January, and so on. Table 4 shows the probabilities assigned to each month.

Table 4: Relative Probability of Flooding by Month, Assuming a Flood Occurs

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Prob. of Flooding	0.2	0.39	0.17	0.06	0	0	0	0	0	0.02	0.04	0.12	1

Source: USACE San Francisco District Water Resources Section

Figure 7 shows how the monthly probability is combined with the cumulative monthly production cost of a particular crop (in this case, strawberries), which results in a probability weighted value of loss related to foregone production investment. In mathematical terms, the final weighted value for a particular crop is the sum of the monthly products of probability and cumulative production cost. For strawberries, the total probability-weighted production cost is approximately $11,700 per acre. In other words, over the long-term the average production cost lost during flood years is expected to be $11,700 ($2017) per acre of strawberries.

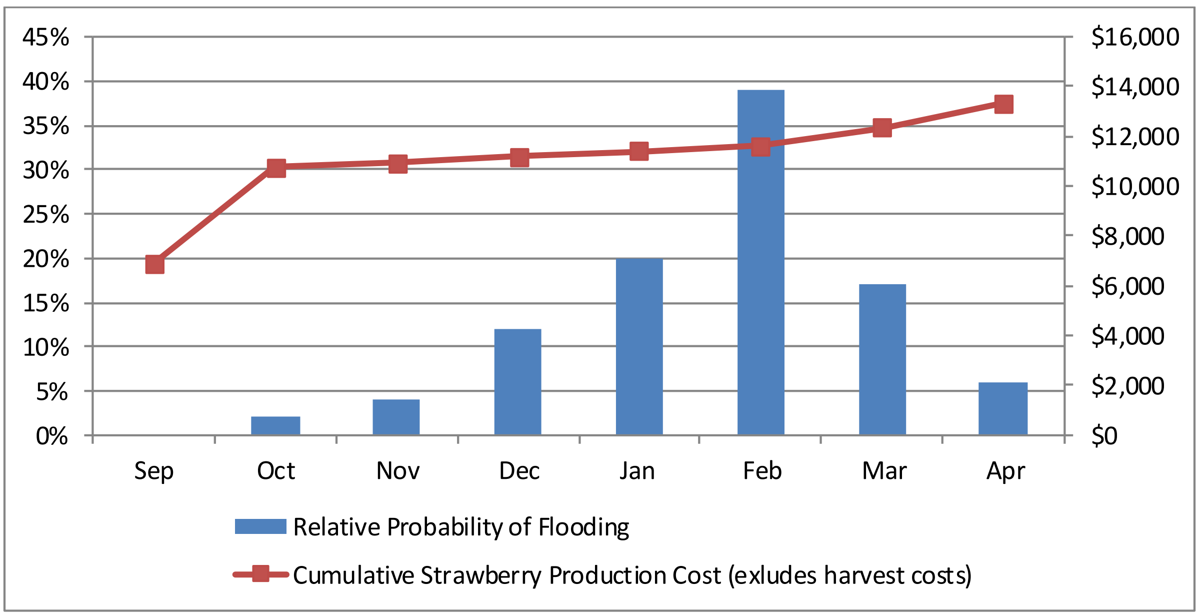


Figure 7: Probability of Flooding and Cumulative Production Loss – Strawberry Crop Example
Source: USACE Engineering and UCCE Crop Report (2010)

As described in more detail further below, the value of this production investment (cost) for each crop will be combined with the estimated net income to comprise the estimated total loss per acre from flooding.

2.2. Cropping Pattern Data

Because there are numerous crops being farmed in the floodplain at any one time, and because they differ in production cost and net income, it is important to include this factor in the damage model. Assumptions used in this model were made based on historical cropping patterns, and confirmed through discussions with local growers.

Consistent with the rest of the agricultural damage model, a probabilistic approach was used to describe the crop pattern. Based on information in a report by the Pajaro Valley Water

Management Agency, '*Estimating Economic Impacts to Agricultural Production'*, it was assumed that at any given time 14% of each area was uncultivated. Also, since strawberries are the dominant crop in the floodplain, the cropping pattern for the entire area was set to be dependent upon the percentage of acres in the floodplain devoted to strawberries.

Relying on county ranch maps and discussions with the local growers, the agricultural damage areas were classified as either approximately half strawberries, or nearly all strawberries. The land west of the city of Watsonville on the Santa Cruz County side of the Pajaro River was assumed to be between 25% and 75% strawberries at any given time, with an average of 50%. Organic strawberries were assumed to account for 23% of the strawberry crop. A triangular distribution with those parameters was assigned to the cropping pattern assumption for Main Stem areas 1, 4, and 5, and the entire Tributary floodplain. This area totals approximately 4,900 unique acres (overlapping floodplains not double-counted).

As a result of discussions with County officials and growers in the study area, the remainder of the floodplain, which includes approximately 3,600 acres, was assumed to be planted more intensively with the strawberry crop. The percentage of acres devoted to strawberries was set to a triangular distribution having a minimum value of 80%, a most likely value of 90%, and a maximum value of 100%.

In all areas, the percentage of acres devoted to the remaining crop types (lettuce, broccoli, cauliflower, and raspberries) was dependent upon the percentage of acres devoted to strawberries as determined via Monte Carlo simulation using risk analysis software. The ratios used to determine the percentage of crops other than strawberries were 35/78 (head lettuce), 10/78 (leaf lettuce), 5/78 (raspberries), 14/78 (broccoli), and 14/78 (cauliflower). These ratios were developed in consultation with local growers and representatives from each of the two counties. In other words, for each simulation the percentage strawberries is first selected based on the particular distribution or curve, and then the remaining percentage would be distributed among the other crops in accordance with the specified ratios. This is done for each of the thousands of iterations and the result is a distribution of risk-based values.

2.3. *Direct Production Investment Loss and Net Income Loss, by Crop*

As described in IWR Report 87-R-10[2], the two major economic impacts to agriculture from flooding are typically categorized as direct production investment (DPI) loss and net income loss. Accordingly, estimates of DPI losses per acre and net income losses per acre for each major crop type formed the basis for determining the vast majority of total flood damage per acre in the floodplain.

Direct production investment consists of the costs needed to bring the product to market and include pre-harvest costs (e.g., land preparation, fertilizer application, equipment costs,

[2] *National Economic Development Procedures Manual – Agricultural Flood Damage,* USACE Institute for Water Resources, 1987

labor costs, seed, planting, etc.). The DPI loss from a flood consists of those investments made in a crop up until the time of the damaging flood event. Harvest costs are not included because they are either incurred prior to a flood (hence eliminating the crop damage potential) or are not incurred because the flood preceded the harvest – resulting in loss of crop. DPI loss per acre for each crop type was based on typical monthly production costs incurred during the growing season and the probability of experiencing a flood event during a particular month. Table 6 shows the calculation of the probability-weighted DPI loss for the strawberry crop before inflation to current dollars.

Net income is the difference between the maximum damageable value of a crop (average price multiplied by average yield, less harvest costs) and direct production cost. For the calculation of net income loss for each crop, the net return tables from the relevant UCCE report were used. The net return tables are part of what the UCCE calls a Ranging Analysis, which are simply a lookup table that displays the estimate of expected net income per acre given a particular combination of yield and price. An example of this table can be found in Table 7. For most of the crops, and for the vast majority of the planted acreage in the floodplain, the net income per acre was estimated using a combination of county data on price and yield, and net the UCCE Ranging Analysis tables. For example, for traditional strawberries five years of yield and price data (2010-2014) was used to estimate net return using the relevant Ranging Analysis table.

The estimates of DPI loss and net income loss per acre for each of the major crops in the floodplain are shown in Table 5.

Table 5: Estimated Production Cost Loss & Net Income Loss, by Crop

Crop	Flood Impact Category	Amount ($2015)
Conventional Strawberry	Production Investment Losses	$11,706
	Net Income Loss Per Acre	$10,645
	TOTAL	**$22,351**
Organic Strawberry	Production Investment Losses	$6,525
	Net Income Loss Per Acre	$51,012
	TOTAL ($2015)	**$57,537**
Head Lettuce	Production Investment Losses	$2,044
	Net Income Loss Per Acre	$858
	TOTAL	**$2,902**
Leaf Lettuce	Production Investment Losses	$2,221
	Net Income Loss Per Acre	$1,182
	TOTAL	**$3,403**
Cauliflower & Broccoli	Production Investment Losses	$1,654
	Net Income Loss Per Acre	$1,015

	TOTAL	**$2,669**
Raspberry	Production Investment Losses	$3,915
	Net Income Loss Per Acre	$25,783
	TOTAL	**$29,697**

The following sections describe the data and methods used to develop the estimates displayed in Table 5. Given that strawberries are, by any measure, the most important crop in the floodplain, more attention and detail is devoted to the estimates for this crop as well as to the reporting of the data, methodology, and assumptions for this crop.

2.3.1. *Strawberries (Conventional)*

In these two counties, the predominant practice is to plant strawberries in fall (October through mid-November) and harvest during the traditional winter, spring, and summer seasons of the next year. This practice accounted for greater than 95% of the traditional and organic strawberries grown in 2015 (California Strawberry Commission, 2015). Peak harvest occurs in June and July. After a strawberry crop is established, a tract is continuously productive for a year, and some tracts can be productive at a reduced level for a second year. However, according to the growers, because new plants are more productive, the predominant practice in the area is to reestablish new strawberry plants every year. While the tract matures at different rates on a plant by plant basis, some highly productive plants can grow and re-grow full-sized berries in 3 or 4 days.

Background Data

The most recent UCCE report for conventional strawberries is from 2010. In its 2010 Report (University of California Cooperative Extension, 2010), the UCCE estimates that, on average and according to the assumptions made for purposes of their report, the gross returns to an acre of conventional strawberry crops in 2010 was $49,800. The total operating cost per acre and the total cost per acre were estimated to be $42,188 and $47,882, respectively. Accordingly, the estimated average net returns above operating cost and total cost are $7,612 and $1,918.

Figure 8 displays the combined average of the historical price and yield for the conventionally-grown strawberry crop in the two counties. The base data for Tons per Acre and Value per Acre were taken directly from the two counties' agricultural commissioner annual crop reports. For all crops analyzed, the county data on price was inflated or deflated to the year of the UCCE report in order to be able to determine the net income using the UCCE reports' ranging analysis for net income. For conventionally-grown strawberries, the UCCE reports give net income on a per tray basis in 2010 dollars. The nominal reported values from the annual crop reports were thus inflated or deflated to 2010 dollars[3] in order to estimate the net income using the Ranging Analysis tables in the UCCE reports.

[3] Series ID: CUUR0000SA0 - Consumer Price Index, All Urban Consumers, San Francisco-Oakland-San Jose, CA, U.S. Bureau of Labor Statistics.

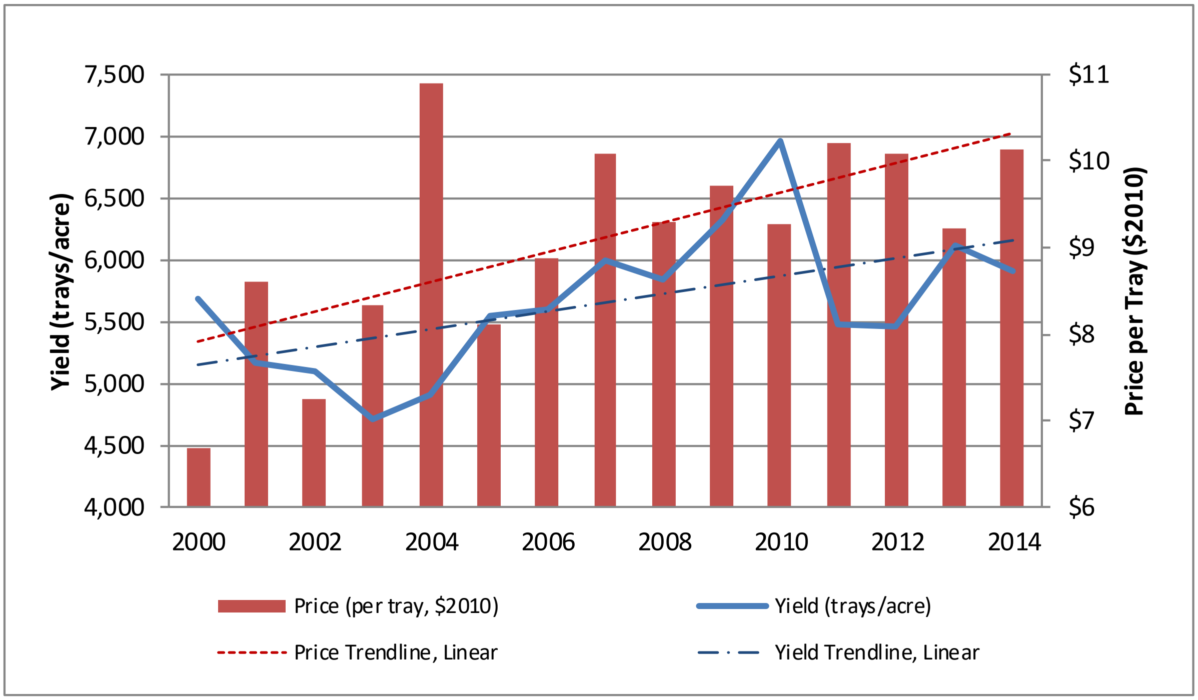


Figure 8: Conventional Strawberry Price & Yield – 2-County Average
Source: Monterey and Santa Cruz County Annual Crop Reports

As Figure 8 shows, both the yield and the real price of strawberries have been trending higher over the last fifteen years. The 2009 Santa Cruz County Agricultural Crop and Livestock Report attributes the trend to high demand, an amenable climate, and improving practices:

> *"Overall production values remain high because of exceptionally fertile soil, a climate that allows for year around [sic] production, and consumer demand for high value crops. New and innovative production techniques continue to be employed and lead to increased yield and a prolonged growing season."*

While this quote is from seven years ago, it applies equally well to today's conditions in the area and in the strawberry market.

DPI Loss

Production cost data for strawberries were taken from studies published by the University of California Cooperative Extension (UCCE). The total production cost for each crop differs from the cost or loss applied in the analysis because of seasonality. In the event of a flood, the applicable flood loss is limited to those costs that have been incurred in order to bring the product to market up to that point. As Table 6 shows, there is essentially zero chance of a flood occurring during the months of May through September. Thus, for the strawberry crop, the only applicable production costs to consider are the non-harvest costs in those months when there is a non-zero chance of a flood occurring. Table 6 shows how the probability-weighted cumulative DPI loss was calculated for the strawberry crop.

Table 6: Calculation of Probability-Weighted DPI Loss, Strawberry Crop

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Total Cash Costs Minus Overhead ($2010)	$5,264	$8,229	$8,360	$8,530	$8,700	$8,871	$9,423	$10,187						
Prob. of Flooding	0.00	0.02	0.04	0.12	0.20	0.39	0.17	0.06	0.00	0.00	0.00	0.00	0.00	
Weighted Production Losses	**$0**	**$165**	**$334**	**$1,024**	**$1,740**	**$3,460**	**$1,602**	**$611**	**$0**	**$0**	**$0**	**$0**	**$0**	**$8,935**

Sources: UCCE 2010; USACE San Francisco District Water Resources Section; GEC, Inc.

As the table shows, the expected DPI for an acre of strawberry crop is just less than $9,000 in 2010 dollars, or $11,700 in 2017 dollars[4]. This procedure to calculate the DPI loss was followed for each of the crops in the analysis.

Net Income Loss

For the calculation of net income loss for the strawberry crop, the net return tables from the UCCE report were used. As explained previously, the net return tables are part of what the UCCE calls a Ranging Analysis, which is shown in Table 7. Data for yields of 4,500, 5,500, and 6,500 were interpolated in order to make the estimates of net income using the annual county data more precise.

Table 7: Net Return per Acre above Cash Costs, Conventional Strawberries

	Yield (trays per acre)						
$/Tray	**4,000**	**4,500**	**5,000**	**5,500**	**6,000**	**6,500**	**7,000**
$6.30	-$12,296	-$11,609	-$10,921	-$10,233	-$9,544	-$8,857	-$8,169
$6.80	-$10,296	-$9,359	-$8,421	-$7,483	-$6,544	-$5,607	-$4,669
$7.30	-$8,296	-$7,109	-$5,921	-$4,733	-$3,544	-$2,357	-$1,169
$7.80	-$6,296	-$4,859	-$3,421	-$1,983	-$544	$894	$2,331
$8.30	-$4,296	-$2,609	-$921	$768	$2,456	$4,144	$5,831
$8.80	-$2,296	-$359	$1,579	$3,518	$5,456	$7,394	$9,331
$9.30	-$296	$1,892	$4,079	$6,268	$8,456	$10,644	$12,831
$9.80	$1,704	$4,142	$6,579	$9,018	$11,456	$13,894	$16,331
$10.30	$3,704	$6,392	$9,079	$11,768	$14,456	$17,144	$19,831
$10.80	$5,704	$8,642	$11,579	$14,518	$17,456	$20,394	$23,331
$11.30	$7,704	$10,892	$14,079	$17,268	$20,456	$23,644	$26,831
$11.80	$9,704	$13,142	$16,579	$21,448	$23,456	$26,894	$30,331
$12.30	$11,704	$15,392	$19,079	$25,629	$26,456	$30,144	$33,831

Source: UCCE 2010 Ranging Analysis; 11 lbs. per tray assumed

[4] Inflated using the USDA NASS Annual Average Index of Prices Paid

In order to estimate future net income per acre for the strawberry crop, the historical prices and yields reported by each of the counties was combined with the net return estimates from the 2010 UCCE report (shown in Table 7 for the strawberry crop). County data for the years 2010-2014 was used. The combination of the data reflected in Figure 8 and the data in Table 7 results in the net income estimate for the strawberry crop.

Figure 9 shows the estimated net income to each acre of conventional strawberry crop between 2010 and 2014 for both counties when combining the historical data and the Ranging Analysis table. The average net income per acre over those years was $8,983 in 2010 dollars, which equates to $10,645 in 2017 dollars.[5]

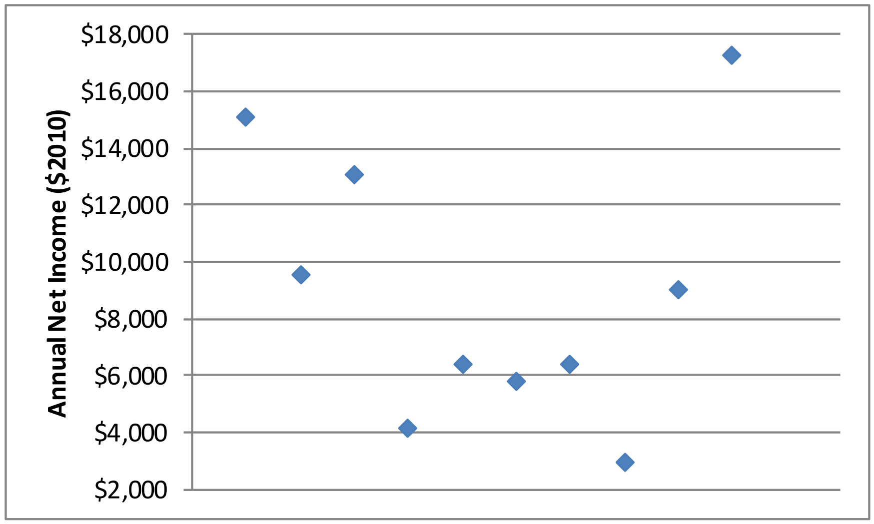


Figure 9: Estimated Annual Net Income per Acre, Conventional Strawberry, Both Counties, 2010-2014

2.3.1. *Strawberries (Organic)*

As stated previously, based on data from the California Strawberry Commission (California Strawberry Commission, 2015) and county crop budget reports, it is assumed that 23% of the strawberry crop in the floodplain is organically-grown.

Background Data

The most recent UCCE report for organic strawberries is from 2014. According to the 2014 UCCE report on Organic Strawberries in the Central Coast (University of California Cooperative Extension, 2014), the costs and the returns for organic strawberries are generally higher than for conventional strawberries. The production cost per acre for organic strawberries is similar to conventionally-grown, but the yields are lower for organic produce, which means that the cost per tray is higher. Generally speaking, the price premium associated with organic strawberries appears to more than make up for the drop in yield however. According to the UCCE's estimate, in 2014 the total operating cost per acre and the total cost per acre for organic strawberries were $42,482 and $49,044, respectively. The gross returns at the assumed yield and price points (4,250 and $15) was estimated to be $63,750, and the corresponding net return above operating cost and total cost are $21,268 and $14,706.

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[5] Inflated using Series the Consumer Price Index – All Urban Consumers, San Francisco-Oakland-San Jose, CA MSA, Series ID: CUUSA422SA0

DPI Loss

Production cost data for organic strawberries were taken from the 2014 UCCE report (University of California Cooperative Extension, 2014). Weighting the monthly cumulative DPI by the relative monthly probability of flooding results in an expected DPI loss of $6,268 in 2014 dollars, and $6,525 in 2017 dollars[6].

Net Income Loss

At the time of this analysis, neither the Santa Cruz nor Monterey County crop reports contained data on historical price or yield for organic strawberries. Thus, for the calculation of net income loss for the organic strawberry crop, the UCCE report's assumption on average price and yield were used. At a yield of 4,250 trays per acre and a price per tray of $15 in 2014 dollars, the estimated annual net income per acre is $16,011 in 2014 dollars, and $17,004 in 2017 dollars.

Additionally, the updated agricultural damage analysis incorporated multi-year net income losses associated with flooding to organic crops. In order to keep its organic certification, businesses would have to comply with the land requirements outlined in the USDA organic regulations as set forth in the Federal Code of Regulations (CFR) in Title 7, Part 205.202, which stipulates that "any field or farm parcel from which harvested crops are intended to be sold, labeled, or represented as "organic" must have had no prohibited substances applied to it for a period of 3 years immediately preceding harvest of the crop." When a flood event occurs, it is practically impossible to prevent "prohibited substances" from seeping into the fields that grow organic crops, and businesses interested in maintaining its organic certification would likely have to fallow the affected fields for three years. This three-year fallowing period for organic strawberries following a flood event is reflected in the estimated annual net income loss per acre of $51,012 applied to organic strawberries in the agricultural model.

2.3.2. Head and Leaf Lettuce

Based on information from the Monterey and Santa Cruz County agricultural commissioner's offices, crop budget reports, and UCCE's production costs studies, lettuce consistently ranks as a major crop both in terms of yield and production value in Monterey and Santa Cruz Counties. In the floodplain, however, the crop is not nearly as prevalent as the strawberry crop.

According to the latest UCCE report on leaf lettuce (University of California Cooperative Extension, 2009), in these two counties lettuce is typically planted from late December through mid-August, and generally harvested from April through October. Harvesting begins 60 to 100 days after planting, and local growers indicate that two production cycles are typical in the area (double cropped).

Background Data

According to the county crop reports for leaf lettuce, the average price (in 2010 dollars) per carton received by producers between the years 2000 and 2009 was approximately $8.72; average yield over the same time period was approximately 890 cartons per acre. For head

[6] Inflated using the USDA NASS Annual Average Index of Prices Paid

lettuce, the average price per carton was approximately $9.46, and the average yield was approximately 854 cartons per acre. However, in recent discussions with local growers, they indicated that, because of the fertile soil and ideal climate, the yields in the floodplain can generally be expected to be greater than the county averages reported in the crop reports.

DPI Loss

Production cost data for both head and leaf lettuce was taken from the UCCE reports on Sample Costs to Produce (University of California Cooperative Extension, 2009). The production cost was weighted by the relative probability of flooding in each month, and was estimated to be $2,221 (2017 dollars) for leaf lettuce, and $2,044 (2017 dollars) for head lettuce. As with the other crops analyzed for this study, the weighted value is only calculated based on non-harvest costs, and is exclusive of overhead.

Net Income Loss

For head lettuce, the combination of county data on price and yield combined with the UCCE ranging analysis resulted in mostly negative net returns per acre between 2000 and 2014. While lettuce is a low margin crop and profitability is more sensitive to price and yield than the strawberry crop, the negative results are at odds with reports from local growers. For this reason, the assumptions on average price and yield from the UCCE report were used to estimate net income. At a yield of 800 and a price per carton of $12 (in 2009 dollars), according to the UCCE report for head lettuce (University of California Cooperative Extension, 2009), the annual net return to an acre of head lettuce is estimated to be $717 in 2009 dollars, and $858 in 2017 dollars.

For leaf lettuce, the combination of county data and UCCE ranging analysis resulted in what appear to be reasonable estimates of annual net income per acre that are generally consistent with reports from local growers. Using five years (2010-2014) of county data on price and yield, the estimated net return per acre is $988 in 2009 dollars, and $1,182 in 2017 dollars. That leaf lettuce has a slightly greater expected net return than head lettuce is consistent with statements for this study that were made by local farmers.

2.3.3. *Other crops (raspberries, broccoli, and cauliflower)*

Although they constitute a very small percentage of the crops planted in the floodplain, three additional crops were included in the analysis of flood damage to agriculture. How these crops were incorporated in the analysis is described below.

Raspberries: According to the UCCE Report (University of California Cooperative Extension, 2012) for raspberries, raspberries are a two-year crop: established plus a two-year production cycle. Since the establishment costs are incurred with the expectation of a two-year return to the crop, for the DPI loss estimate the establishment costs were split between Year 1 and Year 2. The estimate of DPI is an average of the two years as described and estimated in the UCCE Report. The average DPI loss is estimated to be $3,915 in 2017 dollars.

According to the UCCE Report, the return to an acre of raspberries is expected to be higher in the second production year primarily due to higher yields. The UCCE Report assumes net income is approximately 22% greater in Production Year 2 compared to Production Year 1. Using the county data on price and yield for the years 2010-2014, the annual net return from the Ranging Analysis for Production Year 1 is estimated to be $20,869 in 2012 dollars, or $22,747 in 2015 dollars. Averaging this value with a Production Year 2 that is 22% greater results in a net income loss per acre estimate of $23,165 in 2012 dollars, or $25,783 in 2017 dollars.

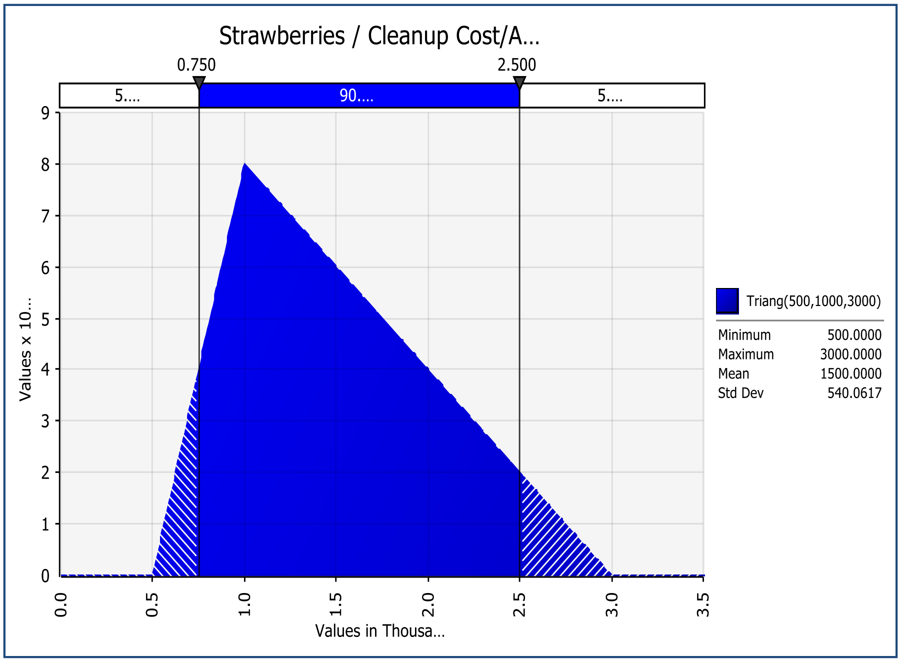
Cauliflower and Broccoli: The most recent UCCE Sample Cost reports for cauliflower and broccoli are from 2001. While not exactly the same, the production cost and the returns to cauliflower and broccoli are very similar, and for practical purposes they have been combined in the analysis. The DPI loss is estimated to be $806 in 2001 dollars, or $1,654 in 2017 dollars. Using five years of data reported for cauliflower by Monterey County (the Santa Cruz crop report combines cauliflower and broccoli with other miscellaneous vegetables), the net income loss per acre is estimated to be $720 in 2001 dollars, or $1,015 in 2017 dollars.

2.4. Post-Flood Cleanup & Reconditioning Cost

According to the local growers and agricultural industry representatives, past floods have required significant post-flood cleanup and reconditioning of the land. According to the growers, after the 1995 flood, the deposition of clay soils was significant enough to require the removal of material. One local grower estimated the cost per acre at as high as $3,000.

The agricultural damage model incorporated this cost by using a range of values between $500 and $3,000 per acre, with a most likely value of $1,000 per acre. This results in the distribution that is depicted in Figure 10 below, which has a mean value of $1,500 per acre. This cost is applied to all flooded acreage, and is a separate variable and consideration from the multiple season impacts scenario that is described in the next section.

Figure 10: Example of Cleanup Cost Distribution



2.5. *Other Considerations – Risk of Multiple Season Impacts & Regional Transfers*

Adding to the uncertainty and complexity of the agricultural damage analysis is the fact that there are some flooding scenarios that could have significant longer term adverse impacts on the ability to grow crops in particular areas of the floodplain. For example, local growers have stated that the impact of previous floods varied widely across the floodplain, and depended on factors such as the amount of sedimentation left on the land, the degree of scouring caused by flood waters, and whether or not contaminants or viruses were deposited on the land as a result of the flood.

While some of the factors such as the likelihood and impact of the deposition of viruses as the result of a flood are extremely difficult to include in the analysis and damage model, it is thought possible to reasonably quantify and incorporate the likelihood and consequences of flood-generated scouring of the agricultural land in the floodplain. While in the absence of scour the impact of a flood event is assumed to be limited to a single growing season, scouring is assumed to cause an impact across multiple seasons on the affected area.

The local growers have stated that scouring of the land has caused significant impacts and that in some cases multi-year impacts were experienced. For example, the 1995 flood caused significant scouring of a large agricultural area as a result of high velocity flows caused by a levee breach. Whereas the damage to agricultural land from slower-moving "up and down" type flooding is generally expected to be limited to damage to the current planted crops and some land cleanup/reconditioning cost, high-velocity scouring flows have caused such significant damage to the land that multiple planting seasons were lost. Under a scenario where scour does occur, no traditional production investment (and thus loss) is expected to be incurred during the second year of impacts; however, a second year of net income loss is incurred.

However, this risk is believed to be limited to relatively small areas near future levee breach locations, and too little is known about the likelihood and extent of such damage that this factor was not included in the damage model.

Another factor that should be addressed in this report, but has been determined to be outside of the realm of quantifying in the damage model, is the potential for a transfer of income from flood-affected farmers to those not affected but selling the same crop. Because the Pajaro River floodplain is responsible for a significant portion of California's and the Nation's summer-harvested strawberry crop, a significant flood event could mean higher prices for strawberries in the short-run. Higher prices would benefit growers outside of the flooded area (like in the Salinas Valley for example). In theory, there may be some gains to these growers from a flood along the Pajaro River, but the overall economic impact to the industry and to the nation is extremely difficult to determine. At this time there is no realistic way of incorporating this factor in the analysis. Thus, the analysis assumes that the net income loss to those growers affected by the flood translates directly as an NED loss. In this way the damage analysis is consistent with the guidance and procedures set forth in the NED Procedures Manual for agricultural flood damage estimation. The concept of willingness-to-pay has been the primary theoretical basis for estimating the NED impact of a flood within the area.

2.6. *The Agricultural Damage Model*

The data and variables described in the previous sections were combined in a spreadsheet model that uses the @Risk program to incorporate risk and uncertainty principles. Figure 11 shows the relationship between the variables, and shows where the important assumptions come into play. The model has been reviewed for computational accuracy and approved for use in this study by USACE HQ.

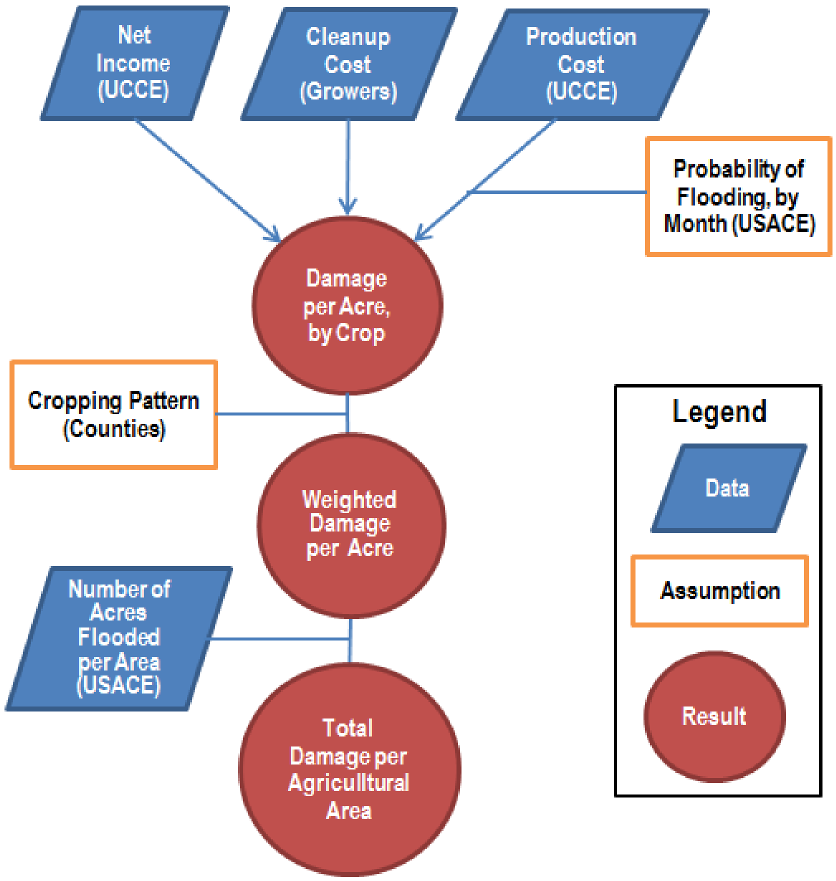


Figure 11: Relationship of Major Inputs to the Agricultural Damage Model

While several of these have already been discussed, some of the important assumptions of the analysis that are reflected in the model are as follows:

- No significant future land use changes in the area that is currently identified as agricultural
- No significant future changes in cropping pattern
- Given the stringent and ever-tightening food safety standards, any flooded crop must be destroyed, and no further planting of a flooded acre will occur for at least one season. This means that whereas some crops can tolerate short periods of inundation without a significant impact on yield, all of the crops in this floodplain are assumed to be a total loss for the year if flooded.
- Outside of the one-year crop loss, there will be no difference in average pre- and post-flood crop yields, and no difference in average crop yield between the without- and with-project conditions.
- 14% of the land in the floodplain is uncultivated at any given time

The assumption that flooding in the study area renders crops ruined and land unusable for the year is reasonable given the evidence from historical flood events as well as discussions with local growers. It also greatly simplifies what would otherwise be a challenging task of developing a crop-loss function for each crop in the floodplain. The figure below was taken from the NED Procedures Manual (Institute for Water Resources, 1987), and shows how the direct production cost curve changes over the year depending on replanting assumptions.

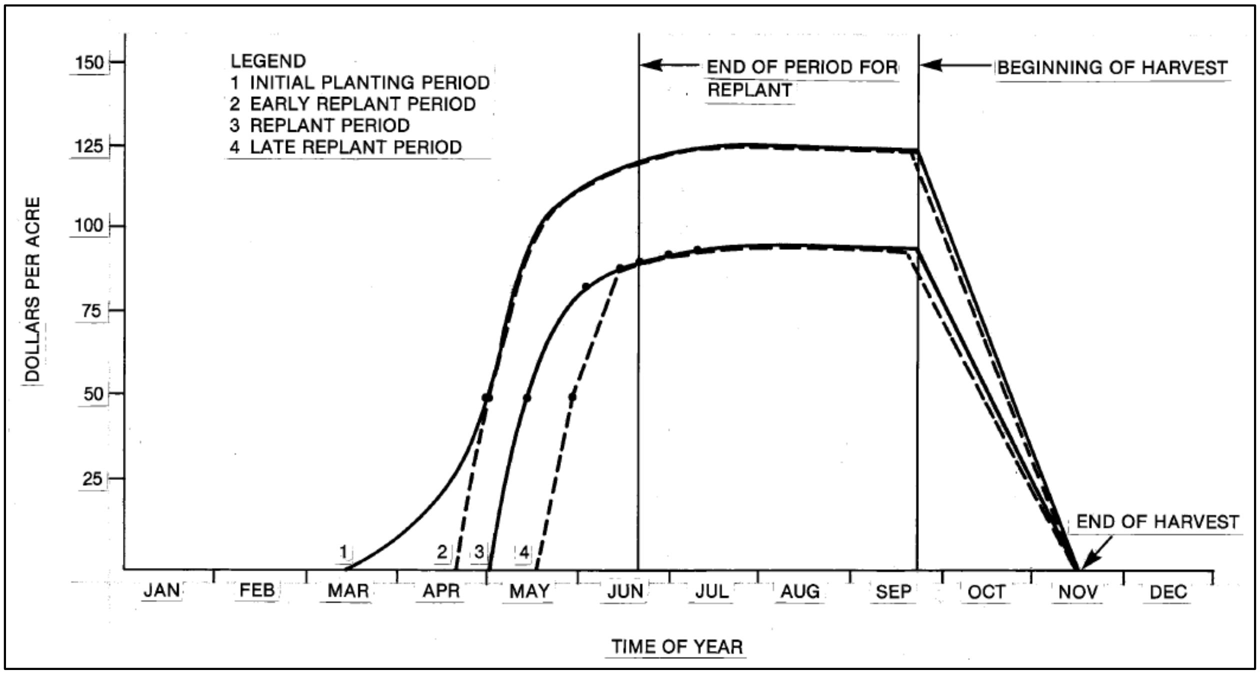


Figure 12: Example of Direct Production Cost Curve with Replanting Assumptions – Taken from IWR 1987

The figure above concerns Direct Production Cost, but a similar graph could be drawn for the potential income loss from flooding that considers the various replanting assumptions.

Total damages for each frequency event were then linked to stage to derive stage-damage curves for each area. These curves were then entered directly into the HEC-FDA program in order to calculate expected annual damages for agriculture.

2.7. Results of the Without-Project Analysis

Before the damages per agricultural area can be calculated, the total damage per acre for each crop, and the weighted damage per acre need to be estimated.

Table 8 and Figure 13 below show the model results for damage per acre for each crop, as well as the results for weighted damage per acre. The weighted totals are the values that are ultimately applied to the acreages in each agricultural area in the floodplain. The minimum, mean, and maximum values are the outputs of the Monte Carlo Simulation with one-thousand iterations.

Table 8: Model Results for Damage per Acre

Crop	Minimum	Mean	Maximum

Strawberry	$20,110	**$21,081**	$22,567
Organic Strawberry	$23,801	**$24,771**	$26,257
Head Lettuce	$2,898	**$3,868**	$5,354
Leaf Lettuce	$3,353	**$4,323**	$5,809
Raspberry	$30,227	**$31,197**	$32,683
Cauliflower and Broccoli	$2,351	**$3,321**	$4,807

Figure 13: Damage per Acre, All Crops and Weighted Value per Acre

	Minimum	Mean	Maximum
Less Strawberry-Intensive Areas	$9,307	**$13,558**	$18,326
Strawberry-Intensive Areas	$17,685	**$20,019**	$22,793

The flood damage to agriculture for each of the events analyzed was estimated within the @Risk model described previously. The model simulation consisted of one-thousand iterations. The model results include all five of the events analyzed – the 10%, 4%, 2%, 1% and .5% annual exceedence probability – for each of the impact areas for both the Pajaro River and the tributaries. Table 9 and Table 10 display the event-based damage results. It is important to highlight that these event-based results only consider the extent of flooding for each of the ACE events (the number of acres flooded), and <u>does not consider the probability of the levee failing of being overtopped by a given event</u>. As explained below, the consideration of levee failure probability will be done in the HEC-FDA modeling.

Table 9: Pajaro River Agricultural Areas, Event-Based Damages (1,000s)

Impact Area	10%	4%	2%	1%	0.20%
1	$11,708	$17,739	$18,593	$19,591	$19,982
2	$6,721	$6,757	$6,775	$6,797	$6,834
3	$6,656	$6,877	$7,062	$7,085	$7,101
4	$1,460	$1,955	$2,078	$2,572	$3,606
5	$4,039	$4,423	$4,498	$4,573	$4,669
6	$10,746	$15,069	$15,334	$15,351	$15,390
7	$661	$4,490	$5,266	$5,816	$6,728
8	$1,716	$2,796	$11,746	$13,399	$13,970
9	$43	$57	$5,394	$5,479	$5,533
10	$31	$41	$2,690	$2,874	$2,990
11	$45	$69	$4,099	$4,116	$4,128
12	$922	$1,043	$6,716	$6,872	$6,999
13	$124	$168	$3,619	$3,625	$3,625
14	$934	$1,025	$3,093	$4,000	$5,637
15	$578	$733	$6,465	$7,671	$9,319
Total	**$46,385**	**$63,240**	**$103,428**	**$109,821**	**$116,509**

Table 10: Tributary Agricultural Areas, Event-Based Damages ($1,000s)

Impact Area	10%	4%	2%	1%	0.20%

1	$1,933	$2,163	$2,695	$3,462	$3,570
2	$22,993	$25,151	$26,154	$27,147	$27,404
3	$950	$1,032	$1,359	$3,619	$3,813
4	$3,588	$4,868	$22,352	$23,845	$25,589
Total	**$29,463**	**$33,214**	**$52,560**	**$58,072**	**$60,376**

The results of the event-based damage estimates comprise the exceedence-probability damage functions which will be related to the probabilities associated with the range of river flows and stages in the HEC-FDA program. The program will also consider the likelihood of levee failure in each of the reaches. The result of this modeling is an estimate of the expected annual damage from flooding in each of the study areas reaches.

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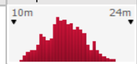
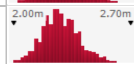
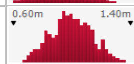
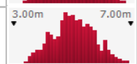
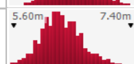
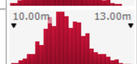
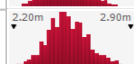
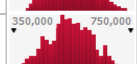
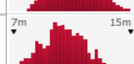
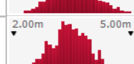
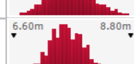
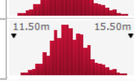
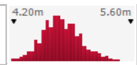
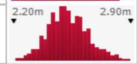
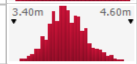
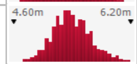
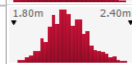
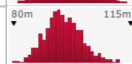
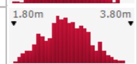
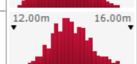
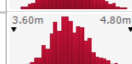
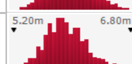
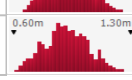
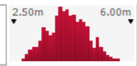
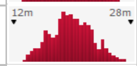
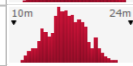
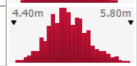
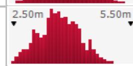
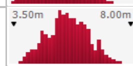
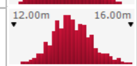
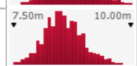
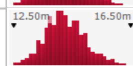
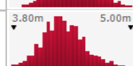
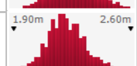
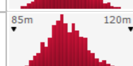
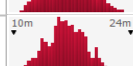
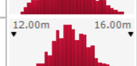
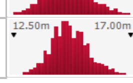
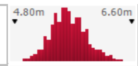
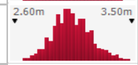
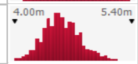
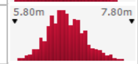
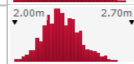
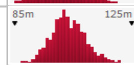
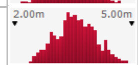
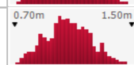
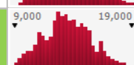
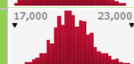
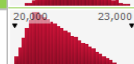
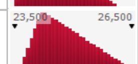
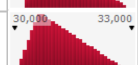
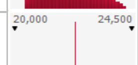
@RISK Output Results

Performed By: Timi Shimabkuro
Date: Monday, August 21, 2017 9:20:38 AM

Name	Worksheet	Cell	Graph	Min	Mean	Max	5%	95%	Errors
Ag 1 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I13		$11,181,330	$16,289,020	$22,017,700	$12,820,240	$19,765,640	0
Ag 2 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I14		$3,893,573	$4,407,427	$5,018,201	$4,115,462	$4,747,532	0
Ag 3 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I15		$2,022,833	$2,289,796	$2,607,112	$2,138,111	$2,466,491	0
Ag 4 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I16		$688,328	$1,002,760	$1,355,421	$789,220	$1,216,783	0
Ag 5 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I17		$3,481,658	$5,072,099	$6,855,907	$3,991,985	$6,154,656	0
Ag 6 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I18		$11,954,490	$13,532,180	$15,407,440	$12,635,750	$14,576,410	0
Ag 7 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I19		$5,612,220	$6,352,893	$7,233,266	$5,932,052	$6,843,122	0
Ag 8 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I20		$10,038,120	$11,362,900	$12,937,550	$10,610,170	$12,239,730	0
Ag 9 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I21		$3,741,480	$4,235,262	$4,822,177	$3,954,701	$4,562,081	0
Ag 10 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I22		$2,235,763	$2,530,827	$2,881,545	$2,363,175	$2,726,122	0
Ag 11 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I23		$3,269,993	$3,701,550	$4,214,505	$3,456,345	$3,987,185	0
Ag 12 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I24		$4,152,130	$4,700,108	$5,351,441	$4,388,754	$5,062,798	0
Ag 13 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I25		$4,441,107	$5,027,221	$5,723,885	$4,694,199	$5,415,153	0
Ag 14 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I26		$1,612,182	$1,824,950	$2,077,849	$1,704,058	$1,965,775	0
Total 10 Percent Event Damages, Main Stem	MODEL OUTPUTS_Damage per Event	I27		$69,989,820	$82,328,980	$96,239,590	$75,457,140	$89,788,060	0
Ag 1 Tribs, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I35		$1,280,610	$1,865,600	$2,521,713	$1,468,316	$2,263,781	0
Ag 2 Tribs, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I36		$5,922,821	$8,628,398	$11,662,920	$6,790,963	$10,469,990	0
Ag 3 Tribs, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I37		$376,179	$548,020	$740,753	$431,318	$664,986	0
Ag 4 Tribs, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I38		$600,286	$874,500	$1,182,053	$688,273	$1,061,148	0
Total 10 Percent Event, Tribs	MODEL OUTPUTS_Damage per Event	I39		$7,203,431	$10,494,000	$14,184,630	$8,259,280	$12,733,770	0
Ag 1 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J13		$11,269,370	$16,417,280	$22,191,070	$12,921,180	$19,921,280	0
Ag 2 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J14		$4,349,851	$4,923,922	$5,606,271	$4,597,742	$5,303,883	0
Ag 3 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J15		$4,790,920	$5,423,201	$6,174,739	$5,063,947	$5,841,689	0
Ag 4 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J16		$2,385,136	$3,474,679	$4,696,690	$2,734,739	$4,216,293	0
Ag 5 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J17		$3,745,784	$5,456,879	$7,376,010	$4,294,826	$6,621,561	0
Ag 6 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J18		$12,319,510	$13,945,370	$15,877,900	$13,021,580	$15,021,490	0
Ag 7 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J19		$6,752,915	$7,644,131	$8,703,442	$7,137,754	$8,234,000	0
Ag 8 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J20		$11,878,440	$13,446,100	$15,309,430	$12,555,370	$14,483,680	0

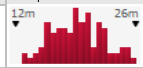
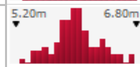
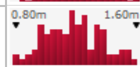
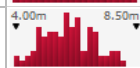
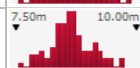
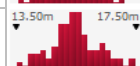
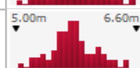
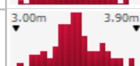
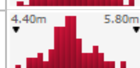
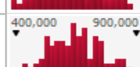
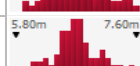
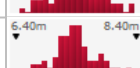
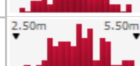
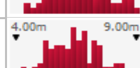
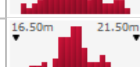
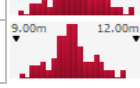
Ag 9 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J21		$4,228,177	$4,786,190	$5,449,452	$4,469,134	$5,155,523	0
Ag 10 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J22		$2,235,763	$2,530,827	$2,881,545	$2,363,175	$2,726,122	0
Ag 11 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J23		$3,498,132	$3,959,798	$4,508,540	$3,697,485	$4,265,361	0
Ag 12 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J24		$4,775,710	$5,405,985	$6,155,137	$5,047,871	$5,823,144	0
Ag 13 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J25		$5,049,477	$5,715,882	$6,507,979	$5,337,239	$6,156,955	0
Ag 14 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J26		$1,840,322	$2,083,198	$2,371,884	$1,945,199	$2,243,951	0
Total 4 Percent Event Damages, Main Stem	MODEL OUTPUTS_Damage per Event	J27		$81,006,310	$95,213,430	$111,181,500	$87,325,820	$103,761,400	0
Ag 1 Tribs, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J35		$1,864,888	$2,716,779	$3,672,244	$2,138,236	$3,296,632	0
Ag 2 Tribs, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J36		$9,636,589	$14,038,640	$18,975,890	$11,049,080	$17,034,950	0
Ag 3 Tribs, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J37		$536,255	$781,220	$1,055,967	$614,858	$947,958	0
Ag 4 Tribs, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J38		$2,617,246	$3,812,819	$5,153,751	$3,000,872	$4,626,603	0
Total 4 Percent Event, Tribs	MODEL OUTPUTS_Damage per Event	J39		$11,501,480	$16,755,420	$22,648,130	$13,187,320	$20,331,590	0
Ag 1 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K13		$11,277,370	$16,428,940	$22,206,830	$12,930,360	$19,935,420	0
Ag 2 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K14		$4,441,107	$5,027,221	$5,723,885	$4,694,199	$5,415,153	0
Ag 3 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K15		$5,353,663	$6,060,212	$6,900,026	$5,658,760	$6,527,856	0
Ag 4 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K16		$2,497,189	$3,637,919	$4,917,340	$2,863,217	$4,414,374	0
Ag 5 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K17		$3,817,818	$5,561,819	$7,517,856	$4,377,418	$6,748,898	0
Ag 6 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K18		$12,349,930	$13,979,810	$15,917,110	$13,053,730	$15,058,580	0
Ag 7 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K19		$7,300,449	$8,263,925	$9,409,126	$7,716,491	$8,901,622	0
Ag 8 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K20		$12,395,550	$14,031,460	$15,975,910	$13,101,960	$15,114,210	0
Ag 9 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K21		$4,669,246	$5,285,469	$6,017,920	$4,935,339	$5,693,329	0
Ag 10 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K22		$2,372,646	$2,685,776	$3,057,966	$2,507,859	$2,893,027	0
Ag 11 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K23		$3,695,852	$4,183,612	$4,763,370	$3,906,473	$4,506,446	0
Ag 12 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K24		$5,231,989	$5,922,480	$6,743,207	$5,530,152	$6,379,496	0
Ag 13 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K25		$5,262,407	$5,956,913	$6,782,412	$5,562,304	$6,416,586	0
Ag 14 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K26		$1,931,577	$2,186,497	$2,489,498	$2,041,655	$2,355,221	0
Total 2 Percent Event Damages, Main Stem	MODEL OUTPUTS_Damage per Event	K27		$84,504,440	$99,212,040	$115,668,500	$91,088,500	$107,999,600	0
Ag 1 Tribs, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K35		$2,153,025	$3,136,539	$4,239,630	$2,468,607	$3,805,982	0
Ag 2 Tribs, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K36		$11,573,510	$16,860,360	$22,789,980	$13,269,910	$20,458,920	0
Ag 3 Tribs, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K37		$632,301	$921,140	$1,245,096	$724,981	$1,117,742	0

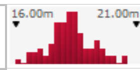
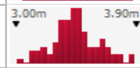
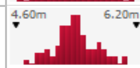
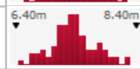
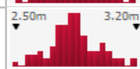
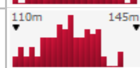
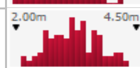
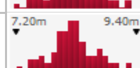
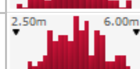
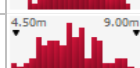
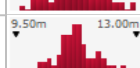
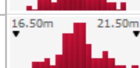
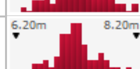
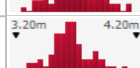
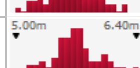
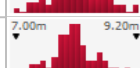
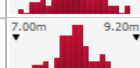
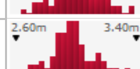
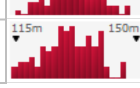
Ag 4 Tribs, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K38		$2,849,357	$4,150,959	$5,610,811	$3,267,004	$5,036,914	0
Total 2 Percent Event, Tribs	MODEL OUTPUTS_Damage per Event	K39		$13,726,540	$19,996,890	$27,029,610	$15,738,520	$24,264,910	0
Ag 1 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L13		$11,285,370	$16,440,600	$22,222,590	$12,939,540	$19,949,570	0
Ag 2 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L14		$4,471,525	$5,061,654	$5,763,090	$4,726,351	$5,452,244	0
Ag 3 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L15		$5,490,546	$6,215,161	$7,076,447	$5,803,444	$6,694,762	0
Ag 4 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L16		$2,545,212	$3,707,879	$5,011,904	$2,918,279	$4,499,266	0
Ag 5 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L17		$3,857,837	$5,620,119	$7,596,660	$4,423,303	$6,819,641	0
Ag 6 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L18		$12,380,340	$14,014,240	$15,956,310	$13,085,880	$15,095,670	0
Ag 7 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L19		$7,589,425	$8,591,039	$9,781,571	$8,021,935	$9,253,978	0
Ag 8 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L20		$12,623,690	$14,289,700	$16,269,950	$13,343,100	$15,392,390	0
Ag 9 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L21		$4,851,757	$5,492,067	$6,253,149	$5,128,251	$5,915,870	0
Ag 10 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L22		$2,479,111	$2,806,291	$3,195,183	$2,620,392	$3,022,842	0
Ag 11 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L23		$3,817,526	$4,321,344	$4,920,189	$4,035,082	$4,654,807	0
Ag 12 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L24		$5,520,965	$6,249,594	$7,115,652	$5,835,596	$6,731,852	0
Ag 13 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L25		$5,399,290	$6,111,862	$6,958,833	$5,706,988	$6,583,491	0
Ag 14 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L26		$1,961,996	$2,220,930	$2,528,703	$2,073,807	$2,392,311	0
Total 1 Percent Main Stem	MODEL OUTPUTS_Damage per Event	L27		$86,192,660	$101,142,500	$117,835,800	$92,924,190	$110,046,400	0
Ag 1 Tribs, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L35		$2,281,086	$3,323,099	$4,491,801	$2,615,439	$4,032,361	0
Ag 2 Tribs, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L36		$13,302,340	$19,378,910	$26,194,290	$15,252,140	$23,515,030	0
Ag 3 Tribs, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L37		$728,347	$1,061,060	$1,434,224	$835,105	$1,287,526	0
Ag 4 Tribs, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L38		$2,937,399	$4,279,219	$5,784,179	$3,367,951	$5,192,549	0
Total 1 Percent Event, Tribs	MODEL OUTPUTS_Damage per Event	L39		$15,583,420	$22,702,010	$30,686,090	$17,867,570	$27,547,390	0
Ag 1 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M13		$11,293,380	$16,452,260	$22,238,350	$12,948,720	$19,963,720	0
Ag 2 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M14		$4,471,525	$5,061,654	$5,763,090	$4,726,351	$5,452,244	0
Ag 3 Main Stem, .3 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M15		$5,520,965	$6,249,594	$7,115,652	$5,835,596	$6,731,852	0
Ag 4 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M16		$2,593,235	$3,777,839	$5,106,468	$2,973,341	$4,584,157	0
Ag 5 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M17		$3,897,856	$5,678,419	$7,675,463	$4,469,188	$6,890,385	0
Ag 6 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M18		$12,395,550	$14,031,460	$15,975,910	$13,101,960	$15,114,210	0
Ag 7 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M19		$8,091,331	$9,159,184	$10,428,450	$8,552,443	$9,865,964	0
Ag 8 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M20		$12,973,510	$14,685,680	$16,720,800	$13,712,850	$15,818,920	0

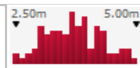
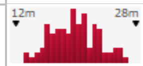
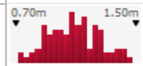
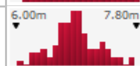
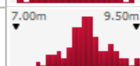
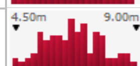
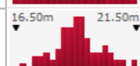
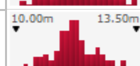
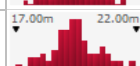
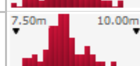
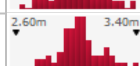
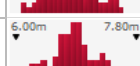
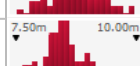
Ag 9 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M21		$4,988,640	$5,647,016	$6,429,570	$5,272,935	$6,082,775	0
Ag 10 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M22		$2,692,041	$3,047,323	$3,469,615	$2,845,456	$3,282,473	0
Ag 11 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M23		$4,045,665	$4,579,592	$5,214,224	$4,276,222	$4,932,982	0
Ag 12 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M24		$5,916,406	$6,697,223	$7,625,313	$6,253,573	$7,214,023	0
Ag 13 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M25		$5,642,639	$6,387,326	$7,272,471	$5,964,204	$6,880,212	0
Ag 14 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M26		$2,022,833	$2,289,796	$2,607,112	$2,138,111	$2,466,491	0
Total .2 Percent Event Damages, Main Stem	MODEL OUTPUTS_Damage per Event	M27		$88,474,050	$103,744,400	$120,745,700	$95,441,380	$112,797,700	0
Ag 1 Tribs, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M35		$2,457,170	$3,579,619	$4,838,537	$2,817,332	$4,343,631	0
Ag 2 Tribs, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M36		$14,799,050	$21,559,330	$29,141,540	$16,968,230	$26,160,820	0
Ag 3 Tribs, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M37		$736,351	$1,072,720	$1,449,985	$844,282	$1,301,674	0
Ag 4 Tribs, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M38		$2,937,399	$4,279,219	$5,784,179	$3,367,951	$5,192,549	0
Total .2% Event, Tribs	MODEL OUTPUTS_Damage per Event	M39		$17,256,220	$25,138,950	$33,980,080	$19,785,560	$30,504,450	0
Weighted Damage/Acre (Less Strawberry Intensive Areas)	Damage per Acre	D29		$9,307	$13,558	$18,326	$10,671	$16,452	0
Weighted Damage/Acre (Strawberry Intensive Areas)	Damage per Acre	D39		$17,685	$20,019	$22,793	$18,693	$21,564	0
Total Expected Damages/Acre Strawberries	Damage per Acre	E9		$20,110	$21,081	$22,567	$20,330	$22,080	0
Total Expected Damages/Organic Strawberries	Damage per Acre	E10		$23,801	$24,771	$26,257	$24,020	$25,771	0
Total Expected Damages/Acre Head Lettuce	Damage per Acre	E11		$2,898	$3,868	$5,354	$3,117	$4,867	0
Total Expected Damages/Acre Leaf Lettuce	Damage per Acre	E12		$3,353	$4,323	$5,809	$3,572	$5,322	0
Total Expected Damages/Acre Raspberries	Damage per Acre	E13		$30,227	$31,197	$32,683	$30,446	$32,196	0
Total Expected Damages/Acre Cauliflower	Damage per Acre	E14		$2,351	$3,321	$4,807	$2,570	$4,320	0
Strawberry Production & Net Income Loss per Acre	Strawberry Damage	B16		$22,351	$22,351	$22,351	$22,351	$22,351	0
Strawberry Production & Net Income Loss per Acre	Org Strawberry Damage	B16		$23,529	$23,529	$23,529	$23,529	$23,529	0
Total Production and Net Income Loss, Head Lettuce	Head Lettuce Damage	B16		$2,902	$2,902	$2,902	$2,902	$2,902	0
Total Production Cost and Net Income Loss, Leaf Lettuce	Leaf Lettuce Damage	B16		$3,403	$3,403	$3,403	$3,403	$3,403	0
Total Production and Net Income Loss, Caul and Brocc	Cauliflower and Brocc Damage	B16		$2,669	$2,669	$2,669	$2,669	$2,669	0
Total Production and Net Income Loss, Raspberries	Raspberry Damage	B16		$29,697	$29,697	$29,697	$29,697	$29,697	0

@RISK Output Results

Performed By: Shimabukuro, Timi R CIV USARMY CESPK (US)
Date: Wednesday, December 20, 2017 11:17:58 AM

Name	Worksheet	Cell	Graph	Min	Mean	Max	5%	95%	Errors
Ag 1 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I13		$13,285,810	$19,358,560	$25,741,970	$15,107,250	$24,158,540	0
Ag 2 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I14		$5,314,271	$6,015,218	$6,731,204	$5,537,800	$6,480,847	0
Ag 3 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I15		$2,760,930	$3,125,093	$3,497,071	$2,877,060	$3,367,002	0
Ag 4 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I16		$817,881	$1,191,722	$1,584,688	$930,010	$1,487,212	0
Ag 5 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I17		$4,136,956	$6,027,898	$8,015,575	$4,704,119	$7,522,524	0
Ag 6 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I18		$16,316,470	$18,468,600	$20,666,900	$17,002,770	$19,898,220	0
Ag 7 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I19		$7,660,023	$8,670,372	$9,702,400	$7,982,219	$9,341,533	0
Ag 8 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I20		$13,700,850	$15,507,980	$17,353,890	$14,277,140	$16,708,430	0
Ag 9 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I21		$5,106,682	$5,780,248	$6,468,267	$5,321,479	$6,227,689	0
Ag 10 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I22		$3,051,554	$3,454,051	$3,865,184	$3,179,908	$3,721,424	0
Ag 11 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I23		$4,463,157	$5,051,843	$5,653,160	$4,650,886	$5,442,899	0
Ag 12 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I24		$5,667,171	$6,414,666	$7,178,198	$5,905,544	$6,911,216	0
Ag 13 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I25		$6,061,590	$6,861,107	$7,677,780	$6,316,553	$7,392,216	0
Ag 14 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I26		$2,200,440	$2,490,676	$2,787,139	$2,292,995	$2,683,476	0
Total 10 Percent Event Damages, Main Stem	MODEL OUTPUTS_Damage per Event	I27		$95,531,420	$108,418,000	$121,563,600	$97,664,430	$116,146,400	0
Ag 1 Tribs, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I35		$1,521,639	$2,217,158	$2,948,258	$1,730,251	$2,766,905	0
Ag 2 Tribs, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I36		$7,037,580	$10,254,360	$13,635,690	$8,002,410	$12,796,940	0
Ag 3 Tribs, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I37		$446,981	$651,290	$866,051	$508,261	$812,778	0
Ag 4 Tribs, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I38		$713,268	$1,039,293	$1,381,996	$811,055	$1,296,987	0
Total 10 Percent Event, Tribs	MODEL OUTPUTS_Damage per Event	I39		$8,559,219	$12,471,510	$16,583,950	$9,732,660	$15,563,840	0
Ag 1 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J13		$13,390,420	$19,510,990	$25,944,670	$15,226,210	$24,348,770	0
Ag 2 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J14		$5,937,037	$6,720,126	$7,520,017	$6,186,760	$7,240,321	0
Ag 3 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J15		$6,539,044	$7,401,537	$8,282,537	$6,814,089	$7,974,480	0
Ag 4 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J16		$2,834,052	$4,129,457	$5,491,130	$3,222,592	$5,153,361	0
Ag 5 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J17		$4,450,794	$6,485,187	$8,623,653	$5,060,983	$8,093,198	0
Ag 6 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J18		$16,814,680	$19,032,520	$21,297,950	$17,521,940	$20,505,800	0
Ag 7 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J19		$9,216,938	$10,432,640	$11,674,430	$9,604,621	$11,240,220	0

Ag 8 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J20		$16,212,680	$18,351,110	$20,535,430	$16,894,610	$19,771,650	0
Ag 9 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J21		$5,770,966	$6,532,150	$7,309,667	$6,013,704	$7,037,795	0
Ag 10 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J22		$3,051,554	$3,454,051	$3,865,184	$3,179,908	$3,721,424	0
Ag 11 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J23		$4,774,540	$5,404,297	$6,047,567	$4,975,367	$5,822,636	0
Ag 12 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J24		$6,518,285	$7,378,040	$8,256,243	$6,792,457	$7,949,164	0
Ag 13 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J25		$6,891,945	$7,800,985	$8,729,530	$7,181,834	$8,404,848	0
Ag 14 Main Stem, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J26		$2,511,823	$2,843,130	$3,181,546	$2,617,476	$3,063,213	0
Total 4 Percent Event Damages, Main Stem	MODEL OUTPUTS_Damage per Event	J27		$110,632,900	$125,476,200	$140,552,500	$113,054,400	$134,286,000	0
Ag 1 Tribs, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J35		$2,215,887	$3,228,736	$4,293,400	$2,519,678	$4,029,306	0
Ag 2 Tribs, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J36		$11,450,330	$16,684,110	$22,185,640	$13,020,140	$20,820,960	0
Ag 3 Tribs, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J37		$637,186	$928,435	$1,234,583	$724,543	$1,158,642	0
Ag 4 Tribs, 4 Percent Event Damages	MODEL OUTPUTS_Damage per Event	J38		$3,109,850	$4,531,317	$6,025,501	$3,536,200	$5,654,863	0
Total 4 Percent Event, Tribs	MODEL OUTPUTS_Damage per Event	J39		$13,666,220	$19,912,850	$26,479,040	$15,539,810	$24,850,270	0
Ag 1 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K13		$13,399,930	$19,524,850	$25,963,090	$15,237,020	$24,366,060	0
Ag 2 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K14		$6,061,590	$6,861,107	$7,677,780	$6,316,553	$7,392,216	0
Ag 3 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K15		$7,307,122	$8,270,924	$9,255,406	$7,614,474	$8,911,164	0
Ag 4 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K16		$2,967,196	$4,323,458	$5,749,102	$3,373,989	$5,395,465	0
Ag 5 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K17		$4,536,386	$6,609,902	$8,789,493	$5,158,310	$8,248,836	0
Ag 6 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K18		$16,856,200	$19,079,520	$21,350,540	$17,565,210	$20,556,440	0
Ag 7 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K19		$9,964,257	$11,278,530	$12,621,010	$10,383,370	$12,151,590	0
Ag 8 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K20		$16,918,480	$19,150,010	$21,429,420	$17,630,100	$20,632,380	0
Ag 9 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K21		$6,372,973	$7,213,562	$8,072,187	$6,641,033	$7,771,953	0
Ag 10 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K22		$3,238,384	$3,665,523	$4,101,828	$3,374,597	$3,949,266	0
Ag 11 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K23		$5,044,405	$5,709,757	$6,389,385	$5,256,583	$6,151,741	0
Ag 12 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K24		$7,141,051	$8,082,949	$9,045,056	$7,441,418	$8,708,638	0
Ag 13 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K25		$7,182,569	$8,129,942	$9,097,643	$7,484,682	$8,759,269	0
Ag 14 Main Stem, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K26		$2,636,376	$2,984,112	$3,339,308	$2,747,268	$3,215,108	0
Total 2 Percent Event Damages, Main Stem	MODEL OUTPUTS_Damage per Event	K27		$115,508,900	$130,884,100	$146,400,700	$117,963,100	$139,868,800	0

Ag 1 Tribs, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K35		$2,558,255	$3,727,597	$4,956,758	$2,908,984	$4,651,859	0
Ag 2 Tribs, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K36		$13,751,810	$20,037,560	$26,644,880	$15,637,140	$25,005,910	0
Ag 3 Tribs, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K37		$751,309	$1,094,722	$1,455,702	$854,311	$1,366,159	0
Ag 4 Tribs, 2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	K38		$3,385,647	$4,933,177	$6,559,873	$3,849,808	$6,156,364	0
Total 2 Percent Event, Tribs	MODEL OUTPUTS_Damage per Event	K39		$16,310,070	$23,765,160	$31,601,630	$18,546,120	$29,657,760	0
Ag 1 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L13		$13,409,440	$19,538,700	$25,981,520	$15,247,830	$24,383,350	0
Ag 2 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L14		$6,103,108	$6,908,101	$7,730,368	$6,359,817	$7,442,848	0
Ag 3 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L15		$7,493,952	$8,482,396	$9,492,050	$7,809,163	$9,139,006	0
Ag 4 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L16		$3,024,257	$4,406,602	$5,859,662	$3,438,873	$5,499,224	0
Ag 5 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L17		$4,583,937	$6,679,188	$8,881,626	$5,212,380	$8,335,302	0
Ag 6 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L18		$16,897,720	$19,126,510	$21,403,130	$17,608,470	$20,607,070	0
Ag 7 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L19		$10,358,680	$11,724,970	$13,120,590	$10,794,380	$12,632,590	0
Ag 8 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L20		$17,229,860	$19,502,460	$21,823,830	$17,954,580	$21,012,120	0
Ag 9 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L21		$6,622,079	$7,495,525	$8,387,712	$6,900,617	$8,075,743	0
Ag 10 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L22		$3,383,696	$3,830,002	$4,285,884	$3,526,021	$4,126,477	0
Ag 11 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L23		$5,210,476	$5,897,733	$6,599,736	$5,429,639	$6,354,268	0
Ag 12 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L24		$7,535,469	$8,529,390	$9,544,637	$7,852,427	$9,189,638	0
Ag 13 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L25		$7,369,399	$8,341,415	$9,334,287	$7,679,370	$8,987,112	0
Ag 14 Main Stem, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L26		$2,677,894	$3,031,106	$3,391,896	$2,790,532	$3,265,739	0
Total 1 Percent Main Stem	MODEL OUTPUTS_Damage per Event	L27		$117,861,600	$133,494,100	$149,224,400	$120,435,800	$142,564,400	0
Ag 1 Tribs, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L35		$2,710,419	$3,949,313	$5,251,584	$3,082,009	$4,928,550	0
Ag 2 Tribs, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L36		$15,806,020	$23,030,730	$30,625,020	$17,972,980	$28,741,230	0
Ag 3 Tribs, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L37		$865,432	$1,261,009	$1,676,822	$984,080	$1,573,677	0
Ag 4 Tribs, 1 Percent Event Damages	MODEL OUTPUTS_Damage per Event	L38		$3,490,259	$5,085,606	$6,762,566	$3,968,763	$6,346,589	0
Total 1 Percent Event, Tribs	MODEL OUTPUTS_Damage per Event	L39		$18,516,440	$26,980,040	$35,876,610	$21,054,990	$33,669,780	0
Ag 1 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M13		$13,418,950	$19,552,560	$25,999,950	$15,258,650	$24,400,640	0
Ag 2 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M14		$6,103,108	$6,908,101	$7,730,368	$6,359,817	$7,442,848	0
Ag 3 Main Stem, .3 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M15		$7,535,469	$8,529,390	$9,544,637	$7,852,427	$9,189,638	0

Ag 4 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M16	3.00m 6.00m	$3,081,319	$4,489,745	$5,970,222	$3,503,758	$5,602,983	0
Ag 5 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M17	4.50m 9.00m	$4,631,489	$6,748,475	$8,973,759	$5,266,451	$8,421,767	0
Ag 6 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M18	16.50m 21.50m	$16,918,480	$19,150,010	$21,429,420	$17,630,100	$20,632,380	0
Ag 7 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M19	11.00m 14.00m	$11,043,720	$12,500,370	$13,988,280	$11,508,240	$13,468,010	0
Ag 8 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M20	17.50m 22.50m	$17,707,310	$20,042,890	$22,428,580	$18,452,120	$21,594,380	0
Ag 9 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M21	6.80m 8.80m	$6,808,909	$7,706,997	$8,624,355	$7,095,306	$8,303,585	0
Ag 10 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M22	3.60m 4.70m	$3,674,320	$4,158,959	$4,653,997	$3,828,869	$4,480,898	0
Ag 11 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M23	5.40m 7.00m	$5,521,859	$6,250,187	$6,994,142	$5,754,120	$6,734,005	0
Ag 12 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M24	8.00m 10.50m	$8,075,200	$9,140,311	$10,228,280	$8,414,859	$9,847,849	0
Ag 13 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M25	7.50m 10.00m	$7,701,540	$8,717,366	$9,754,987	$8,025,483	$9,392,164	0
Ag 14 Main Stem, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M26	2.70m 3.50m	$2,760,930	$3,125,093	$3,497,071	$2,877,060	$3,367,002	0
Total .2 Percent Event Damages, Main Stem	MODEL OUTPUTS_Damage per Event	M27	120m 155m	$121,046,800	$137,020,500	$153,026,900	$123,797,200	$146,194,000	0
Ag 1 Tribs, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M35	2.50m 6.00m	$2,919,645	$4,254,172	$5,656,969	$3,319,919	$5,308,999	0
Ag 2 Tribs, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M36	16m 36m	$17,584,440	$25,622,030	$34,070,800	$19,995,210	$31,975,050	0
Ag 3 Tribs, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M37	0.80m 1.70m	$874,942	$1,274,866	$1,695,248	$994,894	$1,590,971	0
Ag 4 Tribs, .2 Percent Event Damages	MODEL OUTPUTS_Damage per Event	M38	3.00m 7.00m	$3,490,259	$5,085,606	$6,762,566	$3,968,763	$6,346,589	0
Total .2% Event, Tribs	MODEL OUTPUTS_Damage per Event	M39	20m 40m	$20,504,080	$29,876,200	$39,727,770	$23,315,130	$37,284,050	0
Weighted Damage/Acre (Less Strawberry Intensive Areas)	Damage per Acre	D29	10,000 22,000	$11,058	$16,113	$21,426	$12,575	$20,108	0
Weighted Damage/Acre (Strawberry Intensive Areas)	Damage per Acre	D39	24,000 31,000	$24,138	$27,322	$30,574	$25,154	$29,437	0
Total Expected Damages/Acre Strawberries	Damage per Acre	E9	20,000 22,500	$20,165	$21,081	$22,413	$20,308	$22,072	0
Total Expected Damages/Organic Strawberries	Damage per Acre	E10	57,500 60,500	$57,863	$58,779	$60,111	$58,006	$59,770	0
Total Expected Damages/Acre Head Lettuce	Damage per Acre	E11	2,500 5,500	$2,952	$3,869	$5,201	$3,095	$4,859	0
Total Expected Damages/Acre Leaf Lettuce	Damage per Acre	E12	3,000 6,000	$3,407	$4,323	$5,656	$3,550	$5,314	0
Total Expected Damages/Acre Raspberries	Damage per Acre	E13	30,000 33,000	$30,281	$31,198	$32,530	$30,424	$32,188	0
Total Expected Damages/Acre Cauliflower	Damage per Acre	E14	2,000 5,000	$2,405	$3,321	$4,654	$2,548	$4,312	0
Strawberry Production & Net Income Loss per Acre	Strawberry Damage	B16	20,000 24,500	$22,351	$22,351	$22,351	$22,351	$22,351	0
Strawberry Production & Net Income Loss per Acre	Org Strawberry Damage	B16	21,000 26,000	$23,529	$23,529	$23,529	$23,529	$23,529	0
Total Production and Net Income Loss, Head Lettuce	Head Lettuce Damage	B16	2,600 3,200	$2,902	$2,902	$2,902	$2,902	$2,902	0

Total Production Cost and Net Income Loss, Leaf Lettuce	Leaf Lettuce Damage	B16		$3,403	$3,403	$3,403	$3,403	$3,403	0
Total Production and Net Income Loss, Caul and Brocc	Cauliflower and Brocc Damage	B16		$2,669	$2,669	$2,669	$2,669	$2,669	0
Total Production and Net Income Loss, Raspberries	Raspberry Damage	B16		$29,697	$29,697	$29,697	$29,697	$29,697	0

ATTACHMENT 2

Agricultural Model

Planning Model Documentation

Last Update: February 18, 2016

Model Name

Pajaro River GRR Agricultural Damage Model

Functional Area

Flood Risk Management – Agricultural Economics

Model Proponent

USACE, San Francisco District (SPN)

Model Developer

USACE, San Francisco District (SPN)

Point of Contact:
XXXXX

Contents

Tables

Figures

1) Background

a) Purpose of Model

The spreadsheet model is intended to estimate the event-based damage to agricultural crops in the floodplain of the main stem and tributaries of the Pajaro River, located between Santa Cruz County and Monterey County in California. The event-based (annual exceedence probabilities of 10%, 4%, 2%, 1%, and .2%) damages – with uncertainty – are estimated with uncertainty in the spreadsheet model, and then entered into the feasibility study's HEC-FDA model as aggregate exceedence probability-damage functions for the appropriate economic or planning area. The agricultural damage estimated in the model is one of several categories of damage included in the feasibility study.

This model is solely intended for use in the Pajaro General Reevaluation Report (GRR).

Because the input data (price, yield, production cost, etc.) and the underlying assumptions about crop damage are so important to the results of the analysis, the agricultural damage analysis component of the flood damage analysis report underwent Agency Technical Review (ATR) by a USACE technical specialist in agricultural economics in August of 2011. The model and model documentation reflect the outcome of this review process. The model was updated in 2015 and early 2016. Changes made to the model include the addition of organic strawberries, and the combining of cauliflower and broccoli, and the update of all price, cost, and yield data. The changes made within each tab are summarized in the "Explanation" text box at the top of each tab. Some changes were made to simplify the modeling. For example, whereas the previous version used a cumulative distribution to define the range of net income for the strawberry crop, the updated version uses the mean of the net income in the two counties over the most recent five years of data. This update was made so that a) it was more easily explained and more easily understood by all parties concerned, and b) more easily updated over time as appropriate.

b) Model Description & Depiction

In order to estimate flooding damage to agriculture in the study area, it was necessary to develop a spreadsheet model that could incorporate the numerous variables and that would provide a risk-based estimate of flood damage that could then be incorporated into the study's broader FDA model. To this end, a spreadsheet model was created with MS Excel, which uses the @Risk program produced by Palisade, Inc. to run simulations that incorporate the uncertainty as defined by the specified distributions.

The model consists of a series of spreadsheets in a single MS Excel workbook. The first worksheet is an explainer page, which identifies some of the most important assumption. At the top of each of the worksheets is a brief explanation of the intention and construction of the worksheet. Not all of the worksheets in the workbook are directly used in the model simulations; several contain data for reference only. Within each of the worksheets that are directly a part of the simulation, there is a legend that is intended to help the reviewer understand the nature of the data in each of the model's cells (see Figure 1 below).

	= Risk Output
Green Bold	= Risk Distribution
Orange	= Lookup
Red	= Simple Calculation
Black	= Direct Value Input

Figure 1: Model Legend

There are @Risk outputs in many of the spreadsheets, but the main results are contained in the 'Event Damages Report' worksheet.

While there are some differences in the way the expected total damage for the different crops was calculated, the basic construction is the same. Understanding one of the crops will generally enable the reviewer to understand the construction and mechanics of the other crops. Since the most important crop (by far) in the floodplain is strawberry, special attention should be paid to those worksheets that apply specifically to the strawberry crop. The figure below shows a screen capture of part of the strawberry (conventional) damage worksheet.

Strawberries

Explanation: This sheet displays the production investment and net income associated with a single acre of strawberries. The Production Investment Loss is calculated based on the cumulative cash outlay at each month and considering the probability of flooding in each month; this number is carried forward to the Summary of per Acre tab. Assumption: 11 lbs / tray used to convert County Crop Report data to terms that are consistent with the UCCE report data on net income per acre. The price data is in 2010 dollars, and there is an update factor in place to make future year updates easier. **2015 UPDATE**: The 2010 UCCE Report is the most recent for non-organic strawberries. The Prices Paid Index is used to update the producction cost and loss estimate. Price and Yield data have been updated to include the newest data from the Counties through 2014.

	= Risk Output
Green Bold	= Risk Distribu
Orange	= Lookup
Red	= Simple Calcu
Black	= Direct Value

Results - Production Investment & Net Income Loss		
Production Investment Losses ($2010)	$8,935	Weighted value based on probability of flooding
Production Cost Update Factor	1.31	Prices Paid Index 2015/2010
Production Investment Losses ($2015)	$11,706	Product of 2010 production loss and cost update factor
Net Income Loss Per Acre ($2010), Most Recent 5 Years	$8,983	Average of the 2 Counties (Ranging Analysis)
Net Income Update Factor	1.15	SF SJ CPI Urban Consumers
Net Income Loss Per Acre ($2015)	$10,308	Product of Net Income Loss and Net Income Update Factor
TOTAL ANNUAL LOSS	$22,014	Only includes production investment loss and net income loss

Production Investment by Month, and Losses Based on the Probability of Flooding

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Total Cash Costs Minus Overhead (UCCE 2010)	$5,264	$8,229	$8,360	$8,530	$8,700	$8,871	$9,423	$10,187						
Prob of Flooding (USACE)	0.00	0.02	0.04	0.12	0.20	0.39	0.17	0.06	0.00	0.00	0.00	0.00	0.00	
Weighted Production Losses	$0	$165	$334	$1,024	$1,740	$3,460	$1,602	$611	$0	$0	$0	$0	$0	$8,935

Figure 2: Screen Capture – Strawberry Damage Worksheet

The following is a listing of the sequential calculations performed by the model for an iteration of the simulation:

1. Estimate the weighted value of ***direct production loss*** per acre for each crop, considering monthly production costs and the relative probability of flooding in each month

2. Estimate the ***net income loss*** per year per acre for each crop

3. Estimate the ***cleanup cost*** per acre

5. Depending on the (exogenously determined) overall cropping pattern (either about half strawberries or nearly all strawberries), determine the actual ***cropping pattern*** from the specified distributions, which results in an estimate of the total damage per acre weighted by the cropping pattern

5. Estimate the ***total damage*** for each agricultural area and for each of the five flood events modeled by multiplying the total damage per acre by the total planted acreage estimated to get flooded during each event (10%, 4%, 2%, 1%, .2% annual exceedence probability).

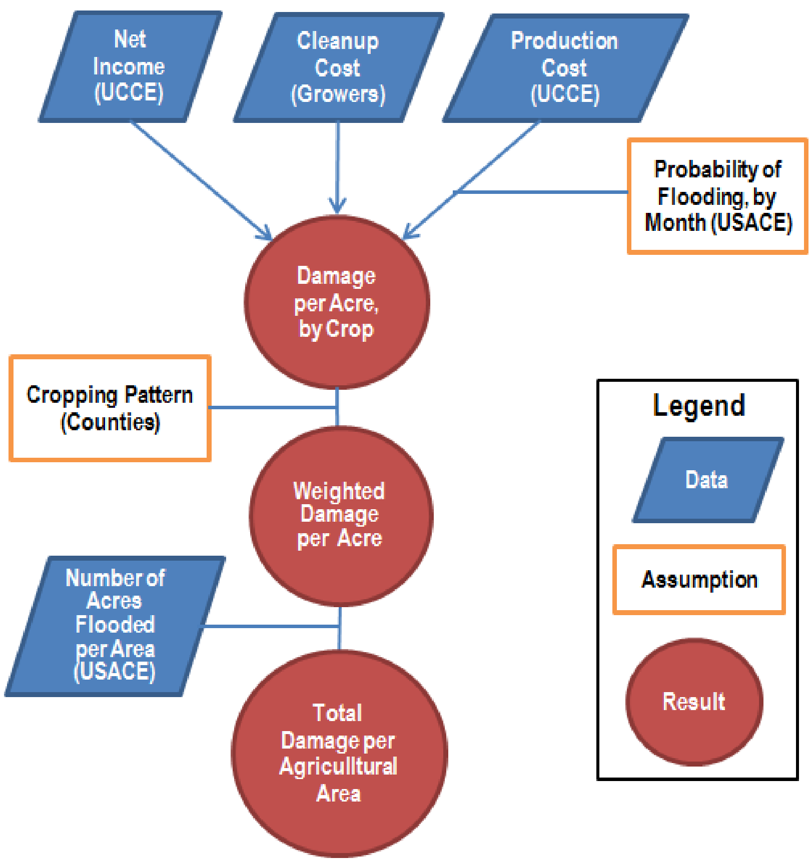


Figure 3: Flowchart of Model Construction

Additional details are provided below on each of the major model components that are listed above.

Direct Production Cost (Loss)

This is an estimate of the production investment loss per acre for each crop, which is a function of the type of crop(s) and the month that a flood occurs. The source of the production cost data for each crop is the University of California Cooperative Extension (UCCE) Cost and Return Studies (http://coststudies.ucdavis.edu/current.php). The direct production cost applied is calculated as the cumulative production cost weighted by the probability of flooding in each month. Direct production investment costs are those costs needed to bring the product to market and include pre-harvest costs (e.g., land preparation, fertilizer application, equipment costs, labor costs, seed, planting, etc.) but do not include variable harvest costs. The date of the UCCE data for each crop varies, and so the price updates are taken from the USDA's National Agricultural Statistics Service.

Table 1 is an example of how the weighted production loss is calculated for a particular crop. Since the probability of a flood event between May and September is zero, these months are not shown here. The maximum direct production loss for each crop is a single year's weighted loss since, even in cases where multiple growing seasons are lost to the consequences of a flood, no direct production cost will be incurred for the second season because there will be no expectation of bringing a crop to harvest that year.

Table 1: Example of Weighted Production Loss Calculation

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total
Total Cash Costs/Acre Minus Overhead	$5,264	$8,229	$8,360	$8,530	$8,700	$8,871	$9,423	$10,187	
Prob. of Flooding (USACE)	0	0.02	0.04	0.12	0.2	0.39	0.17	0.06	
Weighted Production Losses	$0	$165	$334	$1,024	$1,740	$3,460	$1,602	$611	**$8,935**

This is not a risk-based estimate.

Relative Probability of Flooding, by Month

This is an estimate of the relative monthly probability of flooding, as provided by the USACE Water Resources Section engineers. Probabilities were determined by examining peak annual flow records for the Pajaro River for the past 56 years. Figure 5 shows the probabilities assigned to each month. It should be interpreted as follows: For example, if a flood event were to occur, the chance that it would be in January is 20%, February 39%, and so on.

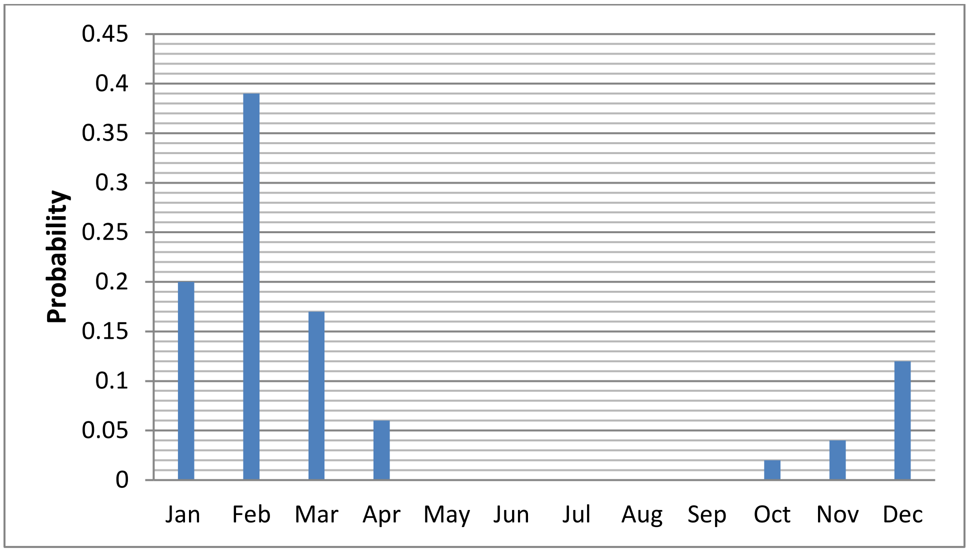


Figure 4: Relative Monthly Probability of Flooding

This is not a risk-based estimate.

Net Income Loss

This is an estimate of the net income loss per acre for each crop, which is taken from the UCCE Cost and Return Studies. Income losses represent net income plus fixed costs related to land, labor and management, as well as pre-harvest and post-harvest activities; it is the difference between the maximum damageable value of a crop (average price multiplied by average yield) and direct production investment costs. For example, for the calculation of net income loss for the strawberry crop, the net return tables from the UCCE report were used. As explained previously, the net return tables are part of what the UCCE calls a Ranging Analysis, which is shown in 2. Data for yields of 4,500, 5,500, and 6,500 were interpolated in order to make the estimates of net income using the annual county data more precise.

Table 2: Net Return per Acre above Cash Costs, Conventional Strawberries

	Yield (trays per acre)						
$/Tray	4,000	4,500	5,000	5,500	6,000	6,500	7,000
$6.30	-$12,296	-$11,609	-$10,921	-$10,233	-$9,544	-$8,857	-$8,169
$6.80	-$10,296	-$9,359	-$8,421	-$7,483	-$6,544	-$5,607	-$4,669
$7.30	-$8,296	-$7,109	-$5,921	-$4,733	-$3,544	-$2,357	-$1,169
$7.80	-$6,296	-$4,859	-$3,421	-$1,983	-$544	$894	$2,331
$8.30	-$4,296	-$2,609	-$921	$768	$2,456	$4,144	$5,831
$8.80	-$2,296	-$359	$1,579	$3,518	$5,456	$7,394	$9,331
$9.30	-$296	$1,892	$4,079	$6,268	$8,456	$10,644	$12,831
$9.80	$1,704	$4,142	$6,579	$9,018	$11,456	$13,894	$16,331
$10.30	$3,704	$6,392	$9,079	$11,768	$14,456	$17,144	$19,831
$10.80	$5,704	$8,642	$11,579	$14,518	$17,456	$20,394	$23,331
$11.30	$7,704	$10,892	$14,079	$17,268	$20,456	$23,644	$26,831
$11.80	$9,704	$13,142	$16,579	$21,448	$23,456	$26,894	$30,331
$12.30	$11,704	$15,392	$19,079	$25,629	$26,456	$30,144	$33,831

Source: UCCE 2010 Ranging Analysis; 11 lbs. per tray assumed

In order to estimate future net income per acre for the strawberry crop, the historical prices and yields reported by each of the counties was combined with the net return estimates from the 2010 UCCE report. County data for the years 2010-2014 was used. The combination of the recent historical price and yield data and the Ranging Analysis data results in the net income estimate for the strawberry crop.

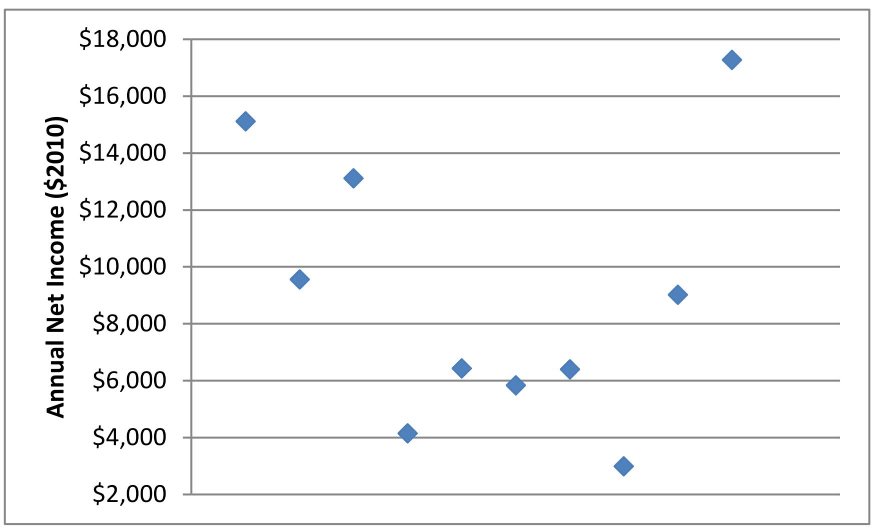


Figure 5: Estimated Annual Net Income per Acre, Strawberry

Figure 5 shows the estimated net income to each acre of conventional strawberry crop between 2010 and 2014 for both counties when combining the historical data and the Ranging Analysis table. The average net income per acre over those years was $8,983 in 2010 dollars, which equates to $10,308 in 2015 dollars.[1]

For head lettuce, the combination of county data on price and yield combined with the UCCE ranging analysis resulted in mostly negative net returns per acre between 2000 and 2014. While lettuce is a low margin crop and profitability is more sensitive to price and yield than the strawberry crop, the negative results are at odds with reports from local growers. For this reason, the assumptions on average price and yield from the UCCE report were used to estimate net income. At a yield of 800 and a price per carton of $12 (in 2009 dollars), according to the UCCE report for head lettuce (University of California Cooperative Extension, 2009), the annual net return to an acre of head lettuce is estimated to be $717 in 2009 dollars, and $834 in 2015 dollars.

For leaf lettuce, the combination of county data and UCCE ranging analysis resulted in what appear to be reasonable estimates of annual net income per acre that are generally consistent with reports from local growers. Using the five most recent years (2010-2014) of county data on price and yield, the estimated net return per acre is $988 in 2009 dollars, and $1,149 in 2015 dollars. That leaf lettuce has a slightly greater expected net return than head lettuce is consistent with statements for this study that were made by local farmers.

Although they constitute a very small percentage of the crops planted in the floodplain, three additional crops were included in the analysis of flood damage to agriculture. How these crops were incorporated in the analysis is described below.

Raspberries: According to the UCCE Report (University of California Cooperative Extension, 2012) for raspberries, raspberries are a two-year crop: established plus a two-year production cycle. Since the establishment costs are incurred with the expectation of a two-year return to the crop, for the DPI loss estimate the establishment costs were split between Year 1 and Year 2. The estimate of DPI is an average of the two years as described and estimated in the UCCE Report. The average DPI loss is estimated to be $3,915 in 2015 dollars.

According to the UCCE Report, the return to an acre of raspberries is expected to be higher in the second production year primarily due to higher yields. The UCCE Report assumes net income is approximately 22% greater in Production Year 2 compared to Production Year 1. Using the county data on price and yield for the years 2010-2014, the annual net return from the Ranging Analysis for Production Year 1 is estimated to be $20,869 in 2012 dollars, or $22,747 in 2015 dollars. Averaging this value with a Production Year 2 that is 22% greater results in a net income loss per acre estimate of $23,165 in 2012 dollars, or $25,230 in 2015 dollars.

Cauliflower and Broccoli: The most recent UCCE Sample Cost reports for cauliflower and broccoli are from 2001. While not exactly the same, the production cost and the returns to cauliflower and

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[1] Inflated using Series the Consumer Price Index – All Urban Consumers, San Francisco-Oakland-San Jose, CA MSA, Series ID: CUUSA422SA0

broccoli are very similar, and for practical purposes they have been combined in the analysis. The DPI loss is estimated to be $806 in 2001 dollars, or $1,654 in 2015 dollars. Using the most recent five years of data reported for cauliflower by Monterey County (the Santa Cruz crop report combines cauliflower and broccoli with other miscellaneous vegetables), the net income loss per acre is estimated to be $720 in 2001 dollars, or $990 in 2015 dollars.

Cleanup & Reconditioning Cost

This is an estimate of the cleanup and reconditioning cost following a flood. The source of this data is discussions with local growers about their experience following prior flood events. The same cleanup/reconditioning cost was applied to every flooded acre, regardless of crop planted. Figure 6 shows that the cost per acre is defined as a triangular distribution, with a minimum of $500, a most-likely value of $1,000, and a maximum value of $3,000.

This is a risk-based estimate.

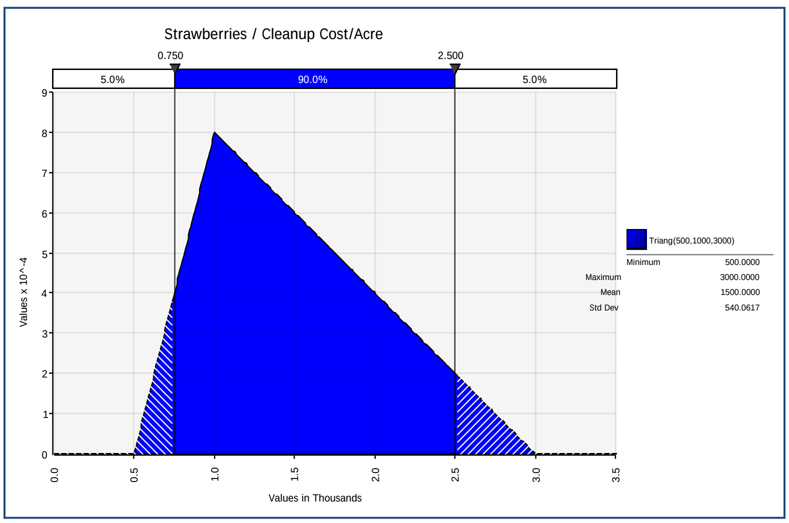


Figure 6: Example of Cleanup Cost Distribution

Adding to the uncertainty and complexity of the damage estimate is the fact that there are some scenarios that, while of relatively low probability, could have very significant adverse impacts on the ability to grow crops and serious long-term impacts to the community and region. For example, local growers have stated that the impact of previous floods varied widely across the floodplain, and depended on factors such as the amount of sedimentation left on the land, the degree of scouring caused by flood waters, and whether or not contaminants or viruses were deposited on the land as a result of the flood. Many of these factors are difficult to incorporate into the damage model because very little is understood about the overall likelihood and more specific spatial likelihood – will it occur, and if so where?

The local growers have stated that scouring of the land has caused significant impacts and that in some cases multi-year impacts were experienced. For example, the 1995 flood caused significant scouring of a large agricultural area as a result of high velocity flows caused by a levee breach. Whereas the damage to agricultural land from slower-moving “up and down” type flooding is generally expected to be limited to damage to the current planted crops and some land cleanup/reconditioning cost, high-velocity scouring flows have caused such significant damage to the land that multiple planting seasons were lost. Under a scenario where scour does occur, no traditional production investment (and thus loss) is expected to be incurred during the second year of impacts; however, a second year of net income loss is incurred.

However, this risk is believed to be limited to relatively small areas near future levee breach locations, and too little is known about the likelihood and extent of such damage that this factor was not included in the damage model. Not including the multi-year impact variable was a recommendation and result that came out of the Agency Technical Review process.

Cropping Pattern

This is an estimate of the future cropping pattern in the floodplain, which is based on historical and current information as provided by the Monterey and Santa Cruz County Agricultural Commissioners’ Offices. The strawberry crop is – and is expected to continue to be – the predominant crop in the floodplain. While the strawberry crop has grown in prevalence and importance in the study are over the last many years, no prediction or assumption of further strawberry crop prevalence is incorporated in the model.

Each acre of land is assumed to be either 50% strawberries, or 90% strawberries, depending on its location in the floodplain. County ranch maps and discussions with local growers provided the information for this distinction. From discussions with local growers and historical reports (Pajaro Valley Water Management Agency – PVWMA, ‘*Estimating Economic Impacts to Agricultural Production*’), it was estimated that at any one time 14% of the land would be unplanted. In a model simulation, once the strawberry percentage is assigned, the percentage assigned to other crops is calculated and applied. Between the non-strawberry crops, the relative proportions are constant. For example, once the percentage for strawberries is determined by the simulation, the percentage for head lettuce, leaf lettuce, raspberries, broccoli, and cauliflower would make up 35/78, 10/78, 5/78, 14/78, and 14/78 of the remainder. Figure 8 below shows the distribution for strawberry percentage in those areas where strawberries are expected to comprise about half of the planted crop.

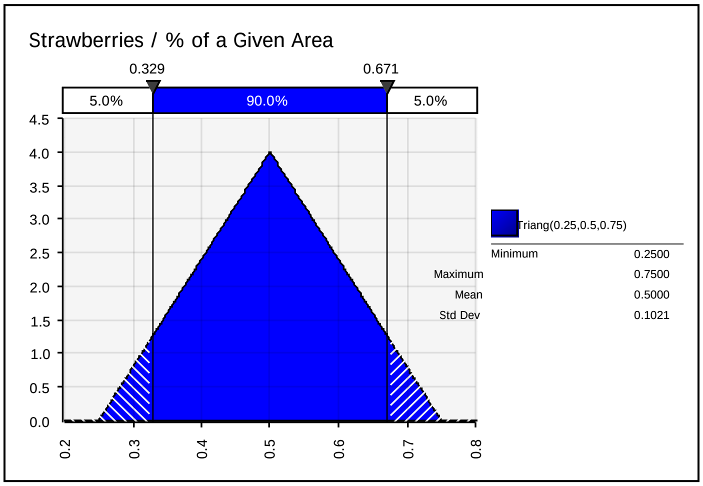


Figure 7: Example of Cropping Pattern Distribution

This is a risk-based estimate.

Acreage Flooded, by Event, by Reach

This is an estimate of total acreage inundated for the range of annual exceedence probabilities: 10%, 4%, 2%, 1%, .2%. The acreage of agricultural land inundated in each reach for these events was estimated by calculating the area within ArcGIS using geospatially-referenced floodplains that were produced by the team's Hydraulic Engineers. Table 3 below is copied from the model for the sake of demonstration.

Table 3: Example of Acreage by Event and Reach

Ag Reach	Number of Acres by Annual Probability Event				
	10%	4%	2%	1%	0.20%
1	1,397	1,408	1,409	1,410	1,411
2	256	286	292	294	294
Total	**1,653**	**1,694**	**1,701**	**1,704**	**1,705**

The actual planted/cultivated acreage applied in the model is slightly lower to account for unplanted land (see the discussion in the Cropping Pattern section below).

This is not a risk-based estimate.

Total Damage per Annual Exceedence Probability Event

When the model is run, the result for each agricultural impact area considers the following: the cropping pattern in the area based on historical data, the production investment at the time of a flood, the net income lost from either one or two years of flood impacts (depending on the risk assigned to the area), the cleanup and reconditioning cost, and the total acreage in that area in the floodplain for each of the five events analyzed. The worksheet named 'Damage per Frequency Event' includes the output cells of the model.

The results for each area for each event are then input into the HEC-FDA model, which then incorporates the levee fragility curves and the engineering data, and when run provides an estimate of the expected annual damages from flooding – both without-project and with-project.

c) Contribution to Planning Effort

The results of the model will be an input to the overall HEC-FDA flood damage model that is used to determine the without-project damages, the BCR and net benefits of project alternatives, and to identify the NED alternative. Since the study area has been sub-divided into several planning reaches, and since a bank-by-bank approach is being taken with respect to project formulation and justification, the estimate of damages in each reach is an important part of the planning effort.

d) Description of Output Data

The output of the model is an estimate of the total agricultural flooding damage from the 10%, 4%, 2%, 1%, and .2% annual exceedence probability events for 14 areas flooded by the Pajaro River, and 4 areas flooded by the Salsipuedes and Corralitos creeks that are tributaries to the Pajaro River. This data will be input into the HEC-FDA model as an aggregated stage-damage function by relating the annual exceedence probability to the exterior stage (in the river) for each reach or impact area.

e) Statement on the Capabilities & Limitations of the Model

The model is an attempt to reasonably capture the impact of flooding in the study area, and incorporates risk and uncertainty in all of the major variables. The model uses historical data on prices and yields, and does not attempt to forecast future crop prices, yields, or production costs. Because of the importance of considering seasonality, the IWR procedures manual for estimating agricultural damages recommends separately treating income loss and direct production cost. This is an acknowledged limitation of the model since net income and production cost are correlated.

f) Description of Model Development Process Including Documentation on Testing Conducted

The model development was initiated in 2004 by Economists at the San Francisco District of the Corps of Engineers. While the basic framework of that original spreadsheet model still persists, the model has been updated, improved, and expanded over the course of the last several years as new information was gathered and as time and funding were made available. There has been no official testing of the model.

2) Technical Quality

a) Theory

The model is based on the procedures described in IWR Report 87-R-10 and the risk analysis principles and requirement s from ER 1105-2-101.

b) Description of System Being Represented by the Model

The study area is located in the southern portion of Santa Cruz County and the northern portion of Monterey County in California, and encompasses an area of approximately 10,000 acres. For flood risk management studies such as this, the study area generally corresponds with the extent of the 500-year (.2% annual exceedence probability) floodplain. The area is divided by the Pajaro River, which serves as a border for the two counties. Santa Cruz County lies to the north of the Pajaro River while Monterey County lies to the south of the Pajaro River. There are two urban areas located within the study area: the city of Watsonville in the southern portion of Santa Cruz County (north of the Pajaro River) and the unincorporated town of Pajaro in Monterey County (south of the Pajaro River). The study area contains a significant amount of agricultural acres devoted to high value crops (e.g., strawberries and lettuce) and also includes a significant amount of residential and commercial/industrial structures within the city of Watsonville and the town of Pajaro. Figure 9 is an aerial photograph that shows the study area.

Figure 8: Aerial of Study Area

Prior to the construction of Federal levees along the Pajaro River and its tributaries in 1949, flooding in the area occurred, on average, once every six years. In 1955, only six years after the completion of the levee system, a major flood event breached the levees causing significant flooding and damages. Additional flood events have taken place in 1955, 1958, 1982, 1986, 1995 and 1998. The 1995 breach of the Pajaro River caused significant flooding and damages – estimated at between $50 million and $95 million[2] to both structures and farmland. Figure 9 captures the extent of the flooding from the 1995 event. It shows that the town of Pajaro (center top) and the surrounding agricultural areas were completely inundated.

Figure 9: Flooding from Pajaro River in Monterey County, 1995

Figure 10 shows the extent and depths associated with the 1% floodplain under a system-wide levee failure or overtop. The annual exceedence probability (AEP) in the study area is between 12% and 18%, depending on the reach and bank. Thus, there exists a high risk of flooding in the area.

[2] www.pajarofloodprotection.org

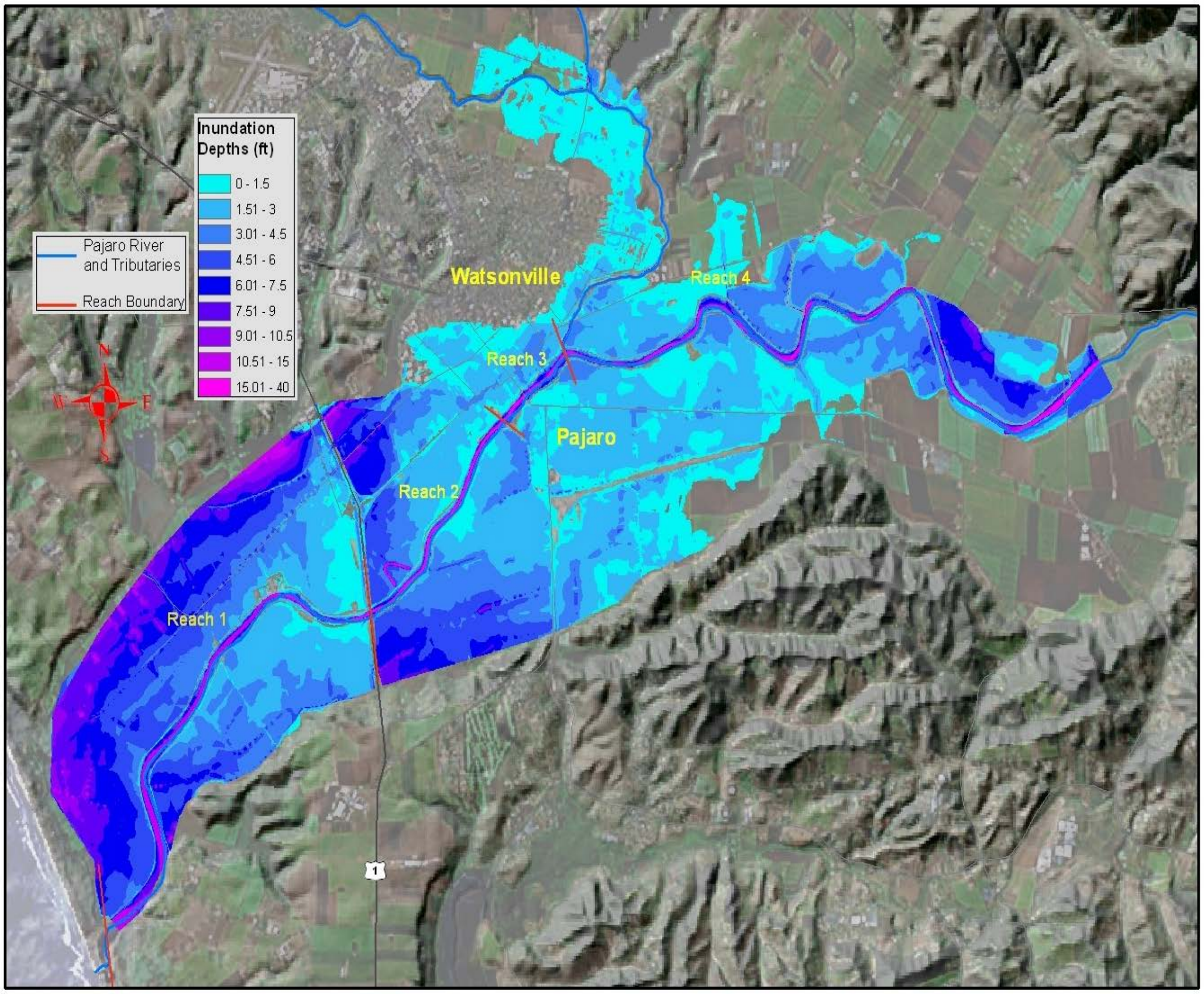


Figure 10: 1% Floodplain Extent and Depths

For purposes of the planning study, the area was divided in several different ways. The main stem floodplain was divided into 14 different areas based on factors such as location, bank, and cropping pattern. The tributary floodplain was divided into four areas. Figure 11 shows how the Pajaro River floodplain was divided into the different areas (please note area 11 is missing a label, but is located to the right of 10), and Table 4 shows the acreage associated with each of the annual probability events for each of the areas.

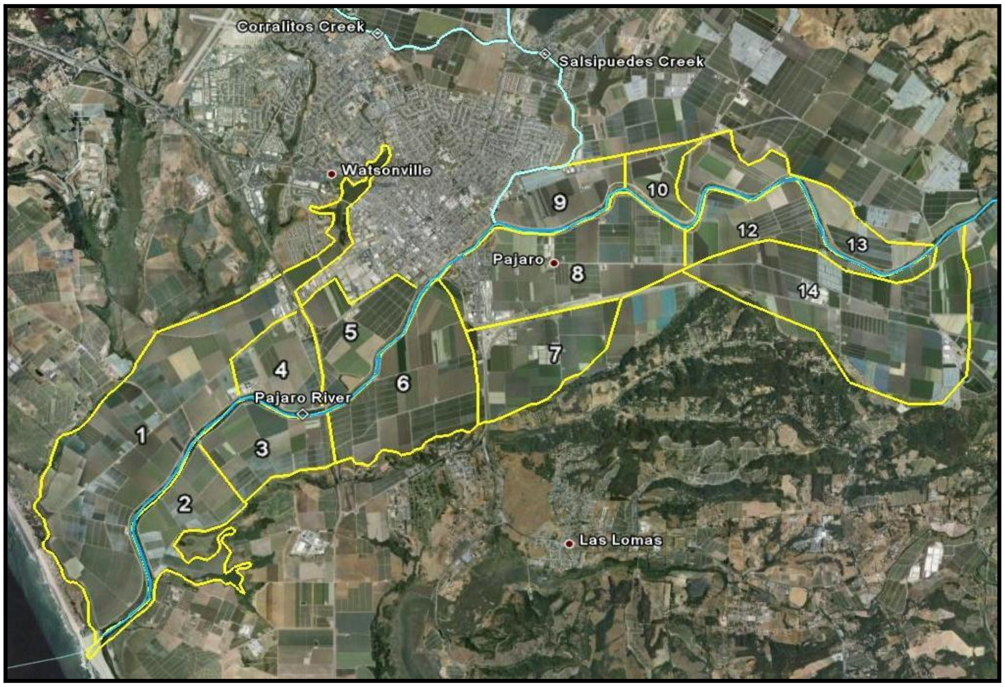


Figure 11: Agricultural Impact Areas – Main Stem Pajaro River

Table 4: Agricultural Acreage by Event, Pajaro River

Ag Reach	Sub Area	Number of Acres by Annual Exceedence Probability Event				
		10%	4%	2%	1%	0.20%
1	D	1,397	1,408	1,409	1,410	1,411
2	A	256	286	292	294	294
3	A	133	315	352	361	363
4	D	86	298	312	318	324
5	F	435	468	477	482	487
6	B	786	810	812	814	815
7	B	369	444	480	499	532
8	B	660	781	815	830	853
9	G	246	278	307	319	328
10	G	147	147	156	163	177
11	G	215	230	243	251	266
12	B	273	314	344	363	389
13	G	292	332	346	355	371
14	B	106	121	127	129	133
Total		**5,401**	**6,232**	**6,472**	**6,588**	**6,743**

Figure 12 shows the general location of the tributary agricultural areas for analysis, and Table 5 shows the acreages associated with each of the annual probability flood events analyzed.

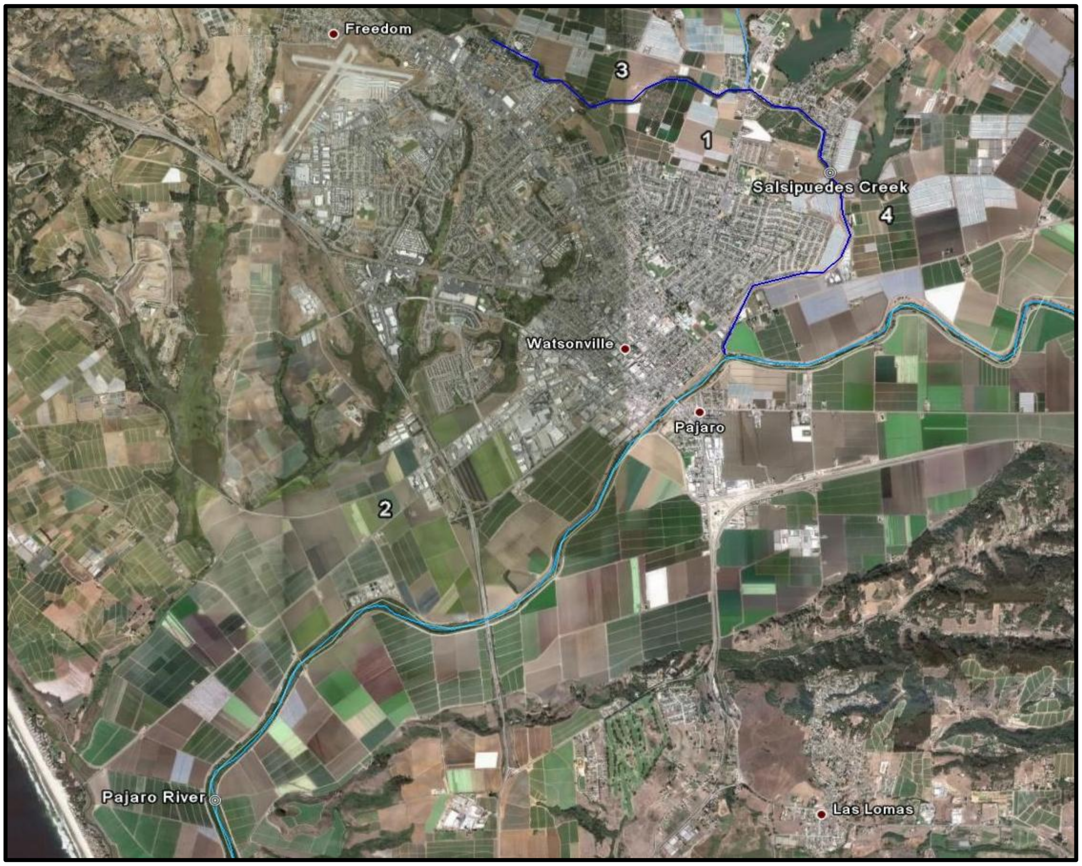


Figure 12: Agricultural Impact Areas, Tributary Reaches

Table 5: Agricultural Acreage by Event, Tributaries

Ag Reach	Sub Area	Number of Acres by Event				
		10%	4%	2%	1%	0.50%
1 (Rt. Corralitos and Salsip.)	**H**	160	233	269	285	307
2 (Rt Wats. and DS HWY 1)	**K**	740	1,204	1,446	1,662	1,849
3 (Left Bank Cor/C. Lake)	**N/A**	47	67	79	91	92
4 (Left Bank Sals)	**N/A**	75	327	356	367	367
Total		**900**	**1,437**	**1,715**	**1,947**	**2,615**

Flooding from the Corralitos and Salsipuedes Creeks is expected to cause agricultural damage to as much as 2,600 acres of farmland on the Santa Cruz side of the study area for the .2% annual exceedence probability flood event.

The agricultural land use in the Pajaro River floodplain is characterized by very intensive cropping. A high percentage of the land is devoted to growing high-value strawberry crops; other major crops include head and leaf lettuce, and other vegetable and fruit crops (e.g., cauliflower, broccoli, and raspberries).

c) Analytical requirements

The results of the model are driven by the historical data inputs and the major assumptions of the model. The most important inputs to the model are production cost and net income data for the type of crops located in the floodplain – most important of all is data on the strawberry crop. The model must implicitly or explicitly define the depth-damage relationship for each of the crops, and in the current version of the model the assumption is that a flooded acre of crop represents a 100% crop loss.

Where good historical data exists, the model estimates historical net income per acre by using lookup formulas that reference net income ranging analysis tables developed by the University of California Cooperative Extension (UCCE). This is the case for the most important crop in the floodplain – strawberry. In this way the model uses actual historical data to develop a distribution of expected future net income per acre for the strawberry crop. The production cost estimates are data driven as well, and are taken from the most recent UCCE report for each crop.

d) Assumptions

- No significant future land use changes in the area that is currently identified as agricultural
- No significant future changes in cropping pattern
- Given the stringent and ever-tightening food safety standards, any flooded crop must be destroyed, and no further planting of a flooded acre will occur for at least one season
- 14% of the land is uncultivated at any given time

e) Conformance with Corps policies and procedures

The model was developed based on the procedures outlined in IWR Report 87-R-10 – *National Economic Development Procedures Manual – Agricultural Flood Damage*, and in accordance with USACE ER 1105-2-101 – *Risk Analysis for Flood Damage Reduction Studies* – which recognizes that, for flood damage reduction studies in agricultural areas, seasonality of flooding and cropping practices are important variables to incorporate in a risk analysis.

f) Identification of Formulas Used in the Model and Proof That the Computations are Appropriate and Done Correctly

There are too many formulas in the model to list here. All of the formulas can be traced within the spreadsheets, and all formulas can be viewed at once by pressing Ctrl and ~ at the same time with the spreadsheet open.

3) System Quality

a) Description and rationale for selection of supporting software tool/programming language and hardware platform

The spreadsheet model was created with MS Excel, and uses the @Risk program produced by Palisade, Inc. to run simulations that incorporate the uncertainty as defined by the specified distributions. No direct programming was done. The @Risk program was chosen because it is a widely-used statistical analysis software packages, it is widely-available and easy to use, the San Francisco District had previous experience using the software, and the District already owned licenses.

b) Proof that the programming was done correctly

No programming was done as part of this model development. Since it is a spreadsheet model, formulas and lookup commands were entered directly into cells. The Monte Carlo simulation reported no errors, and Excel does not report any errors or invalid commands.

c) Availability of software and hardware required by model

Both MS Excel and @Risk are readily available software packages. Both require the purchase of a license before they can be installed and used.

d) Description of process used to test and validate model

The formulas contained in the spreadsheet model were reviewed for accuracy. No errors were reported by the program.

e) Discussion of the ability to import data into other software analysis tools (interoperability issue)

Not applicable: this is a single-use model.

4) Usability

a) Availability of input data necessary to support the model

The primary data source for the model is the Cost and Return Studies produced by the UCCE. The data in the model can easily be updated as new studies are released. The studies are freely available to the public. However, since at this point the model is a single-use, single-study model, the future usability is not particularly relevant.

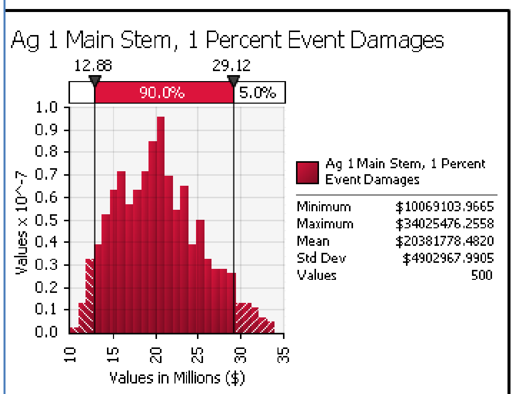
b) Formatting of output in an understandable manner

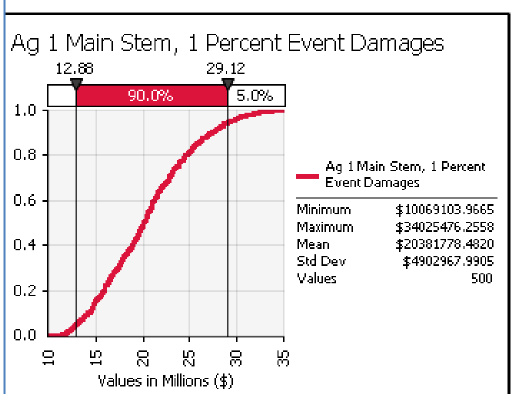
The reporting of the @Risk simulation results can be done in numerous ways, including exporting the results for each of the Output cells to an MS Excel spreadsheet. The results for each designated model output can be shown graphically, in table format, or both. Figures 13 and 14 show examples of one two of the output reporting options using the @Risk program.

@RISK Output Report for Ag 1 Main Stem, 1 Percent Event Damages

Performed By: Mark Daniel Bierman

Date: Tuesday, November 23, 2010 12:50:20 PM





Simulation Summary Information	
Workbook Name	Pajaro Ag Damage Estimation_Sept 2010.xls
Number of Simulations	1
Number of Iterations	500
Number of Inputs	0
Number of Outputs	113
Sampling Type	Latin Hypercube
Simulation Start Time	11/23/10 12:48:59
Simulation Duration	00:00:03
Random # Generator	Mersenne Twister
Random Seed	1455461080

Summary Statistics for Ag 1 Main Stem, 1 Percent Event Damag			
Statistics		Percentile	
Minimum	$10,069,104	5%	$12,880,487
Maximum	$34,025,476	10%	$14,189,839
Mean	$20,381,778	15%	$14,946,145
Std Dev	$4,902,968	20%	$15,842,087
Variance	2.40391E+13	25%	$16,478,779
Skewness	0.363238043	30%	$17,297,510
Kurtosis	2.566368142	35%	$17,962,605
Median	$20,137,171	40%	$18,866,638
Mode	$19,652,780	45%	$19,592,223
Left X	$12,880,487	50%	$20,137,171
Left P	5%	55%	$20,662,050
Right X	$29,119,824	60%	$21,223,220
Right P	95%	65%	$21,839,673
Diff X	$16,239,337	70%	$22,758,317
Diff P	90%	75%	$23,637,774
#Errors	0	80%	$24,478,103
Filter Min	Off	85%	$25,717,403
Filter Max	Off	90%	$27,256,937
#Filtered	0	95%	$29,119,824

Figure 13: Example of Quick Report from @Risk

@RISK Output Results
Performed By: MBierman
Date: Tuesday, February 16, 2016 1:23:47 PM

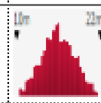
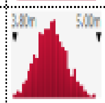
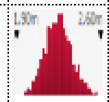
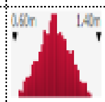
Name	Worksheet	Cell	Graph	Min	Mean	Max
Ag 1 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I13		$10,884,190	**$16,043,970**	$21,390,860
Ag 2 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I14		$3,835,802	**$4,336,921**	$4,925,489
Ag 3 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I15		$1,992,819	**$2,253,166**	$2,558,946
Ag 4 Main Stem, 10 Percent Event Damages	MODEL OUTPUTS_Damage per Event	I16		$670,036	**$987,675**	$1,316,832

Figure 14: Example of Summary Results Table from @Risk

c) Usefulness of results to support project analysis

The results are directly used as inputs to the broader flood damage analysis, and as such are an important part of the project analysis. The mean and standard deviation of each of the primary outputs are input directly into the certified HEC-FDA model.

d) Ability to export results into project reports

The @Risk program allows the export of simulation results directly into spreadsheets, which can easily be cut and pasted into project reports.

e) Training availability

Not applicable. This is a single-use model.

f) Users documentation availability and whether it is user friendly and complete

Not applicable.

g) Technical support availability

Not applicable.

ATTACHMENT 3

Regional Economic Development (RED) Analysis

PAJARO RIVER & TRIBUTARIES
FLOOD RISK MANAGEMENT STUDY
REGIONAL ECONOMIC DEVELOPMENT (RED)

A. INTRODUCTION

In the past, planning studies at the Corps of Engineers have focused primarily on the National Economic Development (NED) account to formulate and evaluate water resource infrastructure projects. In recent years, however, there has been a renewed emphasis on considering the Other Social Effects (OSE), Regional Economic Development (RED), and Environmental Quality (EQ) accounts when making investment decisions, as can be seen in the publication of Engineering Circular (EC) 1105-2-409, "Planning in a Collaborative Environment." EC 1105-2-409 encourages the use of all four accounts in order to develop water resource solutions that are more holistic and acceptable, and which take into account both national and local stakeholder interests.

The following sections describe the OSE assessment developed for the Pajaro River & Tributaries Flood Risk Management General Reevaluation Report (GRR).

B. REGIONAL ECONOMIC DEVELOPMENT (RED)

Purpose and Methodology

The U.S. Army Corps of Engineers (USACE) *Planning Guidance Notebook* (ER 1105-2-100) states that while the National Economic Development (NED) and Environmental Quality (EQ) accounts are required, display of the Regional Economic Development (RED) effects are discretionary. The Corps' NED procedures manual affirms that RED benefits are real and legitimate; however, the concern (from a Federal perspective) is that they are often offset by RED costs in other regions. Nevertheless, for the local community these benefits are important and can help them in making their preferred planning decisions.

Although the RED account is often examined in less detail than NED, it remains useful. For example, Hurricane Katrina caused a significant economic hardship to not just the immediate Gulf Coast but for entire counties, watersheds, and the state of Louisiana. Besides the devastating damage to homes (which are often captured by the NED account), hundreds of thousands of people lost their jobs, property values fell, and tourism and tax revenues declined significantly and were transferred to other parts of the U.S. In this example, the RED account can provide a better depiction of the overall impact to the region.

The distinction between NED and RED is a matter of perspective, not economics. A non-federal partner may consider the impacts at the state, regional, and local levels to be a true measure of a project's impact or benefit, whereas from the Corps' perspective, this may not constitute a national benefit. Gains in RED to one region may be partially or wholly offset by losses elsewhere in the nation. For example, if a Federal project enables a firm to leave one state to relocate to a newly-protected floodplain of another state, the increase in regional income for the project area may come at the expense of the former area's loss. In this case, there is no net increase in the value of the nation's output of goods and services and should be excluded from NED computations.

The following sections describe the impacts of the Tentatively Selected Plan (TSP) from a regional perspective. The impacts were evaluated using the Corps' certified RECONS software.

Key RED Concepts

Econometric analysis allows for the evaluation of a full range of economic impacts related to specific economic activities by calculating effects of the activities in a specific geographic area. These effects are:

- Direct effects, which consist of economic activity contained exclusively within the designated sector. This includes all expenditures made by the companies or organizations in the industry and all employees who work directly for them.
- Indirect effects, which define the creation of additional economic activity that results from linked business, suppliers of goods and services, and provisions of operating inputs.
- Induce effects, which measure the consumption expenditures of direct and indirect sector employees.

Input-output (I/O) models are characterized by their ability to evaluate the effects of industries on each other. Unlike most typical measures of economic activity that examine only the total output of an industry or the final consumption demand provided by a given output, I/O models provide a much more comprehensive view of the interrelated economic impacts. I/O analysis is based on the notion that there is a fundamental relationship between the volume of output of an industry and the volume of the various inputs used to produce that output. Industries are often grouped into production, distribution, transportation, and consumption categories. Additionally, the I/O model can be used to quantify the multiplier effect, which refers to the idea that an increase in spending can lead to an even greater increase in income and consumption, as monies circulate (or multiply) throughout the economy.

Flood Risk Management RED Considerations

There are particular effects for each type of project improvement as they relate to the RED account. The estimation of RED flood-related effects can be very complex. At a minimum, the RED analysis should include a qualitative description of the types of businesses at risk from flooding, particularly those that could have a significant adverse impact (output, employment, etc.) upon the community or regional economies if their operations should be disrupted by flooding and how this would be affected by the recommended project. The potential RED effects to flood risk management projects are summarized in Table 1 below.

Table 1: Potential RED Effects to Flood Risk Management

RED Factor	Potential RED Effects
Construction	Additional construction related activity and resulting spillovers to suppliers
Revenues	Increased local business revenues as a consequence of reduced flooding, particularly from catastrophic floods
Tax Revenues	Increased income and sales taxes from the direct project and spillover industries
Employment	Short-term increase in construction employment; with catastrophic floods, significant losses in local employment (apart from the debris and repair businesses, which may show temporary gains)
Population Distribution	Disadvantage groups may benefit from the creation of a flood-free zone
Increased Wealth	Potential increase in wealth for floodplain residents as less is spent on damaged property, repairs, etc.; potential increase in property values.

RECONS Software

A variety of software programs are available to measure the RED impacts of a project. The Corps of Engineers' Institute for Water Resources (IWR) along with the Louis Berger Group has developed a regional economic impact modeling tool called Regional Economic System (RECONS) that computes estimates of regional and national job creation, retention, and other economic measures. The expenditures made by the USACE for various services and products generate economic activity that can be measured in jobs, income, sales, and gross regional product. The software automates calculations and generates estimates of economic measures associated with USACE's annual civil works program spending. RECONS was built by extracting multipliers and other economic measures from more than 1,500 regional economic models that were built specifically for USACE's project locations by the Minnesota IMPLAN Group. These multipliers were then imported into a database. The software ties various spending profiles to the matching industry sectors by location to produce economic impact estimates. The RECONS program is used to document the performance of direct investment spending of the USACE, and allows users to evaluate project and program expenditures associated with annual expenditures.

RECONS Inputs and Outputs

The economic impacts presented below show the interrelated economic impacts resulting from an injection of flood risk management construction funds into an area of similar size to the Watsonville/Pajaro study area. For this assessment, a generic metropolitan study area[1] having a population of greater than 50,000 and the state of California were used as the geographic designation in the RECONS model in order to assess the overall impacts to the regional economy from constructing the TSP. This places a frame around the economic impacts where the activity

[1] A generic metropolitan RECONS model was used to assess the Watsonville/Pajaro study area since an existing Pajaro River FRM project was not available in the RECONS software.

is internalized. Leakages, which are payments made to imports or value added sectors that do not in turn re-spend the dollars within the area, are not included in the total impacts.

Input Costs: The total project cost of the TSP is approximately $245,556,000 and the total economic cost (i.e., with interest during construction) is approximately $248,282,000. The total project cost used for the RED assessment is approximately $199,432,000. The RED assessment requires the adjustment of costs for two items: (1) interest during construction (IDC) and (2) purchase of land. Interest during construction is used in the NED analysis to estimate the opportunity cost of using money for one economic endeavor (e.g., building a FRM project) instead of another (e.g., building a bullet train); IDC is not actually expended within the region and therefore is not included in the RED analysis. Similarly, the purchase of land, not including administrative costs, is considered a transfer payment from one party to another and therefore is also not included in the RED analysis.

The information in Table 2 is based on the average annual regional expenditures that are expected over the construction period. The construction period for the TSP is assumed to be about 1 year. Over that period, a total of about $199 million (total project cost) is anticipated to be spent in the study area if the TSP is constructed. Approximately $108 million of the total spending is assumed to be for construction labor.

Table 2: TSP Input Assumptions, Generic Metropolitan Area with a Population of Greater than 50,000 (October 2016 Price Level)

Category	Spending	Spending Amount	Local Percentage Capture		
		TSP	Local	State	National
Aggregate Materials	10%	19,544,336	72	77	Not Applicable
Other Materials	1%	2,393,184	84	100	Not Applicable
Equipment	35%	69,801,200	71	99	Not Applicable
Construction Labor	54%	107,693,280	100	100	Not Applicable
Total	100%	199,432,000	Not Applicable	Not Applicable	Not Applicable

RECONS Outputs: Direct expenditures expected for construction of earthen levees are spent primarily in two sectors of the economy, construction labor and equipment (both alternatives). Both accounts for 89% of the total project expenditures. Local capture rates are computed in RECONS to show where the output from expenditures is realized. As indicated in Table 2, all of the construction labor is expected to occur within the metropolitan area, which would include the Watsonville/Pajaro study area as well as other communities within Santa Cruz and Monterey Counties. Much of the expenditures associated with the other main spending categories are expected to also take place within the larger metropolitan area (i.e., regional impact area).

Table 4 summarizes the overall economic impacts of the TSP. The USACE is expected to spend approximately $199 million to build the TSP, of which approximately $174 million will be captured within the regional impact area. It is estimated that the remainder would leak out to the state of California or to the nation. The expenditures made by the USACE for various services and products are expected to generate additional economic activity, which can be measured in jobs, income, sales, and gross regional product (GRP) as summarized in Tables 5-7 (economic activity on regional, state, and national basis). It is important to note that the RED analysis indicates that construction of the TSP is anticipated to generate close to 4,000 jobs (directly and through secondary effects) on the regional level and approximately $181 million (directly and through secondary effects) in labor income during the construction period.

Table 3: TSP, Summary of Economic Impacts, Generic Metropolitan Area with Population Greater than 50,000 (Dollar Values in October 2016 Price Level)

Total Spending		**TSP**		
		Regional	**State**	**National**
		$199,432,000	$199,432,000	$199,432,000
Direct Impact	**Output**	$173,530,775	$194,111,059	$198,716,754
	Jobs	2,810	2,884	2,911
	Labor Income	$127,895,039	$133,533,674	$135,505,773
	GRP[1]	$143,757,132	$155,185,731	$157,754,571
Total Impact	**Output**	$330,892,581	$392,607,196	$524,715,002
	Jobs	3,972	4,225	4,940
	Labor Income	$181,409,896	$201,649,787	$244,664,047
	GRP	$236,320,508	$273,320,620	$346,948,848

[1]Gross Regional Product (GRP) is the market value of all final goods and services produced by all firms in an economy; GRP is one measure of the size of a region's economy.

Table 4: TSP, Economic Impacts – Regional Level, Generic Metropolitan Area with Population Greater than 50,000 (October 2016 Price Level)

Industry Sector		TSP			
		Sales	**Jobs**	**Labor Income**	**GRP**
Direct Effects	Mining and quarrying sand, gravel, clay, & ceramic and refractory minerals	$7,074,821	42	$3,298,378	$3,977,648
	Wholesale trade businesses	$247,246	1	$109,918	$193,116
	Transport by rail	$423,263	1	$134,678	$227,971
	Transport by water	$119,475	0	$25,341	$53,003
	Transport by truck	$6,207,718	48	$2,808,548	$3,373,428
	Construction of other new nonresidential structures	$1,998,565	14	$736,286	$879,574
	Commercial & industrial machinery & equipment rental/leasing	$49,766,318	169	$13,088,610	$27,359,111
	Labor	$107,693,280	2,535	$107,693,280	$107,693,280
Total Direct Effects		$173,530,775	2,810	$127,895,039	$143,757,132
Secondary Effects		$157,361,806	1,162	$53,514,857	$92,563,376
Total Effects		**$330,892,581**	**3,972**	**$181,409,896**	**$236,320,508**

Table 5: TSP, Economic Impacts – State Level (October 2016 Price Level)

Industry Sector		TSP			
		Sales	Jobs	Labor Income	GRP
Direct Effects	Mining and quarrying sand, gravel, clay, & ceramic and refractory minerals	$7,502,570	44	$3,497,801	$4,218,140
	Wholesale trade businesses	$293,175	2	$130,336	$228,990
	Transport by rail	$437,015	1	$139,053	$235,378
	Transport by water	$151,921	0	$32,223	$67,397
	Transport by truck	$6,596,652	51	$2,984,871	$3,585,458
	Construction of other new nonresidential structures	$2,393,184	17	$897,636	$1,082,311
	Commercial & industrial machinery & equipment rental/leasing	$69,043,262	235	$18,158,472	$38,074,778
	Labor	$107,693,280	2,535	$107,693,280	$107,693,280
Total Direct Effects		$194,111,059	2,884	$133,533,674	$155,185,731
Secondary Effects		$198,496,137	1,341	$68,116,113	$118,134,889
Total Effects		**$392,607,196**	**4,225**	**$201,649,787**	**$273,320,620**

Table 6: TSP, Economic Impacts – National Level (October 2016 Price Level)

Industry Sector		TSP			
		Sales	Jobs	Labor Income	GRP
Direct Effects	Mining and quarrying sand, gravel, clay, & ceramic and refractory minerals	$10,848,699	65	$5,057,812	$6,099,421
	Wholesale trade businesses	$297,150	2	$132,104	$232,095
	Transport by rail	$568,418	2	$181,018	$306,394
	Transport by water	$220,033	0	$46,670	$98,075
	Transport by truck	$6,996,762	54	$3,166,261	$3,803,581
	Construction of other new nonresidential structures	$2,393,184	17	$897,636	$1,082,311
	Commercial & industrial machinery & equipment rental/leasing	$69,699,227	237	$18,330,992	$38,439,416
	Labor	$107,693,280	2,535	$107,693,280	$107,693,280
Total Direct Effects		$198,716,754	2,911	$135,505,773	$157,754,571
Secondary Effects		$325,998,248	2,029	$109,158,274	$189,194,276
Total Effects		**$524,715,002**	**4,940**	**$244,664,047**	**$346,948,848**

The creation of jobs in the study area is important to note. In 2010, the unemployment rate in the town of Pajaro (21%) was significantly higher than the unemployment rate for the state of California (7.1%). The number of jobs gained within the region demonstrates the multiplier effect stemming from the infusion of construction funds for this project.

ATTACHMENT 4

Other Social Effects (OSE) Analysis

(Please refer to the Main Plan Formulation Report for the OSE Analysis)

ATTACHMENT 5

Hydrology & Hydraulics (H/H) MFR

CESPN-ET-EW 14 October 2016

MEMORANDUM FOR RECORD (DRAFT)

SUBJECT: Pajaro Future Without-Project Condition (FWOP) Flood Depth - Summary of Methods

1. **Introduction:** The objective of this memorandum is to document the process used to determine flood depths at respective parcels for 8 annual exceedance probability (AEP) events. These flood depth values and corresponding rating curves will be utilized in the economic analysis of future without-project (FWOP) conditions with FDA.

2. **Background Information:** The flood depth assignment process is complicated by the floodplain geography and condition of the existing levees, which result in the possibility of a given parcel being inundated by floodwaters from multiple sources. However, this is not an unprecedented situation in USACE, as SPK completed an analysis of multiple flood sources and single target damages for the Yuba River Basin General Reevaluation (GRR) Study. As a result, the PDT followed the methods outlined in a memorandum[1] that summarized how flood sources (index points) were assigned to given economic impact area (EIAs).

3. **Key Correspondence:** The flood depth assignment and economic analysis approach was informed by correspondence with key staff from SPN, SPK, and SPD. Given the complex nature of the proposed approach, the SPN economist (A. McGregor) requested guidance from the SPD economist (K. Keilman) on 18 May 2016. Mr. Keilman provided the guidance in an email message on 26 May 2016 (see **Attachment A**), which suggested employing the approach outlined in the Yuba River GRR memorandum[1].

   The SPN GIS analyst (J. Zoulas) also worked with the SPK hydraulic engineer (E. Maak) to ensure that the correct iterations of the FWOP floodplain input files were utilized in the GIS analysis. Mr. Maak suggested using the FWOP floodplain depth files from 7 May 2016, and the floodplain depth files for Index Point 7T (on Corralitos Creek) from 6 April 2016. Mr. Maak also noted that the Index Point 6T files from 6 April 2016 should not be used in the analysis, as they were developed under the assumption that the 1-in-25 AEP (and larger) flows would break out. The FWOP now assumes that the channel, while still subject to geotechnical failure, has the capacity to convey the 1-in-25 AEP event, with flows exceeding the 1-in-25 AEP overtopping the hydraulic top of levee. These refinements are reflected in the floodplains dated 7 May 2016.

   In addition, the SPN GIS analyst requested guidance from the SPN Geo-Sciences section (N. Malasavage and T. Nguyen) regarding if (and how) levee fragility curves (developed in 2012) could be used to inform the assignment of index points to EIAs. Mr. Malasavage had concerns about utilizing these levee fragility curves to pair assign index points to EIAs, and indicated that the Geo-Sciences would use historical performance based

[1] USACE, Sacramento District (2008). *Memorandum for File: Yuba River- Flood Damage Analysis, Multiple Source-Single Target Damages*, 24 December 2008.

analysis to develop one levee fragility curve for all index points[2]. Mr. Malasavage also suggested using water surface elevations (from the 8 events) to determine relative loading on the index points, under the assumption that the index points with the greatest loading would also be more likely to experience levee failure and breaching.

As of 3 October 2016, an economist from SPK (T. Shimabukuro) was assigned to the project. Mr. Shimabukuro had a question regarding whether the floodwaters originating from the tributaries could impact parcels in Monterey County. It appears that the original county line followed the centerline of the main-stem Pajaro River. However, the main-stem channel has migrated since then, resulting in an inconsistency between the county line and channel centerline. Thus, there are 12 parcels which are technically in Monterey County but located on the right bank of the main-stem and therefore subject to flooding from the tributaries. This issue was clarified via email on 7 October 2016.

4. **Data Sources:** The flood depth assignment process utilized data from several sources.
    a. The FWOP topography was depicted by a raster file derived from a LiDAR survey conducted under the USGS, and was provided by E. Maak.
    b. The raster files depicting the flood depths for the 8 AEP events at the 9 index points were also provided by E. Maak (see **Section 3**).
    c. Levee crest elevations were derived from the USACE National Levee Database (NLD).
    d. GIS files depicting parcels in Santa Cruz and San Mateo County were obtained from the project economist (A. McGregor) on 5 May 2016, and were presumably originated from the respective county assessors.
    e. The GIS file depicting the United States Geological Survey (USGS) National Hydrography Dataset (NHD) streams data layer was obtained from internal SPN server developed by a SPN GIS contractor (A. Moore).
    f. The flood depth assignment process also utilized the ESRI Basemap World Imagery layer and Google Earth imagery as needed.

5. **Development of Economic Impact Areas:** The Economic Impact Areas (EIAs) for the main stem Pajaro River and the tributaries were developed under the guidance of the project economist (A. McGregor). The boundaries of the EIAs were manually digitized at a scale of 1:24,000 based on the 1-in-500 composite floodplain depicted by the floodplain depth files (**Figures 1** and **2**). A buffer of several hundred feet was utilized around the floodplain boundaries to ensure that the EIAs included all of the parcels that could be flooded by a 1-in-500 AEP event. The EIA boundaries were then refined using the USGS National Hydrography Dataset (NHD) streams layer, and further subdivided (by S. Wong) into urban and agricultural areas consistent with the most recent agricultural flood risk analysis[3] **(Figures 3** and **4**). The final versions of the EIAs and Agricultural Impact Areas (AIAs) feature classes are saved in *FWOPPajaro_FloodDepth_Sep2016.gdb* on the server at:

[2] USACE, San Francisco District (2016). *Pajaro River: Status of Project Economics and Fragility Curves*, 2 September 2016.
[3] Noble Consultants and GEC (2016). *Without-Project Risk Analysis - Agriculture: Pajaro River Feasibility Study*, February 2016.

M:\PROJECTS\Pajaro_River\7 GIS\FWOP Flood Depth

6. **Development of In-Channel Water Surface Elevations (WSEs) at Index Points:** WSEs for the 8 AEPs and each of the index points were derived in order to determine the relative loading on the levee at the respective index points. The initial step of determining the WSEs involved extracting flood depths and channel invert elevations at respective index points from the raster files (provided by E. Maak) with the "Extract Multi Values to Points" tool. The flood depths were then added to the channel invert elevations to determine WSEs, which were plotted against the levee crest elevations for the 8 AEP events (see **Attachment B**). The WSE data and plots are stored in an Excel file ("*WaterSurfaceElev_AllIndexPoints.xlsx*") on the server at:

   M:\PROJECTS\Pajaro_River\7 GIS\FWOP Flood Depth Analysis\Data and Document.

   It should also be noted that a second iteration of the WSE analysis was performed (by E. Maak) with the levees depicted as an "infinite wall" (see **Attachment C).** This analysis was intended to inform the development of the single fragility curve for the project area, and was not used to determine which flood sources (index points) were most likely to impact given EIAs.

7. **Assignment of Index Points to Economic Impact Areas:** The index points were assigned to the EIAs based on engineering judgement and the methods outlined in the Yuba River GRR memorandum[4]. The primary engineering judgement involved determining which index points upstream and adjacent to a given EIA (**Figures 1** and **2**) had the greatest levee loading (based on WSEs) and likelihood of failure. The results of the index point and EIA assignments are presented in **Tables 1** and **2** for the main stem and tributaries, respectively.

   On the left bank of the main stem, Index Point 5 was generally the most likely flooding source, as WSEs approached to within 1 foot of the levee crest elevation for the 1-in-50 and larger AEP events. In addition, there was significant erosion and damage in the vicinity of Index Point 5 in 1998 (per USACE Levee Screening Assessment), which suggests that this reach of levee has been vulnerable to failure in the past. However, it should be noted that the floodwaters that break out at Index Point 5 from smaller events (< 1-in-25 AEP) will not reach EIA A.

   On the right bank of the main stem, the nearest corresponding index points were generally the most likely flooding sources for the respective EIAs. The WSE (rating) curves for Index Points 2 and 3 were very similar in terms of the relationship between event frequency and the levee crest elevation. It also appeared that Index Point 3 could induce some flooding in EIA I, particularly for events larger than the 1-in-25 event.

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[4] USACE, Sacramento District (2008). *Memorandum for File: Yuba River- Flood Damage Analysis, Multiple Source-Single Target Damages*, 24 December 2008.

On the right bank of the tributaries, Index Point 7T was the most likely flooding source as there are no flood protection structures at this index point. As a result, floodwaters are expected to breakout (overtop the bank) during the 1-in-5 AEP and larger events, and flow downstream into Watsonville. On the left bank of the tributaries, Index Point 10 was the most likely flooding source for the “fish head” area between Salsipuedes Creek and the main stem Pajaro River, with overtopping likely to occur between the 1-in-25 and 1-in-50 AEP events.

8. **Development of FWOP Flood Depth Dataset:** The development of the FWOP flood depth dataset involved several steps. First, the two parcel GIS files (Santa Cruz and Monterey County) were merged into one GIS dataset. The parcels within the outline of the 1-in-500 composite floodplain were then exported into a much smaller dataset. The parcels in this smaller dataset were depicted as polygons, and the “Feature to Point” tool was utilized to extract the centroid of each parcel into a new point dataset. Each point then assigned an EIA, AIA, and index point.

   The point dataset was then separated into 19 datasets representing each of the EIAs for both the main stem and tributaries. Next, the FWOP flood depths were extracted from the respective flood depth rasters (based on **Tables 1** and **2**) to each point (parcel centroid) with the “Extract Multi Values to Points” tool. As a result, each of the point datasets contains 8 fields (columns) with depths from each of the respective AEP events. The final versions of the FWOP flood depth GIS files were saved in a geodatabase (*FWOPPajaroFloodDepth_Sep2016.gdb*) on the server at:

   M:\PROJECTS\Pajaro_River\7 GIS\FWOP Flood Depth

   The GIS files were then exported as text files and the datasets were recombined into one Excel spreadsheet (Final version: *Pajaro_FWOP_Floodplains_13Oct2016.xlsx),* which was saved to:

   M:\PROJECTS\Pajaro_River\7 GIS\FWOP Flood Depth Analysis\Economic Input Files\Final Version Sep2016

9. **FWOP Agricultural Flood Risk Analysis:** The FWOP agricultural flood risk involved computing the acreage in a given AIA that would be flooded by a given AEP event (see **Tables 3** and **4**). First, flood depth rasters for each index point and AEP event were converted to polygons with the “Raster Domain” tool. These polygons were then used to “Clip” out the flooded areas in each AIA, and acreages of the clipped areas were computed using the “Calculate Geometry” tool. The final versions of the FWOP agricultural flooded area files were saved in a geodatabases (*Pajaro_Floodplain_Area.gdb* and *Pajaro_Floodplain_Area_12Oct16.gdb*) on the server at:

M:\PROJECTS\Pajaro_River\7 GIS\FWOP Flood Depth Analysis

An excel spreadsheet (*AgriculturalImpactAreas_AreaComputations_13Oct126.xlsx*) with the flooded acreage values was saved to:

M:\PROJECTS\Pajaro_River\7 GIS\FWOP Flood Depth Analysis\Economic Input Files\Final Version Sep2016

10. Please contact the undersigned with any questions or concerns.

James Zoulas, P.E.
GIS Coordinator and Civil Engineer
Water Resources Section
San Francisco District
U.S. Army Corps of Engineers

Table 1: Index Point assignments for Economic Impact areas for the Main Stem

Impact Area	Source of Main Flooding By Event							
	1-in-2	1-in-5	1-in-10	1-in-25	1-in-50	1-in-100	1-in-250	1-in-500
A	1	1	1	5	5	5	5	5
B	5	5	5	5	5	5	5	5
C	5	5	5	5	5	5	5	5
D	5	5	5	5	5	5	5	5
E	2	2	2	2	2	2	2	2
F	3	3	3	3	3	3	3	3
G	3	3	3	3	3	3	3	3
H	3	3	3	3	3	3	3	3
I	-	-	3	3	3	3	3	3
J	4	4	4	4	4	4	4	4

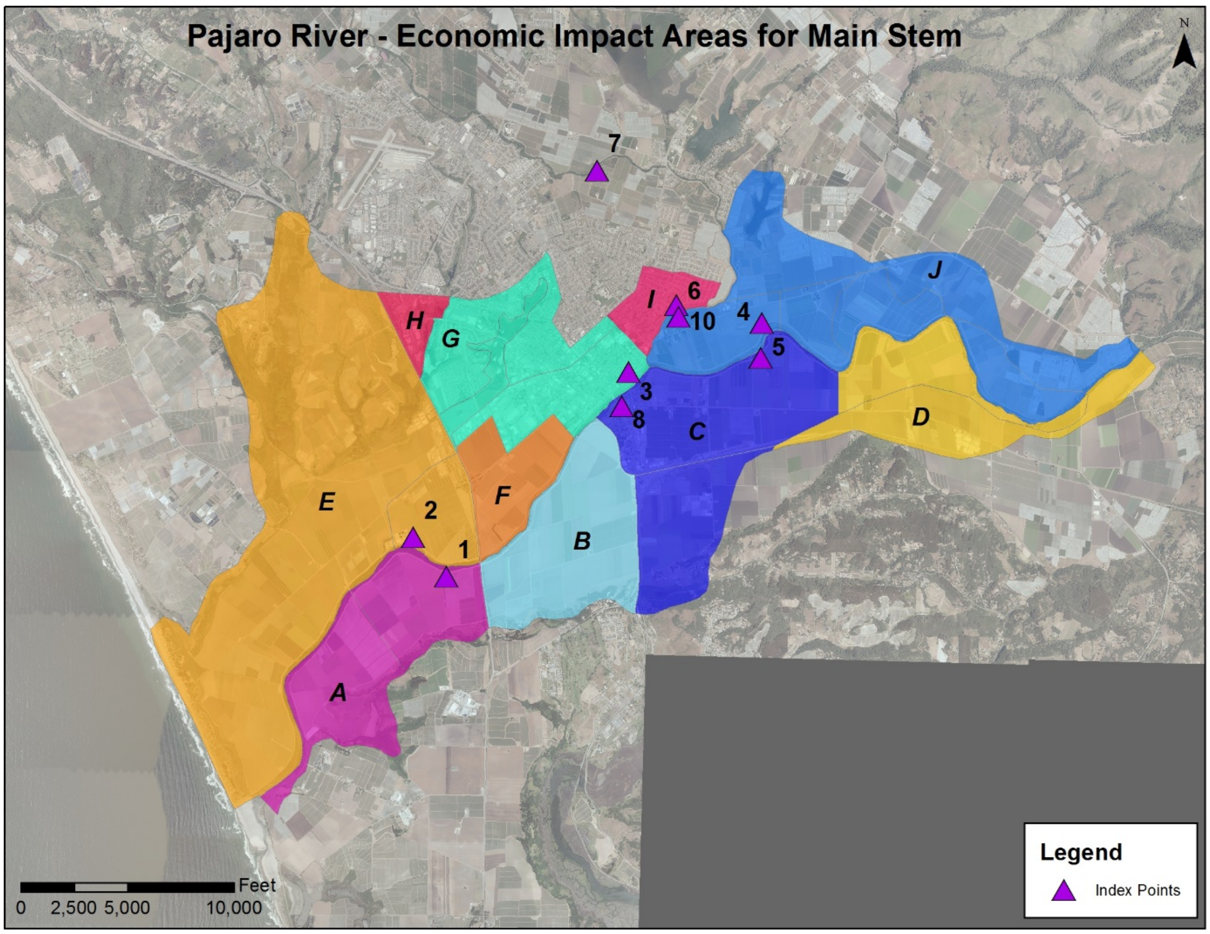


Figure 1: EIAs for the Main Stem (agricultural and urban subdivisions not shown)

Table 2: Index Point assignments for Economic Impact Areas for the Tributaries (Corralitos and Salsipuedes Creeks)

Impact Area	Source of Main Flooding By Event							
	1-in-2	1-in-5	1-in-10	1-in-25	1-in-50	1-in-100	1-in-250	1-in-500
K	10	10	10	10	10	10	10	10
L	7T	7T	7T	7T	7T	7T	7T	7T
M	7T	7T	7T	7T	7T	7T	7T	7T
N	7T	7T	7T	7T	7T	7T	7T	7T
O	7T	7T	7T	7T	7T	7T	7T	7T
P	7T	7T	7T	7T	7T	7T	7T	7T
Q	7T	7T	7T	7T	7T	7T	7T	7T
R	7T	7T	7T	7T	7T	7T	7T	7T
S	7T	7T	7T	7T	7T	7T	7T	7T

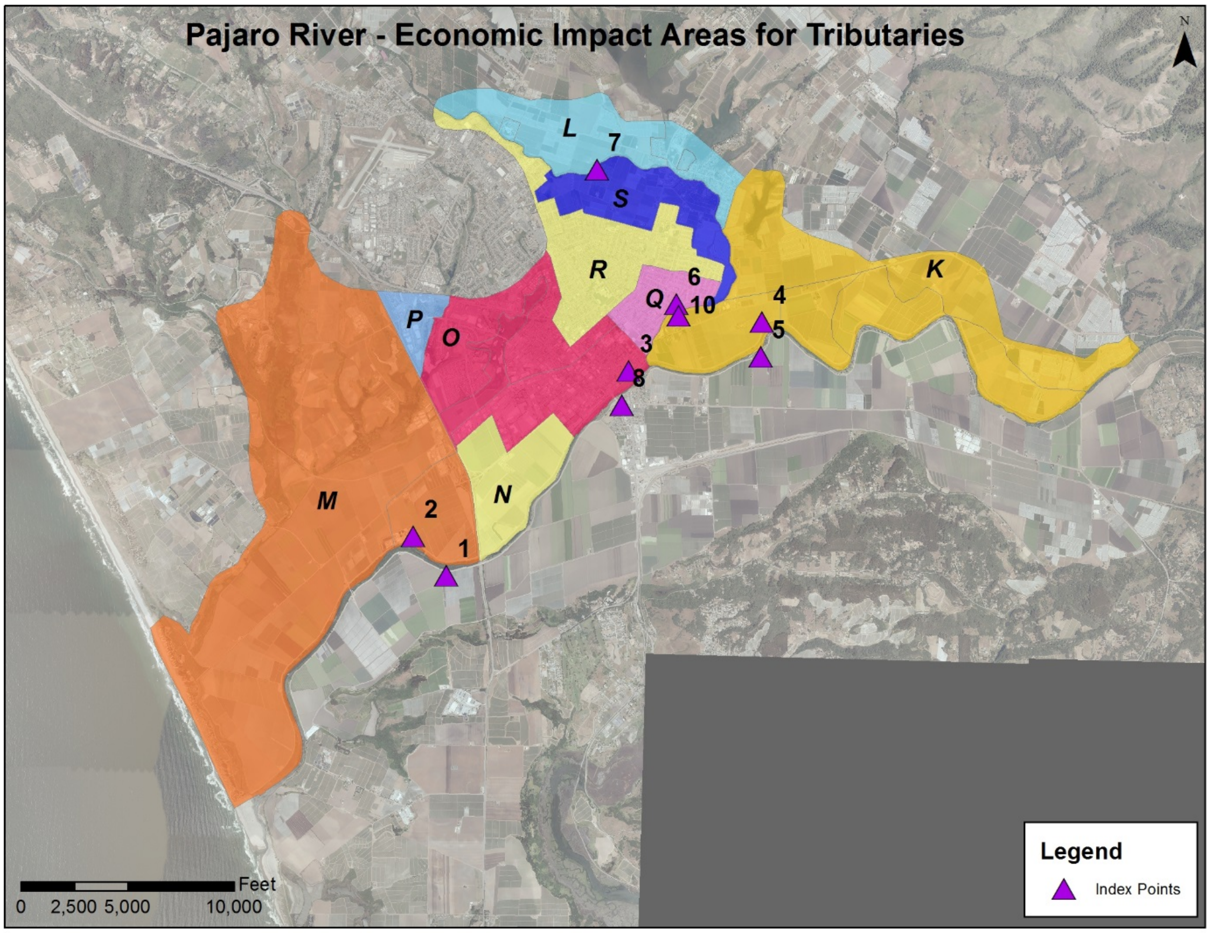


Figure 2: EIAs for Tributaries (agricultural and urban subdivisions not shown)

Table 3: Number of acres flooded by Main Stem by Event and Agricultural Impact Area

Ag. Impact Area	Acres flooded by Event							
	1-in-2	**1-in-5**	**1-in-10**	**1-in-25**	**1-in-50**	**1-in-100**	**1-in-250**	**1-in-500**
1	34.3	1,245.1	1,893.9	2,486.8	2,585.8	2,697.4	2,749.9	2,810.1
2	473.9	426.4	461.5	464.8	470.9	473.8	475.6	480.2
3	470.9	259.0	439.5	426.5	468.1	471.3	472.6	474.6
4	2.1	116.0	146.5	191.4	202.5	245.9	305.7	341.8
5	11.2	270.9	374.3	408.3	415.0	421.8	424.9	430.3
6	16.9	27.9	839.5	935.0	937.9	940.4	942.0	944.5
7	N/A	N/A	55.7	291.2	338.0	371.2	394.0	426.5
8	15.8	57.1	230.9	333.3	864.5	967.2	991.1	1004.1
9	20.3	40.9	45.1	48.1	359.1	365.0	367.1	368.6
10	7.9	22.9	25.2	26.6	180.8	191.7	195.3	198.5
11	12.2	22.8	24.9	27.9	262.5	263.7	264.2	264.7
12	18.4	66.6	91.9	102.6	433.0	442.1	445.9	449.7
13	25.7	49.5	53.8	59.2	260.9	261.5	261.6	261.6
14	3.3	30.4	59.5	65.4	185.6	238.3	275.7	333.4
15	11.2	15.0	48.1	57.3	390.3	473.5	520.4	586.4
Total	1,124.1	2,650.3	4,790.2	5,924.4	8,354.5	8,825.0	9,086.1	9,374.8

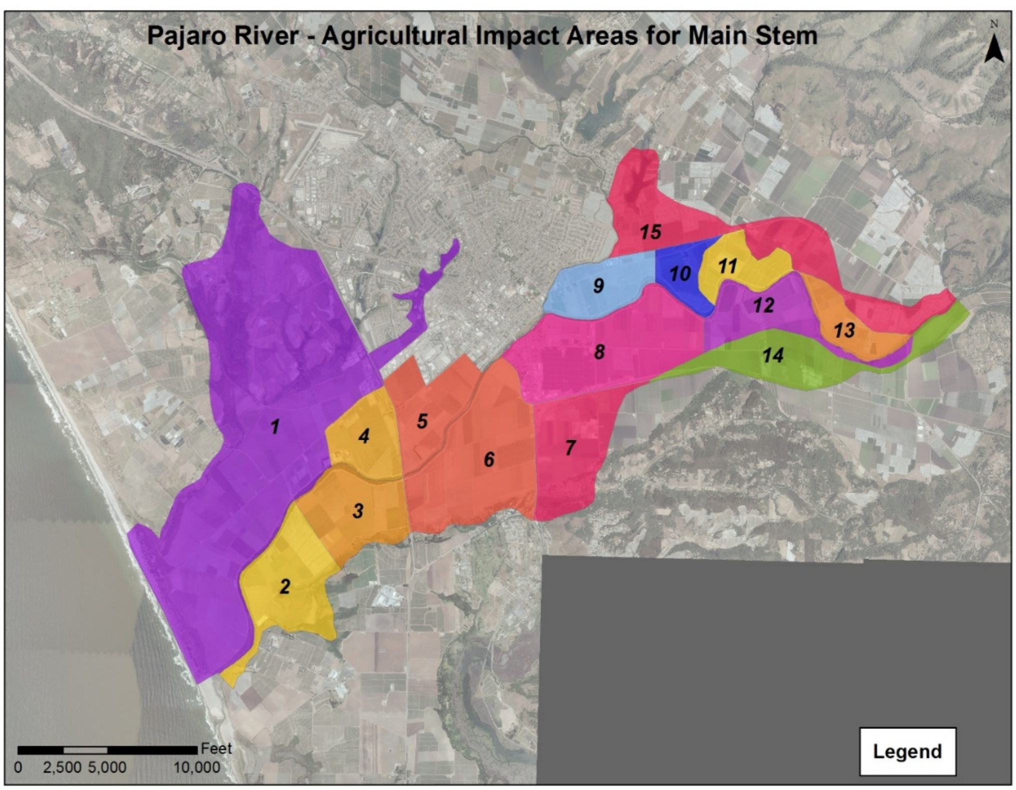


Figure 3: Agricultural Impact Areas (AIAs) for Main Stem

Table 4: Number of acres flooded by Tributaries by Event and Agricultural Impact Area

Ag. Impact Area	Acres Flooded by Event							
	1-in-2	1-in-5	1-in-10	1-in-25	1-in-50	1-in-100	1-in-250	1-in-500
1 (T)	6.1	76.1	174.7	194.8	244.1	314.6	323.2	325.5
2 (T)	44.2	1,411.3	2,878.0	3,100.7	3,226.0	3,362.7	3,395.1	3,406.2
3 (T)	32.2	72.0	101.8	109.9	140.0	337.4	354.6	354.4
4 (T)	234.4	308.4	357.9	441.3	1,459.8	1,562.2	1,614.0	1,683.2
Total	316.9	1,867.7	3,512.4	3,846.7	5,069.9	5,576.9	5,686.9	5,769.3

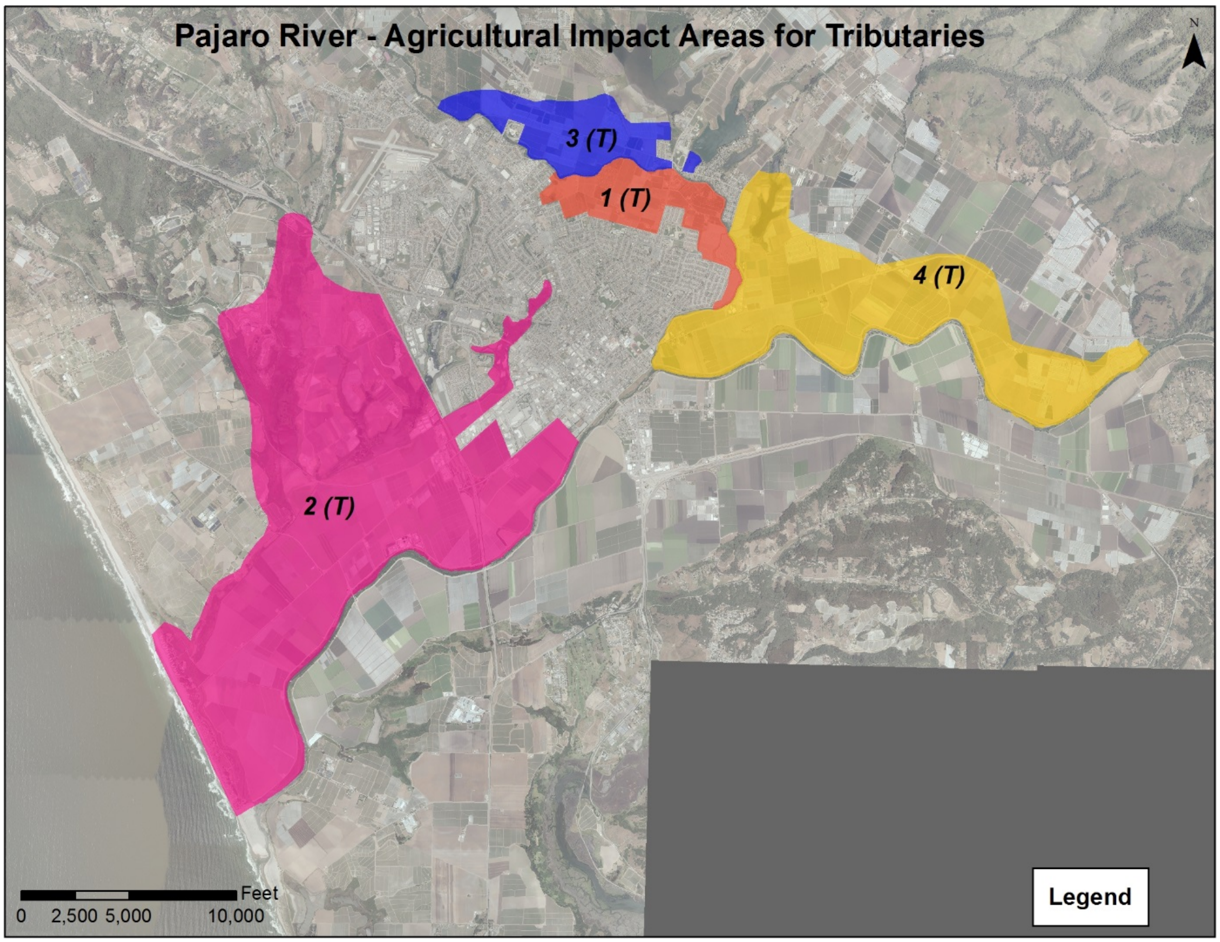


Figure 4: Agricultural Impact Areas (AIAs) for Tributaries

ATTACHMENT A: Key Correspondence

From: Keilman, Kurt SPD
Sent: Thursday, May 26, 2016 7:49 AM
To: Lera-Chan, Janice M SPN <Janice.M.Lera-Chan@usace.army.mil>
Subject: RE: Emailing: Memo-Flooding-Multiple Index points(dec24 2008), WATER SURFACE PROFILE ASSIGNMENTS

Yes, I wrote the memo to support work completed on Yuba River GRR.

Background : NFS had developed basic risk assessment with a big (incorrect) assumption that no matter where the levee failed on one or more of four streams, the flood plains would be the same depth and extent. So they used a single set of 8 WSP's and overestimated Expected Annual Damages.

Concerns: There were multiple index points representing different breaks that had different frequencies of failure and different volumes. So floodplains from The Feather were different from the Yuba which were different from the Bear and so on.
There were residual risks in a given impact area even after that increment was completed. Often the area would see a significant reduction in depth for a given event. With project - benefits for each impact areas would increase as measures were added. Bear area didn't receive maximum benefits until the last increment was completed.

Guidance - no formal guidance. This method wasn't completed to meet guidance. It was a technical issue that challenged existing software. It was developed out of need to perform incremental analysis. The area at risk was surrounded by 4 streams with 4 separate physical measures. The only concept user guide were the papers I had written. Bottom line is it is consistent with ER 1105-2-101 and EM xxxxx-1619 guidance for risk assessment.

The first study using this technical approach was Yuba River and the second was Natomas. Both were approved (Yuba - Directors Report, Natomas - Chief's Report). Both faced a higher level of economic review (lead by USACE Chief of Economics Dr. Dave Moser)

HEC was involved in the Yuba and Natomas, but I can't remember Will's role. But I can promise you it wasn't an SPN/SPA/SPL study.

Final point - I don't know if Pajaro need to go to this level of detail. But my suggestion was if there are commingled flood plains, significant with measure residual risk or varying probability of failure, this method might be useful is solving issues.

ATTACHMENT B: Water Surface Elevations at Index Points with Existing Levee Conditions

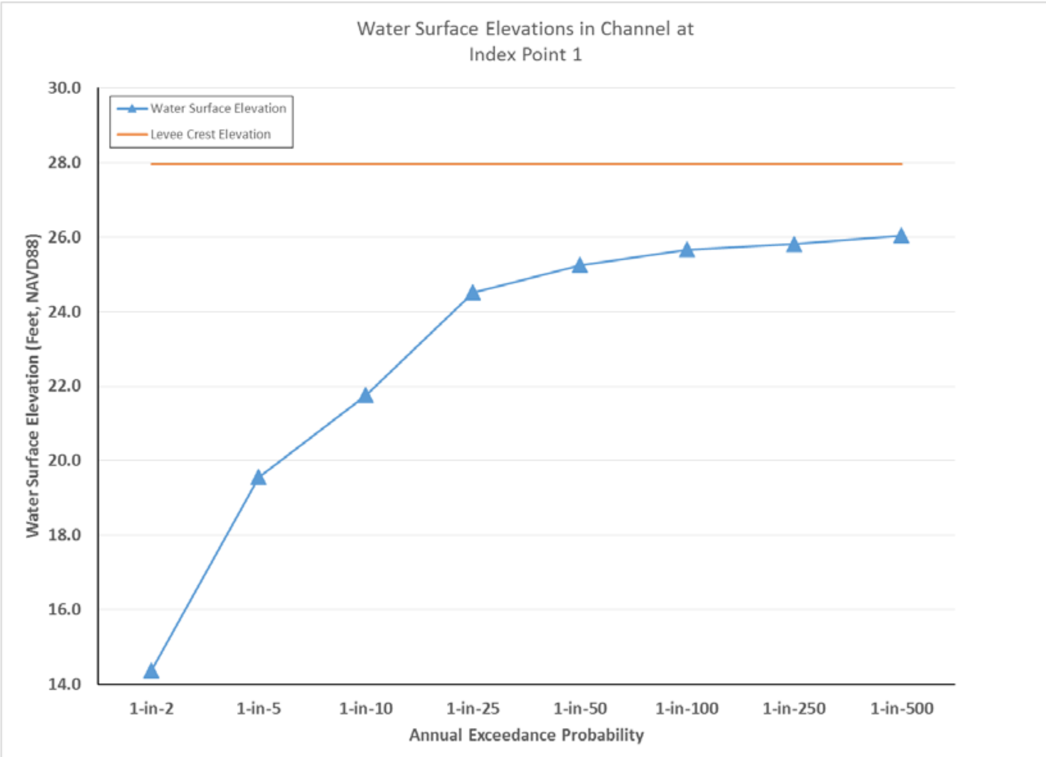


Figure B-1: Water surface elevations for the 8 AEP events and levee crest elevation at Index Point 1

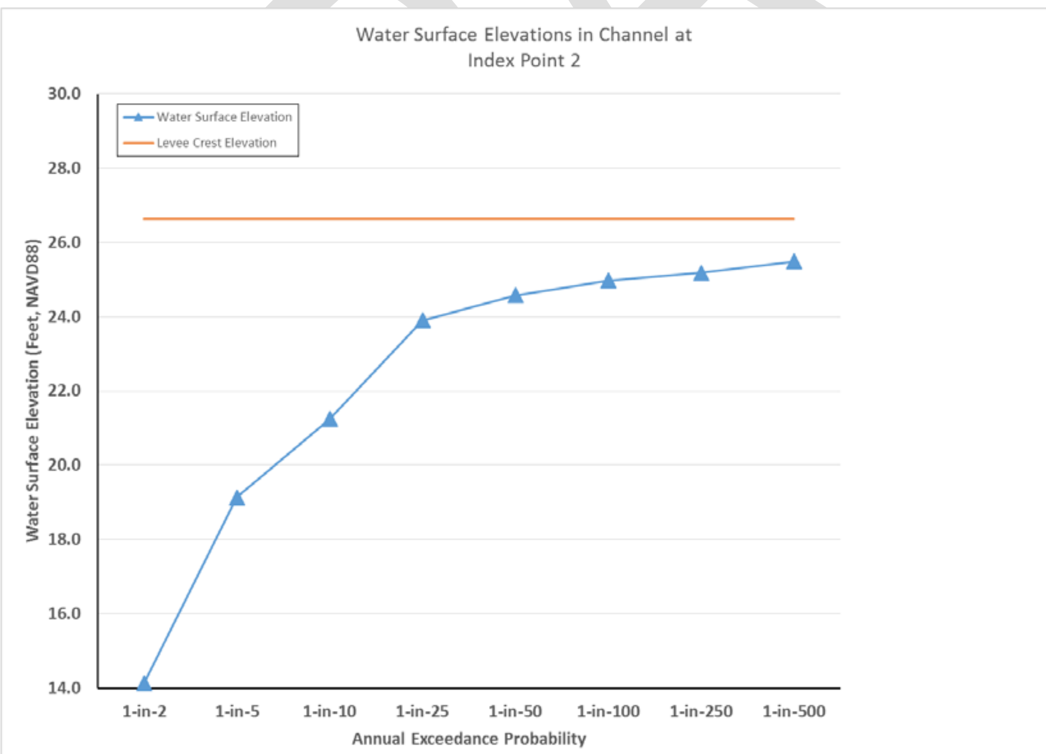


Figure B-2: Water surface elevations for the 8 AEP events and levee crest elevation at Index Point 2

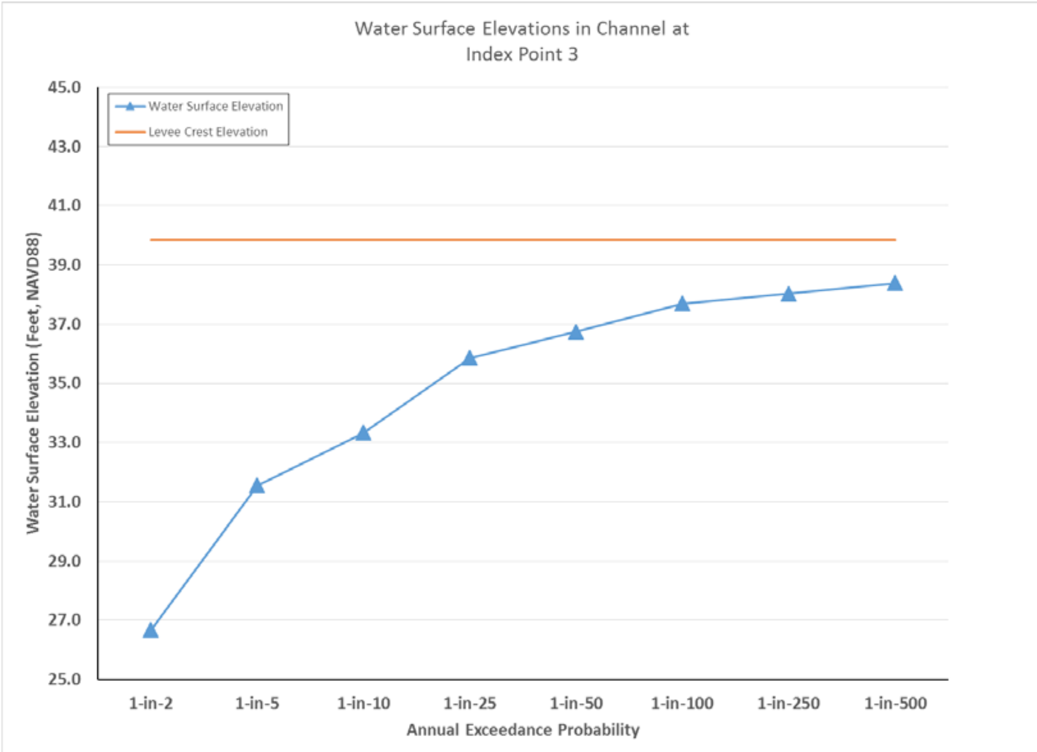


Figure B-3: Water surface elevations for the 8 AEP events and levee crest elevation at Index Point 3

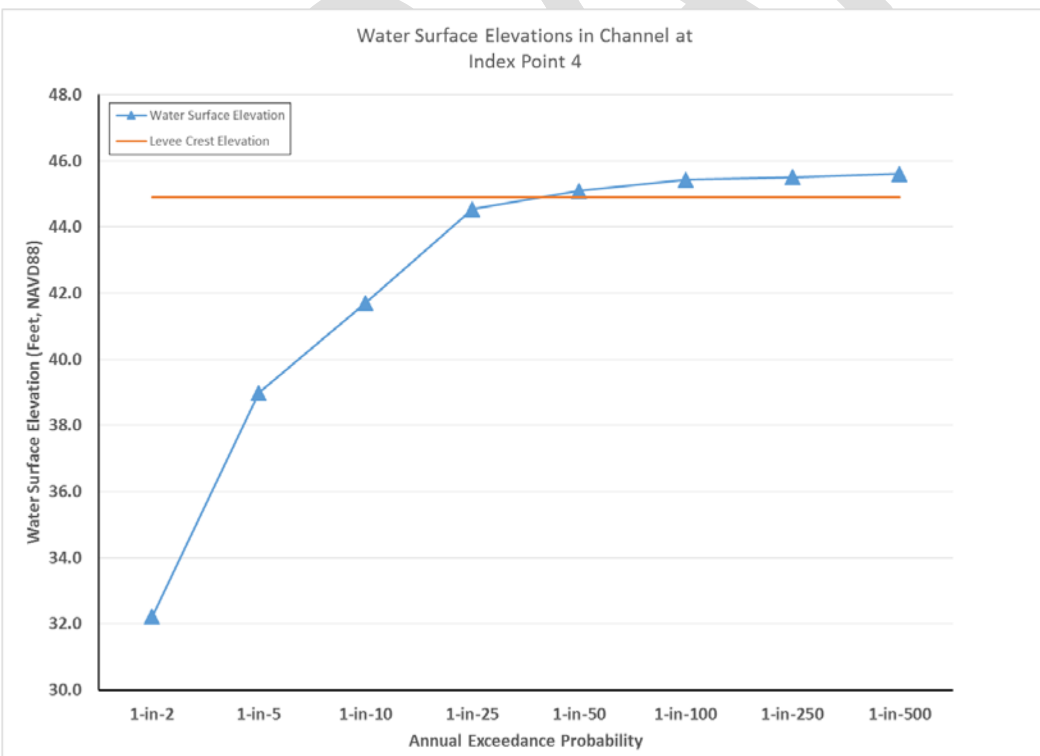


Figure B-4: Water surface elevations for the 8 AEP events and levee crest elevation at Index Point 4

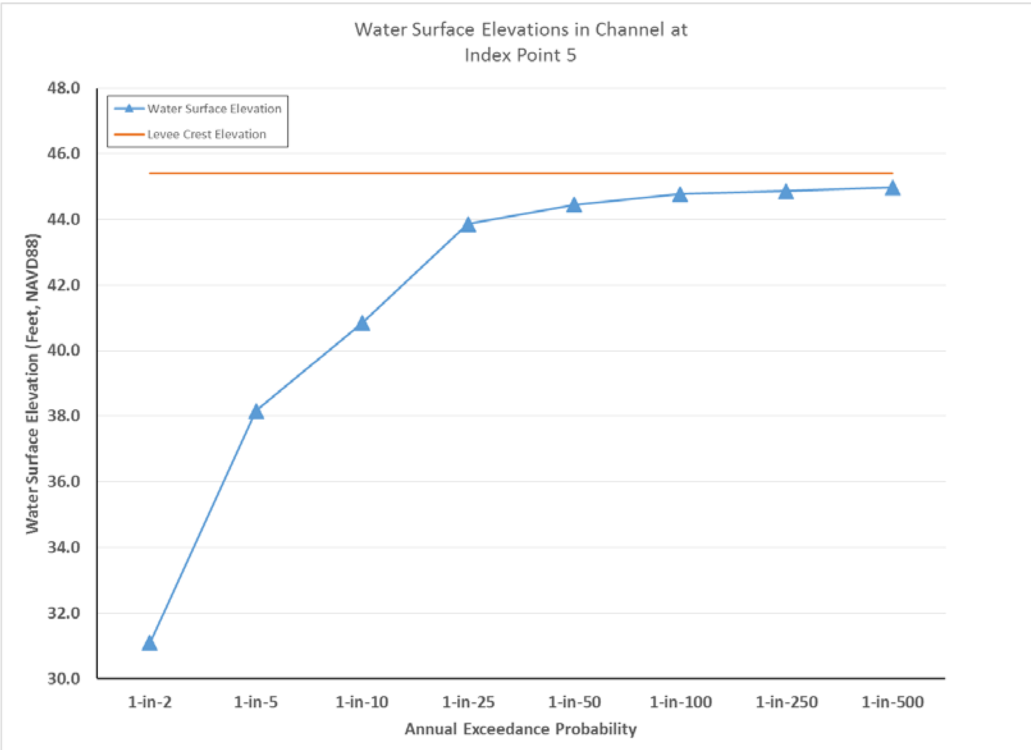


Figure B-5: Water surface elevations for the 8 AEP events and levee crest elevation at Index Point 5

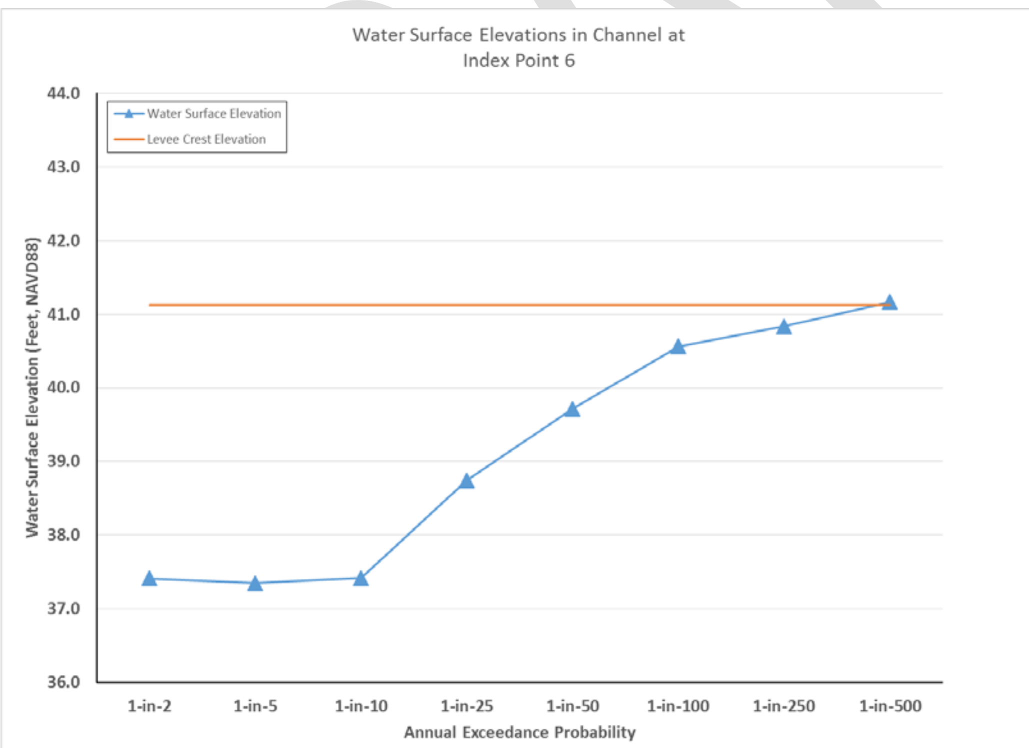


Figure B-6: Water surface elevations for the 8 AEP events and levee crest elevation at Index Point 6

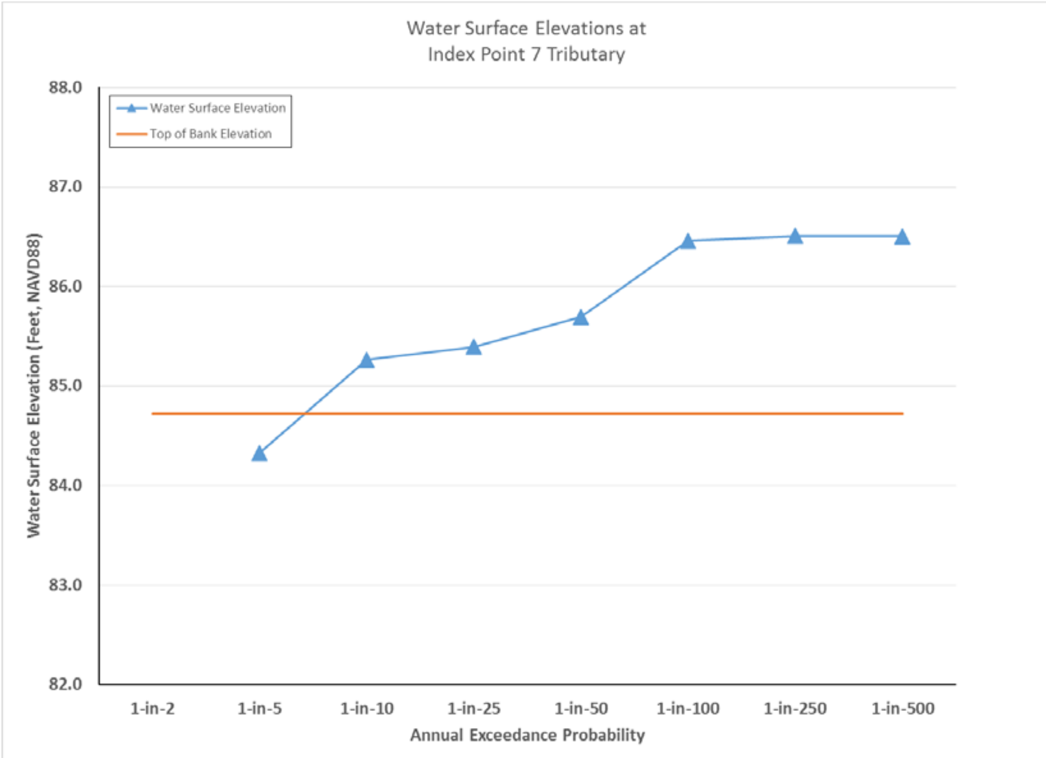


Figure B-7: Water surface elevations for the 8 AEP events and levee crest elevation at Index Point 7 (Tributary)

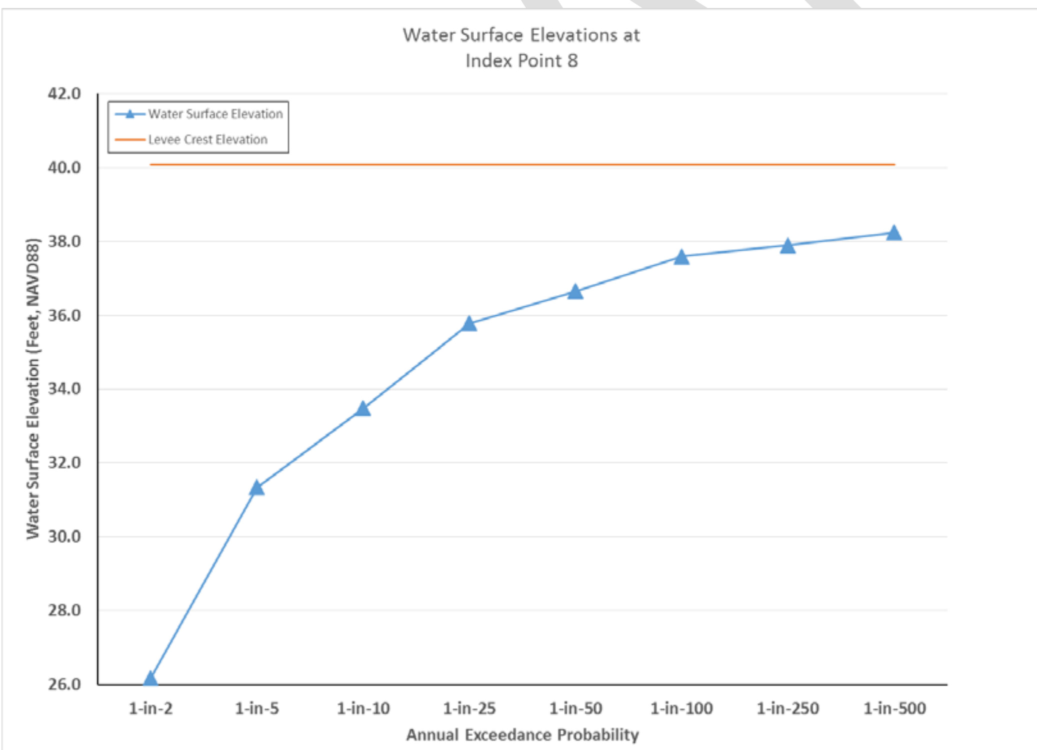


Figure B-8: Water surface elevations for the 8 AEP events and levee crest elevation at Index Point 8

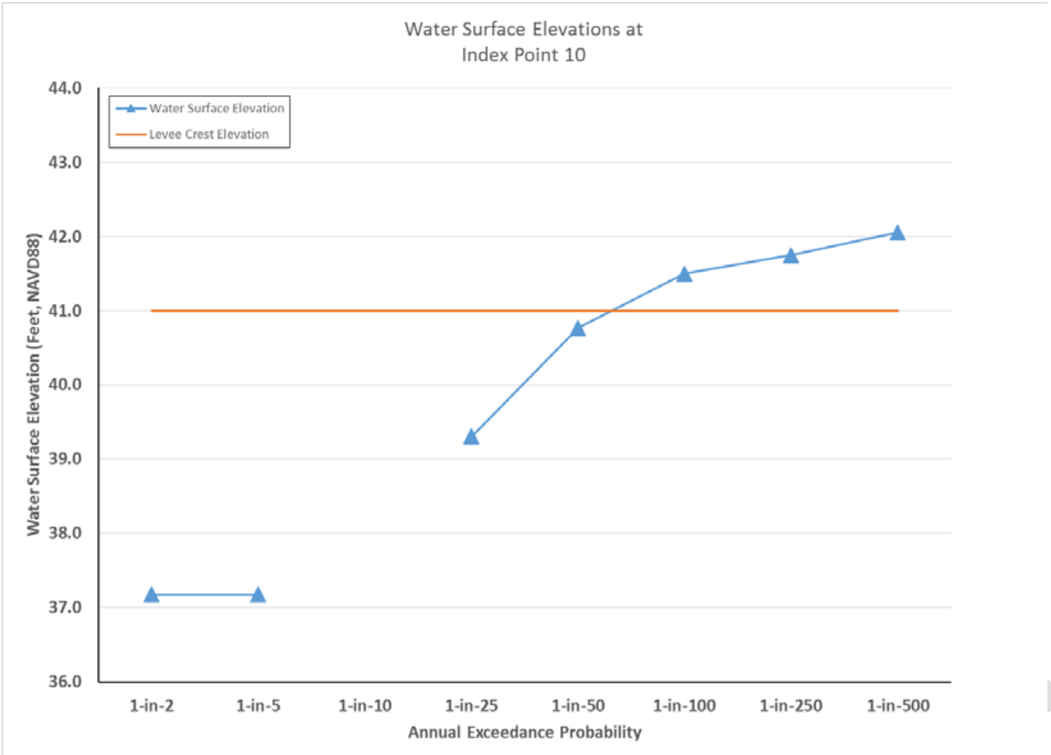
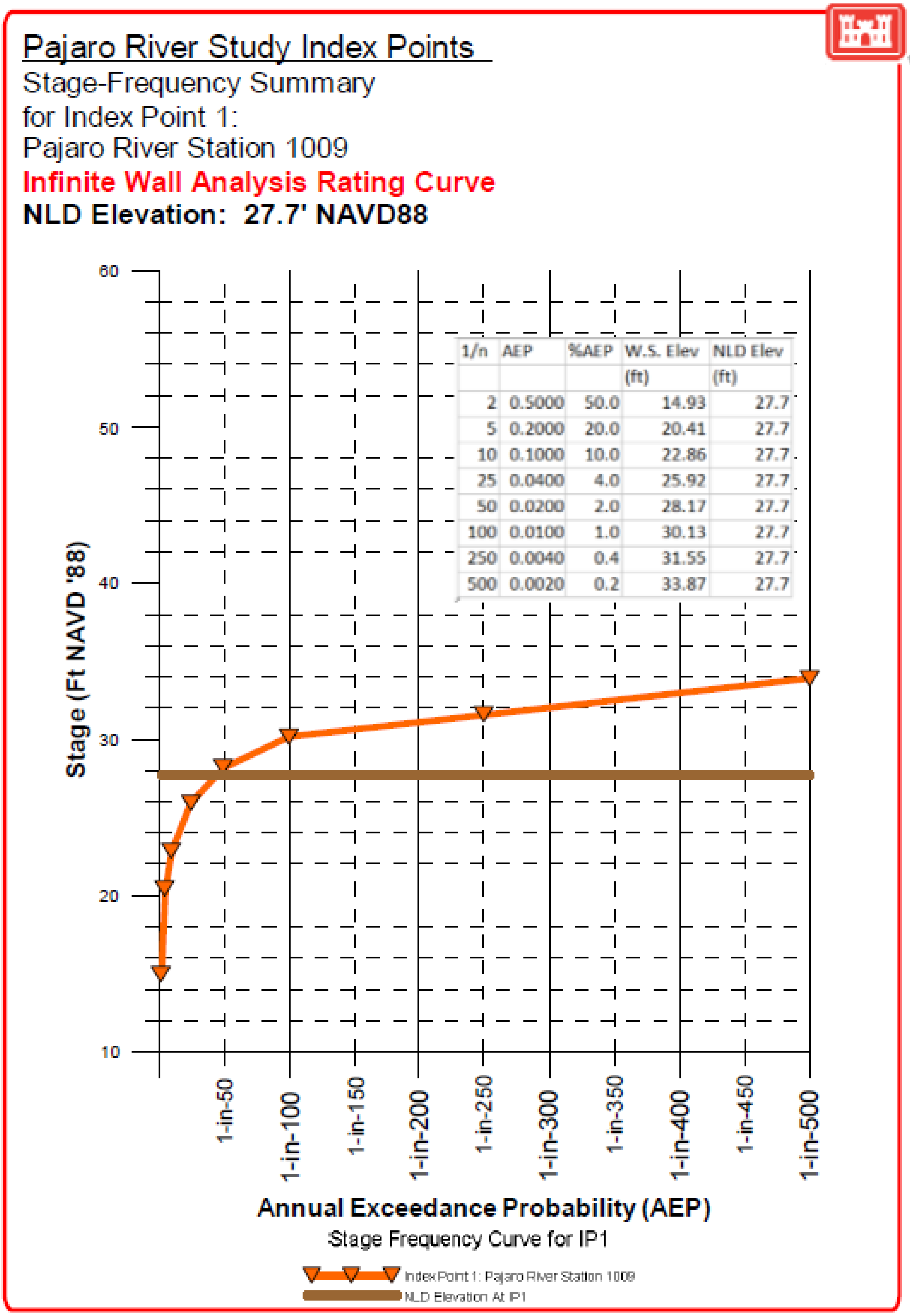


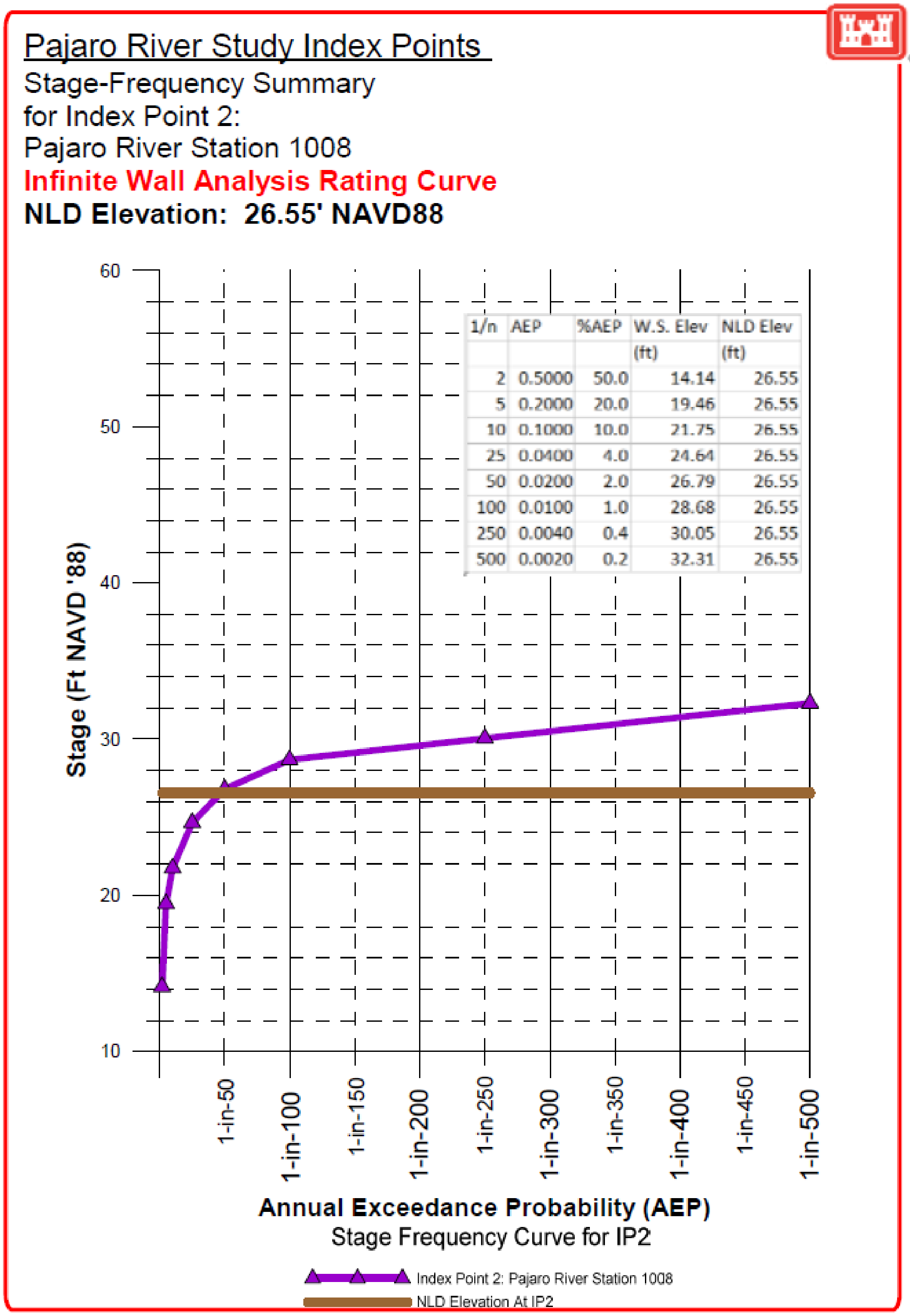
Figure B-9: Water surface elevations for the 8 AEP events and levee crest elevation at Index Point 10

ATTACHMENT C: Water Surface Elevations at Index Points with "Infinite Wall" Levee



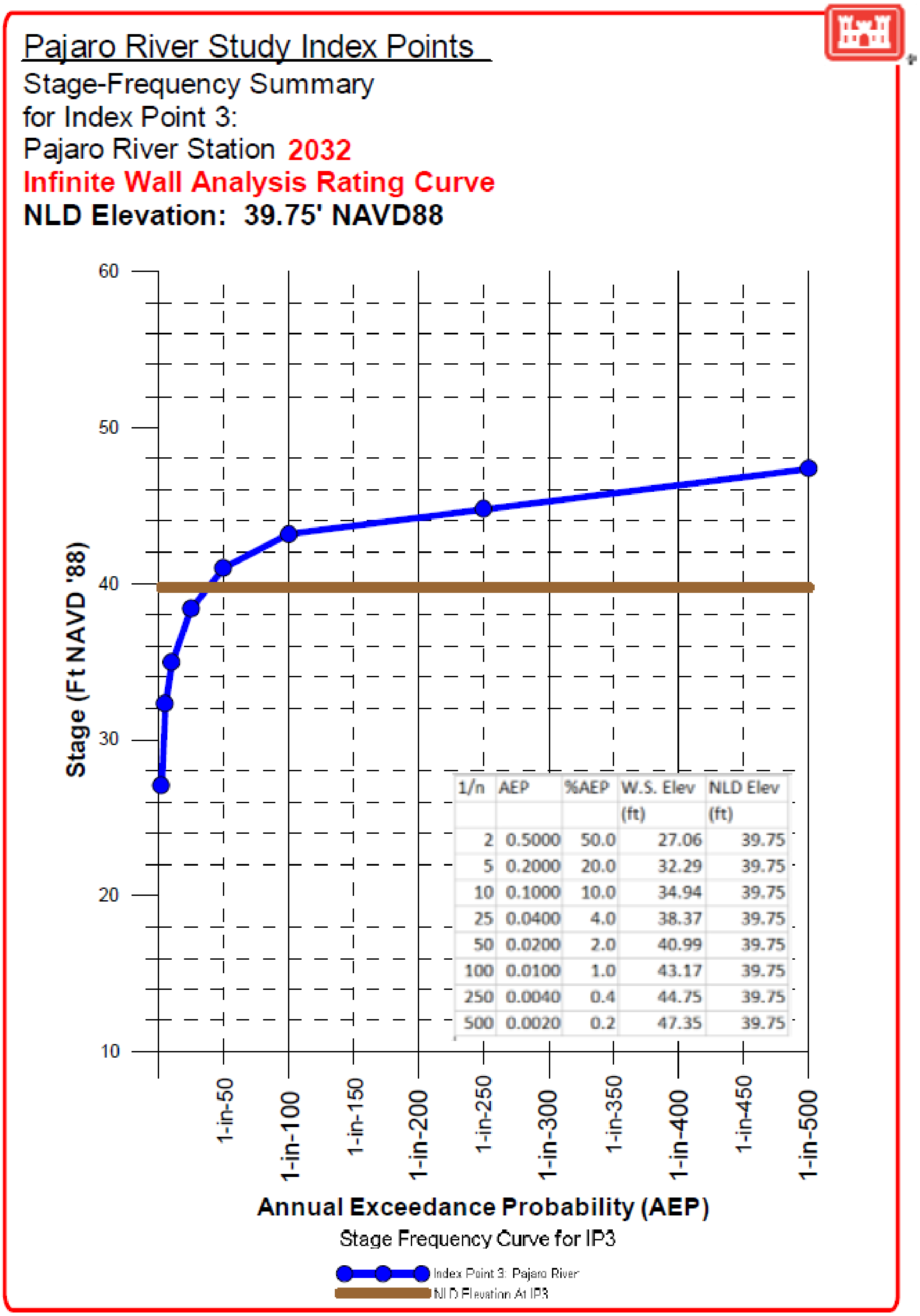
1/n	AEP	%AEP	W.S. Elev (ft)	NLD Elev (ft)
2	0.5000	50.0	14.93	27.7
5	0.2000	20.0	20.41	27.7
10	0.1000	10.0	22.86	27.7
25	0.0400	4.0	25.92	27.7
50	0.0200	2.0	28.17	27.7
100	0.0100	1.0	30.13	27.7
250	0.0040	0.4	31.55	27.7
500	0.0020	0.2	33.87	27.7

Figure C-1: Water surface elevations for the 8 AEP events and levee crest elevation at Index Point 1



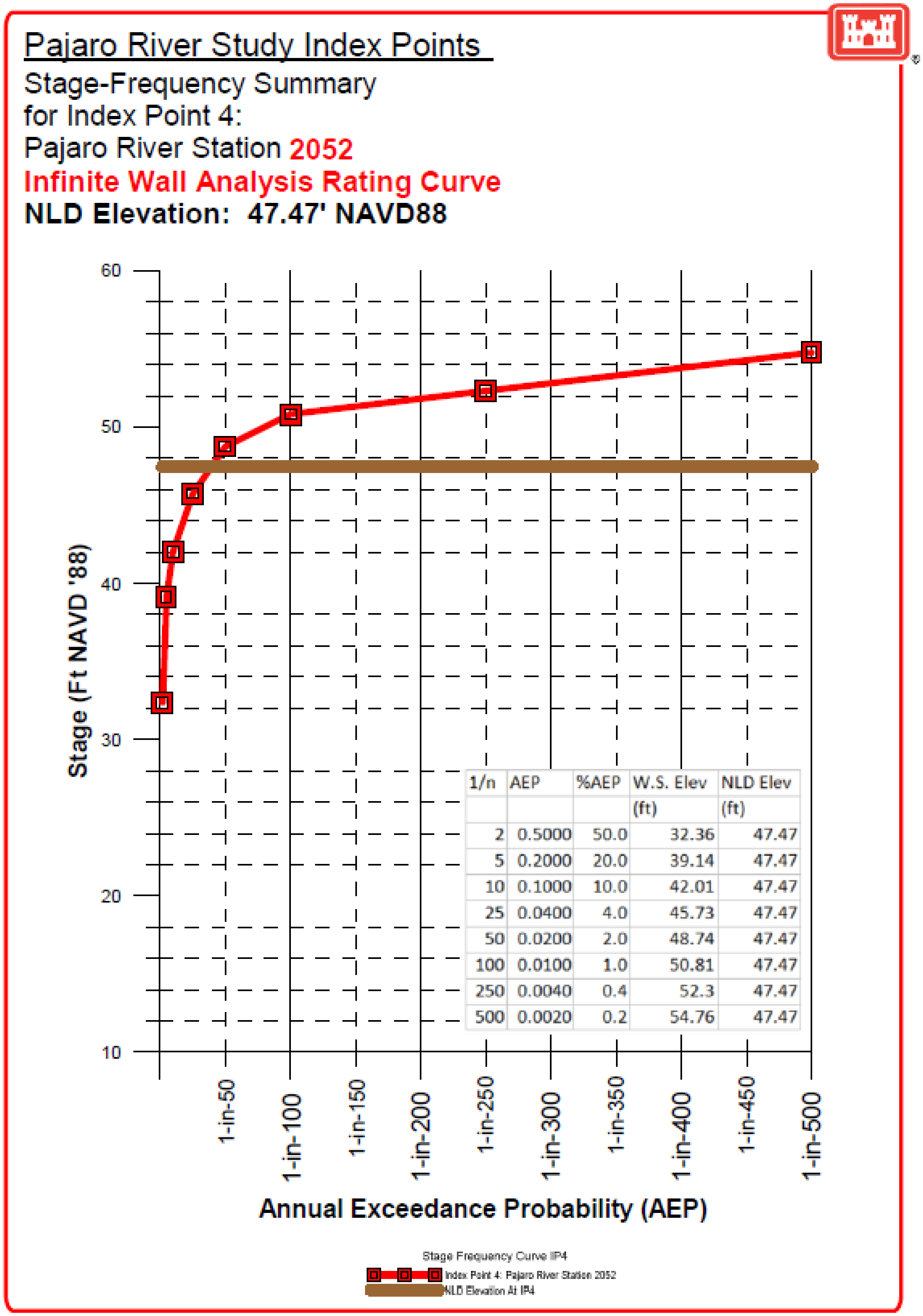
1/n	AEP	%AEP	W.S. Elev (ft)	NLD Elev (ft)
2	0.5000	50.0	14.14	26.55
5	0.2000	20.0	19.46	26.55
10	0.1000	10.0	21.75	26.55
25	0.0400	4.0	24.64	26.55
50	0.0200	2.0	26.79	26.55
100	0.0100	1.0	28.68	26.55
250	0.0040	0.4	30.05	26.55
500	0.0020	0.2	32.31	26.55

Figure C-2: Water surface elevations for the 8 AEP events and levee crest elevation at Index Point 2



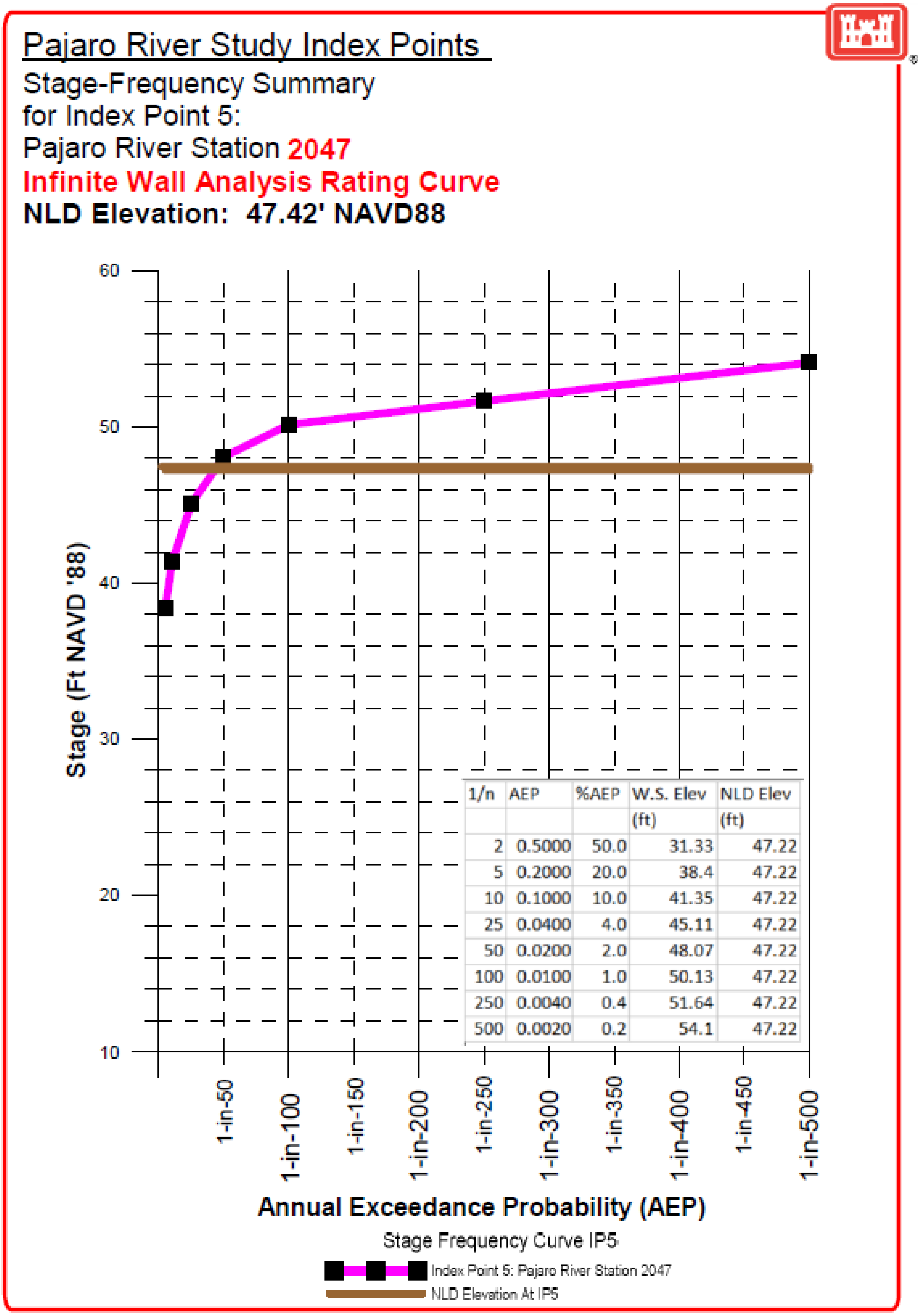
1/n	AEP	%AEP	W.S. Elev (ft)	NLD Elev (ft)
2	0.5000	50.0	27.06	39.75
5	0.2000	20.0	32.29	39.75
10	0.1000	10.0	34.94	39.75
25	0.0400	4.0	38.37	39.75
50	0.0200	2.0	40.99	39.75
100	0.0100	1.0	43.17	39.75
250	0.0040	0.4	44.75	39.75
500	0.0020	0.2	47.35	39.75

Figure C-3: Water surface elevations for the 8 AEP events and levee crest elevation at Index Point 3



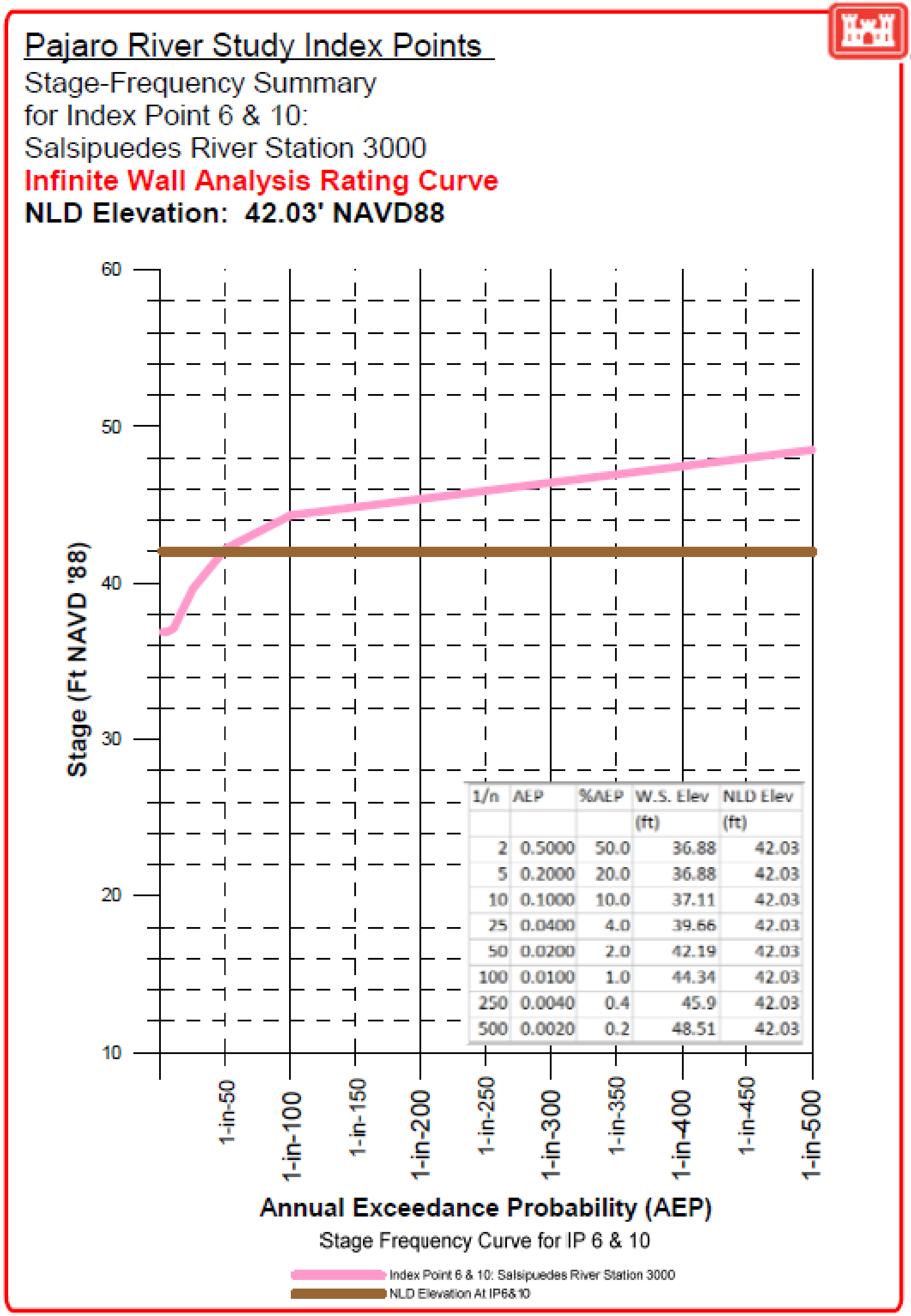
1/n	AEP	%AEP	W.S. Elev (ft)	NLD Elev (ft)
2	0.5000	50.0	32.36	47.47
5	0.2000	20.0	39.14	47.47
10	0.1000	10.0	42.01	47.47
25	0.0400	4.0	45.73	47.47
50	0.0200	2.0	48.74	47.47
100	0.0100	1.0	50.81	47.47
250	0.0040	0.4	52.3	47.47
500	0.0020	0.2	54.76	47.47

Figure C-4: Water surface elevations for the 8 AEP events and levee crest elevation at Index Point 4



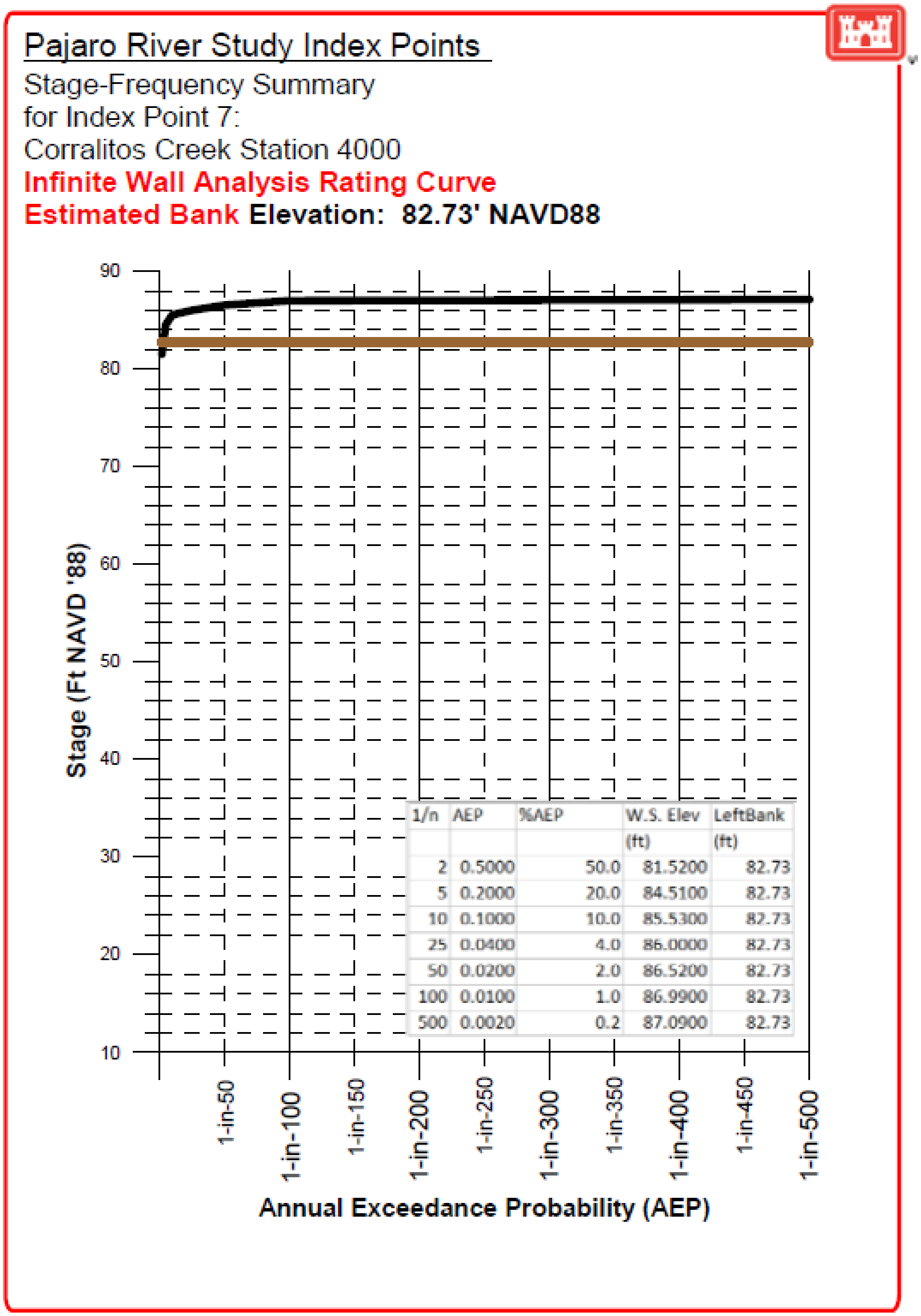
1/n	AEP	%AEP	W.S. Elev (ft)	NLD Elev (ft)
2	0.5000	50.0	31.33	47.22
5	0.2000	20.0	38.4	47.22
10	0.1000	10.0	41.35	47.22
25	0.0400	4.0	45.11	47.22
50	0.0200	2.0	48.07	47.22
100	0.0100	1.0	50.13	47.22
250	0.0040	0.4	51.64	47.22
500	0.0020	0.2	54.1	47.22

Figure C-5: Water surface elevations for the 8 AEP events and levee crest elevation at Index Point 5



1/n	AEP	%AEP	W.S. Elev (ft)	NLD Elev (ft)
2	0.5000	50.0	36.88	42.03
5	0.2000	20.0	36.88	42.03
10	0.1000	10.0	37.11	42.03
25	0.0400	4.0	39.66	42.03
50	0.0200	2.0	42.19	42.03
100	0.0100	1.0	44.34	42.03
250	0.0040	0.4	45.9	42.03
500	0.0020	0.2	48.51	42.03

Figure C-6: Water surface elevations for the 8 AEP events and levee crest elevation at Index Point 6/10



1/n	AEP	%AEP	W.S. Elev (ft)	LeftBank (ft)
2	0.5000	50.0	81.5200	82.73
5	0.2000	20.0	84.5100	82.73
10	0.1000	10.0	85.5300	82.73
25	0.0400	4.0	86.0000	82.73
50	0.0200	2.0	86.5200	82.73
100	0.0100	1.0	86.9900	82.73
500	0.0020	0.2	87.0900	82.73

Figure C-7: Water surface elevations for the 8 AEP events and levee crest elevation at Index Point 7

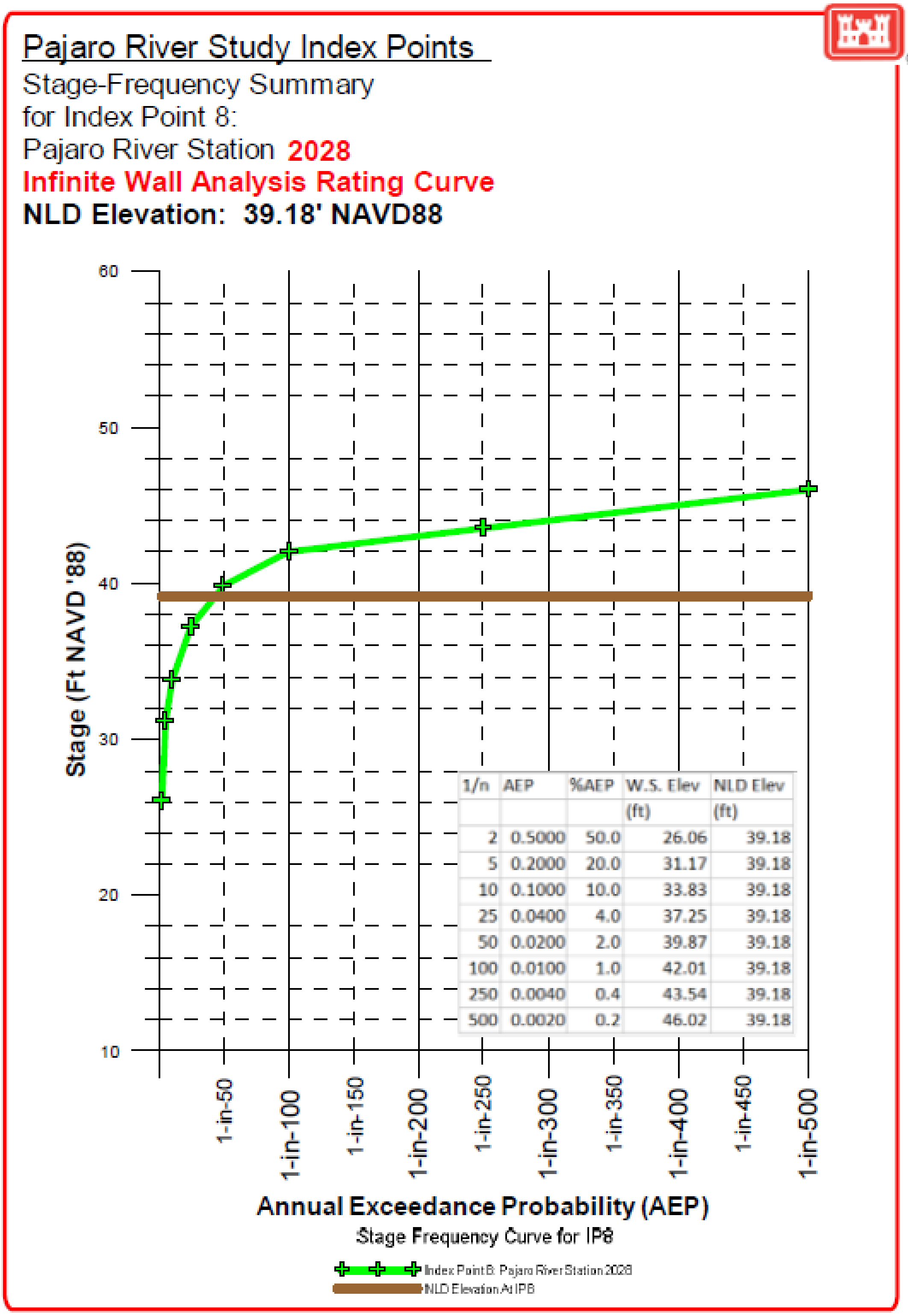


Figure C-8: Water surface elevations for the 8 AEP events and levee crest elevation at Index Point 8

ATTACHMENT 6

Hydrology & Hydraulics (H/H) HEC-FDA Risk Input Data

Pajaro River Without Project Condition Risk Inputs (Infinite Wall)

Index Point #1Pajaro River Station # 1009Downstream Left Bank						
Without Project						
Frequency	Inflow	Outflow	Adjusted Outflow	Standard Deviation (I-O)	Stage NAVD '88	Standard Deviation (Stage)
1yr = .999						0.9
2yr = .5		4,860			14.93	0.9
5yr = .2		12,487			20.41	0.9
10yr = .1		18,592			22.86	0.9
25yr = .04		28,324			25.92	0.9
50yr = .02		36,804			28.17	0.9
100yr = .01		45,079			30.13	0.9
250yr = .004		51,560			31.55	0.9
500yr = .002		62,881			33.87	0.9
Period of Record = 100 Yrs (Since 1911); TOL = 27.70						

Index Point #2Pajaro River Station # 1008Downstream Right Bank						
Without Project						
Frequency	Inflow	Outflow	Adjusted Outflow	Standard Deviation (I-O)	Stage NAVD '88	Standard Deviation (Stage)
1yr = .999						0.9
2yr = .5		4,860			14.14	0.9
5yr = .2		12,487			19.46	0.9
10yr = .1		18,591			21.75	0.9
25yr = .04		28,324			24.64	0.9
50yr = .02		36,803			26.79	0.9
100yr = .01		45,078			28.68	0.9
250yr = .004		51,559			30.05	0.9
500yr = .002		62,880			32.31	0.9
Period of Record = 100 Yrs (Since 1911); TOL = 26.55						

Index Point #3Pajaro River Station # 2032Downstream Right Bank						
Without Project						
Frequency	Inflow	Outflow	Adjusted Outflow	Standard Deviation (I-O)	Stage NAVD '88	Standard Deviation (Stage)
1yr = .999						0.9
2yr = .5		4,862			27.06	0.9
5yr = .2		12,492			32.29	0.9
10yr = .1		18,596			34.94	0.9
25yr = .04		28,327			38.37	0.9
50yr = .02		36,807			40.99	0.9
100yr = .01		45,085			43.17	0.9
250yr = .004		51,567			44.75	0.9
500yr = .002		62,887			47.35	0.9
Period of Record = 100 Yrs (Since 1911); TOL = 39.75						

Index Point #4Pajaro River Station # 2052.02*Upstream Right Bank						
Without Project						
Frequency	Inflow	Outflow	Adjusted Outflow	Standard Deviation (I-O)	Stage NAVD '88	Standard Deviation (Stage)
1yr = .999						0.9
2yr = .5		3,117			32.36	0.9
5yr = .2		10,852			39.14	0.9
10yr = .1		16,957			42.01	0.9
25yr = .04		26,742			45.73	0.9
50yr = .02		35,161			48.74	0.9
100yr = .01		43,446			50.81	0.9
250yr = .004		49,928			52.30	0.9
500yr = .002		61,244			54.76	0.9
Period of Record = 100 Yrs (Since 1911); TOL = 47.47						

Index Point #5Pajaro River Station # 2047Upstream Left Bank						
Without Project						
Frequency	Inflow	Outflow	Adjusted Outflow	Standard Deviation (I-O)	Stage NAVD '88	Standard Deviation (Stage)
1yr = .999						0.9
2yr = .5		3,114			31.33	0.9
5yr = .2		10,851			38.40	0.9
10yr = .1		16,957			41.35	0.9
25yr = .04		26,742			45.11	0.9
50yr = .02		35,161			48.07	0.9
100yr = .01		43,446			50.13	0.9
250yr = .004		49,928			51.64	0.9
500yr = .002		61,244			54.10	0.9
Period of Record = 100 Yrs (Since 1911); TOL = 47.22						

Index Point #6Salsipuedes CreekStation # 3200Right Bank						
Without Project						
Frequency	Inflow	Outflow	Adjusted Outflow	Standard Deviation (I-O)	Stage NAVD '88	Standard Deviation (Stage)
1yr = .999						0.9
2yr = .5		2,051			38.55	0.9
5yr = .2		2,411			39.06	0.9
10yr = .1		3,305			40.07	0.9
25yr = .04		4,593			41.19	0.9
50yr = .02		5,485			42.19	0.9
100yr = .01		7,330			44.34	0.9
250yr = .004		9,770			45.9	0.9
500yr = .002		11,972			48.51	0.9
Period of Record = 100 Yrs (Since 1911); TOL = 42.03						

Index Point #7Coralitos CreekStation # 4099.812Right Bank						
Without Project						
Frequency	Inflow	Outflow	Adjusted Outflow	Standard Deviation (I-O)	Stage NAVD '88	Standard Deviation (Stage)
1yr = .999						0.9
2yr = .5		1,045			81.78	0.9
5yr = .2		2,417			84.85	0.9
10yr = .1		3,323			86.21	0.9
25yr = .04		4,087			87.17	0.9
50yr = .02		4,854			88.07	0.9
100yr = .01		6,254			89.57	0.9
250yr = .004		7,391			90.67	0.9
500yr = .002		9,187			92.26	0.9
Period of Record = 100 Yrs (Since 1911); TOL = 84.41 (right bank) and TOL = 82.73 (left bank)						

Index Point #8Pajaro River Station # 2028Downstream Left Bank						
Without Project						
Frequency	Inflow	Outflow	Adjusted Outflow	Standard Deviation (I-O)	Stage NAVD '88	Standard Deviation (Stage)
1yr = .999						0.9
2yr = .5		4,862			26.06	0.9
5yr = .2		12,491			31.17	0.9
10yr = .1		18,596			33.83	0.9
25yr = .04		28,327			37.25	0.9
50yr = .02		36,807			39.87	0.9
100yr = .01		45,084			42.01	0.9
250yr = .004		51,566			43.54	0.9
500yr = .002		62,887			46.02	0.9
Period of Record = 100 Yrs (Since 1911); TOL = 39.18						

Index Point #10Salsipuedes CreekStation # 3200Left Bank						
Without Project						
Frequency	Inflow	Outflow	Adjusted Outflow	Standard Deviation (I-O)	Stage NAVD '88	Standard Deviation (Stage)
1yr = .999						0.9
2yr = .5		2,051			38.55	0.9
5yr = .2		2,411			39.06	0.9
10yr = .1		3,305			40.07	0.9
25yr = .04		4,593			41.19	0.9
50yr = .02		5,485			42.19	0.9
100yr = .01		7,330			44.34	0.9
250yr = .004		9,770			45.9	0.9
500yr = .002		11,972			48.51	0.9
Period of Record = 100 Yrs (Since 1911); TOL = 42.03						

With-Project Rating Curves - IP 3

Parse20	IP3
Discharge	Stage
0.00	12.69
3288.76	24.13
6577.53	27.72
9866.29	30.09
13155.05	31.86
16443.82	33.28
19732.58	34.49
23021.34	35.54
26310.11	36.50
29598.87	37.38
32887.63	38.22
36176.39	39.03
39465.16	39.81
42753.92	40.57
46042.68	41.32
49331.45	42.06
52620.21	42.79
55908.97	43.51
59197.74	44.21
62486.50	44.90

With-Project Rating Curves - IP 5

Parse20	IP5
Discharge	Stage
0.00	20.35
1636.70	28.29
3273.41	31.67
4910.11	34.21
6546.81	36.20
8183.52	37.77
9820.22	39.00
11456.93	39.98
13093.63	40.80
14730.33	41.50
16367.04	42.13
18003.74	42.71
19640.44	43.27
21277.15	43.80
22913.85	44.32
24550.55	44.83
26187.26	45.33
27823.96	45.82
29460.67	46.30
31097.37	46.78

With-Project Rating Curves - IP 7

Parse20	IP7
Discharge	Stage
0.00	73.57
472.71	79.67
945.41	81.44
1418.12	82.62
1890.82	83.53
2363.53	84.30
2836.24	84.98
3308.94	85.60
3781.65	86.18
4254.35	86.72
4727.06	87.24
5199.77	87.72
5672.47	88.18
6145.18	88.61
6617.89	89.01
7090.59	89.38
7563.30	89.71
8036.00	90.01
8508.71	90.26
8981.42	90.47

With-Project Rating Curves - IP 8

Parse20	IP8
Discharge	Stage
0.00	12.10
3288.72	22.55
6577.44	26.20
9866.16	28.62
13154.88	30.42
16443.59	31.85
19732.31	33.05
23021.03	34.08
26309.75	34.99
29598.47	35.82
32887.19	36.60
36175.91	37.33
39464.63	38.04
42753.35	38.74
46042.07	39.43
49330.78	40.12
52619.50	40.83
55908.22	41.55
59196.94	42.29
62485.66	43.06

ATTACHMENT 7

Geotechnical Engineering MFR

CESPN-ET-EG 17 October 2016

MEMORANDUM FOR RECORD

SUBJECT: PAJARO RIVER LEVEES PERFORMANCE

This memorandum presents findings from an evaluation of the reliability of Pajaro River Right Bank Downstream of Salsipuedes Creek (PJRD), Pajaro River Right Bank Upstream of Salsipuedes Creek (PJRU), and Pajaro River Left Bank (PJL). No effort was made to separate the performance of these individual levee systems. Therefore, PJRD, PJRU, and PJL are hereinafter, collectively referred to as the Pajaro River Levees. The sole purpose of this evaluation was to develop a performance curve for the Pajaro River Levees in support of economic analyses to estimate without project damages. The purpose of this evaluation was not to draw conclusions about the degree of protection afforded by the Pajaro River Levees.

The Pajaro River Levees were originally constructed by the US Army Corps of Engineers in 1948 (USACE, n.d.). Based on recent subsurface exploration programs (Dames and Moore, 1990; URS, 2000), the Pajaro River Levees were primarily constructed from silty fine sand and fine sand. The Pajaro River Levees are susceptible to surface erosion and have experienced severe surface erosion in the past (USACE, 1996, 1997a, 1997b, 1998, and 2000). The likely mode of failure involves antecedent surface erosion followed by seepage and/or slope instability. Due to the complexity of this mode of failure, a performance curve based on statistical analysis was pursued.

Past performance of the Pajaro River Levees is captured in various reports (USACE, 1996, 1997a, 1997b, 1998, and 2000) and summarized in the Table 1. Levee embankment loadings were inferred from report narratives describing surveillance, flood-fight, and/or flooding observations. Approximations of levee embankment loading from gauging stations were not possible because the nearest gauge (USGS Gauge 11159000, Pajaro River at Chittenden) is located approximately 12 miles upstream of the Pajaro River Levees. Similarly, estimates of stage-discharge relationships from direct measurements (e.g., high-water marks) is considerably impacted by vegetation over the period of record (i.e., 1948 to 2015). Only two loading scenarios were considered: (i.) loading below 50 percent of the levee height and (ii.) loading above 50 percent of the levee height.

A performance curve for the Pajaro River Levees is summarized in Table 2 and shown in Figure 1. Expected probability of failures were estimated from past performance. A 70 percent confidence band for the performance curve is also provided and based on Wilson (1927). The Probable Non-Failure Point (PNP) was defined as the toe of the levee embankment (zero percent levee height) and the Probable Failure Point (PFP) was defined as the crest of the levee embankment (100 percent levee height). Stage elevation and percent levee height relationships are summarized in Table 3.

For clarification on the contents of this memorandum, please contact the undersigned.

Encl

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Table 1: Past Performance of the Pajaro River Levees

Event	Peak Discharge (cfs)	Loading	Levee Breach – Bank; Location	Remarks
December 1955	24,000	Above	Yes – right bank; River Mile 7.5 (1 mile upstream of confluence of Salsipuedes Creek & Pajaro River)	No documentation of WSE along levee prism. Erosion damage sustained along the system and repaired/armored at a 1956 cost of $212,000 (USACE, 1996). Specific locations unknown.
April 1958	23,500	Below	Yes – unknown; *upstream of project levees*	No documentation of WSE along levee prism. Flooding described as 13 feet deep across approximately 290 acres between US 101 and Murphy's Crossing; i.e. the approximate upstream extent of the right bank project levee (USACE, 1996). Erosion damage sustained from Murphy's Crossing to the mouth and repaired/armored at a ~1958 cost of $652,000 (USACE, 1996). Specific locations unknown.
January 1982	12,100	Below	No	No documentation of WSE along levee prism. Considerable erosion damage to the levee slopes along Salsipuedes Creek (USACE, 1997a). Rehabilitation at four erosion sites at a 1982 cost of $210,000 (USACE, 1997b). Specific locations unknown.
February 1986	13,100	Below	No	No documentation of WSE along levee prism. Considerable erosion damage to the levee slopes along Salsipuedes Creek (USACE, 1997a).
January 1993	6,630	Below	No	WSE within 4 ft of the levee crest upstream of the confluence with Salsipuedes Creek (USACE, 1996). Considerable erosion damage to the levee slopes along Salsipuedes Creek (USACE, 1997a). Unspecified levee repairs made in 1993 at a cost of $52,000 (USACE, 1997b). Specific locations unknown.
March 1995	21,500	Above	Yes – right bank; River Mile 10.5 (1 mile downstream of Murphy's Crossing) / left bank; River Mile 9 (3 miles upstream of Main Street Bridge)	Overtopping in both breached and non-breached reaches (USACE, 1996). Stage @ Main Street Bridge was ~31 ft at the time of the left bank breach reported, same stage at the time of right bank breach discovery 1-hour after LB reported (USACE, 1996). Considerable erosion damage to the levee slopes along Salsipuedes Creek (USACE, 1997a).
December 1996 to January 1997	Unknown	Unknown	No	No documentation of WSE along levee prism. Rehabilitation at four erosion sites at an estimated cost of $770,000 (USACE, 1997b). Locations described in USACE (1997b).
February 1998	25,100	Above	Yes – right bank; River Mile 3.5 (at CA 1)	Overtopping at breach location (USACE, 1996). Rehabilitation at 12 erosion sites at a 1998 cost of $7,863,000 (USACE, 1998). Locations described in USACE (1998).

Table 2: Performance Curve for Pajaro River Levees

Loading (Percent of Levee Height)	Number of Failures	Number of Observation	Probability of Failure		
			Lower Bound (15th Percentile)	Expected	Upper Bound (85th Percentile)
0 (PNP)			0	0	0
50	0	4	0	0	21
100	3	3	74	100	100
100 (PFP)			100	100	100
Overtopping			100	100	100

Table 3: Stage Elevation and Percent Levee Height Relationships

Index Point	Loading (Percent of Levee Height)		
	0 (Toe)	50	100 (Crest)
1	18.0	22.8	27.5
2	18.0	22.3	26.5
3	30.0	35.0	40.0
4	40.0	43.8	47.5
5	38.0	42.6	47.2
8	31.0	35.0	39.0

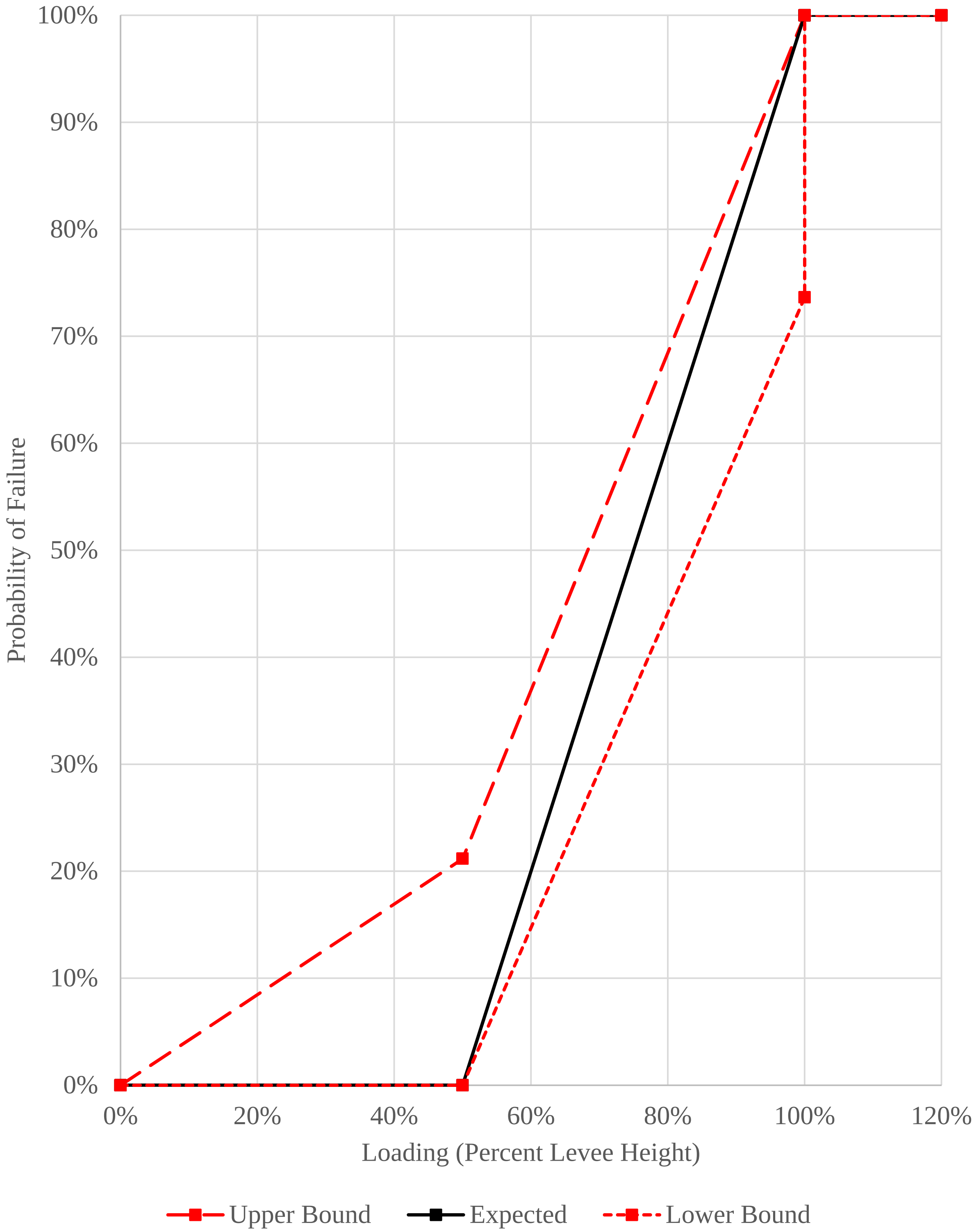


Figure 1: Performance Curve for Pajaro River Levees

List of References

Dames and Moore (1990). Pajaro River Levee SPT Soil Sampling.

URS (2000). Report of Field Activities: Subsurface Geotechnical Investigation: Pajaro River and Salsipuedes Creek.

USACE (n.d.). Pajaro Levee Project: Operation and Maintenance Manual.

USACE (1996). Pajaro River Flood of March 1995: Reconnaissance Report.

USACE (1997a). Pajaro River Basin Santa Cruz County: Hydrologic Engineering Report.

USACE (1997b). Project Information Report: Pajaro River Monterey and Santa Cruz Counties PL-99 1997.

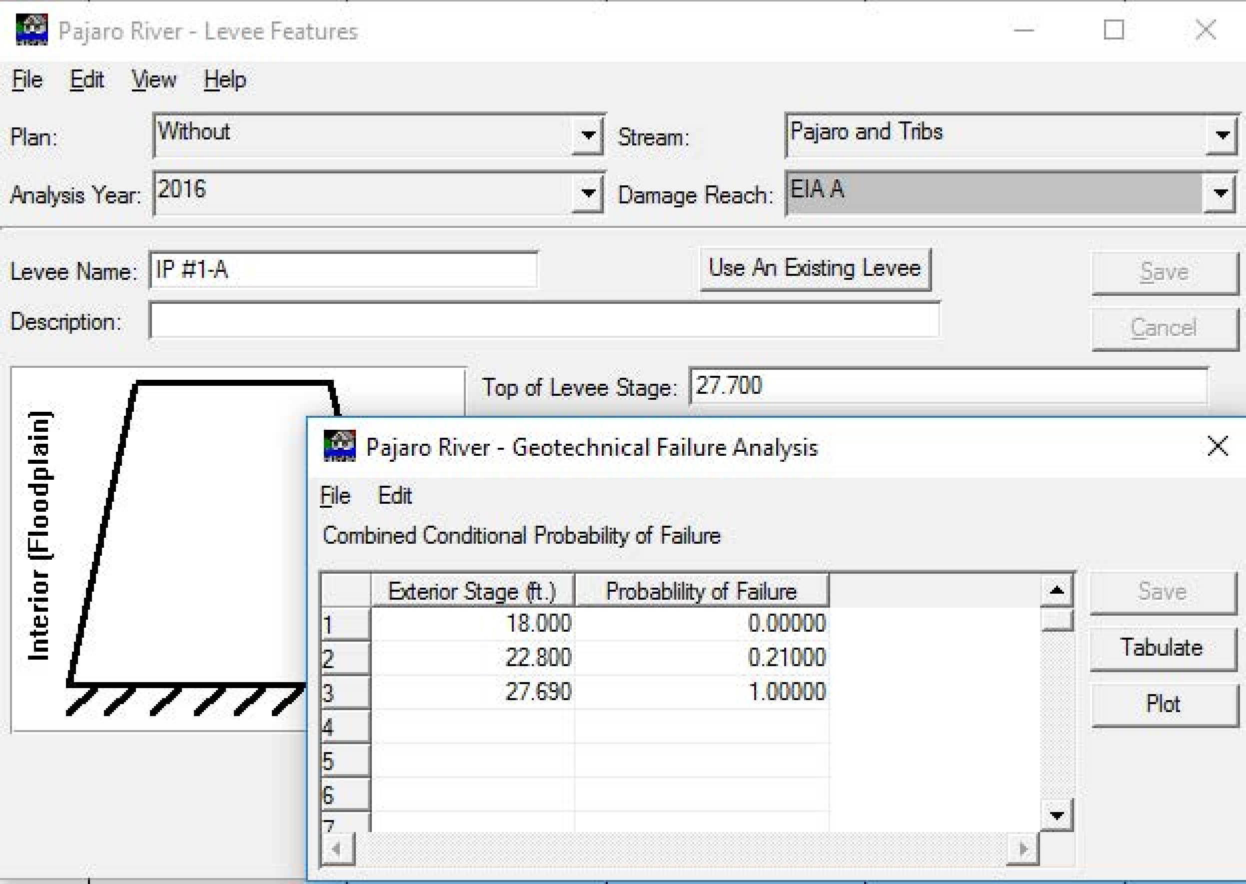
USACE (1998). Project Information Report: Emergency Repairs Pajaro River Monterey and Santa Cruz Counties PL-99 March 1998.

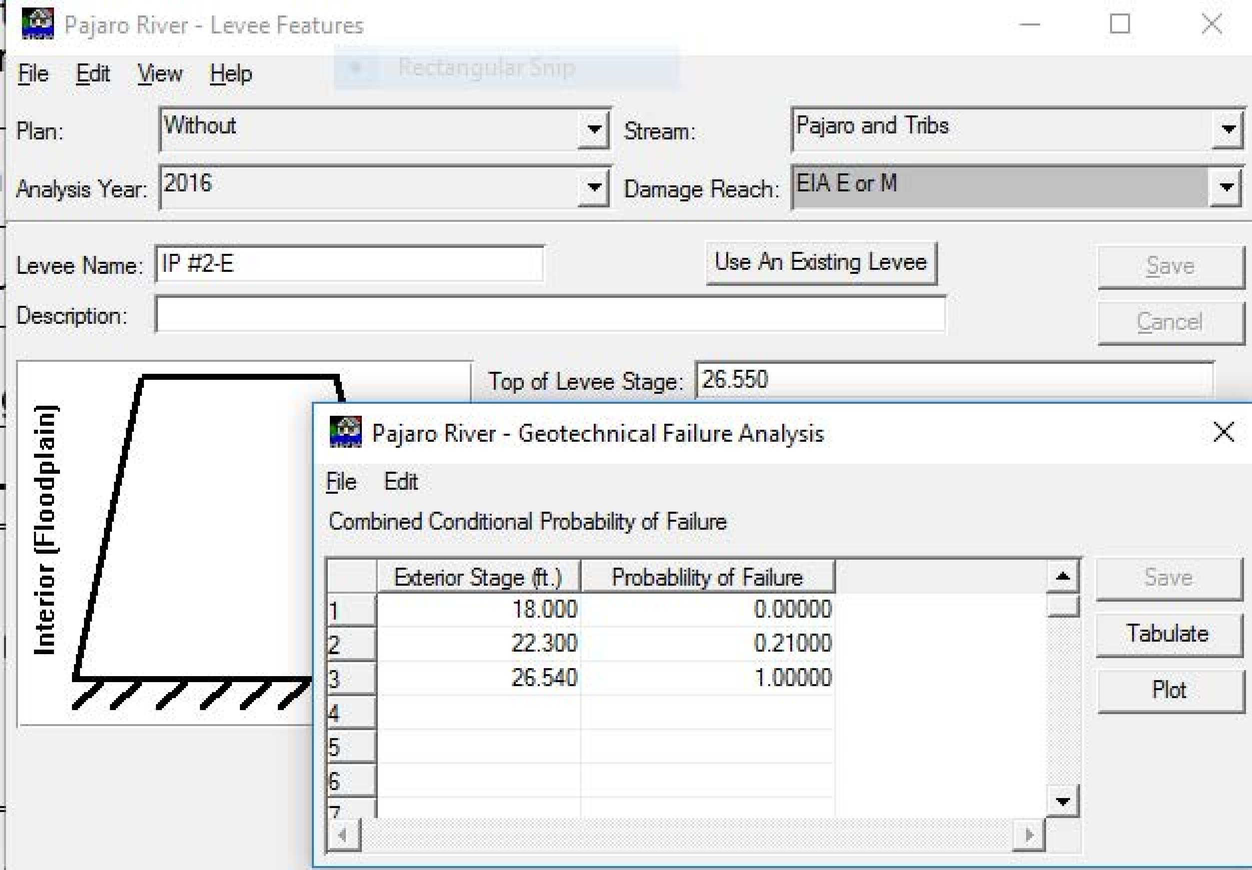
USACE (2000). Channel Stability Problems, Pajaro River, Watsonville and Pajaro, California.

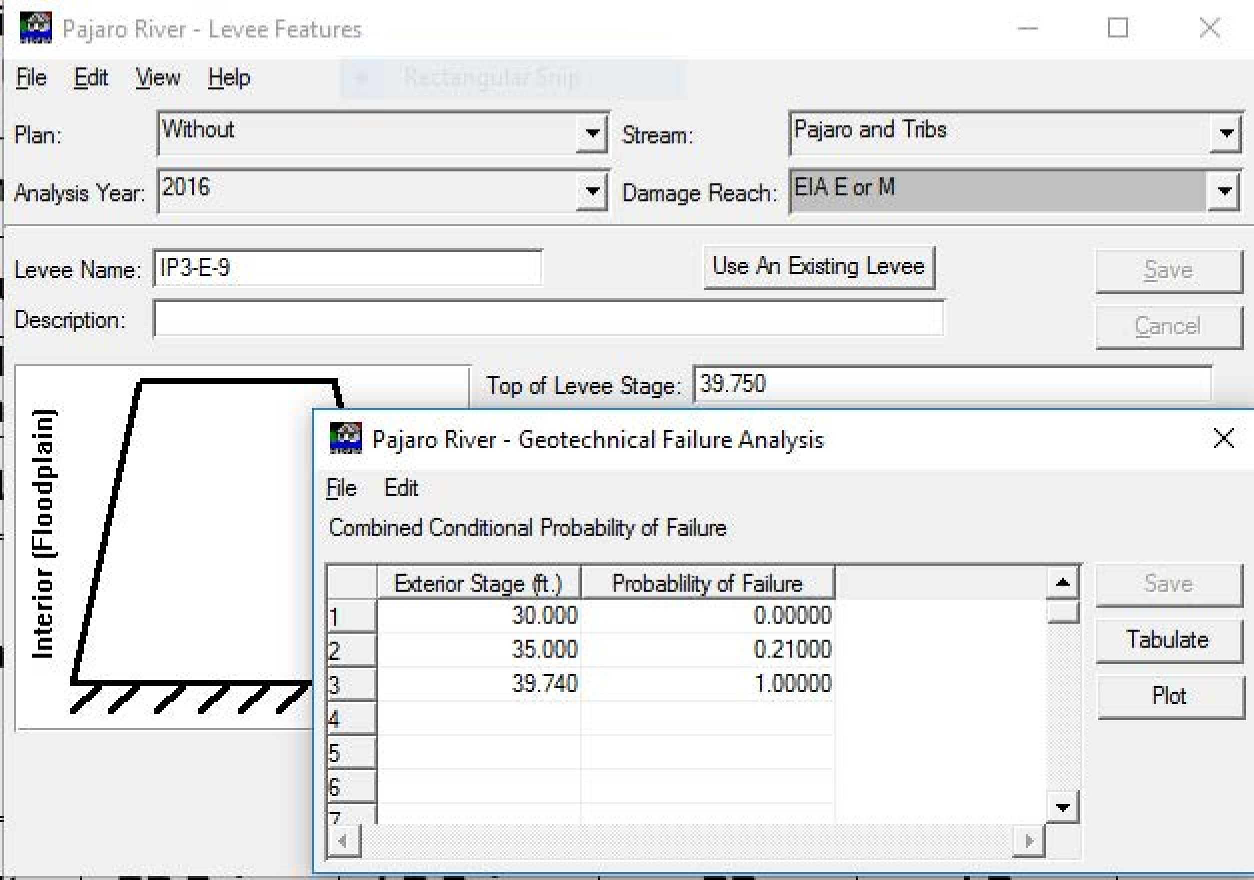
Wilson, E. B. (1927). Probable Inference, the Law of Succession, and Statistical Inference.

ATTACHMENT 8

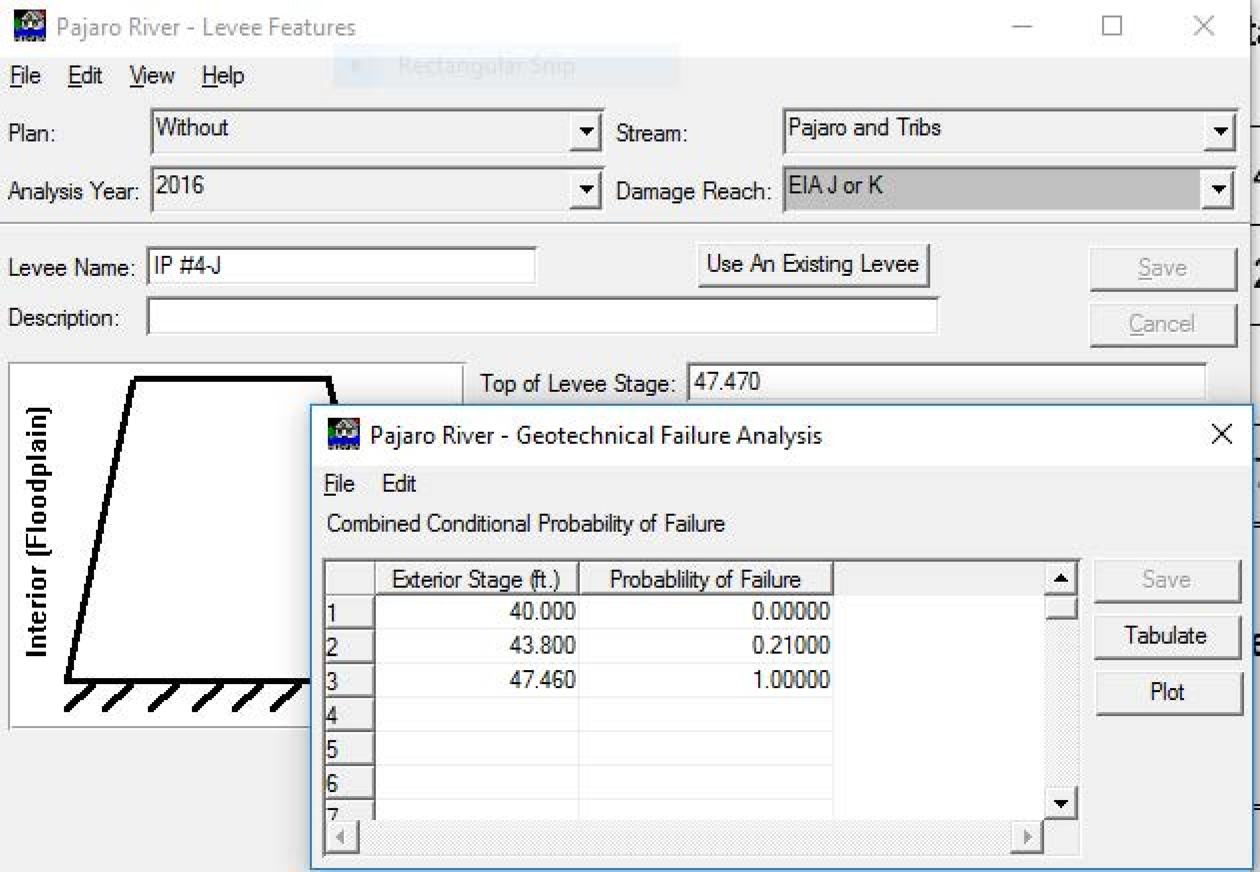
Geotechnical Levee Fragility Curves

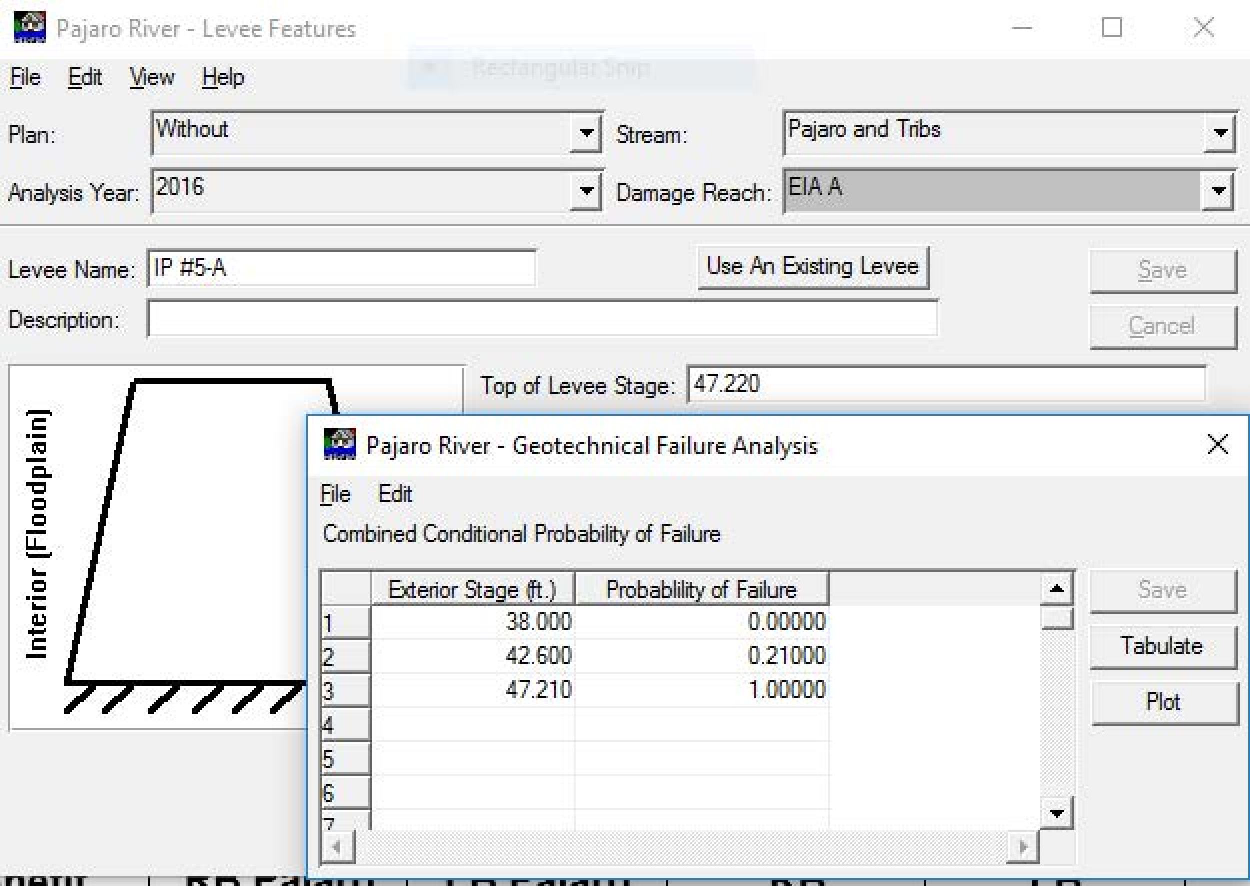

Pajaro River - Levee Features
File Edit View Help
Plan: Without
Stream: Pajaro and Tribs
Analysis Year: 2016
Damage Reach: EIA A
Levee Name: IP #1-A
Use An Existing Levee
Save
Description:
Cancel
Top of Levee Stage: 27.700
Interior (Floodplain)
Pajaro River - Geotechnical Failure Analysis
File Edit
Combined Conditional Probability of Failure
Exterior Stage (ft.)
Probablility of Failure
1 18.000 0.00000
2 22.800 0.21000
3 27.690 1.00000
4
5
6
7
Save
Tabulate
Plot

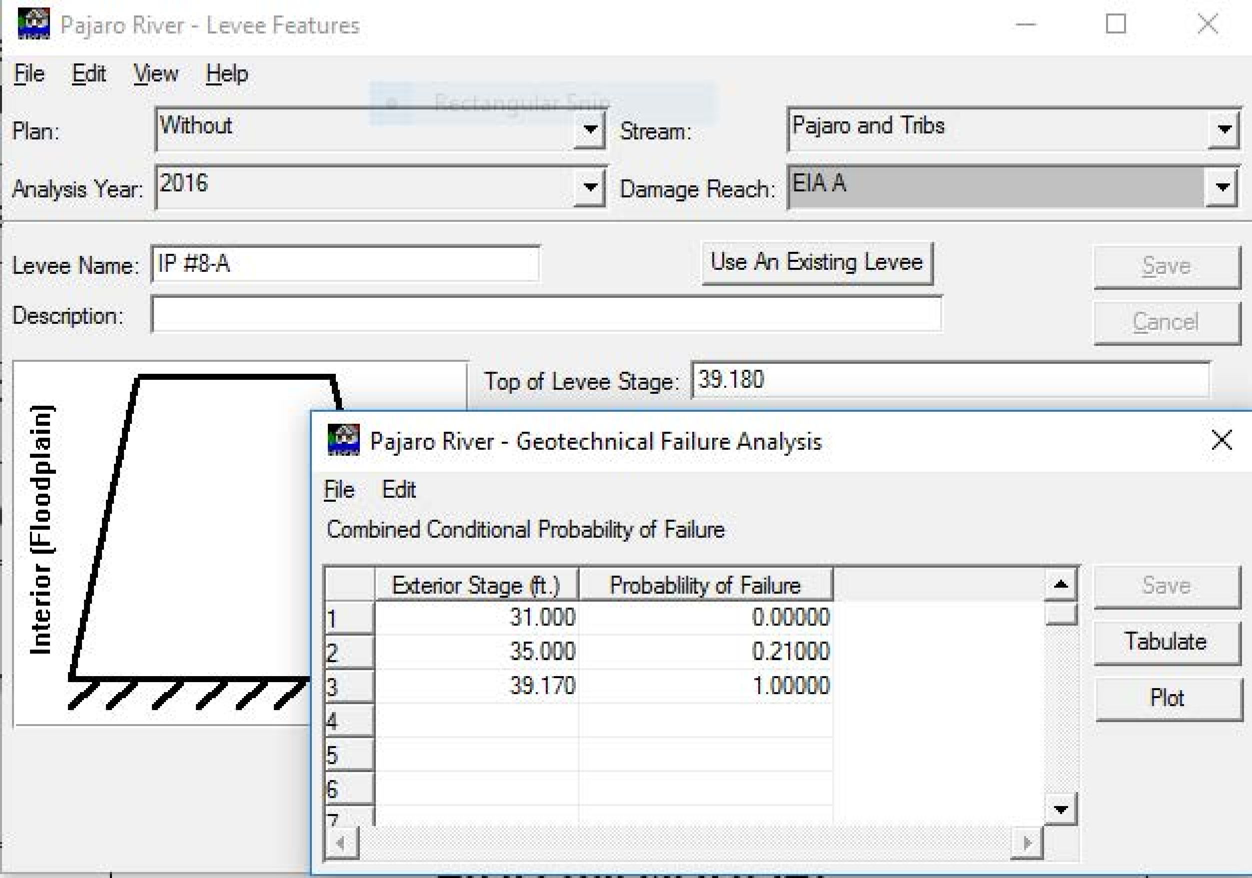

Pajaro River - Levee Features
File Edit View Help
Rectangular Snip
Plan: Without
Stream: Pajaro and Tribs
Analysis Year: 2016
Damage Reach: EIA E or M
Levee Name: IP #2-E
Use An Existing Levee
Save
Description:
Cancel
Top of Levee Stage: 26.550
Interior (Floodplain)
Pajaro River - Geotechnical Failure Analysis
File Edit
Combined Conditional Probability of Failure
Exterior Stage (ft.)
Probablility of Failure
1 18.000 0.00000
2 22.300 0.21000
3 26.540 1.00000
4
5
6
7
Save
Tabulate
Plot



Pajaro River - Levee Features
File
Edit
View
Help
Plan:
Without
Stream:
Pajaro and Tribs
Analysis Year:
2016
Damage Reach:
EIA E or M
Levee Name:
IP3-E-9
Use An Existing Levee
Save
Description:
Cancel
Interior (Floodplain)
Top of Levee Stage:
39.750
Pajaro River - Geotechnical Failure Analysis
File
Edit
Combined Conditional Probability of Failure
Exterior Stage (ft.)
Probablility of Failure
1 30.000 0.00000
2 35.000 0.21000
3 39.740 1.00000
4
5
6
7
Save
Tabulate
Plot


Pajaro River - Levee Features
File
Edit
View
Help
Plan:
Without
Stream:
Pajaro and Tribs
Analysis Year:
2016
Damage Reach:
EIA J or K
Levee Name:
IP #4-J
Use An Existing Levee
Save
Description:
Cancel
Top of Levee Stage:
47.470
Interior (Floodplain)
Pajaro River - Geotechnical Failure Analysis
File
Edit
Combined Conditional Probability of Failure
Exterior Stage (ft.)
Probablility of Failure
1 40.000 0.00000
2 43.800 0.21000
3 47.460 1.00000
4
5
6
Save
Tabulate
Plot


Pajaro River - Levee Features
File
Edit
View
Help
Plan:
Without
Stream:
Pajaro and Tribs
Analysis Year:
2016
Damage Reach:
EIA A
Levee Name:
IP #5-A
Use An Existing Levee
Save
Description:
Cancel
Interior (Floodplain)
Top of Levee Stage:
47.220
Pajaro River - Geotechnical Failure Analysis
File
Edit
Combined Conditional Probability of Failure
Exterior Stage (ft.)
Probability of Failure
1 38.000 0.00000
2 42.600 0.21000
3 47.210 1.00000
4
5
6
7
Save
Tabulate
Plot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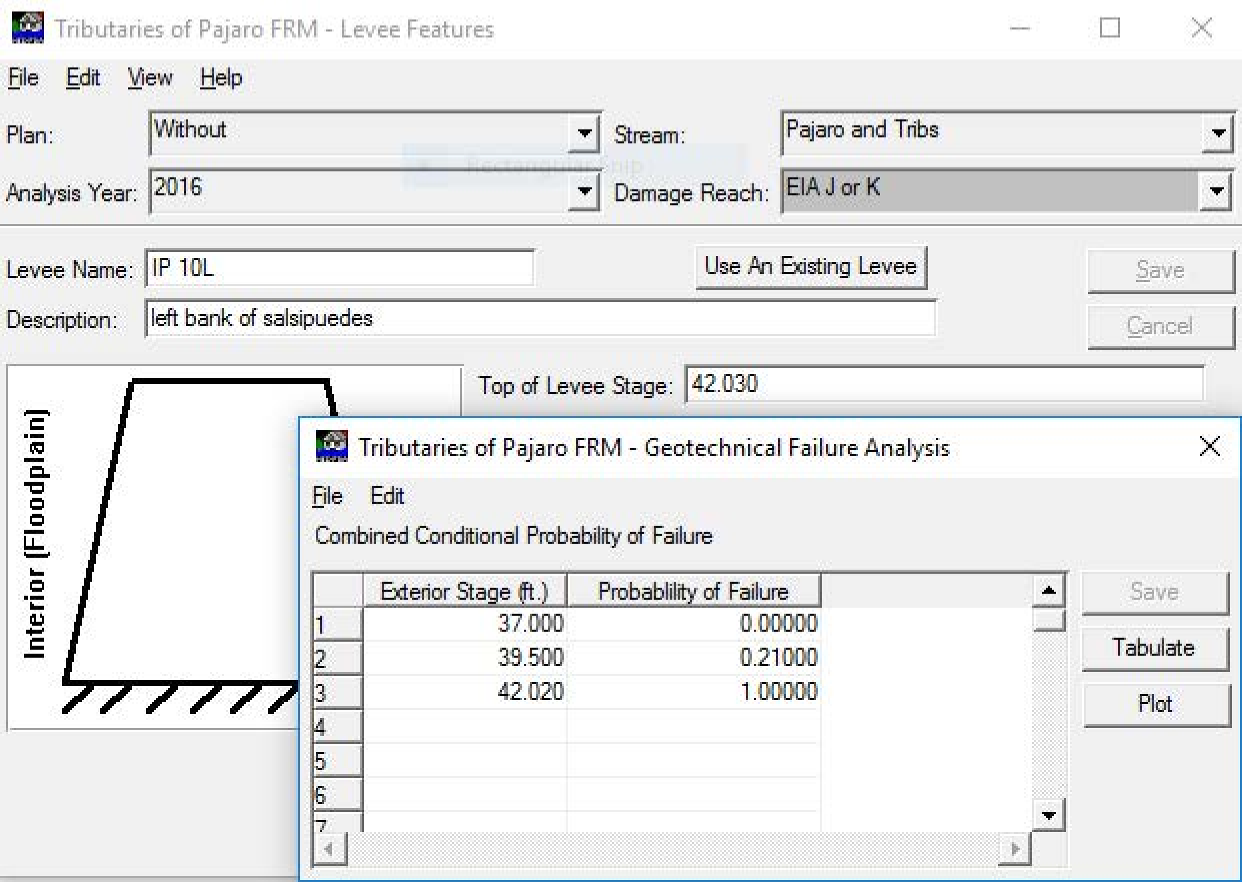
File Edit View Help
Plan: Without
Stream: Pajaro and Tribs
Analysis Year: 2016
Damage Reach: EIA A
Levee Name: IP #8-A
Use An Existing Levee
Save
Cancel
Description:
Top of Levee Stage: 39.180
Interior (Floodplain)
Pajaro River - Geotechnical Failure Analysis
File Edit
Combined Conditional Probability of Failure
Exterior Stage (ft.)
Probablility of Failure
1 31.000 0.00000
2 35.000 0.21000
3 39.170 1.00000
4
5
6
7
Save
Tabulate
Plot


Tributaries of Pajaro FRM - Levee Features
File Edit View Help
Plan: Without
Stream: Pajaro and Tribs
Analysis Year: 2016
Damage Reach: EIA J or K
Levee Name: IP 10L
Use An Existing Levee
Save
Cancel
Description: left bank of salsipuedes
Top of Levee Stage: 42.030
Interior (Floodplain)
Tributaries of Pajaro FRM - Geotechnical Failure Analysis
File Edit
Combined Conditional Probability of Failure
Exterior Stage (ft.)
Probablility of Failure
1 37.000 0.00000
2 39.500 0.21000
3 42.020 1.00000
4
5
6
7
Save
Tabulate
Plot

ATTACHMENT 9

Economic Depth-Percent Damage Curves and CSVRs

Occ_Name	Occ_Description	Cat_Name	Parameter	Start_Data																	
SFR1	Single Family Residential - 1 Story	Residential	Stage	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10		
SFR1			S	0	2.5	8	13.4	18.4	23.3	27.7	32.1	40.1	47.1	53.2	58.6	63.2	67.2	70.5	73.2		
SFR1			SN	0	2.7	2.4	2	1.8	1.6	1.6	1.6	1.8	1.9	2	2.1	2.2	2.3	2.4	2.7		
SFR1			Stage	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10		
SFR1			C	0	2.4	5.3	8.1	10.7	13.3	15.6	17.9	22	25.7	28.8	31.5	33.8	35.7	37.2	38.4		
SFR1			CN	0	2.1	1.8	1.5	1.4	1.2	1.2	1.2	1.4	1.5	1.6	1.6	1.7	1.8	1.9	2.1		
SFR1			Stage	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10		
SFR1			O	0	0	0	0	20.2	33.9	42.8	53.2	70.3	85.1	96.1	98.3	99.2	99.8	100	100		
SFR1			ON	0	0	0	0	2.7	2.3	2	1.8	1.3	0.9	1.2	2	2.1	2.1	2.2	2.2		
SFR1			Struct	N		0.5		N		15		N	100	12			-901				-901
SFR2	Single Family Residential - 2 Story	Residential	Stage	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10		
SFR2			S	0	3	6.2	9.3	12.3	15.2	18.1	20.9	26.3	31.4	36.2	40.7	44.9	48.8	52.4	55.7		
SFR2			SN	0	4.1	3.75	3.4	3.2	3	2.9	2.8	2.9	3.2	3.4	3.7	3.9	4	4.1	4.2		
SFR2			Stage	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10		
SFR2			C	0	1	3	5	6.9	8.7	10.5	12.2	15.5	18.5	21.3	23.9	26.3	28.4	30.3	32		
SFR2			CN	0	3.5	3.2	2.9	2.75	2.6	2.55	2.5	2.5	2.7	3	3.2	3.3	3.4	3.5	3.5		
SFR2			Stage	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10		
SFR2			O	0	0	0	0	20.2	33.9	42.8	53.2	70.3	85.1	96.1	98.3	99.2	99.8	100	100		
SFR2			ON	0	0	0	0	2.7	2.3	2	1.8	1.3	0.9	1.2	2	2.1	2.1	2.2	2.2		
SFR2			Struct	N		0.5		N		15		N	100	12			-901				-901
MFR1	Multi-Family Residential - 1 Story	Residential	Stage	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10		
MFR1			S	0	2.5	7.95	13.4	18.35	23.3	27.7	32.1	40.1	47.1	53.2	58.6	63.2	67.2	70.5	73.2		
MFR1			SN	0	2.7	2.35	2	1.8	1.6	1.6	1.6	1.8	1.9	2	2.1	2.2	2.3	2.4	2.7		
MFR1			Stage	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10		
MFR1			C	0	2.4	5.25	8.1	10.7	13.3	15.6	17.9	22	25.7	28.8	31.5	33.8	35.7	37.2	38.4		
MFR1			CN	0	2.1	1.8	1.5	1.35	1.2	1.2	1.2	1.4	1.5	1.6	1.6	1.7	1.8	1.9	2.1		
MFR1			Stage	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10		
MFR1			O	0	0	0	0	20.2	33.9	42.8	53.2	70.3	85.1	96.1	98.3	99.2	99.8	100	100		
MFR1			ON	0	0	0	0	2.7	2.3	2	1.8	1.3	0.9	1.2	2	2.1	2.1	2.2	2.2		
MFR1			Struct	N		0.5		N		15		N	100	12			-901				-901
MFR2	Multi-Family Residential - 2 Story	Residential	Stage	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10		
MFR2			S	0	3	6.15	9.3	12.25	15.2	18.05	20.9	26.3	31.4	36.2	40.7	44.9	48.8	52.4	55.7		
MFR2			SN	0	4.1	3.75	3.4	3.2	3	2.9	2.8	2.9	3.2	3.4	3.7	3.9	4	4.1	4.2		
MFR2			Stage	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10		
MFR2			C	0	1	3	5	6.85	8.7	10.45	12.2	15.5	18.5	21.3	23.9	26.3	28.4	30.3	32		
MFR2			CN	0	3.5	3.2	2.9	2.75	2.6	2.55	2.5	2.5	2.7	3	3.2	3.3	3.4	3.5	3.5		
MFR2			Stage	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10		
MFR2			O	0	0	0	0	20.2	33.9	42.8	53.2	70.3	85.1	96.1	98.3	99.2	99.8	100	100		
MFR2			ON	0	0	0	0	2.7	2.3	2	1.8	1.3	0.9	1.2	2	2.1	2.1	2.2	2.2		
MFR2			Struct	N		0.5		N		15		N	100	12			-901				-901
MH	Manufactured Housing	Residential	Stage	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10		
MH			S	0	0	0	8	29	50	60	71	82	87	89	91	91	91	100	100		
MH			SN	0	0	0	2	1.8	1.6	1.6	1.6	1.8	1.9	2	2.1	2.2	2.3	2.4	2.7		
MH			Stage	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10		
MH			C	0	0	0	0	20	35	43	56	72	79	84	87	88	90	100	100		
MH			CN	0	2.1	1.8	1.5	1.35	1.2	1.2	1.2	1.4	1.5	1.6	1.6	1.7	1.8	1.9	2.1		
MH			Stage	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10		
MH			O	0	0	0	0	20.2	33.9	42.8	53.2	70.3	85.1	96.1	98.3	99.2	99.8	100	100		
MH			ON	0	0	0	0	2.7	2.3	2	1.8	1.3	0.9	1.2	2	2.1	2.1	2.2	2.2		
MH			Struct	N		0.5		N		15		N	50	12			-901				-901
APT1	Apartment Building - Engineered	Residential	Stage	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10		
APT1			S	0	0	0	0	6.4	9.5	12.7	19.1	21.8	30.5	32.6	35	35.5	41.4	43.8	45.5		
APT1			STL	0	0	0	0	4.5	7.6	9.7	13.9	18.1	22.3	29.2	29.6	29.9	31.1	34.2	39.2		
APT1			STU	0	0.7	0.7	1.9	11.3	16.8	21.6	27.6	34	39.2	45.2	45.2	56.1	58.9	64.3	70.4		
APT1			Stage	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10		
APT1			C	0	0	0	0	14.3	21.7	26.6	30.4	39	45	47.9	51.9	55.7	59.3	60.6	63.4		

APT1			CTL		0	0	0	0	10	15	20	25	30	37.5	42	45	50	55	58	60	
APT1			CTU		0	0	0	0	18	25	32	37	45	53	55	60	65	70	75	80	
APT1			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
APT1			O		0	0	0	0	20.2	33.9	42.8	53.2	70.3	85.1	96.1	98.3	99.2	99.8	100	100	
APT1			ON		0	0	0	0	2.7	2.3	2	1.8	1.3	0.9	1.2	2	2.1	2.1	2.2	2.2	
APT1			Struct	N			0.5		N		15		N	50	12			-901			-901
GROC1	Large Grocery - Pre Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
GROC1			S		0	0	0	0	6.3	11.3	13.8	18.8	25	28.5	33.8	41.3	44.8	52.5	53	55	
GROC1			STL		0	0	0	0	3.2	6.2	8.2	12.9	18.5	20.9	25.8	29.2	32.7	38.8	43.8	48.8	
GROC1			STU		0	0	0	3.5	11.5	16.5	23	28.3	35.4	43.7	49.6	68.1	69.8	79	79	86	
GROC1			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
GROC1			C		0	0	0	0	24	30.7	36.8	40.9	52.9	64	75.4	87.3	98.9	100	100	100	
GROC1			CTL		0	0	0	0	10	20	25	27	35	48	60	70	80	100	100	100	
GROC1			CTU		0	0	0	0	30	38	44	50	60	75	82	95	100	100	100	100	
GROC1			Struct	N			0.5		N		15		N	127	48			-901			-901
GROC2	Large Grocery - Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
GROC2			S		0	5	0	0	27.1	31.6	34	36.3	37.8	44.9	47.1	51.4	52.4	60.5	65.2	65.2	
GROC2			STL		0	0	0	0	7.3	19.7	27.2	28.1	28.9	41.2	46.6	49.3	51.7	58.6	61	63.5	
GROC2			STU		0	0	0	0	38.3	45.1	49.2	50.7	51.1	52.2	56.9	56.9	69.2	75.4	75.4	75.4	
GROC2			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
GROC2			C		0	0	0	0	10	30	30	30	30	60	80	80	80	100	100	100	
GROC2			CTL		0	0	0	0	3.7	21.2	26.5	28	28.7	58.1	77.3	77.3	77.3	96.7	96.7	96.7	
GROC2			CTU		0	0	0	0	13.2	32.3	32.7	34.2	35.1	61.7	82.1	82.1	82.1	100	100	100	
GROC2			Struct	N			0.5		N		15		N	127	48			-901			-901
CONV1	Convenience Store - Pre Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
CONV1			S		0	0	0	0	9.3	14.3	16.4	21.4	30.7	37.1	45.1	51.4	57.4	65.7	65.7	65.7	
CONV1			STL		0	0	0	0	5.3	9.1	11.2	16.2	23.2	29.4	36.5	40.6	44.7	51.8	56.8	59.7	
CONV1			STU		0	0	0	2.9	14.2	21.3	28.3	31.3	40.4	51.7	56.7	71.7	75.8	82.5	82.5	88.3	
CONV1			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
CONV1			C		0	0	0	0	11.6	23.1	32.1	39.9	52.9	70.7	79.3	88	94.1	95.7	97.1	98.6	
CONV1			CTL		0	0	0	0	5	12.7	20	30	40	60	70	80	90	92	95	97	
CONV1			CTU		0	0	0	0	15	28	38	45	60	78	85	95	100	100	100	100	
CONV1			Struct	N			0.5		N		15		N	127	48			-901			-901
CONV2	Convenience Store - Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
CONV2			S		0	0	0	0	8.6	11.7	15.4	20.4	25.8	37.6	42.7	47.6	51.6	58	60.1	61.6	
CONV2			STL		0	0	0	0	5.6	8.7	11.2	14.3	19.2	26	34.7	38.4	42.1	45.8	50.8	53.9	
CONV2			STU		0	0.7	0.7	1.7	13.3	20	26.7	30	38.3	48.3	53.3	56	68	70	71.3	73.3	
CONV2			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
CONV2			C		0	0	0	0	11.6	23.1	32.1	39.9	52.9	70.7	79.3	88	94.1	95.7	97.1	98.6	
CONV2			CTL		0	0	0	0	5	12.7	20	30	40	60	70	80	90	92	95	97	
CONV2			CTU		0	0	0	0	15	28	38	45	60	78	85	95	100	100	100	100	
CONV2			Struct	N			0.5		N		15		N	127	48			-901			-901
HOTEL1	Hotel/Motel - Pre Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
HOTEL1			S		0	0	0	0	6.3	11.3	12.5	17.5	22.5	25	31.3	35	38.5	43.8	46.3	47.5	
HOTEL1			STL		0	0	0	0	2.5	5.8	6.7	11.7	16.7	18	23.3	24.2	25	29.2	34.3	39.9	
HOTEL1			STU		0	0	0	3.5	11.5	16.5	21.5	26.5	32.1	38.9	45.3	60	61.5	69.1	71.5	80	
HOTEL1			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
HOTEL1			C		0	0	0	0	11.8	16.1	18.6	26.3	34.1	39.7	48.7	52.4	58.4	61.3	63.1	64.9	
HOTEL1			CTL		0	0	0	0	6	10	14	20	28	33	40	45	50	55	58	60	
HOTEL1			CTU		0	0	0	0	15	20	25	31	40	45	55	60	66	75	80	80	
HOTEL1			Struct	N			0.5		N		10		N	37	14			-901			-901
HOTEL2	Hotel/Motel - Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
HOTEL2			S		0	0	0	0	6	8.6	12	17	18	28	30.9	33.5	35	38.5	43.2	46	
HOTEL2			STL		0	0	0	0	3.3	5.7	7.3	9.7	12.1	15	22.9	23.6	24.3	24.3	29.4	34.9	
HOTEL2			STU		0	0.8	0.8	1.9	11.2	16.2	21.2	26.2	31.6	38	44	44.6	55.8	57.8	61.2	64.6	
HOTEL2			Stage		-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
HOTEL2			C		0	0	0	0	11.8	16.1	18.6	26.3	34.1	39.7	48.7	52.4	58.4	61.3	63.1	64.9	

HOTEL2			CTL		0	0	0	0	6	10	14	20	28	33	40	45	50	55	58	60	
HOTEL2			CTU		0	0	0	0	15	20	25	31	40	45	55	60	66	75	80	80	
HOTEL2			Struct	N			0.5		N		10		N	37	14			-901			-901
MED	Medical Office - Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
MED			S		0	0	0	0	6.2	10.2	14.9	20.6	24.5	36.3	40.3	50.5	53.2	56.7	60.9	64.2	
MED			STL		0	0	0	0	4	6.6	10.7	14.2	19.4	26.6	32.5	40.8	43.9	47	51	58.1	
MED			STU		0	0.6	0.6	1.4	10	17.2	22.2	28.6	35.8	46.1	52.8	60	69.4	75	76.1	77.8	
MED			Stage		-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MED			C		0	0	0	0	9	14.3	18.4	26.9	40.4	57.1	67.3	75.4	82.3	91.3	96.3	96.9	
MED			CTL		0	0	0	0	5	10	14	20	30	44	50	65	75	80	85	92.5	
MED			CTU		0	0	0	0	15	20	30	34	50.5	70	80	90	100	100	100	100	
MED			Struct	N			0.5		N		10		N	43	-901			-901			-901
OFFICE1	Office Building - Pre Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
OFFICE1			S		0	0	0	0	9.2	12.8	15.6	18.4	25.6	25.6	30.6	36.7	45.3	56.8	62.4	62.4	
OFFICE1			STL		0	0	0	0	3.5	7.6	10.2	12.6	18.9	20.2	25.2	27.7	35.5	43.1	50.6	55.6	
OFFICE1			STU		0	0	0	2.1	12.9	17.9	22.9	27.9	34.6	37.9	42.9	55.5	62.9	78.6	84.3	88.6	
OFFICE1			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
OFFICE1			C		0	0	0	0	10	20	25	30	40	57.5	70	81	95	100	100	100	
OFFICE1			CTL		0	0	0	0	5	12.2	20	28	35	45	54	65	70	78	80	87.5	
OFFICE1			CTU		0	0.1	0.9	0.9	20	25	32.2	42.5	55	65	72.5	80	83.8	100	100	100	
OFFICE1			Struct	N			0.33		N		15		N	43	14			-901			-901
OFFICE2	Office Building - Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
OFFICE2			S		0	0	0	0	8.7	10.9	14.9	17.9	22.3	27.4	30.5	35.6	42.2	51.8	58.4	59.6	
OFFICE2			STL		0	0	0	0	3.9	7.4	10.2	11.3	15.9	18.1	24.7	27.1	34.1	38.8	46.2	51.2	
OFFICE2			STU		0	0.5	0.5	1.3	12.4	17.4	22.4	27.4	33.9	37.4	42.4	45.8	58.8	69.5	75.3	76.9	
OFFICE2			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
OFFICE2			C		0	0	0	0	10	20	25	30	40	57.5	70	81	95	100	100	100	
OFFICE2			CTL		0	0	0	0	5	12.2	20	28	35	45	54	65	70	78	80	87.5	
OFFICE2			CTU		0	0.1	0.9	0.9	20	25	32.2	42.5	55	65	72.5	80	83.8	100	100	100	
OFFICE2			Struct	N			0.5		N		15		N	43	14			-901			-901
FF1	Fast Food Restaurant - Pre Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
FF1			S		0	0	0	0	7.9	15.7	18.6	24.7	31.4	42.9	50.7	58.6	65.6	68.6	74.3	74.3	
FF1			STL		0	0	0	0	3.7	10.1	13.5	18.5	23.5	34.8	42.6	48.3	53.9	58.9	65.3	68.9	
FF1			STU		0	0	0	1.9	13.1	21.7	27.9	34.2	42.2	56.4	64.4	77.1	81.4	88.3	88.3	92.2	
FF1			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
FF1			C		0	0	0	0	10.6	21.3	29.4	38.6	52.7	62.6	73	79.3	88.3	94.9	98.6	98.6	
FF1			CTL		0	0	0	0	5	15	20	30	44	54	65	72.5	80	85	90	92	
FF1			CTU		0	0	0	0	15	28	36	50	60	72.5	80	85	95	100	100	100	
FF1			Struct	N			0.5		N		15		N	114	48			-901			-901
FF2	Fast Food Restaurant - Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
FF2			S		0	0	0	0	7.5	13.5	17.5	23.5	27.5	42.5	48.1	54.7	60	62.2	68.9	70	
FF2			STL		0	0	0	0	4	9.7	13.3	16.8	20.4	31.8	40.8	46	51.2	53.8	60.1	63.8	
FF2			STU		0	0.5	0.5	1.2	12.6	20.8	26.8	32.9	40.5	53.3	61	65.1	75	78.6	79.5	81	
FF2			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
FF2			C		0	0	0	0	10.6	21.3	29.4	38.6	52.7	62.6	73	79.3	88.3	94.9	98.6	98.6	
FF2			CTL		0	0	0	0	5	15	20	30	44	54	65	72.5	80	85	90	92	
FF2			CTU		0	0	0	0	15	28	36	50	60	72.5	80	85	95	100	100	100	
FF2			Struct	N			0.5		N		15		N	114	48			-901			-901
REST1	Restaurant - Pre Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
REST1			S		0	0	0	0	8.8	13.8	15.7	22.6	31.4	35.2	42.9	49	54.7	62.8	62.8	62.8	
REST1			STL		0	0	0	0	4.1	8.8	10	15.7	22.6	28.3	35.2	39	43.8	49.8	54.8	58.8	
REST1			STU		0	0	0	3	13.9	20.9	26.8	34.8	40.2	50.6	55.6	69.8	74.1	81.7	81.7	87.8	
REST1			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
REST1			C		0	0	0	0	17.1	27.7	35.9	48.9	57.3	71.9	79.7	84.9	92.9	93.4	94.3	94.3	
REST1			CTL		0	0	0	0	10	20	28	36	47.5	65	70	74	80	86	90	90	
REST1			CTU		0	0	0	0	21	33	42.5	55	64	76	85	90	95	100	100	100	
REST1			Struct	N			0.5		N		15		N	114	48			-901			-901

REST2	Restaurant - Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
REST2			S		0	0	0	0	8.5	11.6	15.3	22	27.3	37.3	42.3	47.2	51.1	57.5	59.6	61.1	
REST2			STL		0	0	0	0	4.6	8.6	10.4	14.2	19.1	25.8	34.5	38.2	42.7	45.5	50.5	54.5	
REST2			STU		0	0.6	0.6	1.6	13.6	20.4	26.3	33.9	39.3	49.3	54.3	56.1	68.4	71.1	72.4	74.3	
REST2			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
REST2			C		0	0	0	0	17.1	27.7	35.9	48.9	57.3	71.9	79.7	84.9	92.9	93.4	94.3	94.3	
REST2			CTL		0	0	0	0	10	20	28	36	47.5	65	70	74	80	86	90	90	
REST2			CTU		0	0	0	0	21	33	42.5	55	64	76	85	90	95	100	100	100	
REST2			Struct	N			0.5		N		15		N	114	48			-901			-901
ELEC1	Electronic Retail Store - Pre Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
ELEC1			S		0	0	0	0	6	11	12	17	23.2	26	31.6	37.2	42.4	51	52	52	
ELEC1			STL		0	0	0	0	2.6	5.9	7	12.2	17.9	19.5	24.9	27.2	29.4	35.4	41.2	46.3	
ELEC1			STU		0	0	0.1	4	11.6	16.9	22.3	28.1	34.7	41.1	46.6	64.4	67.3	76.9	76.9	84.6	
ELEC1			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
ELEC1			C		0	0	0	0	10.9	23	28.7	34.1	44.3	67	77.7	86.7	95.4	97.4	98.6	98.6	
ELEC1			CTL		0	0	0	0	5	15	20	28	36	58	68	75	82.5	90	95	97.5	
ELEC1			CTU		0	0	0	0	15	30	36	45	52	75	85	92.5	98	100	100	100	
ELEC1			Struct	N			0.5		N		15		N	142	93			-901			-901
ELEC2	Electronic Retail Store - Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
ELEC2			S		0	0	0	0	5.8	8.3	11.7	16.7	18.5	29.2	31.5	35.5	38.3	44.5	48.1	50	
ELEC2			STL		0	0	0	0	3.4	5.8	7.6	10.3	13.4	16.5	24.4	26.4	28.3	30.1	35.8	40.8	
ELEC2			STU		0	0.8	0.9	2.2	11.3	16.5	21.9	27.5	33.8	40	45.4	47.3	60.2	63.4	65.1	67.5	
ELEC2			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
ELEC2			C		0	0	0	0	10.9	23	28.7	34.1	44.3	67	77.7	86.7	95.4	97.4	98.6	98.6	
ELEC2			CTL		0	0	0	0	5	15	20	28	36	58	68	75	82.5	90	95	97.5	
ELEC2			CTU		0	0	0	0	15	30	36	45	52	75	85	92.5	98	100	100	100	
ELEC2			Struct	N			0.5		N		15		N	142	93			-901			-901
FURN1	Furniture Retail Store - Pre Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
FURN1			S		0	0	0	0	6	11.2	12	18	24	25	30	34	36.4	44	44	44	
FURN1			STL		0	0	0	0	2.6	6.2	7.3	12.5	18.2	19.2	24	25.2	25.7	31.1	35.5	39.8	
FURN1			STU		0	0.1	0.2	4.2	11	17.1	22.8	29.3	35.7	41.1	46.3	62.8	63.3	72.7	73.2	81.4	
FURN1			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
FURN1			C		0	0	0	0	39.9	46.9	53.3	61.9	68.1	79.1	85.7	90.7	97.1	99.3	99.3	99.3	
FURN1			CTL		0	0	0	0	25	33	44	50	55	70	75	82	85	92.5	95	97.5	
FURN1			CTU		0	0	0	0	45	55	64	70	75	86	95	95	100	100	100	100	
FURN1			Struct	N			0.5		N		15		N	142	93			-901			-901
FURN2	Furniture Retail Store - Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
FURN2			S		0	0	0	0	5.8	8.5	11.7	17.5	19.2	28.3	30.1	32.9	33.3	38.7	41.4	43.3	
FURN2			STL		0	0	0	0	3.4	6	7.8	10.6	13.7	16.3	23.6	24.6	25.1	26.3	30.7	35.1	
FURN2			STU		0	0.9	0.9	2.3	10.8	16.7	22.3	28.5	34.6	40	45.1	46.1	57	60	62.1	64.9	
FURN2			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
FURN2			C		0	0	0	0	39.9	46.9	53.3	61.9	68.1	79.1	85.7	90.7	97.1	99.3	99.3	99.3	
FURN2			CTL		0	0	0	0	25	33	44	50	55	70	75	82	85	92.5	95	97.5	
FURN2			CTU		0	0	0	0	45	55	64	70	75	86	95	95	100	100	100	100	
FURN2			Struct	N			0.5		N		15		N	142	93			-901			-901
CLOTH1	Clothing Retail Store - Pre Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
CLOTH1			S		0	0	0	0	12.3	29	38.4	46.3	55.4	70	79	89	95.7	97.9	97.9	99.3	
CLOTH1			STL		0	0	0	0	8	17.8	27.8	35.5	48	60	67.5	78	88	94	94	96	
CLOTH1			STU		0	0	0	0	18	37.8	45.5	54.5	65	80	85	96	98	100	100	100	
CLOTH1			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
CLOTH1			C		0	0	0	0	12.3	29	38.4	46.3	55.4	70	79	89	95.7	97.9	97.9	99.3	
CLOTH1			CTL		0	0	0	0	8	17.8	27.8	35.5	48	60	67.5	78	88	94	94	96	
CLOTH1			CTU		0	0	0	0	18	37.8	45.5	54.5	65	80	85	96	98	100	100	100	
CLOTH1			Struct	N			0.5		N		15		N	142	93			-901			-901
CLOTH2	Clothing Retail Store - Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
CLOTH2			S		0	0	0	0	7	9.6	12.8	18.4	20	32	34.9	39.5	42	45.5	50.2	52	
CLOTH2			STL		0	0	0	0	4.4	7	8.8	11.4	14	19.2	28	30.8	33	33.2	39	43.6	

CLOTH2			STU		0	0.8	0.8	1.9	12.3	18	23.5	28.9	34.6	43.1	49.2	51.5	62.7	65.4	66.9	69.2	
CLOTH2			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
CLOTH2			C		0	0	0	0	12.3	29	38.4	46.3	55.4	70	79	89	95.7	97.9	97.9	99.3	
CLOTH2			CTL		0	0	0	0	8	17.8	27.8	35.5	48	60	67.5	78	88	94	94	96	
CLOTH2			CTU		0	0	0	0	18	37.8	45.5	54.5	65	80	85	96	98	100	100	100	
CLOTH2			Struct	N			0.5		N		15		N	142	93			-901			-901
SERVICE	Service Station - Pre Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
SERVICE			S		0	0	0	0	6.3	11.3	12.5	17.5	22.5	25	28.8	36.3	41.3	48.5	50	52.5	
SERVICE			STL		0	0	0	0	2.5	5.8	6.5	11.3	16.5	17.5	22.3	23.3	25.8	30.8	37.5	42.5	
SERVICE			STU		0	0	0	3.5	11.5	16.5	22.3	28	33	40.7	44.8	61.5	64.5	73	76.6	85.4	
SERVICE			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
SERVICE			C		0	0	0	0.4	11.7	16.4	21.9	28.9	40.9	57.7	63.3	70.7	79.3	84.3	87.1	87.1	
SERVICE			CTL		0	0	0	0	5	10	14	20	30	45	55	60	70	75	80	80	
SERVICE			CTU		0	0	0	0.7	16.2	21.6	29.1	35.7	50.9	67	74.3	78.3	84	88	90	90	
SERVICE			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
SERVICE			O		0	0	0	0	20.2	33.9	42.8	53.2	70.3	85.1	96.1	98.3	99.2	99.8	100	100	
SERVICE			ON		0	0	0	0	2.7	2.3	2	1.8	1.3	0.9	1.2	2	2.1	2.1	2.2	2.2	
SERVICE			Struct	N			0.5		N		15		N	206	102			-901			-901
IND-LT1	Industrial Light Manufacturing - Pre Engineered	Industrial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
IND-LT1			S		0	0	0	0	6.5	11.5	12.9	17.9	24.4	26.5	32.4	38.8	40.9	51.8	56.2	56.2	
IND-LT1			STL		0	0	0	0	2.7	6.2	7.3	12.3	17.3	19.2	25.1	26.9	28.1	34.5	41.5	46.5	
IND-LT1			STU		0	0	0	3.3	11.7	17.3	23.3	29.3	36.7	41.7	48.7	65	67.5	77.5	80	86.7	
IND-LT1			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
IND-LT1			C		0	0	0	0	12.1	19.3	26.6	31	42.3	52.3	60.7	72	82.1	90.7	94.3	95	
IND-LT1			CTL		0	0	0	0	5	12	20	25	33	40	50	60	75	80	85	90	
IND-LT1			CTU		0	0	0	0	18	25	35	45	50	66	70	80	90	96	100	100	
IND-LT1			Struct	N			0.5		N		15		N	206	102			-901			-901
IND-LT2	Industrial Light Manufacturing - Engineered	Industrial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
IND-LT2			S		0	0	0	0	6.2	8.9	12.4	17.4	19.8	29	31.8	36.7	37.1	45.3	51.4	53.1	
IND-LT2			STL		0	0	0	0	3.4	6	7.8	10.4	13	16.2	24.4	26	27	29.2	36	41	
IND-LT2			STU		0	0.7	0.7	1.9	11.3	16.8	22.6	28.4	35.2	40.2	46.7	49.1	60.6	64.7	68.1	70.4	
IND-LT2			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
IND-LT2			C		0	0	0	0	12.1	19.3	26.6	31	42.3	52.3	60.7	72	82.1	90.7	94.3	95	
IND-LT2			CTL		0	0	0	0	5	12	20	25	33	40	50	60	75	80	85	90	
IND-LT2			CTU		0	0	0	0	18	25	35	45	50	66	70	80	90	96	100	100	
IND-LT2			Struct	N			0.5		N		15		N	206	102			-901			-901
NFWARE1	Warehouse, NonRef - Pre Engineered	Industrial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
NFWARE1			S		0	0	0	0	6.3	12	12.5	18.8	24	27.5	31.3	37.5	42.3	48.8	52.5	52.5	
NFWARE1			STL		0	0	0	0	2.5	6.2	6.7	11.7	17.2	19.2	24	25	26.7	31.8	38.3	42.5	
NFWARE1			STU		0	0	0	3.5	11.5	18.3	23.9	30.3	36	42.5	47.8	64.5	66	75.3	77.5	85.4	
NFWARE1			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
NFWARE1			C		0	0	0	0	13.4	20.7	27.6	33.7	47.4	56.9	65.6	73.6	81.3	88.4	91.6	93.6	
NFWARE1			CTL		0	0	0	0	7	15	20	25	35	40	50	60	70	76	84	90	
NFWARE1			CTU		0	0	0	0	20	25	35	45	55	66	75	85	90	100	100	100	
NFWARE1			Struct	N			0.5		N		15		N	206	102			-901			-901
NFWARE2	Warehouse, NonRef - Engineered	Industrial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
NFWARE2			S		0	0	0	0	6	9.2	12	18	19.2	30	30.9	35.5	38	42.5	48.2	50	
NFWARE2			STL		0	0	0	0	3.3	6	7.3	9.7	12.6	16	23.4	24.3	25.7	26.6	32.9	37.1	
NFWARE2			STU		0	0.8	0.8	1.9	11.2	17.5	23	29	34.6	40.8	46	48.1	59.2	62.5	65.8	68.8	
NFWARE2			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
NFWARE2			C		0	0	0	0	13.4	20.7	27.6	33.7	47.4	56.9	65.6	73.6	81.3	88.4	91.6	93.6	
NFWARE2			CTL		0	0	0	0	7	15	20	25	35	40	50	60	70	76	84	90	
NFWARE2			CTU		0	0	0	0	20	25	35	45	55	66	75	85	90	100	100	100	
NFWARE2			Struct	N			0.5		N		15		N	168	98			-901			-901
RWARE1	Warehouse, Ref, Pre Engineered	Industrial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	
RWARE1			S		0	0	0	0	7	14	15.6	21	28	32	39	46	51.8	60	62	64	
RWARE1			STL		0	0	0	0	3.1	8.8	9.9	14.7	20.6	24.4	31.3	35	38.8	45.6	52.5	57.5	

RWARE1			STU		0	0	0	2.9	12.1	19.2	25.4	31.3	38.3	47.5	54.6	68.3	72.5	81.5	82.5	88.3											
RWARE1			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10											
RWARE1			C		0	0	0	0	20.7	29.7	37.6	48	59.1	65.7	74.3	79.7	84	89.9	93.6	93.6											
RWARE1			CTL		0	0	0	0	10	20	25	35	45	55	66	72.5	75	80	85	85											
RWARE1			CTU		0	0	0	0	30	38	50	62.5	66	75	85	90	95	97.5	100	100											
RWARE1			Struct	N			0.5		N		15		N	168	98			-901				-901									
RWARE2	Warehouse, Ref, Engineered	Industrial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10											
RWARE2			S		0	0	0	0	6.7	11.3	14.7	20	23.3	33.3	37.4	43	46.7	53	56.8	60											
RWARE2			STL		0	0	0	0	3.7	8.3	10	12.8	16.7	21.3	30	33.3	36.7	40	46.7	51.7											
RWARE2			STU		0	0.7	0.7	1.7	11.7	18.3	24.3	30	36.7	45	51.7	53.3	65.3	69.2	71.3	73.3											
RWARE2			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10											
RWARE2			C		0	0	0	0	20.7	29.7	37.6	48	59.1	65.7	74.3	79.7	84	89.9	93.6	93.6											
RWARE2			CTL		0	0	0	0	10	20	25	35	45	55	66	72.5	75	80	85	85											
RWARE2			CTU		0	0	0	0	30	38	50	62.5	66	75	85	90	95	97.5	100	100											
RWARE2			Struct	N			0.5		N		15		N	168	98			-901				-901									
JAIL	Correctional Facility, Engineered	Public	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10											
JAIL			S		0	0	0	0	6.3	9.6	12.3	18.3	23.9	32.6	34	43	46.5	54.6	57.4	61.4											
JAIL			STL		0	0	0	0	4.4	7.1	8.9	13	20.7	24.9	30.7	34.3	37.9	45	50	55											
JAIL			STU		0	0.5	0.5	1.2	10	15	20	25	31	40.2	45.2	50.5	61.9	68.1	69	70.5											
JAIL			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10											
JAIL			C		0	0	0	0	6.3	13.1	14.6	21.3	31	44.1	53	62.3	69.5	77.5	83.8	87.5											
JAIL			CTL		0	0	0	0	3	8	10	15	22	35	40	50	58	65	75	75											
JAIL			CTU		0	0	0	0	10	18	22	33	36	50	60	75	80	90	90	95											
JAIL			Struct	N			0.5		N		15		N	114	71			-901				-901									
REC1	Recreational Facility, Engineered	Commercial	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10											
REC1			S		0	0	0	0	3.6	7.6	9	13.7	17.8	23.9	34.1	36.2	37.6	39.1	44.9	49.1											
REC1			STL		0	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10											
REC1			STU		0	0	0	0	6.5	11	13	20.5	24.1	35.7	41	44.8	46.4	51.3	56.7	58.3											
REC1			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10											
REC1			C		0	0	0	0	16.9	25.7	31.4	43.7	62.7	72.9	80	84	91.1	95	95	95											
REC1			CTL		0	0	0	0	10	20	25	35	45	55	66	72.5	75	80	85	85											
REC1			CTU		0	0	0	0	20	31.5	35	50	67.5	80	87.5	92.5	95	100	100	100											
REC1			Struct	N			0.5		N		15		N	114	71			-901				-901									
CHURCH1	Religious Facility, Engineered	Public	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10											
CHURCH1			S		0	0	0	0	8	12.6	17.7	23.6	27.9	40	44.9	51.1	55.7	60.4	64.4	65.7											
CHURCH1			STL		0	0	0	0	4.6	9.5	12.9	17.4	22	29.3	38.2	42.7	47.3	51.8	56.3	60.2											
CHURCH1			STU		0	0.6	0.6	1.4	12.9	19.4	26.2	32.8	41.1	50.6	57.8	62.2	72.4	75	76.1	77.8											
CHURCH1			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10											
CHURCH1			C		0	0	0	0	19.7	29.3	41.3	48.4	60	69.3	76.4	81.4	88.4	94.3	97.1	97.1											
CHURCH1			CTL		0	0	0	0	15	25	35	42.5	50	61.3	68	75	79	87.5	90	92.5											
CHURCH1			CTU		0	0	0	0	25	35	47.5	56.3	68	77.5	85	90	93.8	99	100	100											
CHURCH1			Struct	N			0.5		N		15		N	114	71			-901				-901									
SCHOOL	School, Engineered	Public	Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10											
SCHOOL			S		0	0	0	0	7.6	11.8	15.3	22.9	28.2	35.6	38.8	40.3	40.6	48	49.5	50.6											
SCHOOL			STL		0	0	0	0	4.1	8.9	11	14.7	21.1	27.6	33.9	33.9	33.9	36.7	41.7	44.4											
SCHOOL			STU		0	0.4	0.4	1	12.9	20.8	25.8	31.4	38.8	46.7	51.7	51.7	60.6	72.5	73.3	74.6											
SCHOOL			Stage		-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10											
SCHOOL			C		0	0	0	0	14.3	21.7	26.6	30.4	39	45	47.9	51.9	55.7	59.3	60.6	63.4											
SCHOOL			CTL		0	0	0	0	10	15	20	25	30	40	45	50	55	58	59	60											
SCHOOL			CTU		0	0	0	0	20	25	33	40	50	55	66	72.5	75	85	90	90											
SCHOOL			Struct	N			0.5		N		15		N	114	71			-901				-901									
AUTO	Automobiles	Autos	Stage		-8	-7	-6	-5	-4	-3	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AUTO			S		0	0	0	0	0	0	0	0	0	0	3.4	24	33.7	43.4	60.2	74.6	86.4	94.1	97.4	99.4	100	100	100	100	100	100	100
AUTO			SN		0	0	0	0	0	0	0	0	0	0	9.6	8	7.1	6.3	4.6	3.3	4.3	7	7.2	7.5	7.7	7.7	7.7	7.7	7.7	7.7	7.7
AUTO			Stage		-8	-7	-6	-5	-4	-3	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AUTO			C		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AUTO			CN		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AUTO			Struct	N			0.5		N		15		N	0	0			-901				-901		
CLN	Clean-up_Costs	CLN	Stage		-8	-7	-6	-5	-4	-3	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8
CLN			S		0	0	0	0	0	0	0	0	0	0	18	37	41.5	46	55	78	100	100	100	100
CLN			Struct	N			0.5		N		5			-901				-901				-901		
HARES1	TERHA	HA	Stage		-8	-7	-6	-5	-4	-3	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8
HARES1			S		0	0	0	0	0	0	0	0	0	17	28	38	49	57	74	89	100	100	100	100
HARES1			Struct	N			0.5		N		14			-901				-901				-901		
HARES2	TERHA	HA	Stage		-8	-7	-6	-5	-4	-3	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8
HARES2			S		0	0	0	0	0	0	0	0	0	0	15	21	28	34	45	55	66	77	85	94
HARES2			Struct	N			0.5		N		14			-901				-901				-901		
HAMH	TERHA	HA	Stage		-8	-7	-6	-5	-4	-3	-2	-1	-0.5	0	0.5	1	1.5	2	3	4	5	6	7	8
HAMH			S		0	0	0	0	0	0	0	0	0	0	81	85	87	100	100	100	100	100	100	100
HAMH			Struct	N			0.5		N		14			-901				-901				-901		

ATTACHMENT 10

Current (October 2018) Certified Cost Estimate & IDC Calculations for Recommended Plan

****** TOTAL PROJECT COST SUMMARY ******

PROJECT: **PAJARO RIVER FLOOD RISK MANAGEMENT PROJECT**
PROJECT NO: P2 104552
LOCATION: SANTA CRUZ AND MONTEREY COUNTIES, CA

DISTRICT: SAN FRANCISCO DISTRICT **PREPARED: 11/7/2018**
POC: CHIEF, COST ENGINEERING, SON T. HA

This Estimate reflects the scope and schedule in report; PAJARO RIVER GRR

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2019									
						Effective Price Level Date: 1 OCT 18									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: **1-Oct-17** ($K)	**TOTAL FIRST COST** ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*		*K*	*L*	*M*	*N*	*O*
02	RELOCATIONS	$37,616	$15,046	40.0%	$52,662	2.0%	$38,371	$15,348	$53,720	$0	$53,720	14.6%	$43,980	$17,592	$61,572
11	LEVEES & FLOODWALLS	$135,586	$54,234	40.0%	$189,821	2.0%	$138,308	$55,323	$193,631	$0	$193,631	13.0%	$156,294	$62,518	$218,812
16	BANK STABILIZATION	$8,183	$3,273	40.0%	$11,457	2.0%	$8,348	$3,339	$11,687	$0	$11,687	15.5%	$9,646	$3,858	$13,504
	CONSTRUCTION ESTIMATE TOTALS:	$181,385	$72,554		$253,940	2.0%	$185,027	$74,011	$259,038	$0	$259,038	13.5%	$209,920	$83,968	$293,888
01	LANDS AND DAMAGES	$64,534	$20,123	31.2%	$84,657	2.0%	$65,830	$20,527	$86,356	$0	$86,356	11.6%	$73,435	$22,959	$96,393
30	PLANNING, ENGINEERING & DESIGN	$23,580	$9,432	40.0%	$33,012	3.8%	$24,478	$9,791	$34,269	$0	$34,269	13.9%	$27,888	$11,155	$39,044
31	CONSTRUCTION MANAGEMENT	$18,139	$7,255	40.0%	$25,394	3.8%	$18,829	$7,532	$26,361	$0	$26,361	18.8%	$22,362	$8,945	$31,307
	PROJECT COST TOTALS:	$287,638	$109,364	38.0%	$397,002		$294,163	$111,860	**$406,023**	$0	**$406,023**	13.4%	$333,605	$127,027	$460,631

ESTIMATED TOTAL PROJECT COST: $460,631

____________________ **CHIEF, COST ENGINEERING, SON T. HA**

____________________ **PROJECT MANAGER, JAIME L. O'HALLORAN**

____________________ **CHIEF, REAL ESTATE, xxx**

____________________ **CHIEF, PLANNING, xxx**

____________________ **CHIEF, ENGINEERING, SON T. HA**

____________________ **CHIEF, OPERATIONS, xxx**

____________________ **CHIEF, CONSTRUCTION, xxx**

____________________ **CHIEF, CONTRACTING,xxx**

____________________ **CHIEF, PM-PB, xxxx**

____________________ **CHIEF, DPM, xxx**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: PAJARO RIVER FLOOD RISK MANAGEMENT PROJECT
LOCATION: SANTA CRUZ AND MONTEREY COUNTIES, CA
This Estimate reflects the scope and schedule in report; PAJARO RIVER GRR

DISTRICT: SAN FRANCISCO DISTRICT
POC: CHIEF, COST ENGINEERING, SON T. HA
PREPARED: 11/7/2018

Civil Works Work Breakdown Structure		**ESTIMATED COST**				**PROJECT FIRST COST (Constant Dollar Basis)**				**TOTAL PROJECT COST (FULLY FUNDED)**				
		Estimate Prepared:			**4-Apr-18**	Program Year (Budget EC):			2019					
		Effective Price Level:			1-Oct-17	Effective Price Level Date:			1 OCT 18					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	RISK BASED CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	CONTRACT 1 (REACH 2)													
02	RELOCATIONS	$1,151	$460	40.0%	$1,611	2.0%	$1,174	$470	$1,643	2021Q3	7.2%	$1,258	$503	$1,761
11	LEVEES & FLOODWALLS	$42,659	$17,064	40.0%	$59,723	2.0%	$43,516	$17,406	$60,922	2021Q3	7.2%	$46,639	$18,656	$65,295
16	BANK STABILIZATION	$564	$226	40.0%	$790	2.0%	$576	$230	$806	2021Q4	8.0%	$622	$249	$870
	CONSTRUCTION ESTIMATE TOTALS:	$44,374	$17,750	40.0%	**$62,124**		$45,265	$18,106	$63,371			$48,519	$19,408	$67,927
01	LANDS AND DAMAGES	$6,724	$1,800	26.8%	$8,524	2.0%	$6,859	$1,836	$8,695	2020Q2	3.3%	$7,085	$1,897	$8,982
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$444	$177	40.0%	$621	3.8%	$461	$184	$645	2020Q2	4.8%	$483	$193	$676
1.0%	Planning & Environmental Compliance	$444	$177	40.0%	$621	3.8%	$461	$184	$645	2020Q2	4.8%	$483	$193	$676
7.0%	Engineering & Design	$3,106	$1,242	40.0%	$4,349	3.8%	$3,224	$1,290	$4,514	2020Q2	4.8%	$3,380	$1,352	$4,732
0.5%	Reviews, ATRs, IEPRs, VE	$222	$89	40.0%	$311	3.8%	$230	$92	$322	2020Q2	4.8%	$241	$97	$338
0.5%	Life Cycle Updates (cost, schedule, risks)	$222	$89	40.0%	$311	3.8%	$230	$92	$322	2020Q2	4.8%	$241	$97	$338
0.5%	Contracting & Reprographics	$222	$89	40.0%	$311	3.8%	$230	$92	$322	2020Q2	4.8%	$241	$97	$338
1.0%	Engineering During Construction	$444	$177	40.0%	$621	3.8%	$461	$184	$645	2021Q3	9.8%	$506	$202	$708
0.5%	Planning During Construction	$222	$89	40.0%	$311	3.8%	$230	$92	$322	2021Q3	9.8%	$253	$101	$354
0.5%	Adaptive Management & Monitoring	$222	$89	40.0%	$311	3.8%	$230	$92	$322	2020Q2	4.8%	$241	$97	$338
0.5%	Project Operations	$222	$89	40.0%	$311	3.8%	$230	$92	$322	2020Q2	4.8%	$241	$97	$338
31	CONSTRUCTION MANAGEMENT													
6.0%	Construction Management	$2,662	$1,065	40.0%	$3,727	3.8%	$2,764	$1,106	$3,869	2021Q3	9.8%	$3,035	$1,214	$4,249
2.0%	Project Operation:	$887	$355	40.0%	$1,242	3.8%	$921	$369	$1,290	2021Q3	9.8%	$1,012	$405	$1,416
2.0%	Project Management	$887	$355	40.0%	$1,242	3.8%	$921	$369	$1,290	2021Q3	9.8%	$1,012	$405	$1,416
	CONTRACT COST TOTALS:	$61,305	$23,633		$84,937		$62,719	$24,180	**$86,899**			$66,975	$25,853	**$92,827**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: PAJARO RIVER FLOOD RISK MANAGEMENT PROJECT
LOCATION: SANTA CRUZ AND MONTEREY COUNTIES, CA
This Estimate reflects the scope and schedule in report; PAJARO RIVER GRR

DISTRICT: SAN FRANCISCO DISTRICT
POC: CHIEF, COST ENGINEERING, SON T. HA
PREPARED: 11/7/2018

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			4-Apr-18	Program Year (Budget EC):			2019					
		Effective Price Level:			1-Oct-17	Effective Price Level Date:			1 OCT 18					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	CONTRACT 2 (REACH 3)													
02	RELOCATIONS	$1,277	$511	40.0%	$1,788	2.0%	$1,303	$521	$1,824	2023Q1	12.0%	$1,459	$584	$2,043
11	LEVEES & FLOODWALLS	$7,275	$2,910	40.0%	$10,185	2.0%	$7,421	$2,968	$10,390	2023Q1	12.0%	$8,312	$3,325	$11,637
16	BANK STABILIZATION	$1,360	$544	40.0%	$1,904	2.0%	$1,387	$555	$1,942	2023Q3	13.7%	$1,577	$631	$2,208
	CONSTRUCTION ESTIMATE TOTALS:	$9,912	$3,965	40.0%	**$13,877**		$10,111	$4,044	$14,155			$11,348	$4,539	$15,888
01	LANDS AND DAMAGES	$6,612	$1,926	29.1%	$8,538	2.0%	$6,745	$1,965	$8,710	2021Q2	6.4%	$7,175	$2,090	$9,265
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$99	$40	40.0%	$139	3.8%	$103	$41	$144	2021Q2	8.8%	$112	$45	$157
1.0%	Planning & Environmental Compliance	$99	$40	40.0%	$139	3.8%	$103	$41	$144	2021Q2	8.8%	$112	$45	$157
7.0%	Engineering & Design	$694	$278	40.0%	$971	3.8%	$720	$288	$1,008	2021Q2	8.8%	$784	$313	$1,097
0.5%	Reviews, ATRs, IEPRs, VE	$50	$20	40.0%	$69	3.8%	$51	$21	$72	2021Q2	8.8%	$56	$22	$78
0.5%	Life Cycle Updates (cost, schedule, risks)	$50	$20	40.0%	$69	3.8%	$51	$21	$72	2021Q2	8.8%	$56	$22	$78
0.5%	Contracting & Reprographics	$50	$20	40.0%	$69	3.8%	$51	$21	$72	2021Q2	8.8%	$56	$22	$78
1.0%	Engineering During Construction	$99	$40	40.0%	$139	3.8%	$103	$41	$144	2023Q1	16.1%	$119	$48	$167
0.5%	Planning During Construction	$50	$20	40.0%	$69	3.8%	$51	$21	$72	2023Q1	16.1%	$60	$24	$84
0.5%	Adaptive Management & Monitoring	$50	$20	40.0%	$69	3.8%	$51	$21	$72	2021Q2	8.8%	$56	$22	$78
0.5%	Project Operations	$50	$20	40.0%	$69	3.8%	$51	$21	$72	2021Q2	8.8%	$56	$22	$78
31	CONSTRUCTION MANAGEMENT													
6.0%	Construction Management	$595	$238	40.0%	$833	3.8%	$617	$247	$864	2023Q1	16.1%	$716	$287	$1,003
2.0%	Project Operation:	$198	$79	40.0%	$278	3.8%	$206	$82	$288	2023Q1	16.1%	$239	$96	$334
2.0%	Project Management	$198	$79	40.0%	$278	3.8%	$206	$82	$288	2023Q1	16.1%	$239	$96	$334
	CONTRACT COST TOTALS:	$18,804	$6,803		$25,607		$19,222	$6,956	**$26,178**			$21,184	$7,694	**$28,878**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: PAJARO RIVER FLOOD RISK MANAGEMENT PROJECT
LOCATION: SANTA CRUZ AND MONTEREY COUNTIES, CA
This Estimate reflects the scope and schedule in report; PAJARO RIVER GRR

DISTRICT: SAN FRANCISCO DISTRICT
POC: CHIEF, COST ENGINEERING, SON T. HA
PREPARED: 11/7/2018

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 4-Apr-18 Effective Price Level: 1-Oct-17				Program Year (Budget EC): 2019 Effective Price Level Date: 1 OCT 18								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	CONTRACT 3 (REACH 4)													
02	RELOCATIONS	$4,502	$1,801	40.0%	$6,303	2.0%	$4,592	$1,837	$6,429	2023Q3	13.7%	$5,222	$2,089	$7,310
11	LEVEES & FLOODWALLS	$41,345	$16,538	40.0%	$57,884	2.0%	$42,175	$16,870	$59,046	2023Q3	13.7%	$47,956	$19,182	$67,138
16	BANK STABILIZATION	$3,482	$1,393	40.0%	$4,874	2.0%	$3,552	$1,421	$4,972	2023Q4	14.6%	$4,068	$1,627	$5,696
	CONSTRUCTION ESTIMATE TOTALS:	$49,329	$19,732	40.0%	**$69,061**		$50,319	$20,128	$70,447			$57,246	$22,898	$80,144
01	LANDS AND DAMAGES	$5,600	$1,356	24.2%	$6,956	2.0%	$5,713	$1,383	$7,096	2022Q2	9.6%	$6,259	$1,516	$7,775
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$493	$197	40.0%	$691	3.8%	$512	$205	$717	2022Q2	12.8%	$578	$231	$809
1.0%	Planning & Environmental Compliance	$493	$197	40.0%	$691	3.8%	$512	$205	$717	2022Q2	12.8%	$578	$231	$809
7.0%	Engineering & Design	$3,453	$1,381	40.0%	$4,834	3.8%	$3,584	$1,434	$5,018	2022Q2	12.8%	$4,045	$1,618	$5,663
0.5%	Reviews, ATRs, IEPRs, VE	$247	$99	40.0%	$345	3.8%	$256	$102	$358	2022Q2	12.8%	$289	$116	$404
0.5%	Life Cycle Updates (cost, schedule, risks)	$247	$99	40.0%	$345	3.8%	$256	$102	$358	2022Q2	12.8%	$289	$116	$404
0.5%	Contracting & Reprographics	$247	$99	40.0%	$345	3.8%	$256	$102	$358	2022Q2	12.8%	$289	$116	$404
1.0%	Engineering During Construction	$493	$197	40.0%	$691	3.8%	$512	$205	$717	2023Q3	18.2%	$605	$242	$847
0.5%	Planning During Construction	$247	$99	40.0%	$345	3.8%	$256	$102	$358	2023Q3	18.2%	$303	$121	$424
0.5%	Adaptive Management & Monitoring	$247	$99	40.0%	$345	3.8%	$256	$102	$358	2022Q2	12.8%	$289	$116	$404
0.5%	Project Operations	$247	$99	40.0%	$345	3.8%	$256	$102	$358	2022Q2	12.8%	$289	$116	$404
31	CONSTRUCTION MANAGEMENT													
6.0%	Construction Management	$2,960	$1,184	40.0%	$4,144	3.8%	$3,072	$1,229	$4,301	2023Q3	18.2%	$3,632	$1,453	$5,085
2.0%	Project Operation:	$987	$395	40.0%	$1,381	3.8%	$1,024	$410	$1,434	2023Q3	18.2%	$1,211	$484	$1,695
2.0%	Project Management	$987	$395	40.0%	$1,381	3.8%	$1,024	$410	$1,434	2023Q3	18.2%	$1,211	$484	$1,695
	CONTRACT COST TOTALS:	$66,275	$25,626		**$91,901**		$67,810	$26,222	**$94,031**			$77,111	$29,856	**$106,968**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: PAJARO RIVER FLOOD RISK MANAGEMENT PROJECT
LOCATION: SANTA CRUZ AND MONTEREY COUNTIES, CA
This Estimate reflects the scope and schedule in report; PAJARO RIVER GRR

DISTRICT: SAN FRANCISCO DISTRICT
POC: CHIEF, COST ENGINEERING, SON T. HA
PREPARED: 11/7/2018

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 4-Apr-18 Effective Price Level: 1-Oct-17				Program Year (Budget EC): 2019 Effective Price Level Date: 1 OCT 18				FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	CONTRACT 4 (REACH 5)													
02	RELOCATIONS	$17,790	$7,116	40.0%	$24,906	2.0%	$18,147	$7,259	$25,406	2023Q3	13.7%	$20,635	$8,254	$28,888
11	LEVEES & FLOODWALLS	$25,292	$10,117	40.0%	$35,409	2.0%	$25,800	$10,320	$36,120	2024Q2	16.2%	$29,990	$11,996	$41,986
16	BANK STABILIZATION	$1,102	$441	40.0%	$1,542	2.0%	$1,124	$449	$1,573	2024Q3	17.1%	$1,316	$526	$1,842
	CONSTRUCTION ESTIMATE TOTALS:	$44,184	$17,674	40.0%	**$61,858**		$45,071	$18,028	$63,100			$51,941	$20,776	$72,717
01	LANDS AND DAMAGES	$33,346	$10,935	32.8%	$44,281	2.0%	$34,016	$11,155	$45,170	2023Q2	12.9%	$38,388	$12,589	$50,977
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$442	$177	40.0%	$619	3.8%	$459	$183	$642	2023Q2	17.1%	$537	$215	$752
1.0%	Planning & Environmental Compliance	$442	$177	40.0%	$619	3.8%	$459	$183	$642	2023Q2	17.1%	$537	$215	$752
7.0%	Engineering & Design	$3,093	$1,237	40.0%	$4,330	3.8%	$3,211	$1,284	$4,495	2023Q2	17.1%	$3,761	$1,504	$5,265
0.5%	Reviews, ATRs, IEPRs, VE	$221	$88	40.0%	$309	3.8%	$229	$92	$321	2023Q2	17.1%	$269	$107	$376
0.5%	Life Cycle Updates (cost, schedule, risks)	$221	$88	40.0%	$309	3.8%	$229	$92	$321	2023Q2	17.1%	$269	$107	$376
0.5%	Contracting & Reprographics	$221	$88	40.0%	$309	3.8%	$229	$92	$321	2023Q2	17.1%	$269	$107	$376
1.0%	Engineering During Construction	$442	$177	40.0%	$619	3.8%	$459	$183	$642	2024Q3	22.6%	$562	$225	$787
0.5%	Planning During Construction	$221	$88	40.0%	$309	3.8%	$229	$92	$321	2024Q3	22.6%	$281	$112	$394
0.5%	Adaptive Management & Monitoring	$221	$88	40.0%	$309	3.8%	$229	$92	$321	2023Q2	17.1%	$269	$107	$376
0.5%	Project Operations	$221	$88	40.0%	$309	3.8%	$229	$92	$321	2023Q2	17.1%	$269	$107	$376
31	CONSTRUCTION MANAGEMENT													
6.0%	Construction Management	$2,651	$1,060	40.0%	$3,711	3.8%	$2,752	$1,101	$3,853	2024Q3	22.6%	$3,374	$1,349	$4,723
2.0%	Project Operation:	$884	$353	40.0%	$1,237	3.8%	$917	$367	$1,284	2024Q3	22.6%	$1,125	$450	$1,574
2.0%	Project Management	$884	$353	40.0%	$1,237	3.8%	$917	$367	$1,284	2024Q3	22.6%	$1,125	$450	$1,574
	CONTRACT COST TOTALS:	$87,693	$32,674		**$120,366**		$89,636	$33,403	**$123,039**			$102,973	$38,423	**$141,396**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: PAJARO RIVER FLOOD RISK MANAGEMENT PROJECT
LOCATION: SANTA CRUZ AND MONTEREY COUNTIES, CA
This Estimate reflects the scope and schedule in report; PAJARO RIVER GRR

DISTRICT: SAN FRANCISCO DISTRICT
POC: CHIEF, COST ENGINEERING, SON T. HA
PREPARED: 11/7/2018

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 4-Apr-18 Effective Price Level: 1-Oct-17				Program Year (Budget EC): 2019 Effective Price Level Date: 1 OCT 18				FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	CONTRACT 5 (REACH 6)													
02	RELOCATIONS	$12,896	$5,158	40.0%	$18,054	2.0%	$13,155	$5,262	$18,417	2024Q3	17.1%	$15,406	$6,163	$21,569
11	LEVEES & FLOODWALLS	$19,014	$7,606	40.0%	$26,620	2.0%	$19,396	$7,758	$27,154	2025Q3	20.6%	$23,397	$9,359	$32,756
16	BANK STABILIZATION	$1,676	$670	40.0%	$2,346	2.0%	$1,710	$684	$2,394	2025Q3	20.6%	$2,062	$825	$2,887
	CONSTRUCTION ESTIMATE TOTALS:	$33,586	$13,434	40.0%	**$47,020**		$34,260	$13,704	$47,964			$40,866	$16,346	$57,212
01	LANDS AND DAMAGES	$12,252	$4,105	33.5%	$16,356	2.0%	$12,498	$4,187	$16,685	2024Q2	16.2%	$14,527	$4,867	$19,395
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$336	$134	40.0%	$470	3.8%	$349	$139	$488	2024Q2	21.5%	$423	$169	$593
1.0%	Planning & Environmental Compliance	$336	$134	40.0%	$470	3.8%	$349	$139	$488	2024Q2	21.5%	$423	$169	$593
7.0%	Engineering & Design	$2,351	$940	40.0%	$3,291	3.8%	$2,441	$976	$3,417	2024Q2	21.5%	$2,964	$1,186	$4,150
0.5%	Reviews, ATRs, IEPRs, VE	$168	$67	40.0%	$235	3.8%	$174	$70	$244	2024Q2	21.5%	$212	$85	$296
0.5%	Life Cycle Updates (cost, schedule, risks)	$168	$67	40.0%	$235	3.8%	$174	$70	$244	2024Q2	21.5%	$212	$85	$296
0.5%	Contracting & Reprographics	$168	$67	40.0%	$235	3.8%	$174	$70	$244	2024Q2	21.5%	$212	$85	$296
1.0%	Engineering During Construction	$336	$134	40.0%	$470	3.8%	$349	$139	$488	2025Q3	27.2%	$443	$177	$621
0.5%	Planning During Construction	$168	$67	40.0%	$235	3.8%	$174	$70	$244	2025Q3	27.2%	$222	$89	$310
0.5%	Adaptive Management & Monitoring	$168	$67	40.0%	$235	3.8%	$174	$70	$244	2024Q2	21.5%	$212	$85	$296
0.5%	Project Operations	$168	$67	40.0%	$235	3.8%	$174	$70	$244	2024Q2	21.5%	$212	$85	$296
31	CONSTRUCTION MANAGEMENT													
6.0%	Construction Management	$2,015	$806	40.0%	$2,821	3.8%	$2,092	$837	$2,929	2025Q3	27.2%	$2,660	$1,064	$3,724
2.0%	Project Operation:	$672	$269	40.0%	$940	3.8%	$697	$279	$976	2025Q3	27.2%	$887	$355	$1,241
2.0%	Project Management	$672	$269	40.0%	$940	3.8%	$697	$279	$976	2025Q3	27.2%	$887	$355	$1,241
	CONTRACT COST TOTALS:	$53,562	$20,629		**$74,191**		$54,777	$21,099	**$75,875**			$65,361	$25,201	**$90,562**

Filename: Pajaro River FRM Project TPCS Nov 2018.xlsx
TPCS

Construction Period	Cost	Interest Factor	Interest
1	9655444	0.17562556	1695742.76
2	9655444	0.172851963	1668962.45
3	9655444	0.17008491	1642245.322
4	9655444	0.167324385	1615591.226
5	9655444	0.164570372	1589000.013
6	9655444	0.161822857	1562471.536
7	9655444	0.159081824	1536005.647
8	9655444	0.156347258	1509602.197
9	9655444	0.153619144	1483261.039
10	0	0.150897465	0
11	0	0.148182208	0
12	0	0.145473357	0
13	1189909	0.142770897	169884.3751
14	1189909	0.140074812	166676.2798
15	1189909	0.137385089	163475.7533
16	1189909	0.13470171	160282.7776
17	1189909	0.132024663	157097.335
18	1189909	0.129353932	153919.4076
19	1189909	0.126689501	150748.9777
20	1189909	0.124031357	147586.0277
21	1189909	0.121379484	144430.5399
22	1189909	0.118733867	141282.4967
23	1189909	0.116094492	138141.8805
24	1189909	0.113461343	135008.6738
25	11637798	0.110834408	1289868.447
26	11637798	0.108213669	1259368.824
27	11637798	0.105599114	1228941.158
28	11637798	0.102990727	1198585.278
29	11637798	0.100388494	1168301.015
30	11637798	0.0977924	1138088.2
31	11637798	0.095202431	1107946.665
32	11637798	0.092618573	1077876.241
33	11637798	0.09004081	1047876.761
34	1189909	0.087469129	104080.3042
35	0	0.084903516	0
36	0	0.082343955	0
37	5859000	0.079790433	467492.1449
38	5859000	0.077242935	452566.3557
39	5859000	0.074701447	437675.7802
40	5859000	0.072165956	422820.3353
41	5859000	0.069636446	407999.9381
42	5859000	0.067112904	393214.506
43	5859000	0.064595316	378463.9564
44	5859000	0.062083667	363748.2071
45	5859000	0.059577944	349067.176

46	5859000	0.057078133	334420.7811
47	5859000	0.054584219	319808.9407
48	5859000	0.052096189	305231.5734
49	5859000	0.049614029	290688.5977
50	9652750	0.047137725	455008.6781
51	9652750	0.044667264	431161.9282
52	9652750	0.04220263	407371.4389
53	9652750	0.039743812	383637.0773
54	9652750	0.037290794	359958.711
55	9652750	0.034843564	336336.208
56	9652750	0.032402107	312769.4364
57	9652750	0.02996641	289258.2647
58	3793750	0.02753646	104466.4442
59	3793750	0.025112242	95269.56926
60	3793750	0.022693744	86094.39207
61	3793750	0.020280952	76940.86144
62	3793750	0.017873852	67808.92629
63	3793750	0.015472431	58698.53568
64	3793750	0.013076676	49609.63878
65	3793750	0.010686573	40542.18488
66	3793750	0.008302108	31496.12338
67	3793750	0.00592327	22471.40382
68	3793750	0.003550043	13467.97585
69	3793750	0.001182416	4485.78924
		Total:	**35,302,401**

ATTACHMENT 10a

Certified Cost Estimate & IDC Calculations for NED Plan

WALLA WALLA COST ENGINEERING
MANDATORY CENTER OF EXPERTISE

COST AGENCY TECHNICAL REVIEW

CERTIFICATION STATEMENT

For Project No. 104552

SPN – Pajaro River Flood Risk Management General Reevaluation Report

The Pajaro River Flood Risk Management GRR, as presented by San Francisco District, has undergone a successful Cost Agency Technical Review (Cost ATR), performed by the Walla Walla District Cost Engineering Mandatory Center of Expertise (Cost MCX) team. The Cost ATR included study of the project scope, report, cost estimates, schedules, escalation, and risk-based contingencies. This certification signifies the products meet the quality standards as prescribed in ER 1110-2-1150 Engineering and Design for Civil Works Projects and ER 1110-2-1302 Civil Works Cost Engineering.

As of April 20, 2018, the Cost MCX certifies the estimated total project cost:

FY18 Project First Cost: $397,002,000
Fully Funded Amount: $447,525,000

It remains the responsibility of the District to correctly reflect these cost values within the Final Report and to implement effective project management controls and implementation procedures including risk management through the period of Federal Participation.

Michael P. Jacobs, PE, CCE
Chief, Cost Engineering MCX
Walla Walla District

****** TOTAL PROJECT COST SUMMARY ******

PROJECT: **PAJARO RIVER FLOOD RISK MANAGEMENT PROJECT**
PROJECT NO: P2 104552
LOCATION: SANTA CRUZ AND MONTEREY COUNTIES, CA

DISTRICT: SAN FRANCISCO DISTRICT **PREPARED: 4/11/2018**
POC: CHIEF, COST ENGINEERING, SON T. HA

This Estimate reflects the scope and schedule in report; PAJARO RIVER GRR

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2018 Effective Price Level Date: 1 OCT 17									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: **1-Oct-17** ($K)	**TOTAL FIRST COST** ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	***J***		***K***	***L***	***M***	***N***	***O***
02	RELOCATIONS	$37,616	$15,046	40.0%	$52,662	0.0%	$37,616	$15,046	$52,662	$0	$52,662	12.2%	$42,194	$16,878	$59,072
11	LEVEES & FLOODWALLS	$135,586	$54,234	40.0%	$189,821	0.0%	$135,586	$54,234	$189,821	$0	$189,821	11.1%	$150,632	$60,253	$210,885
16	BANK STABILIZATION	$8,183	$3,273	40.0%	$11,457	0.0%	$8,183	$3,273	$11,457	$0	$11,457	12.8%	$9,229	$3,692	$12,920
	CONSTRUCTION ESTIMATE TOTALS:	$181,385	$72,554		$253,940	0.0%	$181,385	$72,554	$253,940	$0	$253,940	11.4%	$202,055	$80,822	$282,877
01	LANDS AND DAMAGES	$64,534	$20,123	31.2%	$84,657	0.0%	$64,534	$20,123	$84,657	$0	$84,657	10.2%	$71,081	$22,203	$93,284
30	PLANNING, ENGINEERING & DESIGN	$23,580	$9,432	40.0%	$33,012	0.0%	$23,580	$9,432	$33,012	$0	$33,012	19.7%	$28,232	$11,293	$39,524
31	CONSTRUCTION MANAGEMENT	$18,139	$7,255	40.0%	$25,394	0.0%	$18,139	$7,255	$25,394	$0	$25,394	25.4%	$22,743	$9,097	$31,840
	PROJECT COST TOTALS:	$287,638	$109,364	38.0%	$397,002		$287,638	$109,364	**$397,002**	$0	**$397,002**	12.7%	$324,110	$123,415	$447,525

ESTIMATED TOTAL PROJECT COST: $447,525

________________ **CHIEF, COST ENGINEERING, SON T. HA**

________________ **PROJECT MANAGER, JAIME L. O'HALLORAN**

________________ **CHIEF, REAL ESTATE, xxx**

________________ **CHIEF, PLANNING, xxx**

________________ **CHIEF, ENGINEERING, SON T. HA**

________________ **CHIEF, OPERATIONS, xxx**

________________ **CHIEF, CONSTRUCTION, xxx**

________________ **CHIEF, CONTRACTING,xxx**

________________ **CHIEF, PM-PB, xxxx**

________________ **CHIEF, DPM, xxx**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: PAJARO RIVER FLOOD RISK MANAGEMENT PROJECT
LOCATION: SANTA CRUZ AND MONTEREY COUNTIES, CA
This Estimate reflects the scope and schedule in report; PAJARO RIVER GRR

DISTRICT: SAN FRANCISCO DISTRICT PREPARED: 4/11/2018
POC: CHIEF, COST ENGINEERING, SON T. HA

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			**4-Apr-18**	Program Year (Budget EC):			2018					
		Effective Price Level:			1-Oct-17	Effective Price Level Date:			1 OCT 17					
				RISK BASED										
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	***J***	***P***	***L***	***M***	***N***	***O***
	CONTRACT 1 (REACH 2)													
02	RELOCATIONS	$1,151	$460	40.0%	$1,611	0.0%	$1,151	$460	$1,611	2021Q3	7.2%	$1,234	$494	$1,728
11	LEVEES & FLOODWALLS	$42,659	$17,064	40.0%	$59,723	0.0%	$42,659	$17,064	$59,723	2021Q3	7.2%	$45,750	$18,300	$64,050
16	BANK STABILIZATION	$564	$226	40.0%	$790	0.0%	$564	$226	$790	2021Q4	7.8%	$608	$243	$852
	CONSTRUCTION ESTIMATE TOTALS:	$44,374	$17,750	40.0%	**$62,124**		$44,374	$17,750	$62,124			$47,592	$19,037	$66,629
01	LANDS AND DAMAGES	$6,724	$1,800	26.8%	$8,524	0.0%	$6,724	$1,800	$8,524	2020Q2	4.6%	$7,034	$1,883	$8,918
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$444	$177	40.0%	$621	0.0%	$444	$177	$621	2020Q2	9.3%	$485	$194	$679
1.0%	Planning & Environmental Compliance	$444	$177	40.0%	$621	0.0%	$444	$177	$621	2020Q2	9.3%	$485	$194	$679
7.0%	Engineering & Design	$3,106	$1,242	40.0%	$4,349	0.0%	$3,106	$1,242	$4,349	2020Q2	9.3%	$3,395	$1,358	$4,753
0.5%	Reviews, ATRs, IEPRs, VE	$222	$89	40.0%	$311	0.0%	$222	$89	$311	2020Q2	9.3%	$242	$97	$339
0.5%	Life Cycle Updates (cost, schedule, risks)	$222	$89	40.0%	$311	0.0%	$222	$89	$311	2020Q2	9.3%	$242	$97	$339
0.5%	Contracting & Reprographics	$222	$89	40.0%	$311	0.0%	$222	$89	$311	2020Q2	9.3%	$242	$97	$339
1.0%	Engineering During Construction	$444	$177	40.0%	$621	0.0%	$444	$177	$621	2021Q3	14.9%	$510	$204	$714
0.5%	Planning During Construction	$222	$89	40.0%	$311	0.0%	$222	$89	$311	2021Q3	14.9%	$255	$102	$357
0.5%	Adaptive Management & Monitoring	$222	$89	40.0%	$311	0.0%	$222	$89	$311	2020Q2	9.3%	$242	$97	$339
0.5%	Project Operations	$222	$89	40.0%	$311	0.0%	$222	$89	$311	2020Q2	9.3%	$242	$97	$339
31	CONSTRUCTION MANAGEMENT													
6.0%	Construction Management	$2,662	$1,065	40.0%	$3,727	0.0%	$2,662	$1,065	$3,727	2021Q3	14.9%	$3,060	$1,224	$4,284
2.0%	Project Operation:	$887	$355	40.0%	$1,242	0.0%	$887	$355	$1,242	2021Q3	14.9%	$1,020	$408	$1,428
2.0%	Project Management	$887	$355	40.0%	$1,242	0.0%	$887	$355	$1,242	2021Q3	14.9%	$1,020	$408	$1,428
	CONTRACT COST TOTALS:	$61,305	$23,633		$84,937		$61,305	$23,633	**$84,937**			$66,069	$25,497	**$91,567**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: PAJARO RIVER FLOOD RISK MANAGEMENT PROJECT
LOCATION: SANTA CRUZ AND MONTEREY COUNTIES, CA
This Estimate reflects the scope and schedule in report; PAJARO RIVER GRR

DISTRICT: SAN FRANCISCO DISTRICT
POC: CHIEF, COST ENGINEERING, SON T. HA
PREPARED: 4/11/2018

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			4-Apr-18	Program Year (Budget EC):			2018					
		Effective Price Level:			1-Oct-17	Effective Price Level Date:			1 OCT 17					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	CONTRACT 2 (REACH 3)													
02	RELOCATIONS	$1,277	$511	40.0%	$1,788	0.0%	$1,277	$511	$1,788	2023Q1	10.5%	$1,411	$564	$1,975
11	LEVEES & FLOODWALLS	$7,275	$2,910	40.0%	$10,185	0.0%	$7,275	$2,910	$10,185	2023Q1	10.5%	$8,036	$3,215	$11,251
16	BANK STABILIZATION	$1,360	$544	40.0%	$1,904	0.0%	$1,360	$544	$1,904	2023Q3	11.6%	$1,517	$607	$2,124
	CONSTRUCTION ESTIMATE TOTALS:	$9,912	$3,965	40.0%	**$13,877**		$9,912	$3,965	$13,877			$10,964	$4,386	$15,350
01	LANDS AND DAMAGES	$6,612	$1,926	29.1%	$8,538	0.0%	$6,612	$1,926	$8,538	2021Q2	6.7%	$7,056	$2,056	$9,111
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$99	$40	40.0%	$139	0.0%	$99	$40	$139	2021Q2	13.8%	$113	$45	$158
1.0%	Planning & Environmental Compliance	$99	$40	40.0%	$139	0.0%	$99	$40	$139	2021Q2	13.8%	$113	$45	$158
7.0%	Engineering & Design	$694	$278	40.0%	$971	0.0%	$694	$278	$971	2021Q2	13.8%	$789	$316	$1,105
0.5%	Reviews, ATRs, IEPRs, VE	$50	$20	40.0%	$69	0.0%	$50	$20	$69	2021Q2	13.8%	$56	$23	$79
0.5%	Life Cycle Updates (cost, schedule, risks)	$50	$20	40.0%	$69	0.0%	$50	$20	$69	2021Q2	13.8%	$56	$23	$79
0.5%	Contracting & Reprographics	$50	$20	40.0%	$69	0.0%	$50	$20	$69	2021Q2	13.8%	$56	$23	$79
1.0%	Engineering During Construction	$99	$40	40.0%	$139	0.0%	$99	$40	$139	2023Q1	22.1%	$121	$48	$169
0.5%	Planning During Construction	$50	$20	40.0%	$69	0.0%	$50	$20	$69	2023Q1	22.1%	$61	$24	$85
0.5%	Adaptive Management & Monitoring	$50	$20	40.0%	$69	0.0%	$50	$20	$69	2021Q2	13.8%	$56	$23	$79
0.5%	Project Operations	$50	$20	40.0%	$69	0.0%	$50	$20	$69	2021Q2	13.8%	$56	$23	$79
31	CONSTRUCTION MANAGEMENT													
6.0%	Construction Management	$595	$238	40.0%	$833	0.0%	$595	$238	$833	2023Q1	22.1%	$726	$290	$1,016
2.0%	Project Operation:	$198	$79	40.0%	$278	0.0%	$198	$79	$278	2023Q1	22.1%	$242	$97	$339
2.0%	Project Management	$198	$79	40.0%	$278	0.0%	$198	$79	$278	2023Q1	22.1%	$242	$97	$339
	CONTRACT COST TOTALS:	$18,804	$6,803		$25,607		$18,804	$6,803	**$25,607**			$20,708	$7,517	**$28,225**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: PAJARO RIVER FLOOD RISK MANAGEMENT PROJECT
LOCATION: SANTA CRUZ AND MONTEREY COUNTIES, CA
This Estimate reflects the scope and schedule in report; PAJARO RIVER GRR

DISTRICT: SAN FRANCISCO DISTRICT PREPARED: 4/11/2018
POC: CHIEF, COST ENGINEERING, SON T. HA

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			**4-Apr-18**	Program Year (Budget EC):			2018					
		Effective Price Level:			1-Oct-17	Effective Price Level Date:			1 OCT 17					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	CONTRACT 3 (REACH 4)													
02	RELOCATIONS	$4,502	$1,801	40.0%	$6,303	0.0%	$4,502	$1,801	$6,303	2023Q3	11.6%	$5,023	$2,009	$7,032
11	LEVEES & FLOODWALLS	$41,345	$16,538	40.0%	$57,884	0.0%	$41,345	$16,538	$57,884	2023Q3	11.6%	$46,132	$18,453	$64,585
16	BANK STABILIZATION	$3,482	$1,393	40.0%	$4,874	0.0%	$3,482	$1,393	$4,874	2023Q4	12.1%	$3,904	$1,562	$5,466
	CONSTRUCTION ESTIMATE TOTALS:	$49,329	$19,732	40.0%	**$69,061**		$49,329	$19,732	$69,061			$55,059	$22,024	$77,083
01	LANDS AND DAMAGES	$5,600	$1,356	24.2%	$6,956	0.0%	$5,600	$1,356	$6,956	2022Q2	8.8%	$6,096	$1,476	$7,572
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$493	$197	40.0%	$691	0.0%	$493	$197	$691	2022Q2	18.4%	$584	$234	$818
1.0%	Planning & Environmental Compliance	$493	$197	40.0%	$691	0.0%	$493	$197	$691	2022Q2	18.4%	$584	$234	$818
7.0%	Engineering & Design	$3,453	$1,381	40.0%	$4,834	0.0%	$3,453	$1,381	$4,834	2022Q2	18.4%	$4,090	$1,636	$5,726
0.5%	Reviews, ATRs, IEPRs, VE	$247	$99	40.0%	$345	0.0%	$247	$99	$345	2022Q2	18.4%	$292	$117	$409
0.5%	Life Cycle Updates (cost, schedule, risks)	$247	$99	40.0%	$345	0.0%	$247	$99	$345	2022Q2	18.4%	$292	$117	$409
0.5%	Contracting & Reprographics	$247	$99	40.0%	$345	0.0%	$247	$99	$345	2022Q2	18.4%	$292	$117	$409
1.0%	Engineering During Construction	$493	$197	40.0%	$691	0.0%	$493	$197	$691	2023Q3	24.6%	$615	$246	$860
0.5%	Planning During Construction	$247	$99	40.0%	$345	0.0%	$247	$99	$345	2023Q3	24.6%	$307	$123	$430
0.5%	Adaptive Management & Monitoring	$247	$99	40.0%	$345	0.0%	$247	$99	$345	2022Q2	18.4%	$292	$117	$409
0.5%	Project Operations	$247	$99	40.0%	$345	0.0%	$247	$99	$345	2022Q2	18.4%	$292	$117	$409
31	CONSTRUCTION MANAGEMENT													
6.0%	Construction Management	$2,960	$1,184	40.0%	$4,144	0.0%	$2,960	$1,184	$4,144	2023Q3	24.6%	$3,688	$1,475	$5,163
2.0%	Project Operation:	$987	$395	40.0%	$1,381	0.0%	$987	$395	$1,381	2023Q3	24.6%	$1,229	$492	$1,721
2.0%	Project Management	$987	$395	40.0%	$1,381	0.0%	$987	$395	$1,381	2023Q3	24.6%	$1,229	$492	$1,721
	CONTRACT COST TOTALS:	$66,275	$25,626		**$91,901**		$66,275	$25,626	**$91,901**			$74,941	$29,014	**$103,956**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: PAJARO RIVER FLOOD RISK MANAGEMENT PROJECT
LOCATION: SANTA CRUZ AND MONTEREY COUNTIES, CA
This Estimate reflects the scope and schedule in report; PAJARO RIVER GRR

DISTRICT: SAN FRANCISCO DISTRICT
POC: CHIEF, COST ENGINEERING, SON T. HA
PREPARED: 4/11/2018

Civil Works Work Breakdown Structure		**ESTIMATED COST**				**PROJECT FIRST COST (Constant Dollar Basis)**				**TOTAL PROJECT COST (FULLY FUNDED)**				
		Estimate Prepared:			**4-Apr-18**	Program Year (Budget EC):			2018	FULLY FUNDED PROJECT ESTIMATE				
		Effective Price Level:			1-Oct-17	Effective Price Level Date:			1 OCT 17					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	***J***	***P***	***L***	***M***	***N***	***O***
	CONTRACT 4 (REACH 5)													
02	RELOCATIONS	$17,790	$7,116	40.0%	$24,906	0.0%	$17,790	$7,116	$24,906	2023Q3	11.6%	$19,850	$7,940	$27,790
11	LEVEES & FLOODWALLS	$25,292	$10,117	40.0%	$35,409	0.0%	$25,292	$10,117	$35,409	2024Q2	13.2%	$28,641	$11,457	$40,098
16	BANK STABILIZATION	$1,102	$441	40.0%	$1,542	0.0%	$1,102	$441	$1,542	2024Q3	13.8%	$1,254	$501	$1,755
	CONSTRUCTION ESTIMATE TOTALS:	$44,184	$17,674	40.0%	**$61,858**		$44,184	$17,674	$61,858			$49,745	$19,898	$69,643
01	LANDS AND DAMAGES	$33,346	$10,935	32.8%	$44,281	0.0%	$33,346	$10,935	$44,281	2023Q2	11.0%	$37,021	$12,140	$49,161
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$442	$177	40.0%	$619	0.0%	$442	$177	$619	2023Q2	23.3%	$545	$218	$763
1.0%	Planning & Environmental Compliance	$442	$177	40.0%	$619	0.0%	$442	$177	$619	2023Q2	23.3%	$545	$218	$763
7.0%	Engineering & Design	$3,093	$1,237	40.0%	$4,330	0.0%	$3,093	$1,237	$4,330	2023Q2	23.3%	$3,813	$1,525	$5,339
0.5%	Reviews, ATRs, IEPRs, VE	$221	$88	40.0%	$309	0.0%	$221	$88	$309	2023Q2	23.3%	$272	$109	$381
0.5%	Life Cycle Updates (cost, schedule, risks)	$221	$88	40.0%	$309	0.0%	$221	$88	$309	2023Q2	23.3%	$272	$109	$381
0.5%	Contracting & Reprographics	$221	$88	40.0%	$309	0.0%	$221	$88	$309	2023Q2	23.3%	$272	$109	$381
1.0%	Engineering During Construction	$442	$177	40.0%	$619	0.0%	$442	$177	$619	2024Q3	29.9%	$574	$230	$803
0.5%	Planning During Construction	$221	$88	40.0%	$309	0.0%	$221	$88	$309	2024Q3	29.9%	$287	$115	$402
0.5%	Adaptive Management & Monitoring	$221	$88	40.0%	$309	0.0%	$221	$88	$309	2023Q2	23.3%	$272	$109	$381
0.5%	Project Operations	$221	$88	40.0%	$309	0.0%	$221	$88	$309	2023Q2	23.3%	$272	$109	$381
31	CONSTRUCTION MANAGEMENT													
6.0%	Construction Management	$2,651	$1,060	40.0%	$3,711	0.0%	$2,651	$1,060	$3,711	2024Q3	29.9%	$3,443	$1,377	$4,820
2.0%	Project Operation:	$884	$353	40.0%	$1,237	0.0%	$884	$353	$1,237	2024Q3	29.9%	$1,148	$459	$1,607
2.0%	Project Management	$884	$353	40.0%	$1,237	0.0%	$884	$353	$1,237	2024Q3	29.9%	$1,148	$459	$1,607
	CONTRACT COST TOTALS:	$87,693	$32,674		**$120,366**		$87,693	$32,674	**$120,366**			$99,629	$37,183	**$136,812**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: PAJARO RIVER FLOOD RISK MANAGEMENT PROJECT
LOCATION: SANTA CRUZ AND MONTEREY COUNTIES, CA
This Estimate reflects the scope and schedule in report; PAJARO RIVER GRR

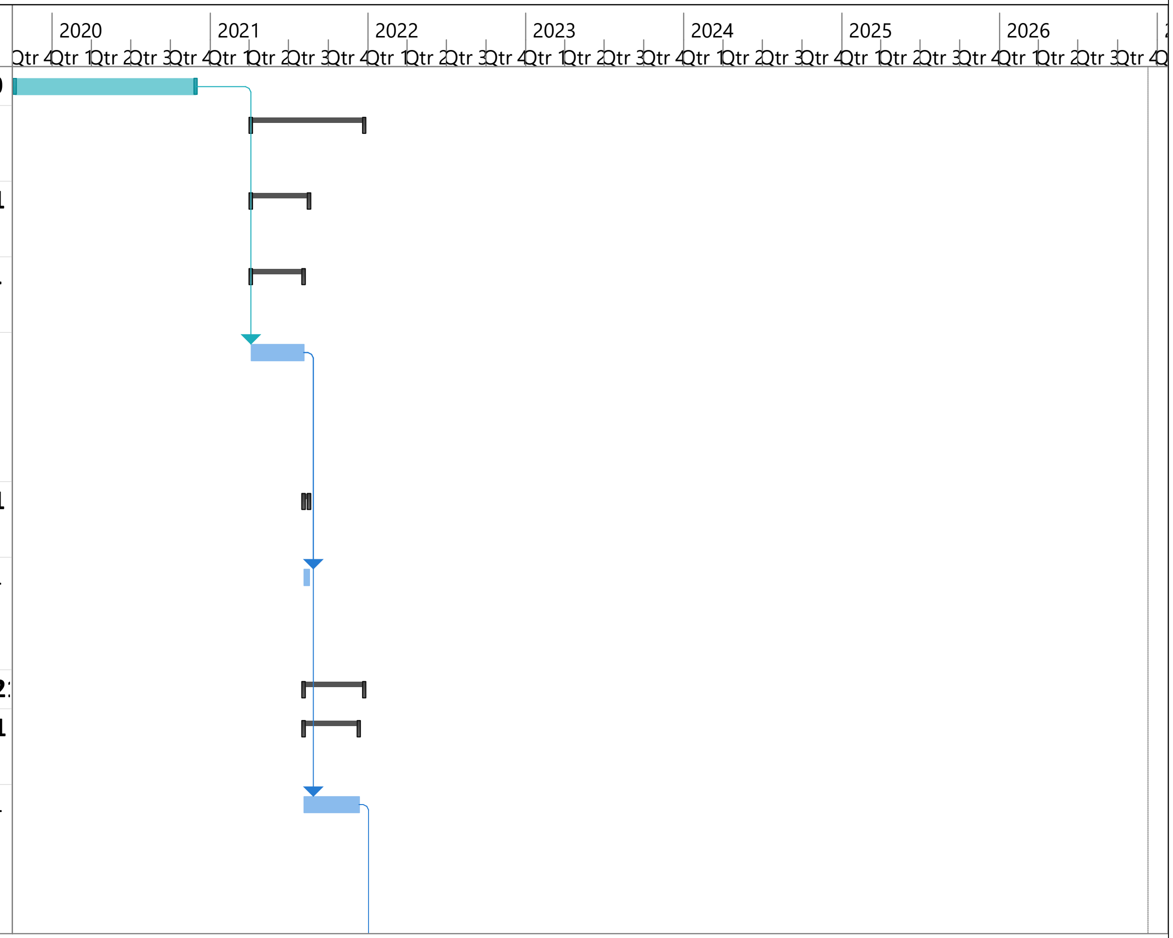
DISTRICT: SAN FRANCISCO DISTRICT
POC: CHIEF, COST ENGINEERING, SON T. HA
PREPARED: 4/11/2018

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			**4-Apr-18**	Program Year (Budget EC):			2018	FULLY FUNDED PROJECT ESTIMATE				
		Effective Price Level:			1-Oct-17	Effective Price Level Date:			1 OCT 17					
WBS NUMBER *A*	Civil Works Feature & Sub-Feature Description *B*	COST ($K) *C*	CNTG ($K) *D*	CNTG (%) *E*	TOTAL ($K) *F*	ESC (%) *G*	COST ($K) *H*	CNTG ($K) *I*	TOTAL ($K) *J*	Mid-Point Date *P*	INFLATED (%) *L*	COST ($K) *M*	CNTG ($K) *N*	FULL ($K) *O*
	CONTRACT 5 (REACH 6)													
02	RELOCATIONS	$12,896	$5,158	40.0%	$18,054	0.0%	$12,896	$5,158	$18,054	2024Q3	13.8%	$14,677	$5,871	$20,547
11	LEVEES & FLOODWALLS	$19,014	$7,606	40.0%	$26,620	0.0%	$19,014	$7,606	$26,620	2025Q3	16.1%	$22,072	$8,829	$30,901
16	BANK STABILIZATION	$1,676	$670	40.0%	$2,346	0.0%	$1,676	$670	$2,346	2025Q3	16.1%	$1,946	$778	$2,724
	CONSTRUCTION ESTIMATE TOTALS:	$33,586	$13,434	40.0%	**$47,020**		$33,586	$13,434	$47,020			$38,695	$15,478	$54,172
01	LANDS AND DAMAGES	$12,252	$4,105	33.5%	$16,356	0.0%	$12,252	$4,105	$16,356	2024Q2	13.2%	$13,874	$4,648	$18,522
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$336	$134	40.0%	$470	0.0%	$336	$134	$470	2024Q2	28.5%	$431	$173	$604
1.0%	Planning & Environmental Compliance	$336	$134	40.0%	$470	0.0%	$336	$134	$470	2024Q2	28.5%	$431	$173	$604
7.0%	Engineering & Design	$2,351	$940	40.0%	$3,291	0.0%	$2,351	$940	$3,291	2024Q2	28.5%	$3,020	$1,208	$4,229
0.5%	Reviews, ATRs, IEPRs, VE	$168	$67	40.0%	$235	0.0%	$168	$67	$235	2024Q2	28.5%	$216	$86	$302
0.5%	Life Cycle Updates (cost, schedule, risks)	$168	$67	40.0%	$235	0.0%	$168	$67	$235	2024Q2	28.5%	$216	$86	$302
0.5%	Contracting & Reprographics	$168	$67	40.0%	$235	0.0%	$168	$67	$235	2024Q2	28.5%	$216	$86	$302
1.0%	Engineering During Construction	$336	$134	40.0%	$470	0.0%	$336	$134	$470	2025Q3	35.4%	$455	$182	$637
0.5%	Planning During Construction	$168	$67	40.0%	$235	0.0%	$168	$67	$235	2025Q3	35.4%	$227	$91	$318
0.5%	Adaptive Management & Monitoring	$168	$67	40.0%	$235	0.0%	$168	$67	$235	2024Q2	28.5%	$216	$86	$302
0.5%	Project Operations	$168	$67	40.0%	$235	0.0%	$168	$67	$235	2024Q2	28.5%	$216	$86	$302
31	CONSTRUCTION MANAGEMENT													
6.0%	Construction Management	$2,015	$806	40.0%	$2,821	0.0%	$2,015	$806	$2,821	2025Q3	35.4%	$2,729	$1,092	$3,821
2.0%	Project Operation:	$672	$269	40.0%	$940	0.0%	$672	$269	$940	2025Q3	35.4%	$910	$364	$1,274
2.0%	Project Management	$672	$269	40.0%	$940	0.0%	$672	$269	$940	2025Q3	35.4%	$910	$364	$1,274
	CONTRACT COST TOTALS:	$53,562	$20,629		**$74,191**		$53,562	$20,629	**$74,191**			$62,762	$24,203	**$86,965**

Construction Period	Cost	Interest Factor	Interest
1	9437444	0.167494635	1580721.237
2	9437444	0.164858235	1555840.361
3	9437444	0.162227789	1531015.669
4	9437444	0.159603282	1506247.036
5	9437444	0.156984702	1481534.335
6	9437444	0.154372035	1456877.439
7	9437444	0.151765268	1432276.222
8	9437444	0.149164388	1407730.56
9	9437444	0.146569381	1383240.325
10	0	0.143980234	0
11	0	0.141396933	0
12	0	0.138819466	0
13	1163955	0.13624782	158586.3312
14	1163955	0.133681981	155599.8097
15	1163955	0.131121935	152620.0322
16	1163955	0.128567671	149646.9836
17	1163955	0.126019175	146680.6486
18	1163955	0.123476433	143721.0121
19	1163955	0.120939434	140768.0589
20	1163955	0.118408164	137821.7741
21	1163955	0.115882609	134882.1424
22	1163955	0.113362758	131949.1489
23	1163955	0.110848597	129022.7786
24	1163955	0.108340113	126103.0166
25	12651580	0.105837294	1339008.996
26	12651580	0.103340127	1307415.884
27	12651580	0.100848599	1275894.116
28	12651580	0.098362697	1244443.529
29	12651580	0.095882409	1213063.962
30	12651580	0.093407721	1181755.256
31	12651580	0.090938622	1150517.25
32	12651580	0.088475098	1119349.785
33	1163955	0.086017138	100120.0778
34	1163955	0.083564728	97265.5829
35	0	0.081117856	0
36	5731714	0.078676509	450951.2499
37	5731714	0.076240676	436989.7483
38	5731714	0.073810343	423059.7741
39	5731714	0.071385498	409161.2562
40	5731714	0.068966128	395294.1234
41	5731714	0.066552222	381458.305
42	5731714	0.064143768	367653.7302
43	5731714	0.061740751	353880.3284
44	5731714	0.059343161	340138.0294
45	5731714	0.056950986	326426.7627
46	5731714	0.054564212	312746.4584
47	5731714	0.052182828	299097.0465
48	5731714	0.049806822	285478.4573
49	9264619	0.047436181	439478.1413
50	9264619	0.045070893	417564.6522
51	9264619	0.042710947	395700.6474
52	9264619	0.040356329	373886.0152
53	9264619	0.038007029	352120.6442
54	9264619	0.035663034	330404.423
55	9264619	0.033324332	308737.2407
56	9264619	0.030990911	287118.9866
57	3532905	0.02866276	101262.8078
58	3532905	0.026339866	93056.24356
59	3532905	0.024022217	84868.2111
60	3532905	0.021709802	76698.6686
61	3532905	0.019402609	68547.57431
62	3532905	0.017100626	60414.88656
63	3532905	0.014803841	52300.5638
64	3532905	0.012512243	44204.56455
65	3532905	0.010225819	36126.84742
66	3532905	0.007944559	28067.37115
67	3532905	0.00566845	20026.09454
68	3532905	0.003397481	12002.97648
69	3532905	0.00113164	3997.975981

PAJARO River Flood Risk Management
Construction Schedule

ID	Task Name	Duration	Start	Finish
1	**Contract 1 PED**	300 days	Mon 10/7/19	Fri 11/27/20
2	**Contract 1 Construction**	**188.5 days**	**Mon 4/5/21**	**Thu 12/23/21**
3	**Reach 2 Right Bank**	**96.5 days**	**Mon 4/5/21**	**Tue 8/17/21**
4	**11 Levees and Floodwalls**	**88 days**	**Mon 4/5/21**	**Wed 8/4/21**
5	Demolish & Build New Levee (8,743 LF)	88 days	Mon 4/5/21	Wed 8/4/21
6	**16 Bank Stablization**	**8.5 days**	**Thu 8/5/21**	**Tue 8/17/21**
7	Riprap Slope Treatment (824 CY)	8.5 days	Thu 8/5/21	Tue 8/17/21
8	**Reach 2 Left Bank**	**100.5 da**	**Thu 8/5/21**	**Thu 12/23/2**
9	**11 Levees and Floodwalls**	**92 days**	**Thu 8/5/21**	**Fri 12/10/21**
10	Demolish & Build New Levee (9,212 LF)	92 days	Thu 8/5/21	Fri 12/10/21

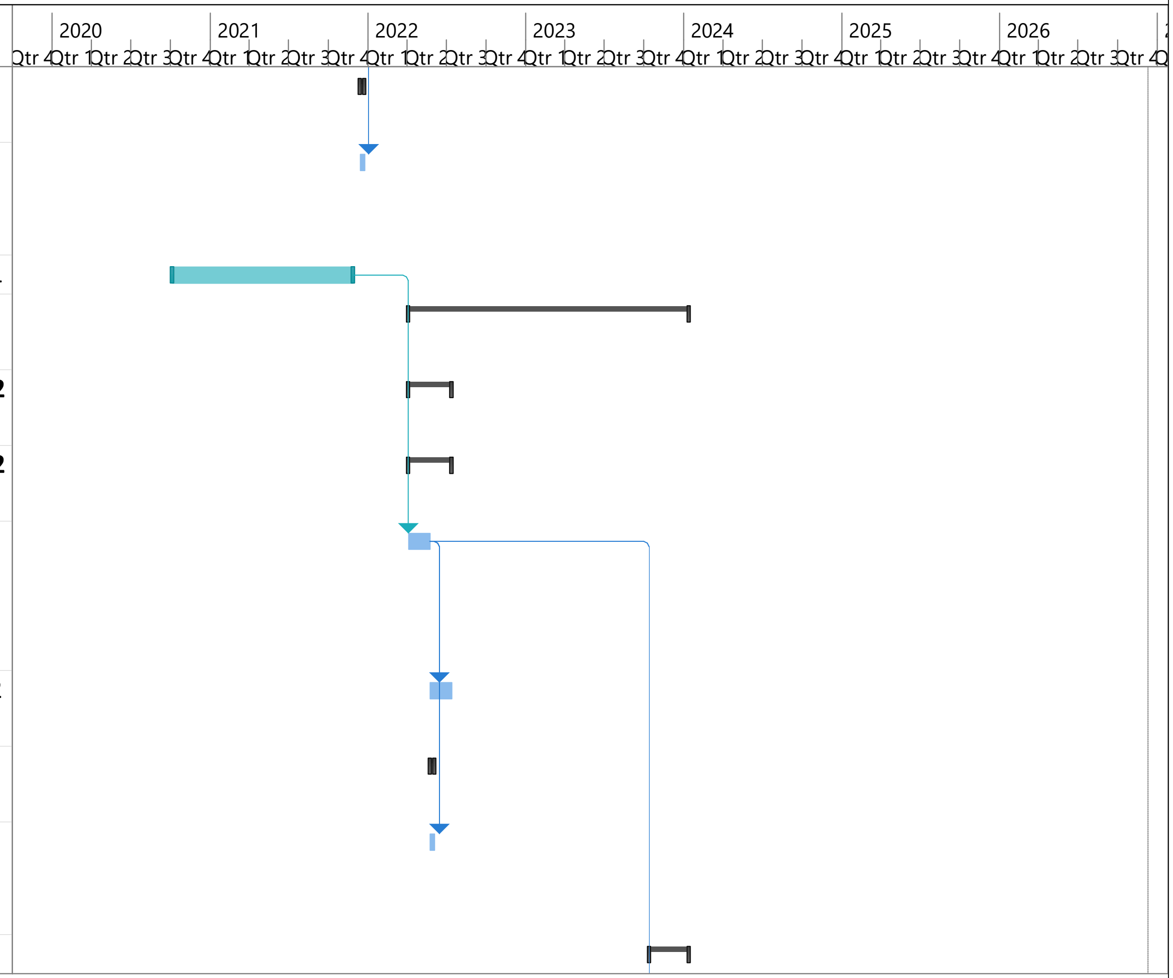


Project: Pajaro River Flood Con
Date: Tue 4/17/18

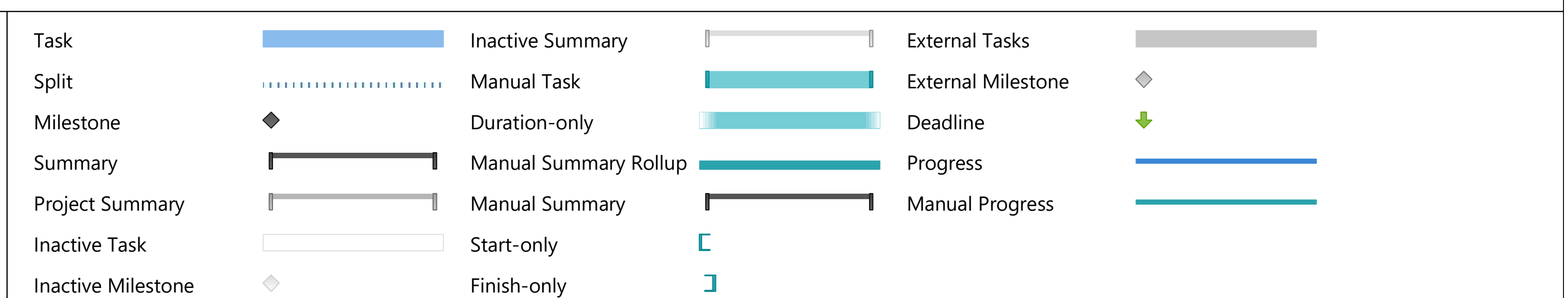
Task	Inactive Summary	External Tasks
Split	Manual Task	External Milestone
Milestone	Duration-only	Deadline
Summary	Manual Summary Rollup	Progress
Project Summary	Manual Summary	Manual Progress
Inactive Task	Start-only	
Inactive Milestone	Finish-only	

PAJARO River Flood Risk Management
Construction Schedule

ID	Task Name	Duration	Start	Finish
11	**16 Bank Stablization**	**8.5 days**	**Mon 12/13/21**	**Thu 12/23/21**
12	Riprap Slope Treatment (783 CY)	8.5 days	Mon 12/13/21	Thu 12/23/21
13	**Contract 2 PED**	300 days	Mon 10/5/20	Fri 11/26/21
14	**Contract 2 Construction**	**465 days**	**Mon 4/4/22**	**Fri 1/12/24**
15	**Reach 3 Right Bank**	**72 days**	**Mon 4/4/22**	**Tue 7/12/22**
16	**11 Levees and Floodwalls**	**72 days**	**Mon 4/4/22**	**Tue 7/12/22**
17	Demolish & Build New Levee (3,613 LF)	36 days	Mon 4/4/22	Mon 5/23/22
18	Floodwall (3,613 LF)	36 days	Tue 5/24/22	Tue 7/12/22
19	**16 Bank Stablization**	**8.5 days**	**Tue 5/24/22**	**Fri 6/3/22**
20	Riprap Slope Treatment (2,136 CY)	8.5 days	Tue 5/24/22	Fri 6/3/22
21	**Reach 3 Left Bank**	**66 days**	**Fri 10/13/23**	**Fri 1/12/24**

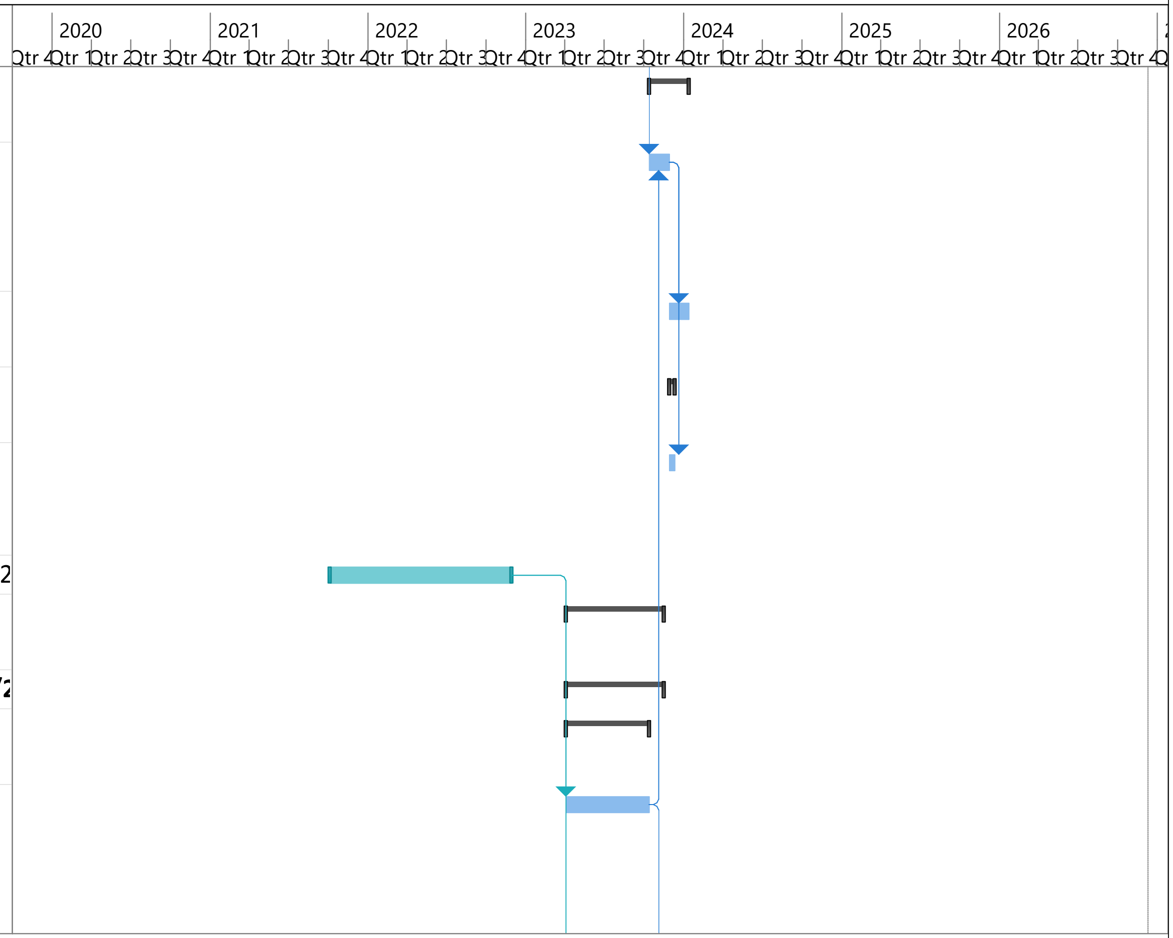


Project: Pajaro River Flood Con
Date: Tue 4/17/18



PAJARO River Flood Risk Management
Construction Schedule

ID	Task Name	Duration	Start	Finish
22	**11 Levees and Floodwalls**	**66 days**	**Fri 10/13/23**	**Fri 1/12/24**
23	Demolish & Build New Levee (3,388 LF)	33 days	Fri 10/13/23	Tue 11/28/23
24	Floodwall (3,388 LF)	33 days	Wed 11/29/23	Fri 1/12/24
25	**16 Bank Stablization**	**8.5 days**	**Wed 11/29/23**	**Mon 12/11/23**
26	Riprap Slope Treatment (2136 CY)	8.5 days	Wed 11/29/23	Mon 12/11/23
27	**Contract 3 PED**	300 days	Tue 10/5/21	Mon 11/28/2
28	**Constract 3 Construction**	**162 days**	**Tue 4/4/23**	**Wed 11/15/23**
29	**Reach 4 Left Bank**	**162 days**	**Tue 4/4/23**	**Wed 11/15/2**
30	**11 Levees and Floodwalls**	**138 days**	**Tue 4/4/23**	**Thu 10/12/23**
31	Demolish & Build New Levee (13,837 LF)	138 days	Tue 4/4/23	Thu 10/12/23

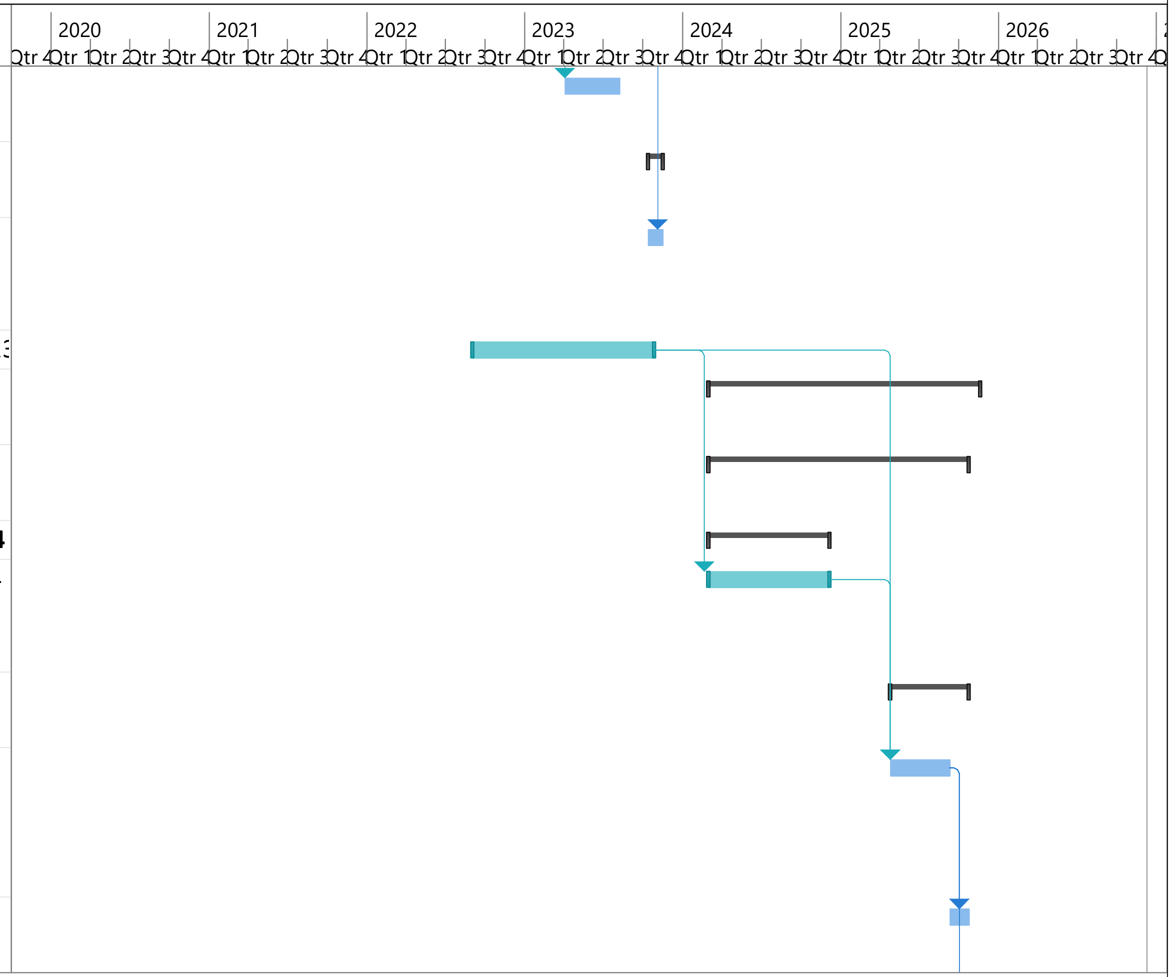


Project: Pajaro River Flood Con
Date: Tue 4/17/18

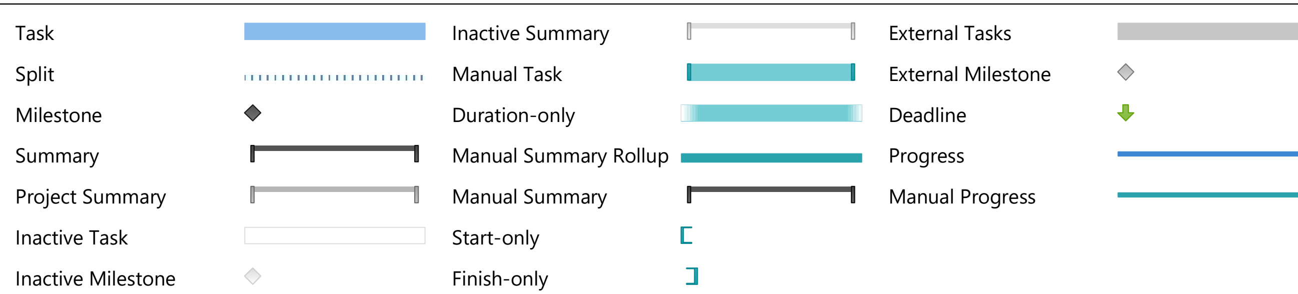
Task
Split
Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Deadline
Progress
Manual Progress

PAJARO River Flood Risk Management
Construction Schedule

ID	Task Name	Duration	Start	Finish
32	Floodgate at Railroad	90 days	Tue 4/4/23	Mon 8/7/23
33	**16 Bank Stablization**	**24 days**	**Fri 10/13/23**	**Wed 11/15/23**
34	Riprap Slope Treatment (10,990 CY)	24 days	Fri 10/13/23	Wed 11/15/23
35	**Contract 4 PED**	300 days	Fri 9/2/22	Thu 10/26/23
36	**Contract 4 Construction**	**449 days**	**Fri 3/1/24**	**Wed 11/19/25**
37	**Reach 5 Right Bank**	**430 days**	**Fri 3/1/24**	**Thu 10/23/25**
38	**02 Relocations**	**200 days**	**Fri 3/1/24**	**Thu 12/5/24**
39	HWY 129 Bridge Modification	200 days	Fri 3/1/24	Thu 12/5/24
40	**11 Levees and Floodwalls**	**130 days**	**Fri 4/25/25**	**Thu 10/23/25**
41	Demolish & Build New Levee (9,816 LF)	98 days	Fri 4/25/25	Tue 9/9/25
42	Floodwall (3,100 LF)	32 days	Wed 9/10/25	Thu 10/23/25

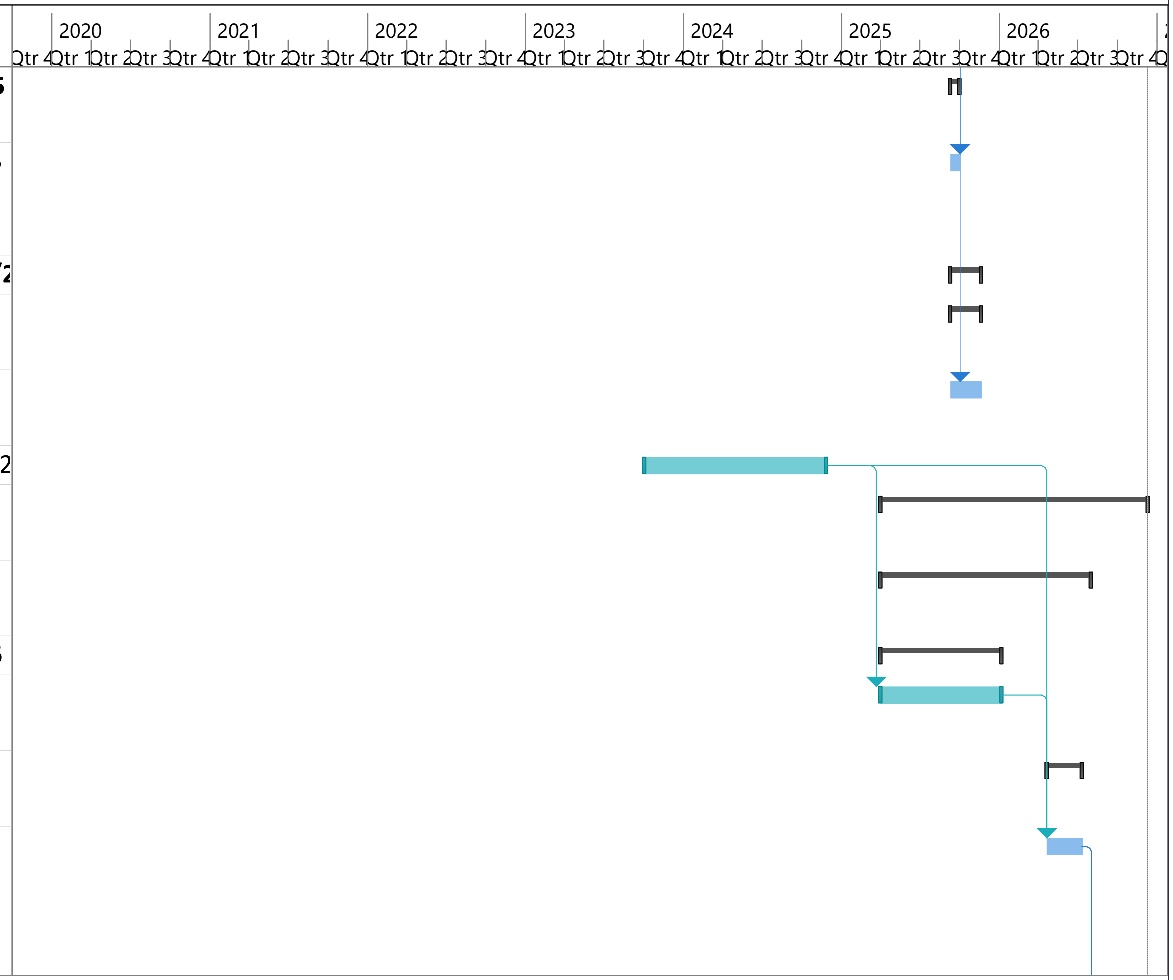


Project: Pajaro River Flood Con
Date: Tue 4/17/18



PAJARO River Flood Risk Management
Construction Schedule

ID	Task Name	Duration	Start	Finish
43	**16 Bank Stablization**	**15 days**	**Wed 9/10/25**	**Tue 9/30/25**
44	Riprap Slope Treatment (3,417 CY)	15 days	Wed 9/10/25	Tue 9/30/25
45	**Reach 5 Left Bank**	**51 days**	**Wed 9/10/25**	**Wed 11/19/2**
46	**11 Levees and Floodwalls**	**51 days**	**Wed 9/10/25**	**Wed 11/19/25**
47	Floodwall (5,129 LF)	51 days	Wed 9/10/25	Wed 11/19/25
48	**Contract 5 PED**	300 days	Tue 10/3/23	Mon 11/25/2
49	**Contract 5 Construction**	**442 days**	**Tue 4/1/25**	**Wed 12/9/26**
50	**Reach 6 Right Bank**	**349 days**	**Tue 4/1/25**	**Fri 7/31/26**
51	**02 Relocations**	**200 days**	**Tue 4/1/25**	**Mon 1/5/26**
52	HWY 152 Bridge	200 days	Tue 4/1/25	Mon 1/5/26
53	**11 Levees and Floodwalls**	**59 days**	**Tue 4/21/26**	**Fri 7/10/26**
54	Demolish & Build New Levee (5,963 LF)	59 days	Tue 4/21/26	Fri 7/10/26

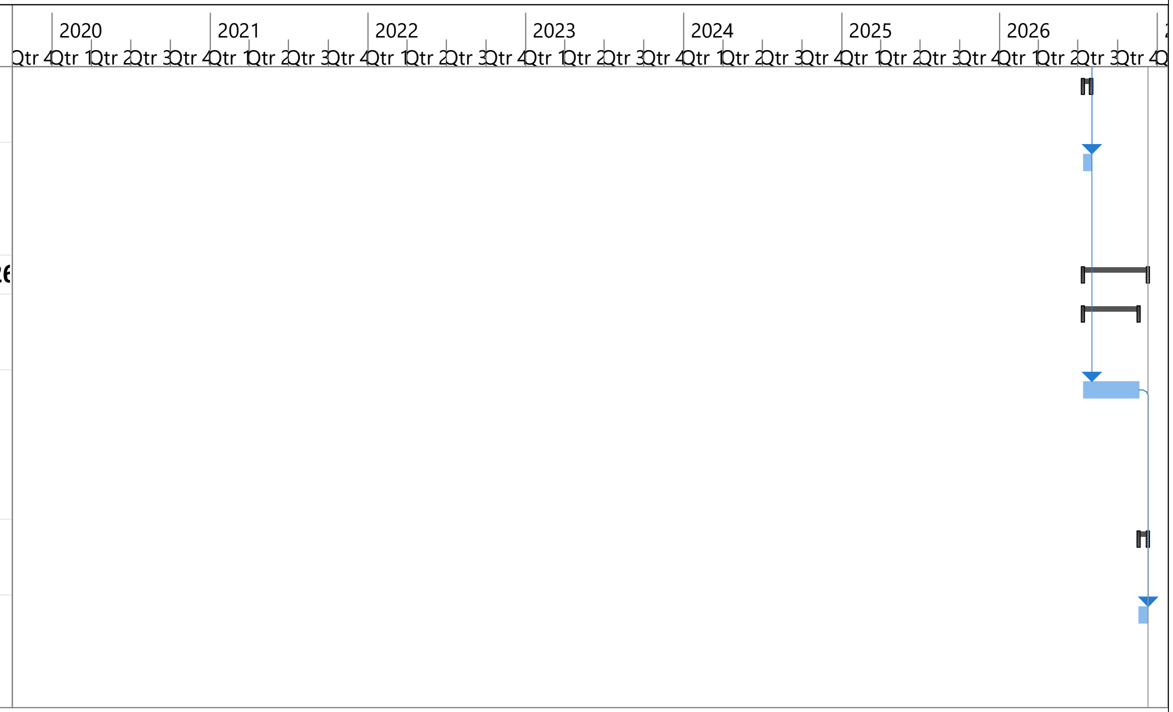


Project: Pajaro River Flood Con
Date: Tue 4/17/18

Task	Inactive Summary	External Tasks
Split	Manual Task	External Milestone
Milestone	Duration-only	Deadline
Summary	Manual Summary Rollup	Progress
Project Summary	Manual Summary	Manual Progress
Inactive Task	Start-only	
Inactive Milestone	Finish-only	

PAJARO River Flood Risk Management
Construction Schedule

ID	Task Name	Duration	Start	Finish
55	**16 Bank Stablization**	**15 days**	**Mon 7/13/26**	**Fri 7/31/26**
56	Riprap Slope Treatment (2,667 CY)	15 days	Mon 7/13/26	Fri 7/31/26
57	**Reach 6 Left Bank**	**108 days**	**Mon 7/13/26**	**Wed 12/9/26**
58	**11 Levees and Floodwalls**	**93 days**	**Mon 7/13/26**	**Wed 11/18/26**
59	Demolish & Build New Levee (9,307 LF)	93 days	Mon 7/13/26	Wed 11/18/26
60	**16 Bank Stablization**	**15 days**	**Thu 11/19/26**	**Wed 12/9/26**
61	Riprap Slope Treatment (2,667 CY)	15 days	Thu 11/19/26	Wed 12/9/26



Project: Pajaro River Flood Con
Date: Tue 4/17/18

Task	Inactive Summary	External Tasks
Split	Manual Task	External Milestone
Milestone	Duration-only	Deadline
Summary	Manual Summary Rollup	Progress
Project Summary	Manual Summary	Manual Progress
Inactive Task	Start-only	
Inactive Milestone	Finish-only	

ATTACHMENT 10b

Cost Estimates and IDC Calculations for Agency Decision Milestone (ADM): Original TSP, 2% ACE Plan, 1% ACE Plan (Recommended Plan – Preliminary and Updated), and 0.4% ACE Plan

PROJECT: Pajaro River Flood Risk Management Project
PROJECT NO:
LOCATION: Santa Cruz and Monterey Counties, CA   Main Stem Pajaro - Original TSP

DISTRICT: San Francisco District   PREPARED: 9/27/2017
POC: CHIEF, COST ENGINEERING, SON HA

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2017									
						Effective Price Level Date: 1 OCT 16									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Spent Thru: 1-Oct-16 ($K)	TOTAL FIRST COST ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J		K	L	M	N	O
02	UTILITY RELOCATIONS	$7,131	$2,506	35.1%	$9,637	0.0%	$7,131	$2,506	$9,637	$0	$9,637	6.4%	$7,589	$2,667	$10,256
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$470	$398	84.7%	$867	0.0%	$441	$374	$815	$0	$815	6.4%	$470	$398	$867
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$2,953	$634	21.5%	$3,587	0.0%	$2,775	$596	$3,371	$0	$3,371	6.4%	$2,953	$634	$3,587
11	DEMOLISH AND REBUILD LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	DEMOLISH AND BUILD NEW LEVEE	$23,199	$9,033	38.9%	$32,232	0.0%	$21,801	$8,488	$30,289	$0	$30,289	6.4%	$23,199	$9,033	$32,232
11	BUILD NEW LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	BUILD NEW FLOODWALL	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$2,399	$1,144	47.7%	$3,543	0.0%	$2,399	$1,144	$3,543	$0	$3,543	0.0%	$2,399	$1,144	$3,543
11	FLOOD GATES	$5,803	$2,807	48.4%	$8,610	0.0%	$5,803	$2,807	$8,610	$0	$8,610	0.0%	$5,803	$2,807	$8,610
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$1,339	$376	28.0%	$1,715	0.0%	$1,339	$376	$1,715	$0	$1,715	0.0%	$1,339	$376	$1,715
	CONSTRUCTION ESTIMATE TOTALS:	$43,295	$16,896		$60,191	-3.7%	$41,690	$16,290	$57,979	$0	$57,979	4.9%	$43,753	$17,057	$60,810
01	LANDS AND DAMAGES	$19,773	$3,562	18.0%	$23,335	0.0%	$19,773	$3,562	$23,335	$0	$23,335	1.8%	$20,138	$3,628	$23,766
30	PLANNING, ENGINEERING & DESIGN	$11,907	$4,647	39.0%	$16,554	0.0%	$11,907	$4,647	$16,554	$0	$16,554	6.1%	$12,633	$4,930	$17,564
31	CONSTRUCTION MANAGEMENT	$6,278	$2,450	39.0%	$8,728	0.0%	$6,278	$2,450	$8,728	$0	$8,728	12.9%	$7,088	$2,766	$9,854
	PROJECT COST TOTALS:	$81,253	$27,555	33.9%	$108,809		$79,648	$26,949	$106,597	$0	$106,597	5.1%	$83,613	$28,382	$111,994

CHIEF, COST ENGINEERING, SON HA

PROJECT MANAGER, xxx

CHIEF, REAL ESTATE, xxx

CHIEF, PLANNING,xxx

CHIEF, ENGINEERING, xxx

CHIEF, OPERATIONS, xxx

CHIEF, CONSTRUCTION, xxx

ESTIMATED TOTAL PROJECT COST: $111,994

1 2 3 4 5 6 8 9 10 11 13 14 15 16 17

PROJECT: **Pajaro River Flood Risk Management Project** DISTRICT: **San Francisco District** PREPARED: **1/30/2016**
PROJECT NO: POC: **CHIEF, COST ENGINEERING, SON HA**
LOCATION: Santa Cruz and Monterey Counties, CA Tributaries - Original TSP

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2017 Effective Price Level Date: 1 OCT 16									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Spent Thru: 1-Oct-16 ($K)	TOTAL FIRST COST ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*		*K*	*L*	*M*	*N*	*O*
02	UTILITY RELOCATIONS	$1,715	$603	35.1%	$2,318	0.0%	$1,715	$603	$2,318	$0	$2,318	6.4%	$1,825	$641	$2,467
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$27,336	$23,148	84.7%	$50,484	0.0%	$25,688	$21,753	$47,441	$0	$47,441	6.4%	$27,336	$23,148	$50,484
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$1,637	$351	21.5%	$1,989	0.0%	$1,539	$330	$1,869	$0	$1,869	6.4%	$1,637	$351	$1,989
11	DEMOLISH AND REBUILD LEVEE	$6,056	$2,358	38.9%	$8,414	0.0%	$5,691	$2,216	$7,907	$0	$7,907	6.4%	$6,056	$2,358	$8,414
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	$0	$0	6.4%	$0	$0	$0
11	BUILD NEW LEVEE	$7,234	$3,162	43.7%	$10,397	0.0%	$6,798	$2,972	$9,770	$0	$9,770	6.4%	$7,234	$3,162	$10,397
11	BUILD NEW FLOODWALL	$1,854	$591	31.9%	$2,446	0.0%	$1,742	$556	$2,298	$0	$2,298	6.4%	$1,854	$591	$2,446
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$1,896	$904	47.7%	$2,800	0.0%	$1,896	$904	$2,800	$0	$2,800	0.0%	$1,896	$904	$2,800
11	FLOOD GATES	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$1,094	$307	28.0%	$1,401	0.0%	$1,094	$307	$1,401	$0	$1,401	0.0%	$1,094	$307	$1,401
	CONSTRUCTION ESTIMATE TOTALS:	$48,823	$31,425		$80,248	-5.5%	$46,164	$29,639	$75,803	$0	$75,803	6.1%	$48,934	$31,463	$80,397
01	LANDS AND DAMAGES	$33,358	$6,819	20.4%	$40,177	0.0%	$33,358	$6,819	$40,177	$0	$40,177	0.0%	$33,975	$6,945	$40,920
30	PLANNING, ENGINEERING & DESIGN	$13,430	$8,644	64.4%	$22,074	0.0%	$13,430	$8,644	$22,074	$0	$22,074	6.1%	$14,249	$9,172	$23,421
31	CONSTRUCTION MANAGEMENT	$7,079	$4,557	64.4%	$11,636	0.0%	$7,079	$4,557	$11,636	$0	$11,636	12.9%	$7,992	$5,145	$13,137
	PROJECT COST TOTALS:	$102,690	$51,445	50.1%	$154,135		$100,031	$49,660	**$149,690**	$0	**$149,690**	5.5%	$105,150	$52,725	$157,875

ESTIMATED TOTAL PROJECT COST: $157,875

______________________ **CHIEF, COST ENGINEERING, SON HA**

______________________ **PROJECT MANAGER, xxx**

______________________ **CHIEF, REAL ESTATE, xxx**

______________________ **CHIEF, PLANNING,xxx**

______________________ **CHIEF, ENGINEERING, xxx**

______________________ **CHIEF, OPERATIONS, xxx**

CHIEF, CONSTRUCTION, xxx

1 2 3 4 5 6 8 9 10 11 13 14 15 16 17

PROJECT: **Pajaro River Flood Risk Management Project - 50-Year Flood Event**
PROJECT NO:
LOCATION: Santa Cruz and Monterey Counties, CA   Main Stem - 2% ACE Plan

DISTRICT: **San Francisco District**
POC: **CHIEF, COST ENGINEERING, xxx**

PREPARED: **12/22/2017**

Civil Works Work Breakdown Structure		**ESTIMATED COST**				**PROJECT FIRST COST (Constant Dollar Basis)**						**TOTAL PROJECT COST (FULLY FUNDED)**			
						Program Year (Budget EC): 2017									
						Effective Price Level Date: 1 OCT 16									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: **1-Oct-16** ($K)	**TOTAL FIRST COST ($K)**	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*		*K*	*L*	*M*	*N*	*O*
02	UTILITY RELOCATIONS	$7,117	$2,501	35.1%	$9,618	0.0%	$7,117	$2,501	$9,618	$0	$9,618	6.4%	$7,573	$2,661	$10,235
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$398	$337	84.7%	$736	0.0%	$374	$317	$692	$0	$692	6.4%	$398	$337	$736
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$4,244	$911	21.5%	$5,155	0.0%	$3,988	$856	$4,844	$0	$4,844	6.4%	$4,244	$911	$5,155
11	DEMOLISH AND REBUILD LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	DEMOLISH AND BUILD NEW LEVEE	$34,984	$13,622	38.9%	$48,605	0.0%	$32,874	$12,800	$45,674	$0	$45,674	6.4%	$34,984	$13,622	$48,605
11	BUILD NEW LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	BUILD NEW FLOODWALL	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$3,473	$1,656	47.7%	$5,128	0.0%	$3,473	$1,656	$5,128	$0	$5,128	0.0%	$3,473	$1,656	$5,128
11	FLOOD GATES	$5,796	$2,803	48.4%	$8,599	0.0%	$5,796	$2,803	$8,599	$0	$8,599	0.0%	$5,796	$2,803	$8,599
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$4,557	$1,278	28.0%	$5,834	0.0%	$4,557	$1,278	$5,834	$0	$5,834	0.0%	$4,557	$1,278	$5,834
	CONSTRUCTION ESTIMATE TOTALS:	$60,568	$23,107		$83,675	-3.9%	$58,179	$22,210	$80,389	$0	$80,389	4.9%	$61,025	$23,267	$84,292
01	LANDS AND DAMAGES	$17,109	$2,799	16.4%	$19,908	0.0%	$17,109	$2,799	$19,908	$0	$19,908	1.8%	$17,425	$2,851	$20,276
30	PLANNING, ENGINEERING & DESIGN	$16,657	$6,355	38.2%	$23,012	0.0%	$16,657	$6,355	$23,012	$0	$23,012	6.1%	$17,673	$6,742	$24,415
31	CONSTRUCTION MANAGEMENT	$8,781	$3,350	38.2%	$12,131	0.0%	$8,781	$3,350	$12,131	$0	$12,131	12.9%	$9,914	$3,782	$13,696
	PROJECT COST TOTALS:	$103,115	$35,611	34.5%	$138,726		$100,726	$34,714	**$135,440**	$0	**$135,440**	5.3%	$106,037	$36,643	$142,680

CHIEF, COST ENGINEERING, xxx

ESTIMATED TOTAL PROJECT COST: **$142,680**

PROJECT MANAGER, Jaime O'Halloran

PROJECT: **Pajaro River Flood Risk Management Project - 50-Year Flood Event** DISTRICT: San Francisco District PREPARED: 1/30/2016
PROJECT NO:
POC: CHIEF, COST ENGINEERING, SON HA
LOCATION: Santa Cruz and Monterey Counties, CA Tributaries - 2% ACE Plan

Program Year (Budget EC): 2017
Effective Price Level Date: 1 OCT 16

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Spent Thru: 1-Oct-16 ($K)	TOTAL FIRST COST ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J		K	L	M	N	O
02	UTILITY RELOCATIONS	$1,707	$600	35.1%	$2,306	0.0%	$1,707	$600	$2,306	$0	$2,306	6.4%	$1,816	$638	$2,454
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$31,546	$26,713	84.7%	$58,259	0.0%	$29,644	$25,103	$54,747	$0	$54,747	6.4%	$31,546	$26,713	$58,259
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$2,104	$451	21.5%	$2,555	0.0%	$1,977	$424	$2,401	$0	$2,401	6.4%	$2,104	$451	$2,555
11	DEMOLISH AND REBUILD LEVEE	$7,245	$2,821	38.9%	$10,066	0.0%	$6,808	$2,651	$9,459	$0	$9,459	6.4%	$7,245	$2,821	$10,066
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	$0	$0	6.4%	$0	$0	$0
11	BUILD NEW LEVEE	$10,529	$4,602	43.7%	$15,131	0.0%	$9,894	$4,325	$14,219	$0	$14,219	6.4%	$10,529	$4,602	$15,131
11	BUILD NEW FLOODWALL	$2,834	$904	31.9%	$3,738	0.0%	$2,663	$849	$3,513	$0	$3,513	6.4%	$2,834	$904	$3,738
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$1,232	$588	47.7%	$1,820	0.0%	$1,232	$588	$1,820	$0	$1,820	0.0%	$1,232	$588	$1,820
11	FLOOD GATES	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0		$0	$0	$0
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0		$0	$0	$0
16	BANK STABILIZATION	$2,561	$718	28.0%	$3,279	0.0%	$2,561	$718	$3,279	$0	$3,279	0.0%	$2,561	$718	$3,279
	CONSTRUCTION ESTIMATE TOTALS:	$59,757	$37,397		$97,154	-5.6%	$56,486	$35,257	$91,743	$0	$91,743	6.1%	$59,867	$37,435	$97,302
01	LANDS AND DAMAGES	$24,923	$5,308	21.3%	$30,231	0.0%	$24,923	$5,308	$30,231	$0	$30,231	0.0%	$25,384	$5,406	$30,790
30	PLANNING, ENGINEERING & DESIGN	$16,436	$10,285	62.6%	$26,721	0.0%	$16,436	$10,285	$26,721	$0	$26,721	6.1%	$17,438	$10,912	$28,351
31	CONSTRUCTION MANAGEMENT	$8,666	$5,423	62.6%	$14,089	0.0%	$8,666	$5,423	$14,089	$0	$14,089	12.9%	$9,784	$6,123	$15,907
	PROJECT COST TOTALS:	$109,782	$58,413	53.2%	$168,195		$106,511	$56,273	**$162,784**	$0	**$162,784**	5.9%	$112,473	$59,876	$172,350

CHIEF, COST ENGINEERING, SON HA

ESTIMATED TOTAL PROJECT COST: $172,350

PROJECT MANAGER, xxx

1 2 3 4 5 6 8 9 10 11 13 14 15 16 17

PROJECT: **Pajaro River Flood Risk Management Project - 100-Year Flood Event**
PROJECT NO:
LOCATION: Santa Cruz and Monterey Counties, CA — Main Stem 1% ACE Plan

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, xxx

PREPARED: 12/22/2017

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2017									
						Effective Price Level Date: 1 OCT 16									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Spent Thru: 1-Oct-16 ($K)	TOTAL FIRST COST ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J		K	L	M	N	O
02	UTILITY RELOCATIONS	$7,117	$2,501	35.1%	$9,618	0.0%	$7,117	$2,501	$9,618	$0	$9,618	6.4%	$7,573	$2,661	$10,235
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$406	$344	84.7%	$751	0.0%	$382	$323	$705	$0	$705	6.4%	$406	$344	$751
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$5,227	$1,122	21.5%	$6,349	0.0%	$4,912	$1,054	$5,966	$0	$5,966	6.4%	$5,227	$1,122	$6,349
11	DEMOLISH AND REBUILD LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	DEMOLISH AND BUILD NEW LEVEE	$44,504	$17,329	38.9%	$61,833	0.0%	$41,821	$16,284	$58,105	$0	$58,105	6.4%	$44,504	$17,329	$61,833
11	BUILD NEW LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	BUILD NEW FLOODWALL	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$3,867	$1,844	47.7%	$5,711	0.0%	$3,867	$1,844	$5,711	$0	$5,711	0.0%	$3,867	$1,844	$5,711
11	FLOOD GATES	$5,796	$2,803	48.4%	$8,599	0.0%	$5,796	$2,803	$8,599	$0	$8,599	0.0%	$5,796	$2,803	$8,599
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$5,454	$1,529	28.0%	$6,984	0.0%	$5,454	$1,529	$6,984	$0	$6,984	0.0%	$5,454	$1,529	$6,984
	CONSTRUCTION ESTIMATE TOTALS:	$72,372	$27,472		$99,843	-4.2%	$69,349	$26,338	$95,687	$0	$95,687	5.0%	$72,828	$27,632	$100,460
01	LANDS AND DAMAGES	$17,109	$2,799	16.4%	$19,908	0.0%	$17,109	$2,799	$19,908	$0	$19,908	1.8%	$17,425	$2,851	$20,276
30	PLANNING, ENGINEERING & DESIGN	$19,903	$7,555	38.0%	$27,458	0.0%	$19,903	$7,555	$27,458	$0	$27,458	6.1%	$21,117	$8,016	$29,133
31	CONSTRUCTION MANAGEMENT	$10,495	$3,984	38.0%	$14,479	0.0%	$10,495	$3,984	$14,479	$0	$14,479	12.9%	$11,849	$4,498	$16,347
	PROJECT COST TOTALS:	$119,879	$41,809	34.9%	$161,688		$116,856	$40,676	**$157,532**	$0	**$157,532**	5.5%	$123,220	$42,996	$166,216

CHIEF, COST ENGINEERING, xxx

ESTIMATED TOTAL PROJECT COST: $166,216

PROJECT MANAGER, Jaime O'Halloran

PROJECT: **Pajaro River Flood Risk Management Project - 100-Year Flood Event** DISTRICT: **San Francisco District** PREPARED: **1/30/2016**
PROJECT NO:
POC: **CHIEF, COST ENGINEERING, SON HA**
LOCATION: Santa Cruz and Monterey Counties, CA Tributaries - 1% ACE Plan

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2017	Effective Price Level Date: 1 OCT 16								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Spent Thru: 1-Oct-16 ($K)	TOTAL FIRST COST ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J		K	L	M	N	O
02	UTILITY RELOCATIONS	$1,707	$600	35.1%	$2,306	0.0%	$1,707	$600	$2,306	$0	$2,306	6.4%	$1,816	$638	$2,454
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$31,546	$26,713	84.7%	$58,259	0.0%	$29,644	$25,103	$54,747	$0	$54,747	6.4%	$31,546	$26,713	$58,259
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$2,227	$478	21.5%	$2,705	0.0%	$2,093	$449	$2,542	$0	$2,542	6.4%	$2,227	$478	$2,705
11	DEMOLISH AND REBUILD LEVEE	$7,769	$3,025	38.9%	$10,795	0.0%	$7,301	$2,843	$10,144	$0	$10,144	6.4%	$7,769	$3,025	$10,795
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	$0	$0	6.4%	$0	$0	$0
11	BUILD NEW LEVEE	$11,153	$4,875	43.7%	$16,027	0.0%	$10,480	$4,581	$15,061	$0	$15,061	6.4%	$11,153	$4,875	$16,027
11	BUILD NEW FLOODWALL	$2,834	$904	31.9%	$3,738	0.0%	$2,663	$849	$3,513	$0	$3,513	6.4%	$2,834	$904	$3,738
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$1,341	$640	47.7%	$1,981	0.0%	$1,341	$640	$1,981	$0	$1,981	0.0%	$1,341	$640	$1,981
11	FLOOD GATES	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$2,810	$788	28.0%	$3,597	0.0%	$2,810	$788	$3,597	$0	$3,597	0.0%	$2,810	$788	$3,597
	CONSTRUCTION ESTIMATE TOTALS:	$61,387	$38,022		$99,408	-5.6%	$58,039	$35,852	$93,891	$0	$93,891	6.0%	$61,496	$38,060	$99,556
01	LANDS AND DAMAGES	$24,923	$5,308	21.3%	$30,231	0.0%	$24,923	$5,308	$30,231	$0	$30,231	0.0%	$25,384	$5,406	$30,790
30	PLANNING, ENGINEERING & DESIGN	$16,882	$10,455	61.9%	$27,337	0.0%	$16,882	$10,455	$27,337	$0	$27,337	6.1%	$17,912	$11,093	$29,005
31	CONSTRUCTION MANAGEMENT	$8,900	$5,512	61.9%	$14,412	0.0%	$8,900	$5,512	$14,412	$0	$14,412	12.9%	$10,048	$6,224	$16,272
	PROJECT COST TOTALS:	$112,092	$59,297	52.9%	$171,389		$108,744	$57,127	**$165,871**	$0	**$165,871**	5.9%	$114,840	$60,783	$175,623

CHIEF, COST ENGINEERING, SON HA

PROJECT MANAGER, xxx

ESTIMATED TOTAL PROJECT COST: $175,623

PROJECT: **Pajaro River Flood Risk Management Project - 250-Year Flood Event** **DISTRICT: San Francisco District** **PREPARED: 12/22/2017**

PROJECT NO: **POC: CHIEF, COST ENGINEERING, xxx**

LOCATION: Santa Cruz and Monterey Counties, CA Main Stem 0.4% ACE Plan

Civil Works Work Breakdown Structure		**ESTIMATED COST**				**PROJECT FIRST COST (Constant Dollar Basis)**						**TOTAL PROJECT COST (FULLY FUNDED)**			
						Program Year (Budget EC): 2017									
						Effective Price Level Date: 1 OCT 16									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	**Spent Thru: 1-Oct-16 ($K)**	**TOTAL FIRST COST ($K)**	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*		*K*	*L*	*M*	*N*	*O*
02	UTILITY RELOCATIONS	$7,117	$2,501	35.1%	$9,618	0.0%	$7,117	$2,501	$9,618	$0	$9,618	6.4%	$7,573	$2,661	$10,235
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$406	$344	84.7%	$751	0.0%	$382	$323	$705	$0	$705	6.4%	$406	$344	$751
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$5,717	$1,227	21.5%	$6,944	0.0%	$5,372	$1,153	$6,525	$0	$6,525	6.4%	$5,717	$1,227	$6,944
11	DEMOLISH AND REBUILD LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	DEMOLISH AND BUILD NEW LEVEE	$49,182	$19,150	38.9%	$68,331	0.0%	$46,216	$17,995	$64,211	$0	$64,211	6.4%	$49,182	$19,150	$68,331
11	BUILD NEW LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	BUILD NEW FLOODWALL	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$4,153	$1,980	47.7%	$6,134	0.0%	$4,153	$1,980	$6,134	$0	$6,134	0.0%	$4,153	$1,980	$6,134
11	FLOOD GATES	$5,796	$2,803	48.4%	$8,599	0.0%	$5,796	$2,803	$8,599	$0	$8,599	0.0%	$5,796	$2,803	$8,599
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$5,688	$1,595	28.0%	$7,283	0.0%	$5,688	$1,595	$7,283	$0	$7,283	0.0%	$5,688	$1,595	$7,283
	CONSTRUCTION ESTIMATE TOTALS:	$78,059	$29,600		$107,659	-4.3%	$74,724	$28,351	$103,075	$0	$103,075	5.0%	$78,515	$29,760	$108,276
01	LANDS AND DAMAGES	$17,109	$4,881	28.5%	$21,990	0.0%	$17,109	$4,881	$21,990	$0	$21,990	1.8%	$17,425	$4,971	$22,396
30	PLANNING, ENGINEERING & DESIGN	$21,463	$8,139	37.9%	$29,602	0.0%	$21,463	$8,139	$29,602	$0	$29,602	6.1%	$22,772	$8,635	$31,407
31	CONSTRUCTION MANAGEMENT	$11,318	$4,292	37.9%	$15,610	0.0%	$11,318	$4,292	$15,610	$0	$15,610	12.9%	$12,779	$4,846	$17,624
	PROJECT COST TOTALS:	$127,949	$46,912	36.7%	$174,860		$124,614	$45,662	**$170,276**	$0	**$170,276**	5.5%	$131,491	$48,212	$179,704

CHIEF, COST ENGINEERING, xxx

ESTIMATED TOTAL PROJECT COST: $179,704

PROJECT MANAGER, Jaime O'Halloran

CHIEF, REAL ESTATE, xxx

PROJECT: Pajaro River Flood Risk Management Project - 250-Year Flood Event
PROJECT NO:
LOCATION: Santa Cruz and Monterey Counties, CA — Tributaries - 0.4% ACE Plan

DISTRICT: San Francisco District — **PREPARED:** 1/30/2016
POC: CHIEF, COST ENGINEERING, SON HA

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2017; Effective Price Level Date: 1 OCT 16									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Spent Thru: 1-Oct-16 ($K)	TOTAL FIRST COST ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*		*K*	*L*	*M*	*N*	*O*
02	UTILITY RELOCATIONS	$1,707	$600	35.1%	$2,306	0.0%	$1,707	$600	$2,306	$0	$2,306	6.4%	$1,816	$638	$2,454
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$31,546	$26,713	84.7%	$58,259	0.0%	$29,644	$25,103	$54,747	$0	$54,747	6.4%	$31,546	$26,713	$58,259
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$2,486	$534	21.5%	$3,020	0.0%	$2,336	$501	$2,837	$0	$2,837	6.4%	$2,486	$534	$3,020
11	DEMOLISH AND REBUILD LEVEE	$9,844	$3,833	38.9%	$13,677	0.0%	$9,251	$3,602	$12,853	$0	$12,853	6.4%	$9,844	$3,833	$13,677
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	$0	$0	6.4%	$0	$0	$0
11	BUILD NEW LEVEE	$11,574	$5,059	43.7%	$16,633	0.0%	$10,876	$4,754	$15,630	$0	$15,630	6.4%	$11,574	$5,059	$16,633
11	BUILD NEW FLOODWALL	$2,834	$904	31.9%	$3,738	0.0%	$2,663	$849	$3,513	$0	$3,513	6.4%	$2,834	$904	$3,738
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$1,463	$697	47.7%	$2,160	0.0%	$1,463	$697	$2,160	$0	$2,160	0.0%	$1,463	$697	$2,160
11	FLOOD GATES	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$3,147	$882	28.0%	$4,030	0.0%	$3,147	$882	$4,030	$0	$4,030	0.0%	$3,147	$882	$4,030
	CONSTRUCTION ESTIMATE TOTALS:	$64,601	$39,222		$103,823	-5.5%	$61,087	$36,989	$98,076	$0	$98,076	6.0%	$64,711	$39,261	$103,971
01	LANDS AND DAMAGES	$24,923	$7,581	30.4%	$32,504	0.0%	$24,923	$7,581	$32,504	$0	$32,504	0.0%	$25,384	$7,721	$33,105
30	PLANNING, ENGINEERING & DESIGN	$17,770	$10,788	60.7%	$28,558	0.0%	$17,770	$10,788	$28,558	$0	$28,558	6.1%	$18,854	$11,446	$30,300
31	CONSTRUCTION MANAGEMENT	$9,367	$5,687	60.7%	$15,054	0.0%	$9,367	$5,687	$15,054	$0	$15,054	12.9%	$10,576	$6,421	$16,997
	PROJECT COST TOTALS:	$116,661	$63,278	54.2%	$179,939		$113,147	$61,045	**$174,192**	$0	**$174,192**	5.8%	$119,524	$64,849	$184,373

CHIEF, COST ENGINEERING, SON HA

ESTIMATED TOTAL PROJECT COST: $184,373

PROJECT MANAGER, xxx

CHIEF, REAL ESTATE, xxx

IDC Main Stem - Original TSP			
Construction Period	Cost	Interest Factor	Interest
1	4533708	0.054564212	247378.2049
2	4533708	0.052182828	236581.7053
3	4533708	0.049806822	225809.5861
4	4533708	0.047436181	215061.7921
5	4533708	0.045070893	204338.2684
6	4533708	0.042710947	193638.9603
7	4533708	0.040356329	182963.813
8	4533708	0.038007029	172312.772
9	4533708	0.035663034	161685.7828
10	4533708	0.033324332	151082.7912
11	4533708	0.030990911	140503.7429
12	4533708	0.02866276	129948.5839
13	4533708	0.026339866	119417.2603
14	4533708	0.024022217	108909.7181
15	4533708	0.021709802	98425.90373
16	4533708	0.019402609	87965.76359
17	4533708	0.017100626	77529.24421
18	4533708	0.014803841	67116.29226
19	4533708	0.012512243	56726.85451
20	4533708	0.010225819	46360.87786
21	4533708	0.007944559	36018.30933
22	4533708	0.00566845	25699.09607
23	4533708	0.003397481	15403.18534
24	4533708	0.00113164	5130.524509
			3,006,009

Main Stem - 2% ACE Plan

Construction Period	Cost	Interest Factor	Interest
1	5780292	0.054564212	315397.0787
2	5780292	0.052182828	301631.984
3	5780292	0.049806822	287897.9731
4	5780292	0.047436181	274194.976
5	5780292	0.045070893	260522.9226
6	5780292	0.042710947	246881.743
7	5780292	0.040356329	233271.3674
8	5780292	0.038007029	219691.7264
9	5780292	0.035663034	206142.7505
10	5780292	0.033324332	192624.3705
11	5780292	0.030990911	179136.5172
12	5780292	0.02866276	165679.1218
13	5780292	0.026339866	152252.1155
14	5780292	0.024022217	138855.4296
15	5780292	0.021709802	125488.9957
16	5780292	0.019402609	112152.7455
17	5780292	0.017100626	98846.61079
18	5780292	0.014803841	85570.52356
19	5780292	0.012512243	72324.41597
20	5780292	0.010225819	59108.22033
21	5780292	0.007944559	45921.86909
22	5780292	0.00566845	32765.29486
23	5780292	0.003397481	19638.43039
24	5780292	0.00113164	6541.208604
			3,832,538

Main Stem - 1% ACE Plan

Construction Period	Cost	Interest Factor	Interest
1	6736958	0.054564212	367596.8052
2	6736958	0.052182828	351553.5214
3	6736958	0.049806822	335546.466
4	6736958	0.047436181	319575.5573
5	6736958	0.045070893	303640.7136
6	6736958	0.042710947	287741.8534
7	6736958	0.040356329	271878.8955
8	6736958	0.038007029	256051.7589
9	6736958	0.035663034	240260.3626
10	6736958	0.033324332	224504.626
11	6736958	0.030990911	208784.4685
12	6736958	0.02866276	193099.8097
13	6736958	0.026339866	177450.5696
14	6736958	0.024022217	161836.668
15	6736958	0.021709802	146258.0253
16	6736958	0.019402609	130714.5618
17	6736958	0.017100626	115206.1981
18	6736958	0.014803841	99732.85489
19	6736958	0.012512243	84294.45308
20	6736958	0.010225819	68890.91379
21	6736958	0.007944559	53522.15829
22	6736958	0.00566845	38188.10803
23	6736958	0.003397481	22888.68465
24	6736958	0.00113164	7623.809944
			4,466,842

Main Stem - 0.4% ACE Plan

Construction Period	Cost	Interest Factor	Interest
1	7285875	0.054564212	397548.0288
2	7285875	0.052182828	380197.5629
3	7285875	0.049806822	362886.2772
4	7285875	0.047436181	345614.0833
5	7285875	0.045070893	328380.893
6	7285875	0.042710947	311186.6181
7	7285875	0.040356329	294031.1707
8	7285875	0.038007029	276914.4633
9	7285875	0.035663034	259836.4083
10	7285875	0.033324332	242796.9184
11	7285875	0.030990911	225795.9066
12	7285875	0.02866276	208833.2859
13	7285875	0.026339866	191908.9697
14	7285875	0.024022217	175022.8714
15	7285875	0.021709802	158174.9048
16	7285875	0.019402609	141364.9838
17	7285875	0.017100626	124593.0224
18	7285875	0.014803841	107858.9349
19	7285875	0.012512243	91162.63577
20	7285875	0.010225819	74504.03973
21	7285875	0.007944559	57883.06161
22	7285875	0.00566845	41299.61647
23	7285875	0.003397481	24753.61955
24	7285875	0.00113164	8244.98628
			4,830,793

Tributaries - Original TSP

Construction Period	Cost	Interest Factor	Interest
1	6422292	0.054564212	350427.3029
2	6422292	0.052182828	335133.3596
3	6422292	0.049806822	319873.9527
4	6422292	0.047436181	304649.0041
5	6422292	0.045070893	289458.4359
6	6422292	0.042710947	274302.1707
7	6422292	0.040356329	259180.1308
8	6422292	0.038007029	244092.2391
9	6422292	0.035663034	229038.4184
10	6422292	0.033324332	214018.5917
11	6422292	0.030990911	199032.6823
12	6422292	0.02866276	184080.6137
13	6422292	0.026339866	169162.3094
14	6422292	0.024022217	154277.6931
15	6422292	0.021709802	139426.6887
16	6422292	0.019402609	124609.2205
17	6422292	0.017100626	109825.2126
18	6422292	0.014803841	95074.58946
19	6422292	0.012512243	80357.27574
20	6422292	0.010225819	65673.19619
21	6422292	0.007944559	51022.27578
22	6422292	0.00566845	36404.43961
23	6422292	0.003397481	21819.61299
24	6422292	0.00113164	7267.721369
			4,258,207

Tributaries - 2% ACE Plan

Construction Period	Cost	Interest Factor	Interest
1	7008125	0.054564212	382392.8189
2	7008125	0.052182828	365703.7824
3	7008125	0.049806822	349052.4325
4	7008125	0.047436181	332438.6841
5	7008125	0.045070893	315862.4524
6	7008125	0.042710947	299323.6527
7	7008125	0.040356329	282822.2003
8	7008125	0.038007029	266358.011
9	7008125	0.035663034	249931.0006
10	7008125	0.033324332	233541.0852
11	7008125	0.030990911	217188.1809
12	7008125	0.02866276	200872.2043
13	7008125	0.026339866	184593.072
14	7008125	0.024022217	168350.7006
15	7008125	0.021709802	152145.0073
16	7008125	0.019402609	135975.9091
17	7008125	0.017100626	119843.3235
18	7008125	0.014803841	103747.168
19	7008125	0.012512243	87687.36037
20	7008125	0.010225819	71663.81847
21	7008125	0.007944559	55676.46044
22	7008125	0.00566845	39725.20455
23	7008125	0.003397481	23809.96929
24	7008125	0.00113164	7930.67332
			4,646,635

Tributaries - 1% ACE Plan

Construction Period	Cost	Interest Factor	Interest
1	7141208	0.054564212	389654.388
2	7141208	0.052182828	372648.4297
3	7141208	0.049806822	355680.8737
4	7141208	0.047436181	338751.6334
5	7141208	0.045070893	321860.6221
6	7141208	0.042710947	305007.7536
7	7141208	0.040356329	288192.9417
8	7141208	0.038007029	271416.1004
9	7141208	0.035663034	254677.1442
10	7141208	0.033324332	237975.9873
11	7141208	0.030990911	221312.5444
12	7141208	0.02866276	204686.7304
13	7141208	0.026339866	188098.4603
14	7141208	0.024022217	171547.6493
15	7141208	0.021709802	155034.2129
16	7141208	0.019402609	138558.0665
17	7141208	0.017100626	122119.1261
18	7141208	0.014803841	105717.3076
19	7141208	0.012512243	89352.52716
20	7141208	0.010225819	73024.70116
21	7141208	0.007944559	56733.74614
22	7141208	0.00566845	40479.57885
23	7141208	0.003397481	24262.11621
24	7141208	0.00113164	8081.275342
			4,734,874

Tributaries - 0.4% ACE Plan

Construction Period	Cost	Interest Factor	Interest
1	7438208	0.054564212	405859.959
2	7438208	0.052182828	388146.7296
3	7438208	0.049806822	370473.4998
4	7438208	0.047436181	352840.179
5	7438208	0.045070893	335246.6773
6	7438208	0.042710947	317692.9047
7	7438208	0.040356329	300178.7715
8	7438208	0.038007029	282704.1881
9	7438208	0.035663034	265269.0653
10	7438208	0.033324332	247873.3139
11	7438208	0.030990911	230516.8451
12	7438208	0.02866276	213199.5701
13	7438208	0.026339866	195921.4005
14	7438208	0.024022217	178682.2478
15	7438208	0.021709802	161482.0241
16	7438208	0.019402609	144320.6414
17	7438208	0.017100626	127198.012
18	7438208	0.014803841	110114.0484
19	7438208	0.012512243	93068.66322
20	7438208	0.010225819	76061.76943
21	7438208	0.007944559	59093.28007
22	7438208	0.00566845	42163.10843
23	7438208	0.003397481	25271.16797
24	7438208	0.00113164	8417.372369
			4,931,795

ATTACHMENT 10

Cost Estimates and IDC Calculations – Tentatively Selected Plan (TSP)

**** TOTAL PROJECT COST SUMMARY ****

PROJECT: **Pajaro River Flood Risk Management Project**
PROJECT NO:
LOCATION: Santa Cruz and Monterey Counties, CA

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA

PREPARED: 9/27/2017

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2017 Effective Price Level Date: 1 OCT 16									
WBS NUMBER *A*	Civil Works Feature & Sub-Feature Description *B*	COST ($K) *C*	CNTG ($K) *D*	CNTG (%) *E*	TOTAL ($K) *F*	ESC (%) *G*	COST ($K) *H*	CNTG ($K) *I*	**TOTAL ($K)** *J*	Spent Thru: **1-Oct-16** ($K)	**TOTAL FIRST COST** ($K) *K*	INFLATED (%) *L*	COST ($K) *M*	CNTG ($K) *N*	FULL ($K) *O*
02	UTILITY RELOCATIONS	$7,131	$2,506	35.1%	$9,637	0.0%	$7,131	$2,506	$9,637	$0	$9,637	6.4%	$7,589	$2,667	$10,256
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$470	$398	84.7%	$867	0.0%	$441	$374	$815	$0	$815	6.4%	$470	$398	$867
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$2,953	$634	21.5%	$3,587	0.0%	$2,775	$596	$3,371	$0	$3,371	6.4%	$2,953	$634	$3,587
11	DEMOLISH AND REBUILD LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	DEMOLISH AND BUILD NEW LEVEE	$23,199	$9,033	38.9%	$32,232	0.0%	$21,801	$8,488	$30,289	$0	$30,289	6.4%	$23,199	$9,033	$32,232
11	BUILD NEW LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	BUILD NEW FLOODWALL	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$2,399	$1,144	47.7%	$3,543	0.0%	$2,399	$1,144	$3,543	$0	$3,543	0.0%	$2,399	$1,144	$3,543
11	FLOOD GATES	$5,803	$2,807	48.4%	$8,610	0.0%	$5,803	$2,807	$8,610	$0	$8,610	0.0%	$5,803	$2,807	$8,610
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$1,339	$376	28.0%	$1,715	0.0%	$1,339	$376	$1,715	$0	$1,715	0.0%	$1,339	$376	$1,715
	CONSTRUCTION ESTIMATE TOTALS:	$43,295	$16,896		$60,191	-3.7%	$41,690	$16,290	$57,979	$0	$57,979	4.9%	$43,753	$17,057	$60,810
01	LANDS AND DAMAGES	$19,773	$3,562	18.0%	$23,335	0.0%	$19,773	$3,562	$23,335	$0	$23,335	1.8%	$20,138	$3,628	$23,766
30	PLANNING, ENGINEERING & DESIGN	$11,907	$4,647	39.0%	$16,554	0.0%	$11,907	$4,647	$16,554	$0	$16,554	6.1%	$12,633	$4,930	$17,564
31	CONSTRUCTION MANAGEMENT	$6,278	$2,450	39.0%	$8,728	0.0%	$6,278	$2,450	$8,728	$0	$8,728	12.9%	$7,088	$2,766	$9,854
	PROJECT COST TOTALS:	$81,253	$27,555	33.9%	$108,809		$79,648	$26,949	**$106,597**	$0	**$106,597**	5.1%	$83,613	$28,382	$111,994

CHIEF, COST ENGINEERING, SON HA

PROJECT MANAGER, xxx

ESTIMATED TOTAL PROJECT COST: $111,994

Filename: TSP-28SEPT2017_Pajaro River Flood Risk Management Project - TSP TPCS.xlsx
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1	2	3	4	5	6	8	9	10	11	13	14	15	16	17	19

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Numbers show up three times

PROJECT: **Pajaro River Flood Risk Management Project**
PROJECT NO:
LOCATION: Santa Cruz and Monterey Counties, CA

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA
PREPARED: 1/30/2016

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2017 / Effective Price Level Date: 1 OCT 16									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: **1-Oct-16** ($K)	**TOTAL FIRST COST ($K)**	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*		*K*	*L*	*M*	*N*	*O*
02	UTILITY RELOCATIONS	$1,715	$603	35.1%	$2,318	0.0%	$1,715	$603	$2,318	$0	$2,318	6.4%	$1,825	$641	$2,467
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$27,336	$23,148	84.7%	$50,484	0.0%	$25,688	$21,753	$47,441	$0	$47,441	6.4%	$27,336	$23,148	$50,484
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$1,637	$351	21.5%	$1,989	0.0%	$1,539	$330	$1,869	$0	$1,869	6.4%	$1,637	$351	$1,989
11	DEMOLISH AND REBUILD LEVEE	$6,056	$2,358	38.9%	$8,414	0.0%	$5,691	$2,216	$7,907	$0	$7,907	6.4%	$6,056	$2,358	$8,414
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	$0	$0	6.4%	$0	$0	$0
11	BUILD NEW LEVEE	$7,234	$3,162	43.7%	$10,397	0.0%	$6,798	$2,972	$9,770	$0	$9,770	6.4%	$7,234	$3,162	$10,397
11	BUILD NEW FLOODWALL	$1,854	$591	31.9%	$2,446	0.0%	$1,742	$556	$2,298	$0	$2,298	6.4%	$1,854	$591	$2,446
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$1,896	$904	47.7%	$2,800	0.0%	$1,896	$904	$2,800	$0	$2,800	0.0%	$1,896	$904	$2,800
11	FLOOD GATES	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$1,094	$307	28.0%	$1,401	0.0%	$1,094	$307	$1,401	$0	$1,401	0.0%	$1,094	$307	$1,401
	CONSTRUCTION ESTIMATE TOTALS:	$48,823	$31,425		$80,248	-5.5%	$46,164	$29,639	$75,803	$0	$75,803	6.1%	$48,934	$31,463	$80,397
01	LANDS AND DAMAGES	$18,586	$4,203	22.6%	$22,789	0.0%	$18,586	$4,203	$22,789	$0	$22,789	0.0%	$18,930	$4,281	$23,211
30	PLANNING, ENGINEERING & DESIGN	$13,430	$8,644	64.4%	$22,074	0.0%	$13,430	$8,644	$22,074	$0	$22,074	6.1%	$14,249	$9,172	$23,421
31	CONSTRUCTION MANAGEMENT	$7,079	$4,557	64.4%	$11,636	0.0%	$7,079	$4,557	$11,636	$0	$11,636	12.9%	$7,992	$5,145	$13,137
	PROJECT COST TOTALS:	$87,918	$48,829	55.5%	$136,747		$85,259	$47,044	**$132,302**	$0	**$132,302**	5.9%	$90,105	$50,061	$140,165

80397 **80397** **Estimate Check**
Program yr check
FF Check **132302**

COLUMN TO CHECK SPREAD SHEET

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2347 DIFFERENCE
137819 CHECK COST
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137819 FUTURE COST 140165.333

CHIEF, COST ENGINEERING, SON HA

ESTIMATED TOTAL PROJECT COST: **$140,165**

PROJECT MANAGER, xxx

CHIEF, REAL ESTATE, xxx

CHIEF, PLANNING,xxx

CHIEF, ENGINEERING, xxx

CHIEF, OPERATIONS, xxx

CHIEF, CONSTRUCTION, xxx

CHIEF, CONTRACTING,xxx

CHIEF, PM-PB, xxxx

CHIEF, DPM, xxx

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA
PREPARED: 1/30/2016

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: **30-Jan-16** / Effective Price Level: 1-Oct-16				Program Year (Budget EC): 2017 / Effective Price Level Date: 1 OCT 16								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	RISK BASED CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	REACH 5, RIGHT BANK													
02	UTILITY RELOCATIONS	$1,253	$440	35.1%	$1,694	0.0%	$1,253	$440	$1,694	2020Q2	6.4%	$1,334	$469	$1,802
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$17,118	$14,496	84.7%	$31,614	-6.0%	$16,086	$13,622	$29,708	2020Q2	6.4%	$17,118	$14,496	$31,614
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$766	$164	21.5%	$930	-6.0%	$719	$154	$874	2020Q2	6.4%	$766	$164	$930
11	DEMOLISH AND REBUILD LEVEE	$6,056	$2,358	38.9%	$8,414	-6.0%	$5,691	$2,216	$7,907	2020Q2	6.4%	$6,056	$2,358	$8,414
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	-6.0%	$0	$0	$0	2020Q2	6.4%	$0	$0	$0
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$1,896	$904	47.7%	$2,800	0.0%	$1,896	$904	$2,800	2020Q2	0.0%	$1,896	$904	$2,800
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
16	BANK STABILIZATION	$563	$158	28.0%	$721	0.0%	$563	$158	$721	2020Q2	0.0%	$563	$158	$721

	CONSTRUCTION ESTIMATE TOTALS:	$27,651	$18,520	67.0%	**$46,171**		$26,208	$17,494	$43,702			$27,732	$18,548	$46,280	42760	
01	LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
30	PLANNING, ENGINEERING & DESIGN															
2.5%	Project Management	$691	$463	67.0%	$1,154	0.0%	$691	$463	$1,154	2018Q2	4.6%	$723	$484	$1,207	1207	
1.0%	Planning & Environmental Compliance	$277	$186	67.0%	$463	0.0%	$277	$186	$463	2018Q2	4.6%	$290	$194	$484	484	
15.0%	Engineering & Design	$4,148	$2,778	67.0%	$6,926	0.0%	$4,148	$2,778	$6,926	2018Q2	4.6%	$4,338	$2,906	$7,244	7244	
1.0%	Reviews, ATRs, IEPRs, VE	$277	$186	67.0%	$463	0.0%	$277	$186	$463	2018Q2	4.6%	$290	$194	$484	484	
1.0%	Life Cycle Updates (cost, schedule, risks)	$277	$186	67.0%	$463	0.0%	$277	$186	$463	2018Q2	4.6%	$290	$194	$484	484	
1.0%	Contracting & Reprographics	$277	$186	67.0%	$463	0.0%	$277	$186	$463	2018Q2	4.6%	$290	$194	$484	484	
3.0%	Engineering During Construction	$830	$556	67.0%	$1,386	0.0%	$830	$556	$1,386	2020Q2	12.9%	$937	$628	$1,565	1565	
2.0%	Planning During Construction	$553	$370	67.0%	$923	0.0%	$553	$370	$923	2020Q2	12.9%	$624	$418	$1,043	1043	
1.0%	Project Operations	$277	$186	67.0%	$463	0.0%	$277	$186	$463	2018Q2	4.6%	$290	$194	$484	484	
31	CONSTRUCTION MANAGEMENT															
10.0%	Construction Management	$2,765	$1,852	67.0%	$4,617	0.0%	$2,765	$1,852	$4,617	2020Q2	12.9%	$3,122	$2,091	$5,213	5213	
2.0%	Project Operation:	$553	$370	67.0%	$923	0.0%	$553	$370	$923	2020Q2	12.9%	$624	$418	$1,043	1043	
2.5%	Project Management	$691	$463	67.0%	$1,154	0.0%	$691	$463	$1,154	2020Q2	12.9%	$780	$523	$1,303	1303	
	CONTRACT COST TOTALS:	$39,267	$26,300		$65,567		$37,824	$25,274	$63,098			$40,329	$26,986	$67,315	63795	checks if the same
															67315	

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA
PREPARED: 1/30/2016

Civil Works Work Breakdown Structure		**ESTIMATED COST**				**PROJECT FIRST COST (Constant Dollar Basis)**				**TOTAL PROJECT COST (FULLY FUNDED)**						
		Estimate Prepared:			**30-Jan-16**	Program Year (Budget EC):			2017							
		Effective Price Level:			1-Oct-16	Effective Price Level Date:			1 OCT 16							
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)		
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*		
	REACH 5, LEFT BANK															
02	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$0	$0	84.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
11	MOBILIZATION/DEMOBILIZATION	$149	$32	21.5%	$180	-6.0%	$140	$30	$169	2020Q2	6.4%	$149	$32	$180		
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	-6.0%	$0	$0	$0	2020Q2	6.4%	$0	$0	$0		
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
11	BUILD NEW FLOODWALL	$1,854	$591	31.9%	$2,446	-6.0%	$1,742	$556	$2,298	2020Q2	6.4%	$1,854	$591	$2,446		
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
	CONSTRUCTION ESTIMATE TOTALS:	$2,003	$623	31.1%	**$2,626**		$1,882	$586	$2,468			$2,003	$623	$2,626	2626	
01	LANDS AND DAMAGES	$13,167	$3,053	0.0%	$16,220	0.0%	$13,167	$3,053	$16,220	2018Q1	1.8%	$13,410	$3,110	$16,520	16520	
30	PLANNING, ENGINEERING & DESIGN															
2.5%	Project Management	$50	$16	31.1%	$66	0.0%	$50	$16	$66	2018Q2	4.6%	$52	$16	$69	69	
1.0%	Planning & Environmental Compliance	$20	$6	31.1%	$26	0.0%	$20	$6	$26	2018Q2	4.6%	$21	$7	$27	27	
15.0%	Engineering & Design	$300	$93	31.1%	$393	0.0%	$300	$93	$393	2018Q2	4.6%	$314	$98	$411	411	
1.0%	Reviews, ATRs, IEPRs, VE	$20	$6	31.1%	$26	0.0%	$20	$6	$26	2018Q2	4.6%	$21	$7	$27	27	
1.0%	Life Cycle Updates (cost, schedule, risks)	$20	$6	31.1%	$26	0.0%	$20	$6	$26	2018Q2	4.6%	$21	$7	$27	27	
1.0%	Contracting & Reprographics	$20	$6	31.1%	$26	0.0%	$20	$6	$26	2018Q2	4.6%	$21	$7	$27	27	
3.0%	Engineering During Construction	$60	$19	31.1%	$79	0.0%	$60	$19	$79	2020Q2	12.9%	$68	$21	$89	89	
2.0%	Planning During Construction	$40	$12	31.1%	$52	0.0%	$40	$12	$52	2020Q2	12.9%	$45	$14	$59	59	
1.0%	Project Operations	$20	$6	31.1%	$26	0.0%	$20	$6	$26	2018Q2	4.6%	$21	$7	$27	27	
31	CONSTRUCTION MANAGEMENT															
10.0%	Construction Management	$200	$62	31.1%	$262	0.0%	$200	$62	$262	2020Q2	12.9%	$226	$70	$296	296	
2.0%	Project Operation:	$40	$12	31.1%	$52	0.0%	$40	$12	$52	2020Q2	12.9%	$45	$14	$59	59	
2.5%	Project Management	$50	$16	31.1%	$66	0.0%	$50	$16	$66	2020Q2	12.9%	$56	$18	$74	74	
	CONTRACT COST TOTALS:	$16,010	$3,938		$19,948		$15,889	$3,900	$19,789			$16,324	$4,016	$20,341	20341	checks if the same
															20341	

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA
PREPARED: 1/30/2016

Civil Works Work Breakdown Structure		**ESTIMATED COST**				**PROJECT FIRST COST (Constant Dollar Basis)**				**TOTAL PROJECT COST (FULLY FUNDED)**				
		Estimate Prepared:			**30-Jan-16**	Program Year (Budget EC):			2017					
		Effective Price Level:			1-Oct-16	Effective Price Level Date:			1 OCT 16					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)

A	B	C	D	E	F	G	H	I	J	P	L	M	N	O		
	REACH 6, RIGHT BANK															
02	UTILITY RELOCATIONS	$39	$14	35.1%	$52	0.0%	$39	$14	$52	2020Q2	6.4%	$41	$14	$55		
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$10,218	$8,653	84.7%	$18,871	-6.0%	$9,602	$8,131	$17,733	2020Q2	6.4%	$10,218	$8,653	$18,871		
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
11	MOBILIZATION/DEMOBILIZATION	$426	$91	21.5%	$518	-6.0%	$401	$86	$486	2020Q2	6.4%	$426	$91	$518		
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
11	BUILD NEW LEVEE	$4,262	$1,863	43.7%	$6,125	-6.0%	$4,005	$1,751	$5,756	2020Q2	6.4%	$4,262	$1,863	$6,125		
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
16	BANK STABILIZATION	$531	$149	28.0%	$680	0.0%	$531	$149	$680	2020Q2	0.0%	$531	$149	$680		
	CONSTRUCTION ESTIMATE TOTALS:	$15,476	$10,769	69.6%	**$26,246**		$14,577	$10,130	$24,707			$15,479	$10,770	$26,249	26249	
01	LANDS AND DAMAGES	$3,677	$822	0.0%	$4,499	0.0%	$3,677	$822	$4,499	2018Q1	1.8%	$3,745	$837	$4,582	4582	
30	PLANNING, ENGINEERING & DESIGN															
2.5%	Project Management	$387	$269	69.6%	$656	0.0%	$387	$269	$656	2018Q2	4.6%	$405	$282	$686	686	
1.0%	Planning & Environmental Compliance	$155	$108	69.6%	$263	0.0%	$155	$108	$263	2018Q2	4.6%	$162	$113	$275	275	
15.0%	Engineering & Design	$2,321	$1,615	69.6%	$3,936	0.0%	$2,321	$1,615	$3,936	2018Q2	4.6%	$2,427	$1,689	$4,117	4117	
1.0%	Reviews, ATRs, IEPRs, VE	$155	$108	69.6%	$263	0.0%	$155	$108	$263	2018Q2	4.6%	$162	$113	$275	275	
1.0%	Life Cycle Updates (cost, schedule, risks)	$155	$108	69.6%	$263	0.0%	$155	$108	$263	2018Q2	4.6%	$162	$113	$275	275	
1.0%	Contracting & Reprographics	$155	$108	69.6%	$263	0.0%	$155	$108	$263	2018Q2	4.6%	$162	$113	$275	275	
3.0%	Engineering During Construction	$464	$323	69.6%	$787	0.0%	$464	$323	$787	2020Q2	12.9%	$524	$365	$888	888	
2.0%	Planning During Construction	$310	$216	69.6%	$526	0.0%	$310	$216	$526	2020Q2	12.9%	$350	$244	$594	594	
1.0%	Project Operations	$155	$108	69.6%	$263	0.0%	$155	$108	$263	2018Q2	4.6%	$162	$113	$275	275	
31	CONSTRUCTION MANAGEMENT															
10.0%	Construction Management	$1,548	$1,077	69.6%	$2,625	0.0%	$1,548	$1,077	$2,625	2020Q2	12.9%	$1,748	$1,216	$2,964	2964	
2.0%	Project Operation:	$310	$216	69.6%	$526	0.0%	$310	$216	$526	2020Q2	12.9%	$350	$244	$594	594	
2.5%	Project Management	$387	$269	69.6%	$656	0.0%	$387	$269	$656	2020Q2	12.9%	$437	$304	$741	741	
	CONTRACT COST TOTALS:	$25,655	$16,116		**$41,771**		$24,756	$15,477	$40,233			$26,275	$16,514	**$42,789**	42789	checks if the same
															42789	

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA

PREPARED: 1/30/2016

Civil Works Work Breakdown Structure		**ESTIMATED COST**				**PROJECT FIRST COST (Constant Dollar Basis)**				**TOTAL PROJECT COST (FULLY FUNDED)**						
		Estimate Prepared: / Effective Price Level:			**30-Jan-16** / 1-Oct-16	Program Year (Budget EC): / Effective Price Level Date:			2017 / 1 OCT 16	FULLY FUNDED PROJECT ESTIMATE						
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)		
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*		
	REACH 6, LEFT BANK															
02	UTILITY RELOCATIONS	$424	$149	35.1%	$572	0.0%	$424	$149	$572	2020Q2	6.4%	$451	$158	$609		
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$0	$0	84.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
11	MOBILIZATION/DEMOBILIZATION	$297	$64	21.5%	$361	-6.0%	$279	$60	$339	2020Q2	6.4%	$297	$64	$361		
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
11	BUILD NEW LEVEE	$2,973	$1,299	43.7%	$4,272	-6.0%	$2,793	$1,221	$4,014	2020Q2	6.4%	$2,973	$1,299	$4,272		
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
	CONSTRUCTION ESTIMATE TOTALS:	$3,693	$1,512	40.9%	**$5,205**		$3,496	$1,430	$4,926			$3,720	$1,521	$5,242	5242	
01	LANDS AND DAMAGES	$1,742	$328	0.0%	$2,070	0.0%	$1,742	$328	$2,070	2018Q1	1.8%	$1,774	$334	$2,108	2108	
30	PLANNING, ENGINEERING & DESIGN															
2.5%	Project Management	$92	$38	40.9%	$130	0.0%	$92	$38	$130	2018Q2	4.6%	$96	$39	$136	136	
1.0%	Planning & Environmental Compliance	$37	$15	40.9%	$52	0.0%	$37	$15	$52	2018Q2	4.6%	$39	$16	$55	55	
15.0%	Engineering & Design	$554	$227	40.9%	$781	0.0%	$554	$227	$781	2018Q2	4.6%	$579	$237	$817	817	
1.0%	Reviews, ATRs, IEPRs, VE	$37	$15	40.9%	$52	0.0%	$37	$15	$52	2018Q2	4.6%	$39	$16	$55	55	
1.0%	Life Cycle Updates (cost, schedule, risks)	$37	$15	40.9%	$52	0.0%	$37	$15	$52	2018Q2	4.6%	$39	$16	$55	55	
1.0%	Contracting & Reprographics	$37	$15	40.9%	$52	0.0%	$37	$15	$52	2018Q2	4.6%	$39	$16	$55	55	
3.0%	Engineering During Construction	$111	$45	40.9%	$156	0.0%	$111	$45	$156	2020Q2	12.9%	$125	$51	$177	177	
2.0%	Planning During Construction	$74	$30	40.9%	$104	0.0%	$74	$30	$104	2020Q2	12.9%	$84	$34	$118	118	
1.0%	Project Operations	$37	$15	40.9%	$52	0.0%	$37	$15	$52	2018Q2	4.6%	$39	$16	$55	55	
31	CONSTRUCTION MANAGEMENT															
10.0%	Construction Management	$369	$151	40.9%	$520	0.0%	$369	$151	$520	2020Q2	12.9%	$417	$171	$587	587	
2.0%	Project Operation:	$74	$30	40.9%	$104	0.0%	$74	$30	$104	2020Q2	12.9%	$84	$34	$118	118	
2.5%	Project Management	$92	$38	40.9%	$130	0.0%	$92	$38	$130	2020Q2	12.9%	$104	$43	$146	146	
	CONTRACT COST TOTALS:	$6,986	$2,475		**$9,461**		$6,789	$2,393	$9,182			$7,177	$2,544	**$9,721**	9721	checks if the same
															9721	

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA
PREPARED: 1/30/2016

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared: 30-Jan-16 Effective Price Level: 1-Oct-16				Program Year (Budget EC): 2017 Effective Price Level Date: 1 OCT 16				FULLY FUNDED PROJECT ESTIMATE					
WBS NUMBER *A*	Civil Works Feature & Sub-Feature Description *B*	COST ($K) *C*	CNTG ($K) *D*	CNTG (%) *E*	TOTAL ($K) *F*	ESC (%) *G*	COST ($K) *H*	CNTG ($K) *I*	TOTAL ($K) *J*	Mid-Point Date *P*	INFLATED (%) *L*	COST ($K) *M*	CNTG ($K) *N*	FULL ($K) *O*	
	REACH 7, RIGHT BANK (NO IMPROVEMENTS)														
02	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$0	$0	84.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$0	$0	21.5%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
	CONSTRUCTION ESTIMATE TOTALS:	$0	$0	0.0%	**$0**		$0	$0	$0			$0	$0	$0	0
01	LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Planning & Environmental Compliance	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
15.0%	Engineering & Design	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Reviews, ATRs, IEPRs, VE	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Life Cycle Updates (cost, schedule, risks)	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Contracting & Reprographics	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
3.0%	Engineering During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
2.0%	Planning During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Project Operations	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
2.0%	Project Operation:	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
2.5%	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
	CONTRACT COST TOTALS:	$0	$0		**$0**		$0	$0	$0			$0	$0	**$0**	0 checks if the same
															0

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA
PREPARED: 1/30/2016

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared: 30-Jan-16 Effective Price Level: 1-Oct-16				Program Year (Budget EC): 2017 Effective Price Level Date: 1 OCT 16				FULLY FUNDED PROJECT ESTIMATE					
WBS NUMBER *A*	Civil Works Feature & Sub-Feature Description *B*	COST ($K) *C*	CNTG ($K) *D*	CNTG (%) *E*	TOTAL ($K) *F*	ESC (%) *G*	COST ($K) *H*	CNTG ($K) *I*	TOTAL ($K) *J*	Mid-Point Date *P*	INFLATED (%) *L*	COST ($K) *M*	CNTG ($K) *N*	FULL ($K) *O*	
	REACH 7, LEFT BANK (NO IMPROVEMENTS)														
02	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$0	$0	84.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$0	$0	21.5%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
	CONSTRUCTION ESTIMATE TOTALS:	$0	$0	0.0%	**$0**		$0	$0	$0			$0	$0	$0	0
01	LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Planning & Environmental Compliance	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
15.0%	Engineering & Design	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Reviews, ATRs, IEPRs, VE	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Life Cycle Updates (cost, schedule, risks)	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Contracting & Reprographics	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
3.0%	Engineering During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0

2.0%	Planning During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Project Operations	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
2.0%	Project Operation:	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
2.5%	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
	CONTRACT COST TOTALS:	$0	$0		**$0**		$0	$0	$0			$0	$0	**$0**	0 checks if the same
															0

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA
PREPARED: 1/30/2016

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared: Effective Price Level:			30-Jan-16 1-Oct-16	Program Year (Budget EC): Effective Price Level Date:			2017 1 OCT 16	FULLY FUNDED PROJECT ESTIMATE					
WBS NUMBER *A*	Civil Works Feature & Sub-Feature Description *B*	COST ($K) *C*	CNTG ($K) *D*	CNTG (%) *E*	TOTAL ($K) *F*	ESC (%) *G*	COST ($K) *H*	CNTG ($K) *I*	TOTAL ($K) *J*	Mid-Point Date *P*	INFLATED (%) *L*	COST ($K) *M*	CNTG ($K) *N*	FULL ($K) *O*	
	REACH 8, RIGHT BANK (NO IMPROVEMENTS)														
02	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$0	$0	84.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$0	$0	21.5%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
	CONSTRUCTION ESTIMATE TOTALS:	$0	$0	0.0%	**$0**		$0	$0	$0			$0	$0	$0	0
01	LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Planning & Environmental Compliance	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
15.0%	Engineering & Design	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Reviews, ATRs, IEPRs, VE	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Life Cycle Updates (cost, schedule, risks)	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Contracting & Reprographics	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
3.0%	Engineering During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
2.0%	Planning During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Project Operations	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
2.0%	Project Operation:	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
2.5%	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
	CONTRACT COST TOTALS:	$0	$0		**$0**		$0	$0	$0			$0	$0	**$0**	0 checks if the same
															0

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA
PREPARED: 1/30/2016

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared: Effective Price Level:			30-Jan-16 1-Oct-16	Program Year (Budget EC): Effective Price Level Date:			2017 1 OCT 16	FULLY FUNDED PROJECT ESTIMATE					
WBS NUMBER *A*	Civil Works Feature & Sub-Feature Description *B*	COST ($K) *C*	CNTG ($K) *D*	CNTG (%) *E*	TOTAL ($K) *F*	ESC (%) *G*	COST ($K) *H*	CNTG ($K) *I*	TOTAL ($K) *J*	Mid-Point Date *P*	INFLATED (%) *L*	COST ($K) *M*	CNTG ($K) *N*	FULL ($K) *O*	
	REACH 8, LEFT BANK (NO IMPROVEMENTS)														
02	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$0	$0	84.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$0	$0	21.5%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
	CONSTRUCTION ESTIMATE TOTALS:	$0	$0	0.0%	**$0**		$0	$0	$0			$0	$0	$0	0

01	LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
30	PLANNING, ENGINEERING & DESIGN															
2.5%	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.0%	Planning & Environmental Compliance	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
15.0%	Engineering & Design	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.0%	Reviews, ATRs, IEPRs, VE	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.0%	Life Cycle Updates (cost, schedule, risks)	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.0%	Contracting & Reprographics	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
3.0%	Engineering During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
2.0%	Planning During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.0%	Project Operations	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
31	CONSTRUCTION MANAGEMENT															
10.0%	Construction Management	$0	$0	0.0%	0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
2.0%	Project Operation:	$0	$0	0.0%	0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
2.5%	Project Management	$0	$0	0.0%	0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
	CONTRACT COST TOTALS:	$0	$0		**0**		$0	$0	$0			$0	$0	**$0**	0	checks if the same
															0	

Construction Period	Cost	Interest Factor	Interest
1	9891727	0.025112242	248403.4453
2	9891727	0.022693744	224480.3223
3	9891727	0.020280952	200613.6399
4	9891727	0.017873852	176803.2651
5	9891727	0.015472431	153049.065
6	9891727	0.013076676	129350.907
7	9891727	0.010686573	105708.6589
8	9891727	0.008302108	82122.18887
9	9891727	0.00592327	58591.36525
10	9891727	0.003550043	35116.05678
11	9891727	0.001182416	11696.13247

Construction Period	Cost	Interest Factor	Interest
1	17093375	0.017873852	305524.4561
2	17093375	0.015472431	264476.0678
3	17093375	0.013076676	223524.523
4	17093375	0.010686573	182669.5933
5	17093375	0.008302108	141911.0505
6	17093375	0.00592327	101248.6675
7	17093375	0.003550043	60682.21727
8	17093375	0.001182416	20211.47351

ATTACHMENT 11

Cost Estimates – Screening & Optimization of Alternatives

**** TOTAL PROJECT COST SUMMARY ****

PROJECT: **ALT 1 - 9D Revised + Completion Levee (4% ACE)**
PROJECT NO:
LOCATION: Santa Cruz and Monterey Counties, CA

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA

PREPARED: 1/27/2017

This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2017 Effective Price Level Date: 1 OCT 16									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: **1-Oct-16** ($K)	**TOTAL FIRST COST** ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	***J***		***K***	***L***	***M***	***N***	***O***
02	UTILITY RELOCATIONS	$7,395	$2,599	35.1%	$9,994	0.0%	$7,395	$2,599	$9,994	$0	$9,994	6.4%	$7,870	$2,765	$10,635
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$559	$473	84.7%	$1,032	0.0%	$525	$445	$970	$0	$970	6.4%	$559	$473	$1,032
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$3,483	$748	21.5%	$4,231	0.0%	$3,273	$702	$3,976	$0	$3,976	6.4%	$3,483	$748	$4,231
11	DEMOLISH AND REBUILD LEVEE	$5,324	$2,073	38.9%	$7,398	0.0%	$5,003	$1,948	$6,952	$0	$6,952	6.4%	$5,324	$2,073	$7,398
11	DEMOLISH AND BUILD NEW LEVEE	$23,199	$9,033	38.9%	$32,232	0.0%	$21,801	$8,488	$30,289	$0	$30,289	6.4%	$23,199	$9,033	$32,232
11	BUILD NEW LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	BUILD NEW FLOODWALL	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$2,399	$1,144	47.7%	$3,543	0.0%	$2,399	$1,144	$3,543	$0	$3,543	0.0%	$2,399	$1,144	$3,543
11	FLOOD GATES	$5,803	$2,807	48.4%	$8,610	0.0%	$5,803	$2,807	$8,610	$0	$8,610	0.0%	$5,803	$2,807	$8,610
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$2,867	$804	28.0%	$3,671	0.0%	$2,867	$804	$3,671	$0	$3,671	0.0%	$2,867	$804	$3,671
	CONSTRUCTION ESTIMATE TOTALS:	$51,030	$19,680		$70,710	-3.8%	$49,067	$18,937	$68,003	$0	$68,003	4.9%	$51,505	$19,847	$71,351
01	LANDS AND DAMAGES	$22,318	$3,922	17.6%	$26,240	0.0%	$22,318	$3,922	$26,240	$0	$26,240	1.8%	$22,731	$3,994	$26,725
30	PLANNING, ENGINEERING & DESIGN	$14,032	$5,412	38.6%	$19,444	0.0%	$14,032	$5,412	$19,444	$0	$19,444	6.1%	$14,888	$5,742	$20,630
31	CONSTRUCTION MANAGEMENT	$7,400	$2,854	38.6%	$10,254	0.0%	$7,400	$2,854	$10,254	$0	$10,254	12.9%	$8,355	$3,222	$11,577
	PROJECT COST TOTALS:	$94,780	$31,867	33.6%	$126,648		$92,817	$31,124	**$123,941**	$0	**$123,941**	5.1%	$97,478	$32,805	$130,283

CHIEF, COST ENGINEERING, SON HA

PROJECT MANAGER, xxx

ESTIMATED TOTAL PROJECT COST: $130,283

PROJECT: **ALT 2 - 9 + Ring Levee**
PROJECT NO:
LOCATION: Santa Cruz and Monterey Counties, CA

DISTRICT: San Francisco District **PREPARED: 1/27/2017**
POC: CHIEF, COST ENGINEERING, SON HA

This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2017									
						Effective Price Level Date: 1 OCT 16									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: **1-Oct-16** ($K)	**TOTAL FIRST COST** ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*		*K*	*L*	*M*	*N*	*O*
02	UTILITY RELOCATIONS	$3,531	$1,241	35.1%	$4,772	0.0%	$3,531	$1,241	$4,772	$0	$4,772	6.4%	$3,757	$1,320	$5,078
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$718	$608	84.7%	$1,326	0.0%	$675	$571	$1,246	$0	$1,246	6.4%	$718	$608	$1,326
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$3,876	$832	21.5%	$4,708	0.0%	$3,642	$782	$4,424	$0	$4,424	6.4%	$3,876	$832	$4,708
11	DEMOLISH AND REBUILD LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	DEMOLISH AND BUILD NEW LEVEE	$6,392	$2,489	38.9%	$8,880	0.0%	$6,006	$2,339	$8,345	$0	$8,345	6.4%	$6,392	$2,489	$8,880
11	BUILD NEW LEVEE	$17,632	$7,707	43.7%	$25,338	0.0%	$16,568	$7,242	$23,810	$0	$23,810	6.4%	$17,632	$7,707	$25,338
11	BUILD NEW FLOODWALL	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$2,054	$980	47.7%	$3,034	0.0%	$2,054	$980	$3,034	$0	$3,034	0.0%	$2,054	$980	$3,034
11	FLOOD GATES	$17,410	$8,420	48.4%	$25,830	0.0%	$17,410	$8,420	$25,830	$0	$25,830	0.0%	$17,410	$8,420	$25,830
13	PUMPING PLANT	$1,996	$952	47.7%	$2,948	0.0%	$1,996	$952	$2,948	$0	$2,948	0.0%	$1,996	$952	$2,948
16	BANK STABILIZATION	$326	$91	28.0%	$417	0.0%	$326	$91	$417	$0	$417	0.0%	$326	$91	$417
	CONSTRUCTION ESTIMATE TOTALS:	$53,934	$23,318		$77,253	-3.1%	$52,209	$22,617	$74,826	$0	$74,826	3.7%	$54,161	$23,398	$77,559
01	LANDS AND DAMAGES	$19,474	$4,313	22.1%	$23,787	0.0%	$19,474	$4,313	$23,787	$0	$23,787	1.8%	$19,834	$4,393	$24,227
30	PLANNING, ENGINEERING & DESIGN	$14,836	$6,414	43.2%	$21,250	0.0%	$14,836	$6,414	$21,250	$0	$21,250	6.1%	$15,741	$6,806	$22,546
31	CONSTRUCTION MANAGEMENT	$7,820	$3,381	43.2%	$11,201	0.0%	$7,820	$3,381	$11,201	$0	$11,201	12.9%	$8,829	$3,817	$12,646
	PROJECT COST TOTALS:	$96,064	$37,426	39.0%	$133,491		$94,339	$36,725	**$131,064**	$0	**$131,064**	4.5%	$98,565	$38,413	$136,978

CHIEF, COST ENGINEERING, SON HA

PROJECT MANAGER, xxx

ESTIMATED TOTAL PROJECT COST: **$136,978**

PROJECT: **ALT 3 - 9D Revised + Optimized CMZ**
PROJECT NO:
LOCATION: Santa Cruz and Monterey Counties, CA

DISTRICT: San Francisco District **PREPARED: 1/27/2017**
POC: CHIEF, COST ENGINEERING, SON HA

This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2017 Effective Price Level Date: 1 OCT 16									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: **1-Oct-16** ($K)	**TOTAL FIRST COST** ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	***J***		***K***	***L***	***M***	***N***	***O***
02	UTILITY RELOCATIONS	$7,395	$2,599	35.1%	$9,994	0.0%	$7,395	$2,599	$9,994	$0	$9,994	6.4%	$7,870	$2,765	$10,635
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$588	$498	84.7%	$1,085	0.0%	$552	$468	$1,020	$0	$1,020	6.4%	$588	$498	$1,085
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$3,515	$754	21.5%	$4,269	0.0%	$3,303	$709	$4,012	$0	$4,012	6.4%	$3,515	$754	$4,269
11	DEMOLISH AND REBUILD LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	DEMOLISH AND BUILD NEW LEVEE	$28,850	$11,233	38.9%	$40,084	0.0%	$27,111	$10,556	$37,667	$0	$37,667	6.4%	$28,850	$11,233	$40,084
11	BUILD NEW LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	BUILD NEW FLOODWALL	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$2,390	$1,140	47.7%	$3,530	0.0%	$2,390	$1,140	$3,530	$0	$3,530	0.0%	$2,390	$1,140	$3,530
11	FLOOD GATES	$5,803	$2,807	48.4%	$8,610	0.0%	$5,803	$2,807	$8,610	$0	$8,610	0.0%	$5,803	$2,807	$8,610
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$668	$187	28.0%	$855	0.0%	$668	$187	$855	$0	$855	0.0%	$668	$187	$855
	CONSTRUCTION ESTIMATE TOTALS:	$49,209	$19,218		$68,427	-4.0%	$47,223	$18,465	$65,687	$0	$65,687	5.1%	$49,684	$19,384	$69,068
01	LANDS AND DAMAGES	$44,961	$9,354	20.8%	$54,315	0.0%	$44,961	$9,354	$54,315	$0	$54,315	1.8%	$45,792	$9,527	$55,319
30	PLANNING, ENGINEERING & DESIGN	$13,532	$5,285	39.1%	$18,817	0.0%	$13,532	$5,285	$18,817	$0	$18,817	6.1%	$14,357	$5,607	$19,964
31	CONSTRUCTION MANAGEMENT	$7,134	$2,786	39.1%	$9,920	0.0%	$7,134	$2,786	$9,920	$0	$9,920	12.9%	$8,055	$3,146	$11,200
	PROJECT COST TOTALS:	$114,836	$36,642	31.9%	$151,479		$112,850	$35,889	**$148,739**	$0	**$148,739**	4.6%	$117,888	$37,664	$155,552

CHIEF, COST ENGINEERING, SON HA

PROJECT MANAGER, xxx

ESTIMATED TOTAL PROJECT COST: **$155,552**

PROJECT: **ALT 4 - 9D Revised + Completion Levee (2% ACE)**
PROJECT NO:
LOCATION: Santa Cruz and Monterey Counties, CA

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA

PREPARED: 1/27/2017

This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Civil Works Work Breakdown Structure		**ESTIMATED COST**				**PROJECT FIRST COST (Constant Dollar Basis)**						**TOTAL PROJECT COST (FULLY FUNDED)**			
						Program Year (Budget EC): 2017; Effective Price Level Date: 1 OCT 16				Spent Thru:					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	**1-Oct-16** ($K)	**TOTAL FIRST COST** ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*		*K*	*L*	*M*	*N*	*O*
02	UTILITY RELOCATIONS	$7,395	$2,599	35.1%	$9,994	0.0%	$7,395	$2,599	$9,994	$0	$9,994	6.4%	$7,870	$2,765	$10,635
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$567	$480	84.7%	$1,047	0.0%	$533	$451	$983	$0	$983	6.4%	$567	$480	$1,047
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$3,714	$797	21.5%	$4,511	0.0%	$3,490	$749	$4,239	$0	$4,239	6.4%	$3,714	$797	$4,511
11	DEMOLISH AND REBUILD LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	DEMOLISH AND BUILD NEW LEVEE	$30,846	$12,010	38.9%	$42,856	0.0%	$28,986	$11,286	$40,272	$0	$40,272	6.4%	$30,846	$12,010	$42,856
11	BUILD NEW LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	BUILD NEW FLOODWALL	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$2,399	$1,144	47.7%	$3,543	0.0%	$2,399	$1,144	$3,543	$0	$3,543	0.0%	$2,399	$1,144	$3,543
11	FLOOD GATES	$5,803	$2,807	48.4%	$8,610	0.0%	$5,803	$2,807	$8,610	$0	$8,610	0.0%	$5,803	$2,807	$8,610
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$3,434	$963	28.0%	$4,397	0.0%	$3,434	$963	$4,397	$0	$4,397	0.0%	$3,434	$963	$4,397
	CONSTRUCTION ESTIMATE TOTALS:	$54,159	$20,799		$74,958	-3.9%	$52,041	$19,998	$72,039	$0	$72,039	4.9%	$54,633	$20,966	$75,599
01	LANDS AND DAMAGES	$21,901	$3,790	17.3%	$25,691	0.0%	$21,901	$3,790	$25,691	$0	$25,691	1.8%	$22,306	$3,860	$26,166
30	PLANNING, ENGINEERING & DESIGN	$14,896	$5,721	38.4%	$20,617	0.0%	$14,896	$5,721	$20,617	$0	$20,617	6.1%	$15,805	$6,070	$21,874
31	CONSTRUCTION MANAGEMENT	$7,853	$3,016	38.4%	$10,869	0.0%	$7,853	$3,016	$10,869	$0	$10,869	12.9%	$8,866	$3,405	$12,272
	PROJECT COST TOTALS:	$98,809	$33,326	33.7%	$132,135		$96,691	$32,525	**$129,216**	$0	**$129,216**	5.2%	$101,610	$34,301	$135,911

CHIEF, COST ENGINEERING, SON HA

PROJECT MANAGER, xxx

ESTIMATED TOTAL PROJECT COST: $135,911

**** TOTAL PROJECT COST SUMMARY ****

PROJECT: ALT 1 - 9D Revised + Completion Levee (4% ACE) (50-Year)
PROJECT NO:
LOCATION: Santa Cruz and Monterey Counties, CA

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA
PREPARED: 2/10/2017

This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Program Year (Budget EC): 2017
Effective Price Level Date: 1 OCT 16

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: **1-Oct-16** ($K)	**TOTAL FIRST COST** ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*		*K*	*L*	*M*	*N*	*O*
02	UTILITY RELOCATIONS	$7,384	$2,595	35.1%	$9,979	0.0%	$7,384	$2,595	$9,979	$0	$9,979	6.4%	$7,858	$2,761	$10,619
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$566	$479	84.7%	$1,045	0.0%	$532	$450	$982	$0	$982	6.4%	$566	$479	$1,045
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$3,466	$744	21.5%	$4,210	0.0%	$3,257	$699	$3,956	$0	$3,956	6.4%	$3,466	$744	$4,210
11	DEMOLISH AND REBUILD LEVEE	$5,787	$2,253	38.9%	$8,041	0.0%	$5,438	$2,118	$7,556	$0	$7,556	6.4%	$5,787	$2,253	$8,041
11	DEMOLISH AND BUILD NEW LEVEE	$22,340	$8,698	38.9%	$31,038	0.0%	$20,993	$8,174	$29,167	$0	$29,167	6.4%	$22,340	$8,698	$31,038
11	BUILD NEW LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	BUILD NEW FLOODWALL	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$2,452	$1,169	47.7%	$3,621	0.0%	$2,452	$1,169	$3,621	$0	$3,621	0.0%	$2,452	$1,169	$3,621
11	FLOOD GATES	$5,803	$2,807	48.4%	$8,610	0.0%	$5,803	$2,807	$8,610	$0	$8,610	0.0%	$5,803	$2,807	$8,610
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$2,724	$764	28.0%	$3,488	0.0%	$2,724	$764	$3,488	$0	$3,488	0.0%	$2,724	$764	$3,488
	CONSTRUCTION ESTIMATE TOTALS:	$50,522	$19,509		$70,031	-3.8%	$48,583	$18,775	$67,358	$0	$67,358	4.9%	$50,996	$19,676	$70,672
01	LANDS AND DAMAGES	$22,318	$3,922	17.6%	$26,240	0.0%	$22,318	$3,922	$26,240	$0	$26,240	1.8%	$22,731	$3,994	$26,725
30	PLANNING, ENGINEERING & DESIGN	$13,884	$5,361	38.6%	$19,245	0.0%	$13,884	$5,361	$19,245	$0	$19,245	6.1%	$14,731	$5,688	$20,419
31	CONSTRUCTION MANAGEMENT	$7,325	$2,829	38.6%	$10,154	0.0%	$7,325	$2,829	$10,154	$0	$10,154	12.9%	$8,270	$3,194	$11,464
	PROJECT COST TOTALS:	$94,049	$31,621	33.6%	$125,670		$92,110	$30,887	**$122,997**	$0	**$122,997**	5.1%	$96,728	$32,552	$129,279

CHIEF, COST ENGINEERING, SON HA

PROJECT MANAGER, xxx

ESTIMATED TOTAL PROJECT COST: $129,279

Filename: Pajaro NED TPCS - Mainstem Alternative 1, 50 & 250-Year.xlsx
TPCS 1, 50-Year

PROJECT: **ALT 1 - 9D Revised + Completion Levee (4% ACE) (250-Year)**
PROJECT NO:
LOCATION: Santa Cruz and Monterey Counties, CA

DISTRICT: San Francisco District **PREPARED: 2/10/2017**
POC: CHIEF, COST ENGINEERING, SON HA

This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2017 Effective Price Level Date: 1 OCT 16				Spent Thru:					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	**1-Oct-16** ($K)	**TOTAL FIRST COST** ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	***J***		***K***	***L***	***M***	***N***	***O***
02	UTILITY RELOCATIONS	$7,384	$2,595	35.1%	$9,979	0.0%	$7,384	$2,595	$9,979	$0	$9,979	6.4%	$7,858	$2,761	$10,619
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$566	$479	84.7%	$1,045	0.0%	$532	$450	$982	$0	$982	6.4%	$566	$479	$1,045
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$3,914	$840	21.5%	$4,754	0.0%	$3,678	$789	$4,468	$0	$4,468	6.4%	$3,914	$840	$4,754
11	DEMOLISH AND REBUILD LEVEE	$5,787	$2,253	38.9%	$8,041	0.0%	$5,438	$2,118	$7,556	$0	$7,556	6.4%	$5,787	$2,253	$8,041
11	DEMOLISH AND BUILD NEW LEVEE	$26,734	$10,410	38.9%	$37,144	0.0%	$25,122	$9,782	$34,904	$0	$34,904	6.4%	$26,734	$10,410	$37,144
11	BUILD NEW LEVEE	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	BUILD NEW FLOODWALL	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$2,541	$1,212	47.7%	$3,753	0.0%	$2,541	$1,212	$3,753	$0	$3,753	0.0%	$2,541	$1,212	$3,753
11	FLOOD GATES	$5,803	$2,807	48.4%	$8,610	0.0%	$5,803	$2,807	$8,610	$0	$8,610	0.0%	$5,803	$2,807	$8,610
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$2,939	$824	28.0%	$3,763	0.0%	$2,939	$824	$3,763	$0	$3,763	0.0%	$2,939	$824	$3,763
	CONSTRUCTION ESTIMATE TOTALS:	$55,669	$21,419		$77,088	-4.0%	$53,438	$20,576	$74,014	$0	$74,014	5.0%	$56,143	$21,586	$77,729
01	LANDS AND DAMAGES	$22,318	$3,922	17.6%	$26,240	0.0%	$22,318	$3,922	$26,240	$0	$26,240	1.8%	$22,731	$3,994	$26,725
30	PLANNING, ENGINEERING & DESIGN	$15,312	$5,892	38.5%	$21,204	0.0%	$15,312	$5,892	$21,204	$0	$21,204	6.1%	$16,246	$6,251	$22,497
31	CONSTRUCTION MANAGEMENT	$8,074	$3,107	38.5%	$11,181	0.0%	$8,074	$3,107	$11,181	$0	$11,181	12.9%	$9,116	$3,507	$12,623
	PROJECT COST TOTALS:	$101,373	$34,339	33.9%	$135,713		$99,142	$33,496	**$132,638**	$0	**$132,638**	5.2%	$104,235	$35,339	$139,574

CHIEF, COST ENGINEERING, SON HA

PROJECT MANAGER, xxx

ESTIMATED TOTAL PROJECT COST: **$139,574**

**** TOTAL PROJECT COST SUMMARY ****

PROJECT: ALT 5 - T3/T4
PROJECT NO:
LOCATION: Santa Cruz and Monterey Counties, CA

DISTRICT: San Francisco District **PREPARED: 1/30/2016**
POC: CHIEF, COST ENGINEERING, SON HA

This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2017 Effective Price Level Date: 1 OCT 16									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: **1-Oct-16** ($K)	**TOTAL FIRST COST** ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	***J***		***K***	***L***	***M***	***N***	***O***
02	UTILITY RELOCATIONS	$3,646	$1,281	35.1%	$4,927	0.0%	$3,646	$1,281	$4,927	$0	$4,927	6.4%	$3,880	$1,363	$5,244
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$44,408	$37,605	84.7%	$82,013	0.0%	$41,731	$35,338	$77,069	$0	$77,069	6.4%	$44,408	$37,605	$82,013
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$2,990	$642	21.5%	$3,632	0.0%	$2,810	$603	$3,413	$0	$3,413	6.4%	$2,990	$642	$3,632
11	DEMOLISH AND REBUILD LEVEE	$11,397	$4,438	38.9%	$15,835	0.0%	$10,710	$4,170	$14,880	$0	$14,880	6.4%	$11,397	$4,438	$15,835
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	$0	$0	6.4%	$0	$0	$0
11	BUILD NEW LEVEE	$13,638	$5,961	43.7%	$19,599	0.0%	$12,816	$5,602	$18,417	$0	$18,417	6.4%	$13,638	$5,961	$19,599
11	BUILD NEW FLOODWALL	$4,072	$1,299	31.9%	$5,371	0.0%	$3,827	$1,220	$5,047	$0	$5,047	6.4%	$4,072	$1,299	$5,371
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$1,896	$904	47.7%	$2,800	0.0%	$1,896	$904	$2,800	$0	$2,800	0.0%	$1,896	$904	$2,800
11	FLOOD GATES	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$1,961	$550	28.0%	$2,511	0.0%	$1,961	$550	$2,511	$0	$2,511	0.0%	$1,961	$550	$2,511
	CONSTRUCTION ESTIMATE TOTALS:	$84,009	$52,679		$136,688	-5.6%	$79,396	$49,668	$129,064	$0	$129,064	6.2%	$84,243	$52,761	$137,004
01	LANDS AND DAMAGES	$49,087	$11,233	0.0%	$60,320	0.0%	$49,087	$11,233	$60,320	$0	$60,320	0.0%	$49,994	$11,441	$61,435
30	PLANNING, ENGINEERING & DESIGN	$23,102	$14,486	62.7%	$37,588	0.0%	$23,102	$14,486	$37,588	$0	$37,588	6.1%	$24,511	$15,369	$39,880
31	CONSTRUCTION MANAGEMENT	$12,181	$7,639	62.7%	$19,820	0.0%	$12,181	$7,639	$19,820	$0	$19,820	12.9%	$13,753	$8,624	$22,377
	PROJECT COST TOTALS:	$168,379	$86,036	51.1%	$254,415		$163,766	$83,025	**$246,791**	$0	**$246,791**	5.6%	$172,501	$88,195	$260,696

Filename: Pajaro NED TPCS - Tributaries Alternatives R1.xlsx
TPCS 5

check for

19 Numbers show up three times

PROJECT: ALT 6 - T5 + Ring Levee
PROJECT NO:
LOCATION: Santa Cruz and Monterev Counties. CA

DISTRICT: San Francisco District **PREPARED:** 1/30/2016
POC: CHIEF, COST ENGINEERING, SON HA

This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Pull Down Menus for your Feature Accounts =>
Pull Down Menus for your Feature Accounts =>
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Pull Down Menus for your Feature Accounts =>

PED % of Construction Contract (w/o Cont) 27.5%
% CM of Construction Contract (w/o Cont) 14.5%

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2017; Effective Price Level Date: 1 OCT 16									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: 1-Oct-16 ($K)	TOTAL FIRST COST ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*		*K*	*L*	*M*	*N*	*O*
02	UTILITY RELOCATIONS	$3,357	$1,180	35.1%	$4,536	0.0%	$3,357	$1,180	$4,536	$0	$4,536	6.4%	$3,572	$1,255	$4,828
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$31,548	$26,715	84.7%	$58,263	0.0%	$29,646	$25,104	$54,750	$0	$54,750	6.4%	$31,548	$26,715	$58,263
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$2,563	$550	21.5%	$3,113	0.0%	$2,409	$517	$2,926	$0	$2,926	6.4%	$2,563	$550	$3,113
11	DEMOLISH AND REBUILD LEVEE	$11,263	$4,385	38.9%	$15,648	0.0%	$10,584	$4,121	$14,704	$0	$14,704	6.4%	$11,263	$4,385	$15,648
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	$0	$0	6.4%	$0	$0	$0
11	BUILD NEW LEVEE	$9,695	$4,238	43.7%	$13,932	0.0%	$9,110	$3,982	$13,092	$0	$13,092	6.4%	$9,695	$4,238	$13,932
11	BUILD NEW FLOODWALL	$3,840	$1,224	31.9%	$5,064	0.0%	$3,608	$1,151	$4,759	$0	$4,759	6.4%	$3,840	$1,224	$5,064
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$1,896	$904	47.7%	$2,800	0.0%	$1,896	$904	$2,800	$0	$2,800	0.0%	$1,896	$904	$2,800
11	FLOOD GATES	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$1,961	$550	28.0%	$2,511	0.0%	$1,961	$550	$2,511	$0	$2,511	0.0%	$1,961	$550	$2,511
	CONSTRUCTION ESTIMATE TOTALS:	$66,122	$39,746		$105,868	-5.5%	$62,570	$37,508	$100,079	$0	$100,079	6.1%	$66,337	$39,821	$106,159
01	LANDS AND DAMAGES	$33,923	$7,500	0.0%	$41,423	0.0%	$33,923	$7,500	$41,423	$0	$41,423	0.0%	$34,550	$7,639	$42,189
30	PLANNING. ENGINEERING & DESIGN	$18.186	$8.551	47.0%	$26.737	0.0%	$18.186	$8.551	$26.737	$0	$26.737	6.1%	$19.295	$9.072	$28.367
31	CONSTRUCTION MANAGEMENT	$9.586	$4.507	47.0%	$14.093	0.0%	$9.586	$4.507	$14.093	$0	$14.093	12.9%	$10.823	$5.089	$15.912
	PROJECT COST TOTALS:	$127,817	$60,303	47.2%	$188,120		$124,265	$58,066	**$182,331**	$0	**$182,331**	5.6%	$131,006	$61,621	$192,626

106159 **106159** Estimate Check
Program yr check
FF Check **182331**

COLUMN TO CHECK SPREAD SHEET

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190280 CHECK COST
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190280 FUTURE COST 192626.431

CHIEF, COST ENGINEERING, SON HA

ESTIMATED TOTAL PROJECT COST: $192.626

PROJECT MANAGER, xxx

CHIEF, REAL ESTATE, xxx

CHIEF. PLANNING.xxx

CHIEF, ENGINEERING, xxx

CHIEF, OPERATIONS, xxx

CHIEF, CONSTRUCTION, xxx

CHIEF, CONTRACTING,xxx

CHIEF, PM-PB, xxxx

CHIEF. DPM. xxx

Pg Brk 1

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District PREPARED: 1/30/2016
POC: CHIEF, COST ENGINEERING, SON HA

Price Level of Esti 2016(Oct - Dec)
Program Year Pric 2016(Oct - Dec)

Price level date of M2 ==> **2017Q1**
Program Year Price Level ==> 2017Q1

847.49	847.49	901.86	2020(Jan - Mar)	02	**Midpoint 02**	**2020Q2**
901.86	847.49	901.86	2020(Jan - Mar)	02	**Midpoint 02**	**2020Q2**
867.10	814.82	867.10	2020(Jan - Mar)	06	**Midpoint 06**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	903.06	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	903.06	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
859.84	859.84	859.84	2020(Jan - Mar)	13	**Midpoint 13**	**2020Q2**
930.68	930.68	930.68	2020(Jan - Mar)	16	**Midpoint 16**	**2020Q2**
826.13	826.13	841.40	2017(Oct - Dec)	All	**Lands And Damages Midpoint**	**2018Q1**
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	**ENTER Design mid point period**	**2018Q2**
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	*2020Q2*
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	**ENTER CONSTRUCTION MIDPOINT**	**2020Q2**
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared: 30-Jan-16; Effective Price Level: 1-Oct-16				Program Year (Budget EC): 2017; Effective Price Level Date: 1 OCT 16									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	RISK BASED CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*	
	REACH 5, RIGHT BANK														
02	UTILITY RELOCATIONS	$1,253	$440	35.1%	$1,694	0.0%	$1,253	$440	$1,694	2020Q2	6.4%	$1,334	$469	$1,802	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$8,559	$7,248	84.7%	$15,807	-6.0%	$8,043	$6,811	$14,854	2020Q2	6.4%	$8,559	$7,248	$15,807	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$766	$164	21.5%	$930	-6.0%	$719	$154	$874	2020Q2	6.4%	$766	$164	$930	
11	DEMOLISH AND REBUILD LEVEE	$6,056	$2,358	38.9%	$8,414	-6.0%	$5,691	$2,216	$7,907	2020Q2	6.4%	$6,056	$2,358	$8,414	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	-6.0%	$0	$0	$0	2020Q2	6.4%	$0	$0	$0	
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$1,896	$904	47.7%	$2,800	0.0%	$1,896	$904	$2,800	2020Q2	0.0%	$1,896	$904	$2,800	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$563	$158	28.0%	$721	0.0%	$563	$158	$721	2020Q2	0.0%	$563	$158	$721	
	CONSTRUCTION ESTIMATE TOTALS:	$19,092	$2,617	13.7%	**$21,709**		$18,165	$10,683	$28,848			$19,173	$11,300	$30,473	26953
01	LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$477	$65	13.7%	$542	0.0%	$477	$65	$542	2018Q2	4.6%	$499	$68	$567	567
1.0%	Planning & Environmental Compliance	$191	$26	13.7%	$217	0.0%	$191	$26	$217	2018Q2	4.6%	$200	$27	$227	227
15.0%	Engineering & Design	$2,864	$393	13.7%	$3,257	0.0%	$2,864	$393	$3,257	2018Q2	4.6%	$2,995	$411	$3,406	3406
1.0%	Reviews, ATRs, IEPRs, VE	$191	$26	13.7%	$217	0.0%	$191	$26	$217	2018Q2	4.6%	$200	$27	$227	227
1.0%	Life Cvcle Updates (cost. schedule. risks)	$191	$26	13.7%	$217	0.0%	$191	$26	$217	2018Q2	4.6%	$200	$27	$227	227
1.0%	Contracting & Reprographics	$191	$26	13.7%	$217	0.0%	$191	$26	$217	2018Q2	4.6%	$200	$27	$227	227
3.0%	Engineering During Construction	$573	$79	13.7%	$652	0.0%	$573	$79	$652	2020Q2	12.9%	$647	$89	$736	736
2.0%	Planning During Construction	$382	$52	13.7%	$434	0.0%	$382	$52	$434	2020Q2	12.9%	$431	$59	$490	490
1.0%	Project Operations	$191	$26	13.7%	$217	0.0%	$191	$26	$217	2018Q2	4.6%	$200	$27	$227	227
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$1,909	$262	13.7%	$2,171	0.0%	$1,909	$262	$2,171	2020Q2	12.9%	$2,155	$295	$2,451	2451
2.0%	Project Operation:	$382	$52	13.7%	$434	0.0%	$382	$52	$434	2020Q2	12.9%	$431	$59	$490	490

1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*

2.5%	Project Management	$477	$65	13.7%	$542	0.0%	$477	$65	$542	2020Q2	12.9%	$539	$74	$612	612	
	CONTRACT COST TOTALS:	$27,111	$3,716		$30,827		$26,184	$11,782	$37,966			$27,869	$12,493	$40,362	36842	checks if the same
															40362	

Pg Brk 2

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives — DISTRICT: San Francisco District — PREPARED: 1/30/2016
LOCATION: Santa Cruz and Monterey Counties, CA — POC: CHIEF, COST ENGINEERING, SON HA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Price Level of Esti	2016(Oct - Dec)	**Price level date of M2 ==>**	**2017Q1**
Program Year Pric	2016(Oct - Dec)	**Program Year Price Level ==>**	2017Q1

847.49	847.49	901.86	2020(Jan - Mar)	02	**Midpoint 02**	**2020Q2**
901.86	847.49	901.86	2020(Jan - Mar)	02	**Midpoint 02**	**2020Q2**
867.10	814.82	867.10	2020(Jan - Mar)	06	**Midpoint 06**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	903.06	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	903.06	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
859.84	859.84	859.84	2020(Jan - Mar)	13	**Midpoint 13**	**2020Q2**
930.68	930.68	930.68	2020(Jan - Mar)	16	**Midpoint 16**	**2020Q2**
826.13	826.13	841.40	2017(Oct - Dec)	All	**Lands And Damages Midpoint**	**2018Q1**
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	**ENTER Design mid point period**	**2018Q2**
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	*2020Q2*
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	**ENTER CONSTRUCTION MIDPOINT**	**2020Q2**
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared: Effective Price Level:			**30-Jan-16** 1-Oct-16	Program Year (Budget EC): Effective Price Level Date:			2017 1 OCT 16						
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*	
	REACH 5. LEFT BANK														
02	UTILITY RELOCATIONS	$1,642	$577	35.1%	$2,218	0.0%	$1,642	$577	$2,218	2020Q2	6.4%	$1,747	$614	$2,361	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$8,559	$7,248	84.7%	$15,807	-6.0%	$8,043	$6,811	$14,854	2020Q2	6.4%	$8,559	$7,248	$15,807	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$800	$172	21.5%	$972	-6.0%	$752	$161	$913	2020Q2	6.4%	$800	$172	$972	
11	DEMOLISH AND REBUILD LEVEE	$5,207	$2,027	38.9%	$7,234	-6.0%	$4,893	$1,905	$6,798	2020Q2	6.4%	$5,207	$2,027	$7,234	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	-6.0%	$0	$0	$0	2020Q2	6.4%	$0	$0	$0	
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW FLOODWALL	$3,487	$1,112	31.9%	$4,599	-6.0%	$3,276	$1,045	$4,321	2020Q2	6.4%	$3,487	$1,112	$4,599	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$867	$243	28.0%	$1,110	0.0%	$867	$243	$1,110	2020Q2	0.0%	$867	$243	$1,110	
	CONSTRUCTION ESTIMATE TOTALS:	$20,561	$11,379	55.3%	**$31,939**		$19,473	$10,742	$30,214			$20,666	$11,416	$32,082	32082
01	LANDS AND DAMAGES	$21,945	$5,089	0.0%	$27,034	0.0%	$21,945	$5,089	$27,034	2018Q1	1.8%	$22,351	$5,183	$27,534	27534
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$514	$284	55.3%	$798	0.0%	$514	$284	$798	2018Q2	4.6%	$538	$297	$835	835
1.0%	Planning & Environmental Compliance	$206	$114	55.3%	$320	0.0%	$206	$114	$320	2018Q2	4.6%	$215	$119	$335	335
15.0%	Engineering & Design	$3,084	$1,707	55.3%	$4,791	0.0%	$3,084	$1,707	$4,791	2018Q2	4.6%	$3,225	$1,785	$5,010	5010
1.0%	Reviews, ATRs, IEPRs, VE	$206	$114	55.3%	$320	0.0%	$206	$114	$320	2018Q2	4.6%	$215	$119	$335	335
1.0%	Life Cycle Updates (cost, schedule, risks)	$206	$114	55.3%	$320	0.0%	$206	$114	$320	2018Q2	4.6%	$215	$119	$335	335
1.0%	Contracting & Reprographics	$206	$114	55.3%	$320	0.0%	$206	$114	$320	2018Q2	4.6%	$215	$119	$335	335
3.0%	Engineering During Construction	$617	$341	55.3%	$958	0.0%	$617	$341	$958	2020Q2	12.9%	$697	$386	$1,082	1082
2.0%	Planning During Construction	$411	$227	55.3%	$638	0.0%	$411	$227	$638	2020Q2	12.9%	$464	$257	$721	721
1.0%	Project Operations	$206	$114	55.3%	$320	0.0%	$206	$114	$320	2018Q2	4.6%	$215	$119	$335	335
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$2,056	$1,138	55.3%	$3,194	0.0%	$2,056	$1,138	$3,194	2020Q2	12.9%	$2,321	$1,285	$3,606	3606
2.0%	Project Operation:	$411	$227	55.3%	$638	0.0%	$411	$227	$638	2020Q2	12.9%	$464	$257	$721	721
2.5%	Project Management	$514	$284	55.3%	$798	0.0%	$514	$284	$798	2020Q2	12.9%	$580	$321	$901	901
	CONTRACT COST TOTALS:	$51,143	$21,247		$72,390		$50,055	$20,611	$70,665			$52,384	$21,782	$74,166	74166 checks if the same
															74166

Pg Brk 3

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives — DISTRICT: San Francisco District — PREPARED: 1/30/2016
LOCATION: Santa Cruz and Monterey Counties, CA — POC: CHIEF, COST ENGINEERING, SON HA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Price Level of Esti	2016(Oct - Dec)	**Price level date of M2 ==>**	**2017Q1**
Program Year Pric	2016(Oct - Dec)	**Program Year Price Level ==>**	2017Q1

847.49	847.49	901.86	2020(Jan - Mar)	02	**Midpoint 02**	**2020Q2**
901.86	847.49	901.86	2020(Jan - Mar)	02	**Midpoint 02**	**2020Q2**
867.10	814.82	867.10	2020(Jan - Mar)	06	**Midpoint 06**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	903.06	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	903.06	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
859.84	859.84	859.84	2020(Jan - Mar)	13	**Midpoint 13**	**2020Q2**
930.68	930.68	930.68	2020(Jan - Mar)	16	**Midpoint 16**	**2020Q2**
826.13	826.13	841.40	2017(Oct - Dec)	All	**Lands And Damages Midpoint**	**2018Q1**
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	**ENTER Design mid point period**	**2018Q2**
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	*2020Q2*
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	**ENTER CONSTRUCTION MIDPOINT**	**2020Q2**
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared: Effective Price Level:			**30-Jan-16** 1-Oct-16	Program Year (Budget EC): Effective Price Level Date:			2017 1 OCT 16						
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*	
	REACH 6. RIGHT BANK														
02	UTILITY RELOCATIONS	$39	$14	35.1%	$52	0.0%	$39	$14	$52	2020Q2	6.4%	$41	$14	$55	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$5,109	$4,326	84.7%	$9,435	-6.0%	$4,801	$4,065	$8,866	2020Q2	6.4%	$5,109	$4,326	$9,435	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$426	$91	21.5%	$518	-6.0%	$401	$86	$486	2020Q2	6.4%	$426	$91	$518	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$4,262	$1,863	43.7%	$6,125	-6.0%	$4,005	$1,751	$5,756	2020Q2	6.4%	$4,262	$1,863	$6,125	
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$531	$149	28.0%	$680	0.0%	$531	$149	$680	2020Q2	0.0%	$531	$149	$680	
	CONSTRUCTION ESTIMATE TOTALS:	$10,367	$6,443	62.2%	**$16,810**		$9,776	$6,065	$15,841			$10,370	$6,444	$16,814	16814
01	LANDS AND DAMAGES	$3,677	$822	0.0%	$4,499	0.0%	$3,677	$822	$4,499	2018Q1	1.8%	$3,745	$837	$4,582	4582
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$259	$161	62.2%	$420	0.0%	$259	$161	$420	2018Q2	4.6%	$271	$168	$439	439
1.0%	Planning & Environmental Compliance	$104	$65	62.2%	$169	0.0%	$104	$65	$169	2018Q2	4.6%	$109	$68	$176	176
15.0%	Engineering & Design	$1,555	$966	62.2%	$2,521	0.0%	$1,555	$966	$2,521	2018Q2	4.6%	$1,626	$1,011	$2,637	2637
1.0%	Reviews, ATRs, IEPRs, VE	$104	$65	62.2%	$169	0.0%	$104	$65	$169	2018Q2	4.6%	$109	$68	$176	176
1.0%	Life Cycle Updates (cost, schedule, risks)	$104	$65	62.2%	$169	0.0%	$104	$65	$169	2018Q2	4.6%	$109	$68	$176	176
1.0%	Contracting & Reprographics	$104	$65	62.2%	$169	0.0%	$104	$65	$169	2018Q2	4.6%	$109	$68	$176	176
3.0%	Engineering During Construction	$311	$193	62.2%	$504	0.0%	$311	$193	$504	2020Q2	12.9%	$351	$218	$569	569
2.0%	Planning During Construction	$207	$129	62.2%	$336	0.0%	$207	$129	$336	2020Q2	12.9%	$234	$145	$379	379
1.0%	Project Operations	$104	$65	62.2%	$169	0.0%	$104	$65	$169	2018Q2	4.6%	$109	$68	$176	176
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$1,037	$645	62.2%	$1,682	0.0%	$1,037	$645	$1,682	2020Q2	12.9%	$1,171	$728	$1,898	1898
2.0%	Project Operation:	$207	$129	62.2%	$336	0.0%	$207	$129	$336	2020Q2	12.9%	$234	$145	$379	379
2.5%	Project Management	$259	$161	62.2%	$420	0.0%	$259	$161	$420	2020Q2	12.9%	$292	$182	$474	474
	CONTRACT COST TOTALS:	$18,399	$9,972		**$28,371**		$17,808	$9,593	$27,402			$18,837	$10,217	**$29,054**	29054 checks if the same
															29054

Pg Brk 4

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives — DISTRICT: San Francisco District — PREPARED: 1/30/2016

LOCATION: Santa Cruz and Monterey Counties, CA
POC: CHIEF, COST ENGINEERING, SON HA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Price Level of Esti 2016(Oct - Dec) | Price level date of M2 ==> 2017Q1
Program Year Pric 2016(Oct - Dec) | Program Year Price Level ==> 2017Q1

847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared:			30-Jan-16	Program Year (Budget EC):			2017	FULLY FUNDED PROJECT ESTIMATE					
		Effective Price Level:			1-Oct-16	Effective Price Level Date:			1 OCT 16						
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*	
	REACH 6. LEFT BANK														
02	UTILITY RELOCATIONS	$424	$149	35.1%	$572	0.0%	$424	$149	$572	2020Q2	6.4%	$451	$158	$609	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$5,109	$4,326	84.7%	$9,435	-6.0%	$4,801	$4,065	$8,866	2020Q2	6.4%	$5,109	$4,326	$9,435	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$74	$16	21.5%	$89	-6.0%	$69	$15	$84	2020Q2	6.4%	$74	$16	$89	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$454	$199	43.7%	$653	-6.0%	$427	$187	$613	2020Q2	6.4%	$454	$199	$653	
11	BUILD NEW FLOODWALL	$353	$113	31.9%	$466	-6.0%	$332	$106	$438	2020Q2	6.4%	$353	$113	$466	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
	CONSTRUCTION ESTIMATE TOTALS:	$6,414	$4,802	74.9%	**$11,216**		$6,052	$4,522	$10,574			$6,441	$4,812	$11,252	11252
01	LANDS AND DAMAGES	$1,742	$328	0.0%	$2,070	0.0%	$1,742	$328	$2,070	2018Q1	1.8%	$1,774	$334	$2,108	2108
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$160	$120	74.9%	$280	0.0%	$160	$120	$280	2018Q2	4.6%	$167	$125	$293	293
1.0%	Planning & Environmental Compliance	$64	$48	74.9%	$112	0.0%	$64	$48	$112	2018Q2	4.6%	$67	$50	$117	117
15.0%	Engineering & Design	$962	$720	74.9%	$1,682	0.0%	$962	$720	$1,682	2018Q2	4.6%	$1,006	$753	$1,759	1759
1.0%	Reviews, ATRs, IEPRs, VE	$64	$48	74.9%	$112	0.0%	$64	$48	$112	2018Q2	4.6%	$67	$50	$117	117
1.0%	Life Cycle Updates (cost, schedule, risks)	$64	$48	74.9%	$112	0.0%	$64	$48	$112	2018Q2	4.6%	$67	$50	$117	117
1.0%	Contracting & Reprographics	$64	$48	74.9%	$112	0.0%	$64	$48	$112	2018Q2	4.6%	$67	$50	$117	117
3.0%	Engineering During Construction	$192	$144	74.9%	$336	0.0%	$192	$144	$336	2020Q2	12.9%	$217	$162	$379	379
2.0%	Planning During Construction	$128	$96	74.9%	$224	0.0%	$128	$96	$224	2020Q2	12.9%	$145	$108	$253	253
1.0%	Project Operations	$64	$48	74.9%	$112	0.0%	$64	$48	$112	2018Q2	4.6%	$67	$50	$117	117
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$641	$480	74.9%	$1,121	0.0%	$641	$480	$1,121	2020Q2	12.9%	$724	$542	$1,266	1266
2.0%	Project Operation:	$128	$96	74.9%	$224	0.0%	$128	$96	$224	2020Q2	12.9%	$145	$108	$253	253
2.5%	Project Management	$160	$120	74.9%	$280	0.0%	$160	$120	$280	2020Q2	12.9%	$181	$135	$316	316
	CONTRACT COST TOTALS:	$10,847	$7,145		**$17,992**		$10,485	$6,864	$17,350			$11,133	$7,331	**$18,464**	18464 checks if the same
															18464

Pg Brk 5

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
DISTRICT: San Francisco District
PREPARED: 1/30/2016
LOCATION: Santa Cruz and Monterey Counties, CA
POC: CHIEF, COST ENGINEERING, SON HA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Price Level of Esti 2016(Oct - Dec) | Price level date of M2 ==> 2017Q1
Program Year Pric 2016(Oct - Dec) | Program Year Price Level ==> 2017Q1

847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared:			30-Jan-16	Program Year (Budget EC):			2017	FULLY FUNDED PROJECT ESTIMATE					
		Effective Price Level:			1-Oct-16	Effective Price Level Date:			1 OCT 16						
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*	
	REACH 7. RIGHT AND LEFT BANKS COMBINED														
02	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	2020Q2	6.4%	$0	$0	$0	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$4,212	$3,567	84.7%	$7,778	-6.0%	$3,958	$3,352	$7,309	2020Q2	6.4%	$4,212	$3,567	$7,778	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$498	$107	21.5%	$605	-6.0%	$468	$100	$568	2020Q2	6.4%	$498	$107	$605	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$4,979	$2,176	43.7%	$7,155	-6.0%	$4,678	$2,045	$6,723	2020Q2	6.4%	$4,979	$2,176	$7,155	
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
	CONSTRUCTION ESTIMATE TOTALS:	$9,688	$5,849	60.4%	**$15,538**		$9,104	$5,497	$14,601			$9,688	$5,849	$15,538	15538
01	LANDS AND DAMAGES	$6,559	$1,261	0.0%	$7,820	0.0%	$6,559	$1,261	$7,820	2018Q1	1.8%	$6,680	$1,284	$7,965	7965
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$242	$146	60.4%	$388	0.0%	$242	$146	$388	2018Q2	4.6%	$253	$153	$406	406
1.0%	Planning & Environmental Compliance	$97	$59	60.4%	$156	0.0%	$97	$59	$156	2018Q2	4.6%	$101	$61	$163	163
15.0%	Engineering & Design	$1,453	$877	60.4%	$2,330	0.0%	$1,453	$877	$2,330	2018Q2	4.6%	$1,520	$918	$2,437	2437
1.0%	Reviews, ATRs, IEPRs, VE	$97	$59	60.4%	$156	0.0%	$97	$59	$156	2018Q2	4.6%	$101	$61	$163	163
1.0%	Life Cycle Updates (cost, schedule, risks)	$97	$59	60.4%	$156	0.0%	$97	$59	$156	2018Q2	4.6%	$101	$61	$163	163
1.0%	Contracting & Reprographics	$97	$59	60.4%	$156	0.0%	$97	$59	$156	2018Q2	4.6%	$101	$61	$163	163
3.0%	Engineering During Construction	$291	$176	60.4%	$467	0.0%	$291	$176	$467	2020Q2	12.9%	$329	$198	$527	527
2.0%	Planning During Construction	$194	$117	60.4%	$311	0.0%	$194	$117	$311	2020Q2	12.9%	$219	$132	$351	351
1.0%	Project Operations	$97	$59	60.4%	$156	0.0%	$97	$59	$156	2018Q2	4.6%	$101	$61	$163	163
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$969	$585	60.4%	$1,554	0.0%	$969	$585	$1,554	2020Q2	12.9%	$1,094	$661	$1,755	1755
2.0%	Project Operation:	$194	$117	60.4%	$311	0.0%	$194	$117	$311	2020Q2	12.9%	$219	$132	$351	351
2.5%	Project Management	$242	$146	60.4%	$388	0.0%	$242	$146	$388	2020Q2	12.9%	$273	$165	$438	438
	CONTRACT COST TOTALS:	$20,317	$9,568		**$29,885**		$19,733	$9,215	$28,948			$20,782	$9,799	**$30,581**	30581 checks if the same
															30581

Pg Brk 6

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
DISTRICT: San Francisco District
PREPARED: 1/30/2016
LOCATION: Santa Cruz and Monterey Counties, CA
POC: CHIEF, COST ENGINEERING, SON HA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Price Level of Esti 2016(Oct - Dec) | Price level date of M2 ==> 2017Q1
Program Year Pric 2016(Oct - Dec) | Program Year Price Level ==> 2017Q1

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			30-Jan-16	Program Year (Budget EC):			2017	FULLY FUNDED PROJECT ESTIMATE				
		Effective Price Level:			1-Oct-16	Effective Price Level Date:			1 OCT 16					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*

							14		REACH 7 (IGNORE)														
847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2	15	02	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2	16	02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$0	$0	84.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2	17	06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	18	11	MOBILIZATION/DEMOBILIZATION	$0	$0	21.5%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	19	11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	20	11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	21	11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	22	11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2		11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2		11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2		13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2		16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
							1																
							2		CONSTRUCTION ESTIMATE TOTALS:	$0	$0	0.0%	$0		$0	$0	$0			$0	$0	$0	0
							3																
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1	4	01	LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
					(This uses the CWCCIS Composite Index escalation factor).		5																
							6																
							7	30	PLANNING, ENGINEERING & DESIGN														
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2	8	2.5%	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	9	1.0%	Planning & Environmental Compliance	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	10	15.0%	Engineering & Design	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	11	1.0%	Reviews, ATRs, IEPRs, VE	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2	12	1.0%	Life Cycle Updates (cost, schedule, risks)	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	13	1.0%	Contracting & Reprographics	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2	14	3.0%	Engineering During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2	15	2.0%	Planning During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	16	1.0%	Project Operations	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
							17																
							18	31	CONSTRUCTION MANAGEMENT														
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2	19	10.0%	Construction Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggreagate Constrction Midpoint	2020Q2	20	2.0%	Project Operation:	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggreagate Constrction Midpoint	2020Q2	21	2.5%	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
							22																
							23		CONTRACT COST TOTALS:	$0	$0		$0		$0	$0	$0			$0	$0	$0	0 checks if the same
							24																0

Pg Brk 7

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives | DISTRICT: San Francisco District | PREPARED: 1/30/2016
LOCATION: Santa Cruz and Monterey Counties, CA | POC: CHIEF, COST ENGINEERING, SON HA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Price Level of Esti 2016(Oct - Dec) | Price level date of M2 ==> 2017Q1
Program Year Pric 2016(Oct - Dec) | Program Year Price Level ==> 2017Q1

								Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
										Estimate Prepared: 30-Jan-16				Program Year (Budget EC): 2017				FULLY FUNDED PROJECT ESTIMATE					
										Effective Price Level: 1-Oct-16				Effective Price Level Date: 1 OCT 16									
								WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
								A	B	C	D	E	F	G	H	I	J	P	L	M	N	O	
							14		REACH 8. RIGHT BANK (NO IMPROVEMENTS)														
847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2	15	02	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2	16	02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$0	$0	84.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2	17	06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	18	11	MOBILIZATION/DEMOBILIZATION	$0	$0	21.5%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	19	11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	20	11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	21	11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	22	11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2		11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2		11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2		13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2		16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
							1																
							2		CONSTRUCTION ESTIMATE TOTALS:	$0	$0	0.0%	$0		$0	$0	$0			$0	$0	$0	0
							3																
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1	4	01	LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
					(This uses the CWCCIS Composite Index escalation factor).		5																
							6																
							7	30	PLANNING, ENGINEERING & DESIGN														
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2	8	2.5%	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	9	1.0%	Planning & Environmental Compliance	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	10	15.0%	Engineering & Design	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	11	1.0%	Reviews, ATRs, IEPRs, VE	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2	12	1.0%	Life Cycle Updates (cost, schedule, risks)	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	13	1.0%	Contracting & Reprographics	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2	14	3.0%	Engineering During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2	15	2.0%	Planning During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	16	1.0%	Project Operations	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
							17																
							18	31	CONSTRUCTION MANAGEMENT														
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2	19	10.0%	Construction Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggreagate Constrction Midpoint	2020Q2	20	2.0%	Project Operation:	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggreagate Constrction Midpoint	2020Q2	21	2.5%	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
							22																
							23		CONTRACT COST TOTALS:	$0	$0		$0		$0	$0	$0			$0	$0	$0	0 checks if the same
							24																0

Pg Brk 8

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives | DISTRICT: San Francisco District | PREPARED: 1/30/2016
LOCATION: Santa Cruz and Monterey Counties, CA | POC: CHIEF, COST ENGINEERING, SON HA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Price Level of Esti 2016(Oct - Dec) | Price level date of M2 ==> 2017Q1
Program Year Pric 2016(Oct - Dec) | Program Year Price Level ==> 2017Q1

								Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
										Estimate Prepared: 30-Jan-16				Program Year (Budget EC): 2017				FULLY FUNDED PROJECT ESTIMATE					
										Effective Price Level: 1-Oct-16				Effective Price Level Date: 1 OCT 16									
								WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
								A	B	C	D	E	F	G	H	I	J	P	L	M	N	O	
							14		REACH 8. LEFT BANK (NO IMPROVEMENTS)														
847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2	15	02	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2	16	02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$0	$0	84.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2	17	06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	18	11	MOBILIZATION/DEMOBILIZATION	$0	$0	21.5%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	19	11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	20	11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	21	11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	22	11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2		11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	

903.06	903.06	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**	**11**		FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
859.84	859.84	859.84	2020(Jan - Mar)	13	**Midpoint 13**	**2020Q2**	**13**		PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
930.68	930.68	930.68	2020(Jan - Mar)	16	**Midpoint 16**	**2020Q2**	**16**		BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
									CONSTRUCTION ESTIMATE TOTALS:	$0	$0	0.0%	**$0**		$0	$0	$0			$0	$0	$0	0	
826.13	826.13	841.40	2017(Oct - Dec)	All	**Lands And Damages Midpoint**	**2018Q1**	**01**		LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
					(This uses the CWCCIS Composite Index escalation factor).																			
							30		PLANNING, ENGINEERING & DESIGN															
1.048	1.048	1.096	2018(Jan - Mar)	30	**ENTER Design mid point period**	**2018Q2**		*2.5%*	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2		*1.0%*	Planning & Environmental Compliance	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2		*15.0%*	Engineering & Design	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2		*1.0%*	Reviews, ATRs, IEPRs, VE	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2		*1.0%*	Life Cycle Updates (cost, schedule, risks)	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2		*1.0%*	Contracting & Reprographics	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2		*3.0%*	Engineering During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	*2020Q2*		*2.0%*	Planning During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2		*1.0%*	Project Operations	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
							31		CONSTRUCTION MANAGEMENT															
1.048	1.048	1.183	2020(Jan - Mar)	31	**ENTER CONSTRUCTION MIDPOINT**	**2020Q2**		*10.0%*	Construction Management	$0	$0	0.0%	0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*		*2.0%*	Project Operation:	$0	$0	0.0%	0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*		*2.5%*	Project Management	$0	$0	0.0%	0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
									CONTRACT COST TOTALS:	$0	$0		**0**		$0	$0	$0			$0	$0	**$0**	0	checks if the same
																							0	

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PROJECT: ALT 7 - Optimized CMZ With Corralitos Left Bank Levee
PROJECT NO:
LOCATION: Santa Cruz and Monterey Counties. CA

DISTRICT: San Francisco District **PREPARED:** 1/30/2016
POC: CHIEF, COST ENGINEERING, SON HA

This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Program Year (Budget EC): 2017
Effective Price Level Date: 1 OCT 16

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Spent Thru: 1-Oct-16 ($K)	TOTAL FIRST COST ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J		K	L	M	N	O
02	UTILITY RELOCATIONS	$3,646	$1,281	35.1%	$4,927	0.0%	$3,646	$1,281	$4,927	$0	$4,927	6.4%	$3,880	$1,363	$5,244
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$44,408	$37,605	84.7%	$82,013	0.0%	$41,731	$35,338	$77,069	$0	$77,069	6.4%	$44,408	$37,605	$82,013
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$2,530	$543	21.5%	$3,073	0.0%	$2,377	$510	$2,887	$0	$2,887	6.4%	$2,530	$543	$3,073
11	DEMOLISH AND REBUILD LEVEE	$10,838	$4,220	38.9%	$15,058	0.0%	$10,184	$3,965	$14,150	$0	$14,150	6.4%	$10,838	$4,220	$15,058
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	$0	$0	6.4%	$0	$0	$0
11	BUILD NEW LEVEE	$9,457	$4,134	43.7%	$13,590	0.0%	$8,887	$3,884	$12,771	$0	$12,771	6.4%	$9,457	$4,134	$13,590
11	BUILD NEW FLOODWALL	$4,213	$1,343	31.9%	$5,556	0.0%	$3,959	$1,262	$5,221	$0	$5,221	6.4%	$4,213	$1,343	$5,556
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$1,896	$904	47.7%	$2,800	0.0%	$1,896	$904	$2,800	$0	$2,800	0.0%	$1,896	$904	$2,800
11	FLOOD GATES	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$1,961	$550	28.0%	$2,511	0.0%	$1,961	$550	$2,511	$0	$2,511	0.0%	$1,961	$550	$2,511
	CONSTRUCTION ESTIMATE TOTALS:	$78,948	$50,580		$129,528	-5.6%	$74,641	$47,695	$122,336	$0	$122,336	6.1%	$79,182	$50,662	$129,844
01	LANDS AND DAMAGES	$57.118	$12.981	0.0%	$70.099	0.0%	$57.118	$12.981	$70.099	$0	$70.099	0.0%	$58.174	$13.221	$71.395
30	PLANNING. ENGINEERING & DESIGN	$21.711	$13.909	64.1%	$35.620	0.0%	$21.711	$13.909	$35.620	$0	$35.620	6.1%	$23.035	$14.758	$37.793
31	CONSTRUCTION MANAGEMENT	$11.448	$7.334	64.1%	$18.782	0.0%	$11.448	$7.334	$18.782	$0	$18.782	12.9%	$12.925	$8.281	$21.206
	PROJECT COST TOTALS:	$169.225	$84.804	50.1%	$254.030		$164.918	$81.920	**$246.838**	$0	**$246.838**	5.4%	$173.317	$86.921	$260.238

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PED % of Construction Contract (w/o Cont) 27.5%
% CM of Construction Contract (w/o Cont) 14.5%

129844 **129844** **Estimate Check**
Program yr check
FF Check **246838**

COLUMN TO CHECK SPREAD SHEET

260238 260237.9577

#N/A DIFFERENCE
#N/A CHECK COST
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0 COMPLETED COST
COST NOT IN BELOW SHEET

SUMMED COST IN BELOW SHEETS
#N/A FUTURE COST 260237.96

ESTIMATED TOTAL PROJECT COST: **$260.238**

______________________ **CHIEF, COST ENGINEERING, SON HA**

______________________ **PROJECT MANAGER, xxx**

______________________ **CHIEF, REAL ESTATE, xxx**

______________________ **CHIEF. PLANNING.xxx**

______________________ **CHIEF, ENGINEERING, xxx**

______________________ **CHIEF, OPERATIONS. xxx**

______________________ **CHIEF. CONSTRUCTION. xxx**

______________________ **CHIEF, CONTRACTING.xxx**

______________________ **CHIEF. PM-PB. xxxx**

______________________ **CHIEF, DPM, xxx**

Pg Brk 1

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties. CA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District PREPARED: 1/30/2016
POC: CHIEF. COST ENGINEERING. SON HA

Estimate Prepared: **30-Jan-16**
Effective Price Level: 1-Oct-16
Program Year (Budget EC): 2017
Effective Price Level Date: 1 OCT 16

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	RISK BASED CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
	REACH 5. RIGHT BANK													
02	UTILITY RELOCATIONS	$1,253	$440	35.1%	$1,694	0.0%	$1,253	$440	$1,694	2020Q2	6.4%	$1,334	$469	$1,802
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$8,559	$7,248	84.7%	$15,807	-6.0%	$8,043	$6,811	$14,854	2020Q2	6.4%	$8,559	$7,248	$15,807
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$702	$151	21.5%	$852	-6.0%	$659	$142	$801	2020Q2	6.4%	$702	$151	$852
11	DEMOLISH AND REBUILD LEVEE	$5,417	$2,109	38.9%	$7,527	-6.0%	$5,091	$1,982	$7,073	2020Q2	6.4%	$5,417	$2,109	$7,527
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	-6.0%	$0	$0	$0	2020Q2	6.4%	$0	$0	$0
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$1,896	$904	47.7%	$2,800	0.0%	$1,896	$904	$2,800	2020Q2	0.0%	$1,896	$904	$2,800
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
16	BANK STABILIZATION	$563	$158	28.0%	$721	0.0%	$563	$158	$721	2020Q2	0.0%	$563	$158	$721
	CONSTRUCTION ESTIMATE TOTALS:	$18,390	$11,010	59.9%	**$29,400**		$17,505	$10,437	$27,942			$18,470	$11,038	$29,508
01	LANDS AND DAMAGES	$13,763	$2,354	0.0%	$16,117	0.0%	$13,763	$2,354	$16,117	2018Q1	1.8%	$14,017	$2,398	$16,415
30	PLANNING, ENGINEERING & DESIGN													
2.5%	Project Management	$460	$275	59.9%	$735	0.0%	$460	$275	$735	2018Q2	4.6%	$481	$288	$769
1.0%	Planning & Environmental Compliance	$184	$110	59.9%	$294	0.0%	$184	$110	$294	2018Q2	4.6%	$192	$115	$308
15.0%	Engineering & Design	$2,758	$1,651	59.9%	$4,409	0.0%	$2,758	$1,651	$4,409	2018Q2	4.6%	$2,885	$1,727	$4,611
1.0%	Reviews, ATRs, IEPRs, VE	$184	$110	59.9%	$294	0.0%	$184	$110	$294	2018Q2	4.6%	$192	$115	$308
1.0%	Life Cycle Updates (cost, schedule, risks)	$184	$110	59.9%	$294	0.0%	$184	$110	$294	2018Q2	4.6%	$192	$115	$308
1.0%	Contracting & Reprographics	$184	$110	59.9%	$294	0.0%	$184	$110	$294	2018Q2	4.6%	$192	$115	$308
3.0%	Engineering During Construction	$552	$330	59.9%	$882	0.0%	$552	$330	$882	2020Q2	12.9%	$623	$373	$996
2.0%	Planning During Construction	$368	$220	59.9%	$588	0.0%	$368	$220	$588	2020Q2	12.9%	$415	$249	$664
1.0%	Project Operations	$184	$110	59.9%	$294	0.0%	$184	$110	$294	2018Q2	4.6%	$192	$115	$308
31	CONSTRUCTION MANAGEMENT													
10.0%	Construction Management	$1,839	$1,101	59.9%	$2,940	0.0%	$1,839	$1,101	$2,940	2020Q2	12.9%	$2,076	$1,243	$3,319
2.0%	Project Operation:	$368	$220	59.9%	$588	0.0%	$368	$220	$588	2020Q2	12.9%	$415	$249	$664
2.5%	Project Management	$460	$275	59.9%	$735	0.0%	$460	$275	$735	2020Q2	12.9%	$519	$311	$830
	CONTRACT COST TOTALS:	$39,878	$17,989		$57,867		$38,993	$17,416	$56,408			$40,865	$18,451	$59,317

Price Level of Est 2016(Oct - Dec) Price level date of M2 ==> **2017Q1**
Program Year Pri 2016(Oct - Dec) Program Year Price Level ==> 2017Q1

847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggreagate Constrction Midpoint	2020Q2

25988
16415
769
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4611
308
308
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996
664
308
3319
664
830
55797 checks if the same
59317

Pg Brk 2

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties. CA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District PREPARED: 1/30/2016
POC: CHIEF. COST ENGINEERING. SON HA

Civil Works Work Breakdown Structure	ESTIMATED COST	PROJECT FIRST COST (Constant Dollar Basis)	TOTAL PROJECT COST (FULLY FUNDED)

Price Level of Est			2016(Oct - Dec)		Price level date of M2 ==>	2017Q1
Program Year Pri			2016(Oct - Dec)		Program Year Price Level ==>	2017Q1
847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
	Pg Brk					3

		Estimate Prepared: Effective Price Level:			30-Jan-16 1-Oct-16	Program Year (Budget EC): Effective Price Level Date:			2017 1 OCT 16						
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Mid-Point Date P	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O	
	REACH 5. LEFT BANK														
02	UTILITY RELOCATIONS	$1,642	$577	35.1%	$2,218	0.0%	$1,642	$577	$2,218	2020Q2	6.4%	$1,747	$614	$2,361	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$8,559	$7,248	84.7%	$15,807	-6.0%	$8,043	$6,811	$14,854	2020Q2	6.4%	$8,559	$7,248	$15,807	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$821	$176	21.5%	$998	-6.0%	$772	$166	$938	2020Q2	6.4%	$821	$176	$998	
11	DEMOLISH AND REBUILD LEVEE	$5,420	$2,111	38.9%	$7,531	-6.0%	$5,094	$1,983	$7,077	2020Q2	6.4%	$5,420	$2,111	$7,531	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	-6.0%	$0	$0	$0	2020Q2	6.4%	$0	$0	$0	
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW FLOODWALL	$3,487	$1,112	31.9%	$4,599	-6.0%	$3,276	$1,045	$4,321	2020Q2	6.4%	$3,487	$1,112	$4,599	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$867	$243	28.0%	$1,110	0.0%	$867	$243	$1,110	2020Q2	0.0%	$867	$243	$1,110	
	CONSTRUCTION ESTIMATE TOTALS:	$20,796	$11,466	55.1%	**$32,262**		$19,693	$10,824	$30,518			$20,901	$11,503	$32,405	32405
01	LANDS AND DAMAGES	$22,667	$5,330	0.0%	$27,997	0.0%	$22,667	$5,330	$27,997	2018Q1	1.8%	$23,086	$5,429	$28,514	28514
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$520	$287	55.1%	$807	0.0%	$520	$287	$807	2018Q2	4.6%	$544	$300	$844	844
1.0%	Planning & Environmental Compliance	$208	$115	55.1%	$323	0.0%	$208	$115	$323	2018Q2	4.6%	$218	$120	$337	337
15.0%	Engineering & Design	$3,119	$1,720	55.1%	$4,839	0.0%	$3,119	$1,720	$4,839	2018Q2	4.6%	$3,262	$1,799	$5,061	5061
1.0%	Reviews, ATRs, IEPRs, VE	$208	$115	55.1%	$323	0.0%	$208	$115	$323	2018Q2	4.6%	$218	$120	$337	337
1.0%	Life Cycle Updates (cost, schedule, risks)	$208	$115	55.1%	$323	0.0%	$208	$115	$323	2018Q2	4.6%	$218	$120	$337	337
1.0%	Contracting & Reprographics	$208	$115	55.1%	$323	0.0%	$208	$115	$323	2018Q2	4.6%	$218	$120	$337	337
3.0%	Engineering During Construction	$624	$344	55.1%	$968	0.0%	$624	$344	$968	2020Q2	12.9%	$705	$388	$1,093	1093
2.0%	Planning During Construction	$416	$229	55.1%	$645	0.0%	$416	$229	$645	2020Q2	12.9%	$470	$259	$729	729
1.0%	Project Operations	$208	$115	55.1%	$323	0.0%	$208	$115	$323	2018Q2	4.6%	$218	$120	$337	337
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$2,080	$1,147	55.1%	$3,227	0.0%	$2,080	$1,147	$3,227	2020Q2	12.9%	$2,348	$1,295	$3,643	3643
2.0%	Project Operation:	$416	$229	55.1%	$645	0.0%	$416	$229	$645	2020Q2	12.9%	$470	$259	$729	729
2.5%	Project Management	$520	$287	55.1%	$807	0.0%	$520	$287	$807	2020Q2	12.9%	$587	$324	$911	911
	CONTRACT COST TOTALS:	$52,198	$21,613		$73,811		$51,095	$20,971	$72,066			$53,460	$22,155	$75,615	75615 checks if the same
															75615

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District PREPARED: 1/30/2016
POC: CHIEF, COST ENGINEERING, SON HA

Price Level of Est			2016(Oct - Dec)		Price level date of M2 ==>	2017Q1
Program Year Pri			2016(Oct - Dec)		Program Year Price Level ==>	2017Q1
847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
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1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
	Pg Brk					4

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared: Effective Price Level:			30-Jan-16 1-Oct-16	Program Year (Budget EC): Effective Price Level Date:			2017 1 OCT 16						
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Mid-Point Date P	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O	
	REACH 6. RIGHT BANK														
02	UTILITY RELOCATIONS	$39	$14	35.1%	$52	0.0%	$39	$14	$52	2020Q2	6.4%	$41	$14	$55	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$5,109	$4,326	84.7%	$9,435	-6.0%	$4,801	$4,065	$8,866	2020Q2	6.4%	$5,109	$4,326	$9,435	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$399	$86	21.5%	$484	-6.0%	$375	$80	$455	2020Q2	6.4%	$399	$86	$484	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$3,987	$1,743	43.7%	$5,730	-6.0%	$3,747	$1,638	$5,384	2020Q2	6.4%	$3,987	$1,743	$5,730	
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$531	$149	28.0%	$680	0.0%	$531	$149	$680	2020Q2	0.0%	$531	$149	$680	
	CONSTRUCTION ESTIMATE TOTALS:	$10,065	$6,317	62.8%	**$16,382**		$9,492	$5,946	$15,438			$10,067	$6,318	$16,385	16385
01	LANDS AND DAMAGES	$4,242	$928	0.0%	$5,170	0.0%	$4,242	$928	$5,170	2018Q1	1.8%	$4,320	$945	$5,266	5266
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$252	$158	62.8%	$410	0.0%	$252	$158	$410	2018Q2	4.6%	$264	$165	$429	429
1.0%	Planning & Environmental Compliance	$101	$63	62.8%	$164	0.0%	$101	$63	$164	2018Q2	4.6%	$106	$66	$172	172
15.0%	Engineering & Design	$1,510	$948	62.8%	$2,458	0.0%	$1,510	$948	$2,458	2018Q2	4.6%	$1,579	$991	$2,571	2571
1.0%	Reviews, ATRs, IEPRs, VE	$101	$63	62.8%	$164	0.0%	$101	$63	$164	2018Q2	4.6%	$106	$66	$172	172
1.0%	Life Cycle Updates (cost, schedule, risks)	$101	$63	62.8%	$164	0.0%	$101	$63	$164	2018Q2	4.6%	$106	$66	$172	172
1.0%	Contracting & Reprographics	$101	$63	62.8%	$164	0.0%	$101	$63	$164	2018Q2	4.6%	$106	$66	$172	172
3.0%	Engineering During Construction	$302	$190	62.8%	$492	0.0%	$302	$190	$492	2020Q2	12.9%	$341	$214	$555	555
2.0%	Planning During Construction	$201	$126	62.8%	$327	0.0%	$201	$126	$327	2020Q2	12.9%	$227	$142	$369	369
1.0%	Project Operations	$101	$63	62.8%	$164	0.0%	$101	$63	$164	2018Q2	4.6%	$106	$66	$172	172
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$1,006	$631	62.8%	$1,637	0.0%	$1,006	$631	$1,637	2020Q2	12.9%	$1,136	$713	$1,849	1849
2.0%	Project Operation:	$201	$126	62.8%	$327	0.0%	$201	$126	$327	2020Q2	12.9%	$227	$142	$369	369
2.5%	Project Management	$252	$158	62.8%	$410	0.0%	$252	$158	$410	2020Q2	12.9%	$285	$179	$463	463
	CONTRACT COST TOTALS:	$18,536	$9,899		**$28,435**		$17,963	$9,528	$27,492			$18,974	$10,142	**$29,115**	29115 checks if the same
															29115

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District PREPARED: 1/30/2016
POC: CHIEF, COST ENGINEERING, SON HA

Price Level of Est			2016(Oct - Dec)		Price level date of M2 ==>	2017Q1
Program Year Pri			2016(Oct - Dec)		Program Year Price Level ==>	2017Q1
847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
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867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: Effective Price Level:			30-Jan-16 1-Oct-16	Program Year (Budget EC): Effective Price Level Date:			2017 1 OCT 16	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Mid-Point Date P	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
	REACH 6. LEFT BANK													
02	UTILITY RELOCATIONS	$701	$246	35.1%	$948	0.0%	$701	$246	$948	2020Q2	6.4%	$746	$262	$1,008
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$5,109	$4,326	84.7%	$9,435	-6.0%	$4,801	$4,065	$8,866	2020Q2	6.4%	$5,109	$4,326	$9,435
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$474	$102	21.5%	$576	-6.0%	$445	$96	$541	2020Q2	6.4%	$474	$102	$576
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	BUILD NEW LEVEE	$4,740	$2,072	43.7%	$6,812	-6.0%	$4,454	$1,947	$6,401	2020Q2	6.4%	$4,740	$2,072	$6,812
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0

826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggreagate Constrction Midpoint	2020Q2

	CONSTRUCTION ESTIMATE TOTALS:	$11,024	$6,746	61.2%	$17,770		$10,402	$6,354	$16,756			$11,069	$6,762	$17,831	17831
01	LANDS AND DAMAGES	$14,684	$4,164	0.0%	$18,848	0.0%	$14,684	$4,164	$18,848	2018Q1	1.8%	$14,955	$4,241	$19,196	19196
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$276	$169	61.2%	$445	0.0%	$276	$169	$445	2018Q2	4.6%	$289	$177	$465	465
1.0%	Planning & Environmental Compliance	$110	$67	61.2%	$177	0.0%	$110	$67	$177	2018Q2	4.6%	$115	$70	$185	185
15.0%	Engineering & Design	$1,654	$1,012	61.2%	$2,666	0.0%	$1,654	$1,012	$2,666	2018Q2	4.6%	$1,730	$1,059	$2,788	2788
1.0%	Reviews, ATRs, IEPRs, VE	$110	$67	61.2%	$177	0.0%	$110	$67	$177	2018Q2	4.6%	$115	$70	$185	185
1.0%	Life Cycle Updates (cost, schedule, risks)	$110	$67	61.2%	$177	0.0%	$110	$67	$177	2018Q2	4.6%	$115	$70	$185	185
1.0%	Contracting & Reprographics	$110	$67	61.2%	$177	0.0%	$110	$67	$177	2018Q2	4.6%	$115	$70	$185	185
3.0%	Engineering During Construction	$331	$203	61.2%	$534	0.0%	$331	$203	$534	2020Q2	12.9%	$374	$229	$602	602
2.0%	Planning During Construction	$220	$135	61.2%	$355	0.0%	$220	$135	$355	2020Q2	12.9%	$248	$152	$400	400
1.0%	Project Operations	$110	$67	61.2%	$177	0.0%	$110	$67	$177	2018Q2	4.6%	$115	$70	$185	185
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$1,102	$674	61.2%	$1,776	0.0%	$1,102	$674	$1,776	2020Q2	12.9%	$1,244	$761	$2,006	2006
2.0%	Project Operation:	$220	$135	61.2%	$355	0.0%	$220	$135	$355	2020Q2	12.9%	$248	$152	$400	400
2.5%	Project Management	$276	$169	61.2%	$445	0.0%	$276	$169	$445	2020Q2	12.9%	$312	$191	$502	502
	CONTRACT COST TOTALS:	$30,337	$13,743		$44,080		$29,715	$13,351	$43,066			$31,045	$14,075	$45,120	45120 checks if the same
															45120

Pg Brk 5

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA
PREPARED: 1/30/2016

Price Level of Est 2016(Oct - Dec)
Program Year Pri 2016(Oct - Dec)
Price level date of M2 ==> 2017Q1
Program Year Price Level ==> 2017Q1

847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggreagate Constrction Midpoint	2020Q2

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared:			30-Jan-16	Program Year (Budget EC):			2017						
		Effective Price Level:			1-Oct-16	Effective Price Level Date:			1 OCT 16	FULLY FUNDED PROJECT ESTIMATE					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O	
	REACH 7. RIGHT AND LEFT BANKS COMBINED														
02	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$4,212	$3,567	84.7%	$7,778	-6.0%	$3,958	$3,352	$7,309	2020Q2	6.4%	$4,212	$3,567	$7,778	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$61	$13	21.5%	$74	-6.0%	$57	$12	$70	2020Q2	6.4%	$61	$13	$74	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW FLOODWALL	$726	$232	31.9%	$958	-6.0%	$682	$218	$900	2020Q2	6.4%	$726	$232	$958	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
	CONSTRUCTION ESTIMATE TOTALS:	$4,999	$3,811	76.2%	$8,810		$4,698	$3,581	$8,279			$4,999	$3,811	$8,810	8810
01	LANDS AND DAMAGES	$781	$25	0.0%	$806	0.0%	$781	$25	$806	2018Q1	1.8%	$795	$25	$821	821
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$125	$95	76.2%	$220	0.0%	$125	$95	$220	2018Q2	4.6%	$131	$100	$230	230
1.0%	Planning & Environmental Compliance	$50	$38	76.2%	$88	0.0%	$50	$38	$88	2018Q2	4.6%	$52	$40	$92	92
15.0%	Engineering & Design	$750	$572	76.2%	$1,322	0.0%	$750	$572	$1,322	2018Q2	4.6%	$784	$598	$1,382	1382
1.0%	Reviews, ATRs, IEPRs, VE	$50	$38	76.2%	$88	0.0%	$50	$38	$88	2018Q2	4.6%	$52	$40	$92	92
1.0%	Life Cycle Updates (cost, schedule, risks)	$50	$38	76.2%	$88	0.0%	$50	$38	$88	2018Q2	4.6%	$52	$40	$92	92
1.0%	Contracting & Reprographics	$50	$38	76.2%	$88	0.0%	$50	$38	$88	2018Q2	4.6%	$52	$40	$92	92
3.0%	Engineering During Construction	$150	$114	76.2%	$264	0.0%	$150	$114	$264	2020Q2	12.9%	$169	$129	$298	298
2.0%	Planning During Construction	$100	$76	76.2%	$176	0.0%	$100	$76	$176	2020Q2	12.9%	$113	$86	$199	199
1.0%	Project Operations	$50	$38	76.2%	$88	0.0%	$50	$38	$88	2018Q2	4.6%	$52	$40	$92	92
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$500	$381	76.2%	$881	0.0%	$500	$381	$881	2020Q2	12.9%	$565	$430	$995	995
2.0%	Project Operation:	$100	$76	76.2%	$176	0.0%	$100	$76	$176	2020Q2	12.9%	$113	$86	$199	199
2.5%	Project Management	$125	$95	76.2%	$220	0.0%	$125	$95	$220	2020Q2	12.9%	$141	$108	$249	249
	CONTRACT COST TOTALS:	$7,880	$5,437		$13,317		$7,579	$5,207	$12,786			$8,072	$5,573	$13,645	13645 checks if the same
															13645

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**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA
PREPARED: 1/30/2016

Price Level of Est 2016(Oct - Dec)
Program Year Pri 2016(Oct - Dec)
Price level date of M2 ==> 2017Q1
Program Year Price Level ==> 2017Q1

847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggreagate Constrction Midpoint	2020Q2

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared:			30-Jan-16	Program Year (Budget EC):			2017						
		Effective Price Level:			1-Oct-16	Effective Price Level Date:			1 OCT 16	FULLY FUNDED PROJECT ESTIMATE					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O	
	REACH 7 (IGNORE)														
02	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$0	$0	84.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$0	$0	21.5%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
	CONSTRUCTION ESTIMATE TOTALS:	$0	$0	0.0%	$0		$0	$0	$0			$0	$0	$0	0
01	LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Planning & Environmental Compliance	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
15.0%	Engineering & Design	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Reviews, ATRs, IEPRs, VE	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Life Cycle Updates (cost, schedule, risks)	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Contracting & Reprographics	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
3.0%	Engineering During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
2.0%	Planning During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Project Operations	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
2.0%	Project Operation:	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
2.5%	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0

	CONTRACT COST TOTALS:	$0	$0		$0		$0	$0	$0			$0	$0	$0	0 checks if the same
															0

Pg Brk 7

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District PREPARED: 1/30/2016
POC: CHIEF, COST ENGINEERING, SON HA

Price Level of Est	2016(Oct - Dec)				Price level date of M2 ==>	2017Q1
Program Year Pri	2016(Oct - Dec)				Program Year Price Level ==>	2017Q1
847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared:			30-Jan-16	Program Year (Budget EC):			2017						
		Effective Price Level:			1-Oct-16	Effective Price Level Date:			1 OCT 16	FULLY FUNDED PROJECT ESTIMATE					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*	
	REACH 8. RIGHT BANK (ONLY ½ BRIDGE)														
02	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$6,430	$5,445	84.7%	$11,875	-6.0%	$6,043	$5,117	$11,159	2020Q2	6.4%	$6,430	$5,445	$11,875	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$0	$0	21.5%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
	CONSTRUCTION ESTIMATE TOTALS:	$6,430	$5,445	84.7%	**$11,875**		$6,043	$5,117	$11,159			$6,430	$5,445	$11,875	11875
01	LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$161	$136	84.7%	$297	0.0%	$161	$136	$297	2018Q2	4.6%	$168	$143	$311	311
1.0%	Planning & Environmental Compliance	$64	$54	84.7%	$118	0.0%	$64	$54	$118	2018Q2	4.6%	$67	$57	$124	124
15.0%	Engineering & Design	$965	$817	84.7%	$1,782	0.0%	$965	$817	$1,782	2018Q2	4.6%	$1,009	$855	$1,864	1864
1.0%	Reviews, ATRs, IEPRs, VE	$64	$54	84.7%	$118	0.0%	$64	$54	$118	2018Q2	4.6%	$67	$57	$124	124
1.0%	Life Cycle Updates (cost, schedule, risks)	$64	$54	84.7%	$118	0.0%	$64	$54	$118	2018Q2	4.6%	$67	$57	$124	124
1.0%	Contracting & Reprographics	$64	$54	84.7%	$118	0.0%	$64	$54	$118	2018Q2	4.6%	$67	$57	$124	124
3.0%	Engineering During Construction	$193	$163	84.7%	$356	0.0%	$193	$163	$356	2020Q2	12.9%	$218	$185	$402	402
2.0%	Planning During Construction	$129	$109	84.7%	$238	0.0%	$129	$109	$238	2020Q2	12.9%	$146	$123	$269	269
1.0%	Project Operations	$64	$54	84.7%	$118	0.0%	$64	$54	$118	2018Q2	4.6%	$67	$57	$124	124
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$643	$544	84.7%	$1,187	0.0%	$643	$544	$1,187	2020Q2	12.9%	$726	$615	$1,341	1341
2.0%	Project Operation:	$129	$109	84.7%	$238	0.0%	$129	$109	$238	2020Q2	12.9%	$146	$123	$269	269
2.5%	Project Management	$161	$136	84.7%	$297	0.0%	$161	$136	$297	2020Q2	12.9%	$182	$154	$336	336
	CONTRACT COST TOTALS:	$9,131	$7,732		**$16,864**		$8,744	$7,404	$16,148			$9,360	$7,926	**$17,285**	17285 checks if the same
															17285

Pg Brk 8

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District PREPARED: 1/30/2016
POC: CHIEF, COST ENGINEERING, SON HA

Price Level of Est	2016(Oct - Dec)				Price level date of M2 ==>	2017Q1
Program Year Pri	2016(Oct - Dec)				Program Year Price Level ==>	2017Q1
847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared:			30-Jan-16	Program Year (Budget EC):			2017						
		Effective Price Level:			1-Oct-16	Effective Price Level Date:			1 OCT 16	FULLY FUNDED PROJECT ESTIMATE					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*	
	REACH 8. LEFT BANK														
02	UTILITY RELOCATIONS	$12	$4	35.1%	$16	0.0%	$12	$4	$16	2020Q2	6.4%	$12	$4	$17	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$6,430	$5,445	84.7%	$11,875	-6.0%	$6,043	$5,117	$11,159	2020Q2	6.4%	$6,430	$5,445	$11,875	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$73	$16	21.5%	$89	-6.0%	$69	$15	$83	2020Q2	6.4%	$73	$16	$89	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$730	$319	43.7%	$1,049	-6.0%	$686	$300	$986	2020Q2	6.4%	$730	$319	$1,049	
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
	CONSTRUCTION ESTIMATE TOTALS:	$7,245	$5,784	79.8%	**$13,029**		$6,809	$5,435	$12,244			$7,245	$5,784	$13,030	13030
01	LANDS AND DAMAGES	$981	$180	0.0%	$ 1,161	0.0%	$981	$180	$1,161	2018Q1	1.8%	$999	$183	$1,182	1182
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$181	$145	79.8%	$326	0.0%	$181	$145	$326	2018Q2	4.6%	$189	$151	$340	340
1.0%	Planning & Environmental Compliance	$72	$57	79.8%	$129	0.0%	$72	$57	$129	2018Q2	4.6%	$75	$60	$135	135
15.0%	Engineering & Design	$1,087	$868	79.8%	$1,955	0.0%	$1,087	$868	$1,955	2018Q2	4.6%	$1,137	$908	$2,044	2044
1.0%	Reviews, ATRs, IEPRs, VE	$72	$57	79.8%	$129	0.0%	$72	$57	$129	2018Q2	4.6%	$75	$60	$135	135
1.0%	Life Cycle Updates (cost, schedule, risks)	$72	$57	79.8%	$129	0.0%	$72	$57	$129	2018Q2	4.6%	$75	$60	$135	135
1.0%	Contracting & Reprographics	$72	$57	79.8%	$129	0.0%	$72	$57	$129	2018Q2	4.6%	$75	$60	$135	135
3.0%	Engineering During Construction	$217	$173	79.8%	$390	0.0%	$217	$173	$390	2020Q2	12.9%	$245	$196	$441	441
2.0%	Planning During Construction	$145	$116	79.8%	$261	0.0%	$145	$116	$261	2020Q2	12.9%	$164	$131	$294	294
1.0%	Project Operations	$72	$57	79.8%	$129	0.0%	$72	$57	$129	2018Q2	4.6%	$75	$60	$135	135
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$724	$578	79.8%	1,302	0.0%	$724	$578	$1,302	2020Q2	12.9%	$817	$653	$1,470	1470
2.0%	Project Operation:	$145	$116	79.8%	261	0.0%	$145	$116	$261	2020Q2	12.9%	$164	$131	$294	294
2.5%	Project Management	$181	$145	79.8%	326	0.0%	$181	$145	$326	2020Q2	12.9%	$204	$163	$368	368
	CONTRACT COST TOTALS:	$11,266	$8,391		**19,657**		$10,830	$8,042	$18,872			$11,541	$8,600	**$20,141**	20141 checks if the same
															20141

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PROJECT: ALT 8 - Optimized CMZ Without Corralitos Left Bank Levee
PROJECT NO:
LOCATION: Santa Cruz and Monterev Counties. CA

DISTRICT: San Francisco District **PREPARED:** 1/30/2016
POC: CHIEF. COST ENGINEERING. SON HA

This Estimate reflects the scope and schedule in report; Paiaro Focused Arrav of Alternatives

Pull Down Menus for your Feature Accounts =>

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis) Program Year (Budget EC): 2017 Effective Price Level Date: 1 OCT 16						TOTAL PROJECT COST (FULLY FUNDED)			
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Spent Thru: 1-Oct-16 ($K)	TOTAL FIRST COST ($K) K	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
02	UTILITY RELOCATIONS	$3,223	$1,133	35.1%	$4,356	0.0%	$3,223	$1,133	$4,356	$0	$4,356	6.4%	$3,430	$1,205	$4,635
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$44,408	$37,605	84.7%	$82,013	0.0%	$41,731	$35,338	$77,069	$0	$77,069	6.4%	$44,408	$37,605	$82,013
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$2,477	$532	21.5%	$3,009	0.0%	$2,328	$500	$2,828	$0	$2,828	6.4%	$2,477	$532	$3,009
11	DEMOLISH AND REBUILD LEVEE	$10,689	$4,162	38.9%	$14,851	0.0%	$10,045	$3,911	$13,956	$0	$13,956	6.4%	$10,689	$4,162	$14,851
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	$0	$0	6.4%	$0	$0	$0
11	BUILD NEW LEVEE	$9,693	$4,237	43.7%	$13,929	0.0%	$9,108	$3,981	$13,089	$0	$13,089	6.4%	$9,693	$4,237	$13,929
11	BUILD NEW FLOODWALL	$3,487	$1,112	31.9%	$4,599	0.0%	$3,276	$1,045	$4,321	$0	$4,321	6.4%	$3,487	$1,112	$4,599
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$1,896	$904	47.7%	$2,800	0.0%	$1,896	$904	$2,800	$0	$2,800	0.0%	$1,896	$904	$2,800
11	FLOOD GATES	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$1,961	$550	28.0%	$2,511	0.0%	$1,961	$550	$2,511	$0	$2,511	0.0%	$1,961	$550	$2,511
	CONSTRUCTION ESTIMATE TOTALS:	$77,834	$50,234		$128,068	-5.6%	$73,568	$47,361	$120,929	$0	$120,929	6.1%	$78,041	$50,306	$128,347
01	LANDS AND DAMAGES	$42.434	$8.817	0.0%	$51.251	0.0%	$42.434	$8.817	$51.251	$0	$51.251	0.0%	$43.218	$8.980	$52.198
30	PLANNING. ENGINEERING & DESIGN	$21.410	$13.817	64.5%	$35.227	0.0%	$21.410	$13.817	$35.227	$0	$35.227	6.1%	$22.716	$14.660	$37.376
31	CONSTRUCTION MANAGEMENT	$11.286	$7.284	64.5%	$18.570	0.0%	$11.286	$7.284	$18.570	$0	$18.570	12.9%	$12.742	$8.224	$20.967
	PROJECT COST TOTALS:	$152.964	$80.152	52.4%	$233.116		$148.698	$77.280	**$225.978**	$0	**$225.978**	5.7%	$156.718	$82.171	$238.888

PED % of Construction Contract (w/o Cont) 27.5%

% CM of Construction Contract (w/o Cont) 14.5%

128347 **128347 Estimate Check**
Program yr check
FF Check 225978

COLUMN TO CHECK SPREAD SHEET

238888 238888.2181

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SUMMED COST IN BELOW SHEETS
236541 FUTURE COST 238888.22

______________________ **CHIEF, COST ENGINEERING, SON HA**

______________________ **PROJECT MANAGER, xxx**

______________________ **CHIEF, REAL ESTATE, xxx**

______________________ **CHIEF. PLANNING.xxx**

______________________ **CHIEF, ENGINEERING, xxx**

______________________ **CHIEF. OPERATIONS. xxx**

______________________ **CHIEF. CONSTRUCTION. xxx**

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______________________ **CHIEF. PM-PB. xxxx**

______________________ **CHIEF, DPM, xxx**

ESTIMATED TOTAL PROJECT COST: $238.888

Pg Brk 1

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterev Counties. CA
This Estimate reflects the scope and schedule in report: Paiaro Focused Arrav of Alternatives

DISTRICT: San Francisco District PREPARED: 1/30/2016
POC: CHIEF. COST ENGINEERING. SON HA

Price Level of Est 2016(Oct - Dec) — Price level date of M2 ==> 2017Q1
Program Year Pri 2016(Oct - Dec) — Program Year Price Level ==> 2017Q1

847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggregate Constrction Midpoint	2020Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggregate Constrction Midpoint	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggregate Constrction Midpoint	2020Q2

Civil Works Work Breakdown Structure			ESTIMATED COST Estimate Prepared: 30-Jan-16 Effective Price Level: 1-Oct-16				PROJECT FIRST COST (Constant Dollar Basis) Program Year (Budget EC): 2017 Effective Price Level Date: 1 OCT 16				TOTAL PROJECT COST (FULLY FUNDED)					
WBS NUMBER A		Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	RISK BASED CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Mid-Point Date P	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O	
		REACH 5. RIGHT BANK														
02		UTILITY RELOCATIONS	$1,253	$440	35.1%	$1,694	0.0%	$1,253	$440	$1,694	2020Q2	6.4%	$1,334	$469	$1,802	
02		ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$8,559	$7,248	84.7%	$15,807	-6.0%	$8,043	$6,811	$14,854	2020Q2	6.4%	$8,559	$7,248	$15,807	
06		FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11		MOBILIZATION/DEMOBILIZATION	$699	$150	21.5%	$849	-6.0%	$657	$141	$798	2020Q2	6.4%	$699	$150	$849	
11		DEMOLISH AND REBUILD LEVEE	$5,393	$2,100	38.9%	$7,492	-6.0%	$5,068	$1,973	$7,041	2020Q2	6.4%	$5,393	$2,100	$7,492	
11		DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	-6.0%	$0	$0	$0	2020Q2	6.4%	$0	$0	$0	
11		BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11		BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11		LOWER LEVEE AND BUILD NEW FLOODWALL	$1,896	$904	47.7%	$2,800	0.0%	$1,896	$904	$2,800	2020Q2	0.0%	$1,896	$904	$2,800	
11		FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13		PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16		BANK STABILIZATION	$563	$158	28.0%	$721	0.0%	$563	$158	$721	2020Q2	0.0%	$563	$158	$721	
		CONSTRUCTION ESTIMATE TOTALS:	$18,363	$11,000	59.9%	**$29,362**		$17,479	$10,427	$27,906			$18,443	$11,028	$29,471	25951
01		LANDS AND DAMAGES	$13,763	$2,354	0.0%	$16,117	0.0%	$13,763	$2,354	$16,117	2018Q1	1.8%	$14,017	$2,398	$16,415	16415
30		PLANNING, ENGINEERING & DESIGN														
	2.5%	Project Management	$459	$275	59.9%	$734	0.0%	$459	$275	$734	2018Q2	4.6%	$480	$288	$768	768
	1.0%	Planning & Environmental Compliance	$184	$110	59.9%	$294	0.0%	$184	$110	$294	2018Q2	4.6%	$192	$115	$308	308
	15.0%	Engineering & Design	$2,754	$1,650	59.9%	$4,404	0.0%	$2,754	$1,650	$4,404	2018Q2	4.6%	$2,880	$1,725	$4,606	4606
	1.0%	Reviews, ATRs, IEPRs, VE	$184	$110	59.9%	$294	0.0%	$184	$110	$294	2018Q2	4.6%	$192	$115	$308	308
	1.0%	Life Cycle Updates (cost, schedule, risks)	$184	$110	59.9%	$294	0.0%	$184	$110	$294	2018Q2	4.6%	$192	$115	$308	308
	1.0%	Contracting & Reprographics	$184	$110	59.9%	$294	0.0%	$184	$110	$294	2018Q2	4.6%	$192	$115	$308	308
	3.0%	Engineering During Construction	$551	$330	59.9%	$881	0.0%	$551	$330	$881	2020Q2	12.9%	$622	$373	$995	995
	2.0%	Planning During Construction	$367	$220	59.9%	$587	0.0%	$367	$220	$587	2020Q2	12.9%	$414	$248	$663	663
	1.0%	Project Operations	$184	$110	59.9%	$294	0.0%	$184	$110	$294	2018Q2	4.6%	$192	$115	$308	308
31		CONSTRUCTION MANAGEMENT														
	10.0%	Construction Management	$1,836	$1,100	59.9%	$2,936	0.0%	$1,836	$1,100	$2,936	2020Q2	12.9%	$2,073	$1,242	$3,315	3315
	2.0%	Project Operation:	$367	$220	59.9%	$587	0.0%	$367	$220	$587	2020Q2	12.9%	$414	$248	$663	663
	2.5%	Project Management	$459	$275	59.9%	$734	0.0%	$459	$275	$734	2020Q2	12.9%	$518	$310	$829	829
		CONTRACT COST TOTALS:	$39,839	$17,974		$57,813		$38,955	$17,401	$56,357			$40,825	$18,436	$59,261	55741 checks if the same

59261

Pg Brk 2

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterev Counties. CA
This Estimate reflects the scope and schedule in report: Paiaro Focused Arrav of Alternatives

DISTRICT: San Francisco District PREPARED: 1/30/2016
POC: CHIEF. COST ENGINEERING. SON HA

Civil Works Work Breakdown Structure	ESTIMATED COST	PROJECT FIRST COST (Constant Dollar Basis)	TOTAL PROJECT COST (FULLY FUNDED)

	Price Level of Est	2016(Oct - Dec)			Price level date of M2 ==>	2017Q1
	Program Year Pri	2016(Oct - Dec)			Program Year Price Level ==>	2017Q1
847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*

		Estimate Prepared:			30-Jan-16	Program Year (Budget EC):			2017						
		Effective Price Level:			1-Oct-16	Effective Price Level Date:			1 OCT 16						
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*	
	REACH 5. LEFT BANK														
02	UTILITY RELOCATIONS	$1,642	$577	35.1%	$2,218	0.0%	$1,642	$577	$2,218	2020Q2	6.4%	$1,747	$614	$2,361	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$8,559	$7,248	84.7%	$15,807	-6.0%	$8,043	$6,811	$14,854	2020Q2	6.4%	$8,559	$7,248	$15,807	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$809	$174	21.5%	$983	-6.0%	$760	$163	$923	2020Q2	6.4%	$809	$174	$983	
11	DEMOLISH AND REBUILD LEVEE	$5,297	$2,062	38.9%	$7,359	-6.0%	$4,977	$1,938	$6,915	2020Q2	6.4%	$5,297	$2,062	$7,359	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	-6.0%	$0	$0	$0	2020Q2	6.4%	$0	$0	$0	
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW FLOODWALL	$3,487	$1,112	31.9%	$4,599	-6.0%	$3,276	$1,045	$4,321	2020Q2	6.4%	$3,487	$1,112	$4,599	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$867	$243	28.0%	$1,110	0.0%	$867	$243	$1,110	2020Q2	0.0%	$867	$243	$1,110	
	CONSTRUCTION ESTIMATE TOTALS:	$20,660	$11,415	55.3%	**$32,075**		$19,566	$10,777	$30,342			$20,765	$11,452	$32,218	32218
01	LANDS AND DAMAGES	$22,667	$5,330	0.0%	$27,997	0.0%	$22,667	$5,330	$27,997	2018Q1	1.8%	$23,086	$5,429	$28,514	28514
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$516	$285	55.3%	$801	0.0%	$516	$285	$801	2018Q2	4.6%	$540	$298	$838	838
1.0%	Planning & Environmental Compliance	$207	$114	55.3%	$321	0.0%	$207	$114	$321	2018Q2	4.6%	$216	$120	$336	336
15.0%	Engineering & Design	$3,099	$1,712	55.3%	$4,811	0.0%	$3,099	$1,712	$4,811	2018Q2	4.6%	$3,241	$1,791	$5,032	5032
1.0%	Reviews, ATRs, IEPRs, VE	$207	$114	55.3%	$321	0.0%	$207	$114	$321	2018Q2	4.6%	$216	$120	$336	336
1.0%	Life Cycle Updates (cost, schedule, risks)	$207	$114	55.3%	$321	0.0%	$207	$114	$321	2018Q2	4.6%	$216	$120	$336	336
1.0%	Contracting & Reprographics	$207	$114	55.3%	$321	0.0%	$207	$114	$321	2018Q2	4.6%	$216	$120	$336	336
3.0%	Engineering During Construction	$620	$343	55.3%	$963	0.0%	$620	$343	$963	2020Q2	12.9%	$700	$387	$1,087	1087
2.0%	Planning During Construction	$413	$228	55.3%	$641	0.0%	$413	$228	$641	2020Q2	12.9%	$466	$258	$724	724
1.0%	Project Operations	$207	$114	55.3%	$321	0.0%	$207	$114	$321	2018Q2	4.6%	$216	$120	$336	336
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$2,066	$1,142	55.3%	$3,208	0.0%	$2,066	$1,142	$3,208	2020Q2	12.9%	$2,333	$1,289	$3,621	3621
2.0%	Project Operation:	$413	$228	55.3%	$641	0.0%	$413	$228	$641	2020Q2	12.9%	$466	$258	$724	724
2.5%	Project Management	$516	$285	55.3%	$801	0.0%	$516	$285	$801	2020Q2	12.9%	$583	$322	$904	904
	CONTRACT COST TOTALS:	$52,005	$21,540		$73,545		$50,911	$20,902	$71,812			$53,262	$22,081	$75,343	75343 checks if the same
															75343

Pg Brk 3

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District PREPARED: 1/30/2016
POC: CHIEF, COST ENGINEERING, SON HA

	Price Level of Est	2016(Oct - Dec)			Price level date of M2 ==>	2017Q1
	Program Year Pri	2016(Oct - Dec)			Program Year Price Level ==>	2017Q1
847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared:			30-Jan-16	Program Year (Budget EC):			2017						
		Effective Price Level:			1-Oct-16	Effective Price Level Date:			1 OCT 16						
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*	
	REACH 6. RIGHT BANK														
02	UTILITY RELOCATIONS	$39	$14	35.1%	$52	0.0%	$39	$14	$52	2020Q2	6.4%	$41	$14	$55	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$5,109	$4,326	84.7%	$9,435	-6.0%	$4,801	$4,065	$8,866	2020Q2	6.4%	$5,109	$4,326	$9,435	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$399	$86	21.5%	$484	-6.0%	$375	$80	$455	2020Q2	6.4%	$399	$86	$484	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$3,987	$1,743	43.7%	$5,730	-6.0%	$3,747	$1,638	$5,384	2020Q2	6.4%	$3,987	$1,743	$5,730	
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$531	$149	28.0%	$680	0.0%	$531	$149	$680	2020Q2	0.0%	$531	$149	$680	
	CONSTRUCTION ESTIMATE TOTALS:	$10,065	$6,317	62.8%	**$16,382**		$9,492	$5,946	$15,438			$10,067	$6,318	$16,385	16385
01	LANDS AND DAMAGES	$4,242	$928	0.0%	$5,170	0.0%	$4,242	$928	$5,170	2018Q1	1.8%	$4,320	$945	$5,266	5266
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$252	$158	62.8%	$410	0.0%	$252	$158	$410	2018Q2	4.6%	$264	$165	$429	429
1.0%	Planning & Environmental Compliance	$101	$63	62.8%	$164	0.0%	$101	$63	$164	2018Q2	4.6%	$106	$66	$172	172
15.0%	Engineering & Design	$1,510	$948	62.8%	$2,458	0.0%	$1,510	$948	$2,458	2018Q2	4.6%	$1,579	$991	$2,571	2571
1.0%	Reviews, ATRs, IEPRs, VE	$101	$63	62.8%	$164	0.0%	$101	$63	$164	2018Q2	4.6%	$106	$66	$172	172
1.0%	Life Cycle Updates (cost, schedule, risks)	$101	$63	62.8%	$164	0.0%	$101	$63	$164	2018Q2	4.6%	$106	$66	$172	172
1.0%	Contracting & Reprographics	$101	$63	62.8%	$164	0.0%	$101	$63	$164	2018Q2	4.6%	$106	$66	$172	172
3.0%	Engineering During Construction	$302	$190	62.8%	$492	0.0%	$302	$190	$492	2020Q2	12.9%	$341	$214	$555	555
2.0%	Planning During Construction	$201	$126	62.8%	$327	0.0%	$201	$126	$327	2020Q2	12.9%	$227	$142	$369	369
1.0%	Project Operations	$101	$63	62.8%	$164	0.0%	$101	$63	$164	2018Q2	4.6%	$106	$66	$172	172
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$1,006	$631	62.8%	$1,637	0.0%	$1,006	$631	$1,637	2020Q2	12.9%	$1,136	$713	$1,849	1849
2.0%	Project Operation:	$201	$126	62.8%	$327	0.0%	$201	$126	$327	2020Q2	12.9%	$227	$142	$369	369
2.5%	Project Management	$252	$158	62.8%	$410	0.0%	$252	$158	$410	2020Q2	12.9%	$285	$179	$463	463
	CONTRACT COST TOTALS:	$18,536	$9,899		**$28,435**		$17,963	$9,528	$27,492			$18,974	$10,142	**$29,115**	29115 checks if the same
															29115

Pg Brk 4

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District PREPARED: 1/30/2016
POC: CHIEF, COST ENGINEERING, SON HA

	Price Level of Est	2016(Oct - Dec)			Price level date of M2 ==>	2017Q1
	Program Year Pri	2016(Oct - Dec)			Program Year Price Level ==>	2017Q1
847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			30-Jan-16	Program Year (Budget EC):			2017					
		Effective Price Level:			1-Oct-16	Effective Price Level Date:			1 OCT 16	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	REACH 6. LEFT BANK (ONLY ½ BRIDGE)													
02	UTILITY RELOCATIONS	$278	$98	35.1%	$376	0.0%	$278	$98	$376	2020Q2	6.4%	$296	$104	$400
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$5,109	$4,326	84.7%	$9,435	-6.0%	$4,801	$4,065	$8,866	2020Q2	6.4%	$5,109	$4,326	$9,435
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$0	$0	21.5%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0

								CONSTRUCTION ESTIMATE TOTALS:	$5,387	$4,424	82.1%	$9,811		$5,079	$4,163	$9,242			$5,405	$4,430	$9,835	9835	
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1	01	LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
					(This uses the CWCCIS Composite Index escalation factor).																		
							30	PLANNING, ENGINEERING & DESIGN															
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2	2.5%	Project Management	$135	$111	82.1%	$246	0.0%	$135	$111	$246	2018Q2	4.6%	$141	$116	$257	257	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	1.0%	Planning & Environmental Compliance	$54	$44	82.1%	$98	0.0%	$54	$44	$98	2018Q2	4.6%	$56	$46	$103	103	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	15.0%	Engineering & Design	$808	$664	82.1%	$1,472	0.0%	$808	$664	$1,472	2018Q2	4.6%	$845	$694	$1,539	1539	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	1.0%	Reviews, ATRs, IEPRs, VE	$54	$44	82.1%	$98	0.0%	$54	$44	$98	2018Q2	4.6%	$56	$46	$103	103	
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2	1.0%	Life Cycle Updates (cost, schedule, risks)	$54	$44	82.1%	$98	0.0%	$54	$44	$98	2018Q2	4.6%	$56	$46	$103	103	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	1.0%	Contracting & Reprographics	$54	$44	82.1%	$98	0.0%	$54	$44	$98	2018Q2	4.6%	$56	$46	$103	103	
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2	3.0%	Engineering During Construction	$162	$133	82.1%	$295	0.0%	$162	$133	$295	2020Q2	12.9%	$183	$150	$333	333	
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2	2.0%	Planning During Construction	$108	$89	82.1%	$197	0.0%	$108	$89	$197	2020Q2	12.9%	$122	$100	$222	222	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	1.0%	Project Operations	$54	$44	82.1%	$98	0.0%	$54	$44	$98	2018Q2	4.6%	$56	$46	$103	103	
							31	CONSTRUCTION MANAGEMENT															
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2	10.0%	Construction Management	$539	$443	82.1%	$982	0.0%	$539	$443	$982	2020Q2	12.9%	$609	$500	$1,108	1108	
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggregate Constrction Midpoint*	*2020Q2*	2.0%	Project Operation:	$108	$89	82.1%	$197	0.0%	$108	$89	$197	2020Q2	12.9%	$122	$100	$222	222	
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggregate Constrction Midpoint*	*2020Q2*	2.5%	Project Management	$135	$111	82.1%	$246	0.0%	$135	$111	$246	2020Q2	12.9%	$152	$125	$278	278	
								CONTRACT COST TOTALS:	$7,652	$6,284		$13,936		$7,344	$6,023	$13,367			$7,861	$6,448	**$14,309**	14309	checks if the same
																						14309	

Pg Brk 5

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives — DISTRICT: San Francisco District — PREPARED: 1/30/2016
LOCATION: Santa Cruz and Monterey Counties, CA — POC: CHIEF, COST ENGINEERING, SON HA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

							Civil Works Work Breakdown Structure		**ESTIMATED COST**				**PROJECT FIRST COST (Constant Dollar Basis)**				**TOTAL PROJECT COST (FULLY FUNDED)**						
									Estimate Prepared:			**30-Jan-16**	Program Year (Budget EC):		2017		FULLY FUNDED PROJECT ESTIMATE						
									Effective Price Level:			1-Oct-16	Effective Price Level Date:		1 OCT 16								
Price Level of Est	2016(Oct - Dec)				Price level date of M2 ==>	**2017Q1**	WBS NUMBER *A*	Civil Works Feature & Sub-Feature Description *B*	COST ($K) *C*	CNTG ($K) *D*	CNTG (%) *E*	TOTAL ($K) *F*	ESC (%) *G*	COST ($K) *H*	CNTG ($K) *I*	TOTAL ($K) *J*	Mid-Point Date *P*	INFLATED (%) *L*	COST ($K) *M*	CNTG ($K) *N*	FULL ($K) *O*		
Program Year Pri	2016(Oct - Dec)				Program Year Price Level ==>	2017Q1																	
								REACH 7, RIGHT AND LEFT BANKS COMBINED															
847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2	02	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	2020Q2	6.4%	$0	$0	$0		
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2	02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$4,212	$3,567	84.7%	$7,778	-6.0%	$3,958	$3,352	$7,309	2020Q2	6.4%	$4,212	$3,567	$7,778		
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2	06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	11	MOBILIZATION/DEMOBILIZATION	$498	$107	21.5%	$604	-6.0%	$468	$100	$568	2020Q2	6.4%	$498	$107	$604		
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	11	BUILD NEW LEVEE	$4,976	$2,175	43.7%	$7,151	-6.0%	$4,676	$2,044	$6,719	2020Q2	6.4%	$4,976	$2,175	$7,151		
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2	13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2	16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
								CONSTRUCTION ESTIMATE TOTALS:	$9,685	$5,848	60.4%	$15,533		$9,101	$5,496	$14,597			$9,685	$5,848	$15,533	15533	
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1	01	LANDS AND DAMAGES	$781	$25	0.0%	$806	0.0%	$781	$25	$806	2018Q1	1.8%	$795	$25	$821	821	
					(This uses the CWCCIS Composite Index escalation factor).																		
							30	PLANNING, ENGINEERING & DESIGN															
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2	2.5%	Project Management	$242	$146	60.4%	$388	0.0%	$242	$146	$388	2018Q2	4.6%	$253	$153	$406	406	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	1.0%	Planning & Environmental Compliance	$97	$59	60.4%	$156	0.0%	$97	$59	$156	2018Q2	4.6%	$101	$61	$163	163	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	15.0%	Engineering & Design	$1,453	$877	60.4%	$2,330	0.0%	$1,453	$877	$2,330	2018Q2	4.6%	$1,520	$918	$2,437	2437	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	1.0%	Reviews, ATRs, IEPRs, VE	$97	$59	60.4%	$156	0.0%	$97	$59	$156	2018Q2	4.6%	$101	$61	$163	163	
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2	1.0%	Life Cycle Updates (cost, schedule, risks)	$97	$59	60.4%	$156	0.0%	$97	$59	$156	2018Q2	4.6%	$101	$61	$163	163	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	1.0%	Contracting & Reprographics	$97	$59	60.4%	$156	0.0%	$97	$59	$156	2018Q2	4.6%	$101	$61	$163	163	
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2	3.0%	Engineering During Construction	$291	$176	60.4%	$467	0.0%	$291	$176	$467	2020Q2	12.9%	$329	$198	$527	527	
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2	2.0%	Planning During Construction	$194	$117	60.4%	$311	0.0%	$194	$117	$311	2020Q2	12.9%	$219	$132	$351	351	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	1.0%	Project Operations	$97	$59	60.4%	$156	0.0%	$97	$59	$156	2018Q2	4.6%	$101	$61	$163	163	
							31	CONSTRUCTION MANAGEMENT															
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2	10.0%	Construction Management	$969	$585	60.4%	$1,554	0.0%	$969	$585	$1,554	2020Q2	12.9%	$1,094	$661	$1,755	1755	
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggregate Constrction Midpoint*	*2020Q2*	2.0%	Project Operation:	$194	$117	60.4%	$311	0.0%	$194	$117	$311	2020Q2	12.9%	$219	$132	$351	351	
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggregate Constrction Midpoint*	*2020Q2*	2.5%	Project Management	$242	$146	60.4%	$388	0.0%	$242	$146	$388	2020Q2	12.9%	$273	$165	$438	438	
								CONTRACT COST TOTALS:	$14,536	$8,331		$22,867		$13,952	$7,978	$21,930			$14,894	$8,539	**$23,433**	23433	checks if the same
																						23433	

Pg Brk 6

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives — DISTRICT: San Francisco District — PREPARED: 1/30/2016
LOCATION: Santa Cruz and Monterey Counties, CA — POC: CHIEF, COST ENGINEERING, SON HA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

							Civil Works Work Breakdown Structure		**ESTIMATED COST**				**PROJECT FIRST COST (Constant Dollar Basis)**				**TOTAL PROJECT COST (FULLY FUNDED)**						
									Estimate Prepared:			**30-Jan-16**	Program Year (Budget EC):		2017		FULLY FUNDED PROJECT ESTIMATE						
									Effective Price Level:			1-Oct-16	Effective Price Level Date:		1 OCT 16								
Price Level of Est	2016(Oct - Dec)				Price level date of M2 ==>	**2017Q1**	WBS NUMBER *A*	Civil Works Feature & Sub-Feature Description *B*	COST ($K) *C*	CNTG ($K) *D*	CNTG (%) *E*	TOTAL ($K) *F*	ESC (%) *G*	COST ($K) *H*	CNTG ($K) *I*	TOTAL ($K) *J*	Mid-Point Date *P*	INFLATED (%) *L*	COST ($K) *M*	CNTG ($K) *N*	FULL ($K) *O*		
Program Year Pri	2016(Oct - Dec)				Program Year Price Level ==>	2017Q1																	
								REACH 7 (IGNORE)															
847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2	02	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2	02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$0	$0	84.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2	06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	11	MOBILIZATION/DEMOBILIZATION	$0	$0	21.5%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2	11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2	13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2	16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0		
								CONSTRUCTION ESTIMATE TOTALS:	$0	$0	0.0%	**$0**		$0	$0	$0			$0	$0	$0	0	
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1	01	LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
					(This uses the CWCCIS Composite Index escalation factor).																		
							30	PLANNING, ENGINEERING & DESIGN															
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2	2.5%	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	1.0%	Planning & Environmental Compliance	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	15.0%	Engineering & Design	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	1.0%	Reviews, ATRs, IEPRs, VE	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2	1.0%	Life Cycle Updates (cost, schedule, risks)	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	1.0%	Contracting & Reprographics	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2	3.0%	Engineering During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2	2.0%	Planning During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	1.0%	Project Operations	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
							31	CONSTRUCTION MANAGEMENT															
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2	10.0%	Construction Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggregate Constrction Midpoint*	*2020Q2*	2.0%	Project Operation:	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggregate Constrction Midpoint*	*2020Q2*	2.5%	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0	

	CONTRACT COST TOTALS:	$0	$0		$0		$0	$0	$0			$0	$0	$0	0	checks if the same
															0	

Pg Brk 7

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA
PREPARED: 1/30/2016

Price Level of Est 2016(Oct - Dec) — Price level date of M2 ==> **2017Q1**
Program Year Pri 2016(Oct - Dec) — Program Year Price Level ==> 2017Q1

847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint (This uses the CWCCIS Composite Index escalation factor).	2018Q1
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggreagate Constrction Midpoint	2020Q2

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared: 30-Jan-16 Effective Price Level: 1-Oct-16				Program Year (Budget EC): 2017 Effective Price Level Date: 1 OCT 16				FULLY FUNDED PROJECT ESTIMATE					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O	
	REACH 8. RIGHT BANK (ONLY ½ BRIDGE)														
02	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	2020Q2	6.4%	$0	$0	$0	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$6,430	$5,445	84.7%	$11,875	-6.0%	$6,043	$5,117	$11,159	2020Q2	6.4%	$6,430	$5,445	$11,875	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$0	$0	21.5%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
	CONSTRUCTION ESTIMATE TOTALS:	$6,430	$5,445	84.7%	$11,875		$6,043	$5,117	$11,159			$6,430	$5,445	$11,875	11875
01	LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$161	$136	84.7%	$297	0.0%	$161	$136	$297	2018Q2	4.6%	$168	$143	$311	311
1.0%	Planning & Environmental Compliance	$64	$54	84.7%	$118	0.0%	$64	$54	$118	2018Q2	4.6%	$67	$57	$124	124
15.0%	Engineering & Design	$965	$817	84.7%	$1,782	0.0%	$965	$817	$1,782	2018Q2	4.6%	$1,009	$855	$1,864	1864
1.0%	Reviews, ATRs, IEPRs, VE	$64	$54	84.7%	$118	0.0%	$64	$54	$118	2018Q2	4.6%	$67	$57	$124	124
1.0%	Life Cycle Updates (cost, schedule, risks)	$64	$54	84.7%	$118	0.0%	$64	$54	$118	2018Q2	4.6%	$67	$57	$124	124
1.0%	Contracting & Reprographics	$64	$54	84.7%	$118	0.0%	$64	$54	$118	2018Q2	4.6%	$67	$57	$124	124
3.0%	Engineering During Construction	$193	$163	84.7%	$356	0.0%	$193	$163	$356	2020Q2	12.9%	$218	$185	$402	402
2.0%	Planning During Construction	$129	$109	84.7%	$238	0.0%	$129	$109	$238	2020Q2	12.9%	$146	$123	$269	269
1.0%	Project Operations	$64	$54	84.7%	$118	0.0%	$64	$54	$118	2018Q2	4.6%	$67	$57	$124	124
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$643	$544	84.7%	$1,187	0.0%	$643	$544	$1,187	2020Q2	12.9%	$726	$615	$1,341	1341
2.0%	Project Operation:	$129	$109	84.7%	$238	0.0%	$129	$109	$238	2020Q2	12.9%	$146	$123	$269	269
2.5%	Project Management	$161	$136	84.7%	$297	0.0%	$161	$136	$297	2020Q2	12.9%	$182	$154	$336	336
	CONTRACT COST TOTALS:	$9,131	$7,732		$16,864		$8,744	$7,404	$16,148			$9,360	$7,926	$17,285	17285 checks if the same
															17285

Pg Brk 8

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries Alternatives
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA
PREPARED: 1/30/2016

Price Level of Est 2016(Oct - Dec) — Price level date of M2 ==> **2017Q1**
Program Year Pri 2016(Oct - Dec) — Program Year Price Level ==> 2017Q1

847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint (This uses the CWCCIS Composite Index escalation factor).	2018Q1
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	From Aggreagate Constrction Midpoint	2020Q2

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared: 30-Jan-16 Effective Price Level: 1-Oct-16				Program Year (Budget EC): 2017 Effective Price Level Date: 1 OCT 16				FULLY FUNDED PROJECT ESTIMATE					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O	
	REACH 8. LEFT BANK														
02	UTILITY RELOCATIONS	$12	$4	35.1%	$16	0.0%	$12	$4	$16	2020Q2	6.4%	$12	$4	$17	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$6,430	$5,445	84.7%	$11,875	-6.0%	$6,043	$5,117	$11,159	2020Q2	6.4%	$6,430	$5,445	$11,875	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$73	$16	21.5%	$89	-6.0%	$69	$15	$83	2020Q2	6.4%	$73	$16	$89	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$730	$319	43.7%	$1,049	-6.0%	$686	$300	$986	2020Q2	6.4%	$730	$319	$1,049	
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
	CONSTRUCTION ESTIMATE TOTALS:	$7,245	$5,784	79.8%	$13,029		$6,809	$5,435	$12,244			$7,245	$5,784	$13,030	13030
01	LANDS AND DAMAGES	$981	$180	0.0%	$ 1,161	0.0%	$981	$180	$1,161	2018Q1	1.8%	$999	$183	$1,182	1182
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$181	$145	79.8%	$326	0.0%	$181	$145	$326	2018Q2	4.6%	$189	$151	$340	340
1.0%	Planning & Environmental Compliance	$72	$57	79.8%	$129	0.0%	$72	$57	$129	2018Q2	4.6%	$75	$60	$135	135
15.0%	Engineering & Design	$1,087	$868	79.8%	$1,955	0.0%	$1,087	$868	$1,955	2018Q2	4.6%	$1,137	$908	$2,044	2044
1.0%	Reviews, ATRs, IEPRs, VE	$72	$57	79.8%	$129	0.0%	$72	$57	$129	2018Q2	4.6%	$75	$60	$135	135
1.0%	Life Cycle Updates (cost, schedule, risks)	$72	$57	79.8%	$129	0.0%	$72	$57	$129	2018Q2	4.6%	$75	$60	$135	135
1.0%	Contracting & Reprographics	$72	$57	79.8%	$129	0.0%	$72	$57	$129	2018Q2	4.6%	$75	$60	$135	135
3.0%	Engineering During Construction	$217	$173	79.8%	$390	0.0%	$217	$173	$390	2020Q2	12.9%	$245	$196	$441	441
2.0%	Planning During Construction	$145	$116	79.8%	$261	0.0%	$145	$116	$261	2020Q2	12.9%	$164	$131	$294	294
1.0%	Project Operations	$72	$57	79.8%	$129	0.0%	$72	$57	$129	2018Q2	4.6%	$75	$60	$135	135
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$724	$578	79.8%	1,302	0.0%	$724	$578	$1,302	2020Q2	12.9%	$817	$653	$1,470	1470
2.0%	Project Operation:	$145	$116	79.8%	261	0.0%	$145	$116	$261	2020Q2	12.9%	$164	$131	$294	294
2.5%	Project Management	$181	$145	79.8%	326	0.0%	$181	$145	$326	2020Q2	12.9%	$204	$163	$368	368
	CONTRACT COST TOTALS:	$11,266	$8,391		19,657		$10,830	$8,042	$18,872			$11,541	$8,600	$20,141	20141 checks if the same
															20141

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**** TOTAL PROJECT COST SUMMARY ****

PROJECT: **ALT 6 - T5 + Ring Levee (50-Year)**
PROJECT NO:
LOCATION: Santa Cruz and Monterey Counties, CA

DISTRICT: San Francisco District **PREPARED: 2/10/2017**
POC: CHIEF, COST ENGINEERING, SON HA

This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Program Year (Budget EC): 2017
Effective Price Level Date: 1 OCT 16

Civil Works Work Breakdown Structure		**ESTIMATED COST**				**PROJECT FIRST COST (Constant Dollar Basis)**						**TOTAL PROJECT COST (FULLY FUNDED)**			
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: **1-Oct-16** ($K)	**TOTAL FIRST COST** ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	***J***		***K***	***L***	***M***	***N***	***O***
02	UTILITY RELOCATIONS	$3,358	$1,180	35.1%	$4,538	0.0%	$3,358	$1,180	$4,538	$0	$4,538	6.4%	$3,574	$1,256	$4,830
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$31,580	$26,742	84.7%	$58,322	0.0%	$29,676	$25,130	$54,806	$0	$54,806	6.4%	$31,580	$26,742	$58,322
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$2,345	$503	21.5%	$2,848	0.0%	$2,203	$473	$2,676	$0	$2,676	6.4%	$2,345	$503	$2,848
11	DEMOLISH AND REBUILD LEVEE	$10,407	$4,052	38.9%	$14,460	0.0%	$9,780	$3,808	$13,588	$0	$13,588	6.4%	$10,407	$4,052	$14,460
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	$0	$0	6.4%	$0	$0	$0
11	BUILD NEW LEVEE	$8,203	$3,585	43.7%	$11,788	0.0%	$7,708	$3,369	$11,078	$0	$11,078	6.4%	$8,203	$3,585	$11,788
11	BUILD NEW FLOODWALL	$3,915	$1,248	31.9%	$5,164	0.0%	$3,679	$1,173	$4,852	$0	$4,852	6.4%	$3,915	$1,248	$5,164
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$1,981	$945	47.7%	$2,925	0.0%	$1,981	$945	$2,925	$0	$2,925	0.0%	$1,981	$945	$2,925
11	FLOOD GATES	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$1,775	$498	28.0%	$2,273	0.0%	$1,775	$498	$2,273	$0	$2,273	0.0%	$1,775	$498	$2,273
	CONSTRUCTION ESTIMATE TOTALS:	$63,565	$38,754		$102,318	-5.5%	$60,161	$36,575	$96,737	$0	$96,737	6.1%	$63,780	$38,830	$102,610
01	LANDS AND DAMAGES	$33,923	$7,500	0.0%	$41,423	0.0%	$33,923	$7,500	$41,423	$0	$41,423	0.0%	$34,550	$7,639	$42,189
30	PLANNING, ENGINEERING & DESIGN	$17,481	$8,316	47.6%	$25,797	0.0%	$17,481	$8,316	$25,797	$0	$25,797	6.1%	$18,547	$8,823	$27,371
31	CONSTRUCTION MANAGEMENT	$9,217	$4,385	47.6%	$13,602	0.0%	$9,217	$4,385	$13,602	$0	$13,602	12.9%	$10,406	$4,951	$15,357
	PROJECT COST TOTALS:	$124,186	$58,955	47.5%	$183,140		$120,782	$56,776	**$177,558**	$0	**$177,558**	5.6%	$127,284	$60,242	$187,526

Filename: Pajaro NED TPCS - Tributaries Alternative 6, 50 & 500-Year.xlsx
TPCS 6, 50-Year

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18 Numbers show up three times

PROJECT: ALT 6 - T5 + Ring Levee (500-Year)
PROJECT NO:
LOCATION: Santa Cruz and Monterev Counties. CA

DISTRICT: San Francisco District **PREPARED:** 2/10/2017
POC: CHIEF, COST ENGINEERING, SON HA

This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

Program Year (Budget EC): 2017
Effective Price Level Date: 1 OCT 16

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Spent Thru: 1-Oct-16 ($K)	TOTAL FIRST COST ($K) K	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
02	UTILITY RELOCATIONS	$3,358	$1,180	35.1%	$4,538	0.0%	$3,358	$1,180	$4,538	$0	$4,538	6.4%	$3,574	$1,256	$4,830
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$31,580	$26,742	84.7%	$58,322	0.0%	$29,676	$25,130	$54,806	$0	$54,806	6.4%	$31,580	$26,742	$58,322
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	$0	$0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$3,069	$659	21.5%	$3,728	0.0%	$2,884	$619	$3,503	$0	$3,503	6.4%	$3,069	$659	$3,728
11	DEMOLISH AND REBUILD LEVEE	$13,502	$5,257	38.9%	$18,759	0.0%	$12,688	$4,940	$17,628	$0	$17,628	6.4%	$13,502	$5,257	$18,759
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	$0	$0	6.4%	$0	$0	$0
11	BUILD NEW LEVEE	$12,355	$5,400	43.7%	$17,755	0.0%	$11,610	$5,075	$16,684	$0	$16,684	6.4%	$12,355	$5,400	$17,755
11	BUILD NEW FLOODWALL	$3,915	$1,248	31.9%	$5,164	0.0%	$3,679	$1,173	$4,852	$0	$4,852	6.4%	$3,915	$1,248	$5,164
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$1,981	$945	47.7%	$2,925	0.0%	$1,981	$945	$2,925	$0	$2,925	0.0%	$1,981	$945	$2,925
11	FLOOD GATES	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
13	PUMPING PLANT	$0	$0	-	$0	0.0%	$0	$0	$0	$0	$0	-	$0	$0	$0
16	BANK STABILIZATION	$2,458	$689	28.0%	$3,148	0.0%	$2,458	$689	$3,148	$0	$3,148	0.0%	$2,458	$689	$3,148
	CONSTRUCTION ESTIMATE TOTALS:	$72,219	$42,120		$114,339	-5.5%	$68,335	$39,751	$108,085	$0	$108,085	6.1%	$72,434	$42,196	$114,630
01	LANDS AND DAMAGES	$33.923	$7.500	0.0%	$41.423	0.0%	$33.923	$7.500	$41.423	$0	$41.423	0.0%	$34.550	$7.639	$42.189
30	PLANNING. ENGINEERING & DESIGN	$19.861	$9.027	45.4%	$28.888	0.0%	$19.861	$9.027	$28.888	$0	$28.888	6.1%	$21.072	$9.577	$30.650
31	CONSTRUCTION MANAGEMENT	$10.473	$4.760	45.4%	$15.233	0.0%	$10.473	$4.760	$15.233	$0	$15.233	12.9%	$11.824	$5.374	$17.199
	PROJECT COST TOTALS:	$136.476	$63.407	46.5%	$199.883		$132.592	$61.037	**$193.629**	$0	**$193.629**	5.7%	$139.881	$64.786	$204.667

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____________________ **CHIEF, COST ENGINEERING, SON HA**

ESTIMATED TOTAL PROJECT COST: $204.667

____________________ **PROJECT MANAGER, xxx**

____________________ **CHIEF, REAL ESTATE, xxx**

____________________ **CHIEF. PLANNING.xxx**

____________________ **CHIEF, ENGINEERING, xxx**

____________________ **CHIEF. OPERATIONS. xxx**

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____________________ **CHIEF, DPM, xxx**

Pg Brk 1

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries NED Alternative 6
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District PREPARED: 2/10/2017
POC: CHIEF, COST ENGINEERING, SON HA

Estimate Prepared: 10-Feb-17
Effective Price Level: 1-Oct-16
Program Year (Budget EC): 2017
Effective Price Level Date: 1 OCT 16

Civil Works Work Breakdown Structure			ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
WBS NUMBER A		Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	RISK BASED CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Mid-Point Date P	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
		REACH 5. RIGHT BANK													
02		UTILITY RELOCATIONS	$1,255	$441	35.1%	$1,695	0.0%	$1,255	$441	$1,695	2020Q2	6.4%	$1,335	$469	$1,804
02		ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$8,559	$7,248	84.7%	$15,807	-6.0%	$8,043	$6,811	$14,854	2020Q2	6.4%	$8,559	$7,248	$15,807
06		FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11		MOBILIZATION/DEMOBILIZATION	$895	$192	21.5%	$1,087	-6.0%	$841	$180	$1,021	2020Q2	6.4%	$895	$192	$1,087
11		DEMOLISH AND REBUILD LEVEE	$7,264	$2,828	38.9%	$10,092	-6.0%	$6,826	$2,658	$9,483	2020Q2	6.4%	$7,264	$2,828	$10,092
11		DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	-6.0%	$0	$0	$0	2020Q2	6.4%	$0	$0	$0
11		BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11		BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11		LOWER LEVEE AND BUILD NEW FLOODWALL	$1,981	$945	47.7%	$2,925	0.0%	$1,981	$945	$2,925	2020Q2	0.0%	$1,981	$945	$2,925
11		FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
13		PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
16		BANK STABILIZATION	$925	$259	28.0%	$1,184	0.0%	$925	$259	$1,184	2020Q2	0.0%	$925	$259	$1,184
		CONSTRUCTION ESTIMATE TOTALS:	$20,878	$2,617	12.5%	**$23,495**		$19,870	$11,294	$31,163			$20,958	$11,941	$32,899
01		LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30		PLANNING, ENGINEERING & DESIGN													
	2.5%	Project Management	$522	$65	12.5%	$587	0.0%	$522	$65	$587	2018Q2	4.6%	$546	$68	$614
	1.0%	Planning & Environmental Compliance	$209	$26	12.5%	$235	0.0%	$209	$26	$235	2018Q2	4.6%	$219	$27	$246
	15.0%	Engineering & Design	$3,132	$393	12.5%	$3,525	0.0%	$3,132	$393	$3,525	2018Q2	4.6%	$3,276	$411	$3,686
	1.0%	Reviews, ATRs, IEPRs, VE	$209	$26	12.5%	$235	0.0%	$209	$26	$235	2018Q2	4.6%	$219	$27	$246
	1.0%	Life Cycle Updates (cost, schedule, risks)	$209	$26	12.5%	$235	0.0%	$209	$26	$235	2018Q2	4.6%	$219	$27	$246
	1.0%	Contracting & Reprographics	$209	$26	12.5%	$235	0.0%	$209	$26	$235	2018Q2	4.6%	$219	$27	$246
	3.0%	Engineering During Construction	$626	$78	12.5%	$704	0.0%	$626	$78	$704	2020Q2	12.9%	$707	$89	$795
	2.0%	Planning During Construction	$418	$52	12.5%	$470	0.0%	$418	$52	$470	2020Q2	12.9%	$472	$59	$531
	1.0%	Project Operations	$209	$26	12.5%	$235	0.0%	$209	$26	$235	2018Q2	4.6%	$219	$27	$246
31		CONSTRUCTION MANAGEMENT													
	10.0%	Construction Management	$2,088	$262	12.5%	$2,350	0.0%	$2,088	$262	$2,350	2020Q2	12.9%	$2,357	$296	$2,653
	2.0%	Project Operation:	$418	$52	12.5%	$470	0.0%	$418	$52	$470	2020Q2	12.9%	$472	$59	$531
	2.5%	Project Management	$522	$65	12.5%	$587	0.0%	$522	$65	$587	2020Q2	12.9%	$589	$74	$663
		CONTRACT COST TOTALS:	$29,649	$3,716		$33,365		$28,641	$12,393	$41,034			$30,470	$13,133	$43,603

Price Level of Est 2016(Oct - Dec) Price level date of M2 ==> **2017Q1**
Program Year Pri 2016(Oct - Dec) Program Year Price Level ==> 2017Q1

847.49	847.49	901.86	2020(Jan - Mar)	02	**Midpoint 02**	**2020Q2**
901.86	847.49	901.86	2020(Jan - Mar)	02	**Midpoint 02**	**2020Q2**
867.10	814.82	867.10	2020(Jan - Mar)	06	**Midpoint 06**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	903.06	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	903.06	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
859.84	859.84	859.84	2020(Jan - Mar)	13	**Midpoint 13**	**2020Q2**
930.68	930.68	930.68	2020(Jan - Mar)	16	**Midpoint 16**	**2020Q2**
826.13	826.13	841.40	2017(Oct - Dec)	All	**Lands And Damages Midpoint**	**2018Q1**
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	**ENTER Design mid point period**	**2018Q2**
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	*2020Q2*
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	**ENTER CONSTRUCTION MIDPOINT**	**2020Q2**
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*

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Pg Brk 2

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries NED Alternative 6
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District PREPARED: 2/10/2017
POC: CHIEF, COST ENGINEERING, SON HA

Civil Works Work Breakdown Structure	ESTIMATED COST	PROJECT FIRST COST (Constant Dollar Basis)	TOTAL PROJECT COST (FULLY FUNDED)

Price Level of Est			2016(Oct - Dec)		Price level date of M2 ==>	2017Q1
Program Year Pri			2016(Oct - Dec)		Program Year Price Level ==>	2017Q1
847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared: / Effective Price Level:			10-Feb-17 / 1-Oct-16	Program Year (Budget EC): / Effective Price Level Date:			2017 / 1 OCT 16						
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*	
	REACH 5. LEFT BANK														
02	UTILITY RELOCATIONS	$1,642	$577	35.1%	$2,218	0.0%	$1,642	$577	$2,218	2020Q2	6.4%	$1,747	$614	$2,361	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$8,559	$7,248	84.7%	$15,807	-6.0%	$8,043	$6,811	$14,854	2020Q2	6.4%	$8,559	$7,248	$15,807	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$910	$195	21.5%	$1,105	-6.0%	$855	$184	$1,039	2020Q2	6.4%	$910	$195	$1,105	
11	DEMOLISH AND REBUILD LEVEE	$6,238	$2,429	38.9%	$8,667	-6.0%	$5,862	$2,283	$8,145	2020Q2	6.4%	$6,238	$2,429	$8,667	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	-6.0%	$0	$0	$0	2020Q2	6.4%	$0	$0	$0	
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW FLOODWALL	$3,556	$1,134	31.9%	$4,690	-6.0%	$3,342	$1,066	$4,407	2020Q2	6.4%	$3,556	$1,134	$4,690	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$920	$258	28.0%	$1,178	0.0%	$920	$258	$1,178	2020Q2	0.0%	$920	$258	$1,178	
	CONSTRUCTION ESTIMATE TOTALS:	$21,825	$11,841	54.3%	**$33,666**		$20,664	$11,177	$31,841			$21,931	$11,878	$33,808	33808
01	LANDS AND DAMAGES	$21,945	$5,089	0.0%	$27,034	0.0%	$21,945	$5,089	$27,034	2018Q1	1.8%	$22,351	$5,183	$27,534	27534
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$546	$296	54.3%	$842	0.0%	$546	$296	$842	2018Q2	4.6%	$571	$310	$881	881
1.0%	Planning & Environmental Compliance	$218	$118	54.3%	$336	0.0%	$218	$118	$336	2018Q2	4.6%	$228	$124	$352	352
15.0%	Engineering & Design	$3,274	$1,776	54.3%	$5,050	0.0%	$3,274	$1,776	$5,050	2018Q2	4.6%	$3,424	$1,858	$5,282	5282
1.0%	Reviews, ATRs, IEPRs, VE	$218	$118	54.3%	$336	0.0%	$218	$118	$336	2018Q2	4.6%	$228	$124	$352	352
1.0%	Life Cycle Updates (cost, schedule, risks)	$218	$118	54.3%	$336	0.0%	$218	$118	$336	2018Q2	4.6%	$228	$124	$352	352
1.0%	Contracting & Reprographics	$218	$118	54.3%	$336	0.0%	$218	$118	$336	2018Q2	4.6%	$228	$124	$352	352
3.0%	Engineering During Construction	$655	$355	54.3%	$1,010	0.0%	$655	$355	$1,010	2020Q2	12.9%	$740	$401	$1,141	1141
2.0%	Planning During Construction	$437	$237	54.3%	$674	0.0%	$437	$237	$674	2020Q2	12.9%	$493	$268	$761	761
1.0%	Project Operations	$218	$118	54.3%	$336	0.0%	$218	$118	$336	2018Q2	4.6%	$228	$124	$352	352
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$2,183	$1,184	54.3%	$3,367	0.0%	$2,183	$1,184	$3,367	2020Q2	12.9%	$2,465	$1,337	$3,802	3802
2.0%	Project Operation:	$437	$237	54.3%	$674	0.0%	$437	$237	$674	2020Q2	12.9%	$493	$268	$761	761
2.5%	Project Management	$546	$296	54.3%	$842	0.0%	$546	$296	$842	2020Q2	12.9%	$616	$334	$951	951
	CONTRACT COST TOTALS:	$52,938	$21,904		$74,842		$51,777	$21,240	$73,017			$54,224	$22,455	$76,679	76679 checks if the same
															76679

Pg Brk 3

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries NED Alternative 6 — DISTRICT: San Francisco District — PREPARED: 2/10/2017
LOCATION: Santa Cruz and Monterey Counties, CA — POC: CHIEF, COST ENGINEERING, SON HA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

Price Level of Est			2016(Oct - Dec)		Price level date of M2 ==>	2017Q1
Program Year Pri			2016(Oct - Dec)		Program Year Price Level ==>	2017Q1
847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2
826.13	826.13	841.40	2017(Oct - Dec)	All	Lands And Damages Midpoint	2018Q1
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggreagate Constrction Midpoint	2020Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	ENTER CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared: / Effective Price Level:			10-Feb-17 / 1-Oct-16	Program Year (Budget EC): / Effective Price Level Date:			2017 / 1 OCT 16						
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*	
	REACH 6. RIGHT BANK														
02	UTILITY RELOCATIONS	$39	$14	35.1%	$52	0.0%	$39	$14	$52	2020Q2	6.4%	$41	$14	$55	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$5,109	$4,326	84.7%	$9,435	-6.0%	$4,801	$4,065	$8,866	2020Q2	6.4%	$5,109	$4,326	$9,435	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$505	$108	21.5%	$613	-6.0%	$474	$102	$576	2020Q2	6.4%	$505	$108	$613	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$5,046	$2,206	43.7%	$7,252	-6.0%	$4,742	$2,073	$6,815	2020Q2	6.4%	$5,046	$2,206	$7,252	
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$614	$172	28.0%	$786	0.0%	$614	$172	$786	2020Q2	0.0%	$614	$172	$786	
	CONSTRUCTION ESTIMATE TOTALS:	$11,312	$6,826	60.3%	**$18,138**		$10,669	$6,425	$17,095			$11,314	$6,827	$18,141	18141
01	LANDS AND DAMAGES	$3,677	$822	0.0%	$4,499	0.0%	$3,677	$822	$4,499	2018Q1	1.8%	$3,745	$837	$4,582	4582
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$283	$171	60.3%	$454	0.0%	$283	$171	$454	2018Q2	4.6%	$296	$179	$475	475
1.0%	Planning & Environmental Compliance	$113	$68	60.3%	$181	0.0%	$113	$68	$181	2018Q2	4.6%	$118	$71	$189	189
15.0%	Engineering & Design	$1,697	$1,024	60.3%	$2,721	0.0%	$1,697	$1,024	$2,721	2018Q2	4.6%	$1,775	$1,071	$2,846	2846
1.0%	Reviews, ATRs, IEPRs, VE	$113	$68	60.3%	$181	0.0%	$113	$68	$181	2018Q2	4.6%	$118	$71	$189	189
1.0%	Life Cycle Updates (cost, schedule, risks)	$113	$68	60.3%	$181	0.0%	$113	$68	$181	2018Q2	4.6%	$118	$71	$189	189
1.0%	Contracting & Reprographics	$113	$68	60.3%	$181	0.0%	$113	$68	$181	2018Q2	4.6%	$118	$71	$189	189
3.0%	Engineering During Construction	$339	$205	60.3%	$544	0.0%	$339	$205	$544	2020Q2	12.9%	$383	$231	$614	614
2.0%	Planning During Construction	$226	$136	60.3%	$362	0.0%	$226	$136	$362	2020Q2	12.9%	$255	$154	$409	409
1.0%	Project Operations	$113	$68	60.3%	$181	0.0%	$113	$68	$181	2018Q2	4.6%	$118	$71	$189	189
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$1,131	$682	60.3%	$1,813	0.0%	$1,131	$682	$1,813	2020Q2	12.9%	$1,277	$771	$2,047	2047
2.0%	Project Operation:	$226	$136	60.3%	$362	0.0%	$226	$136	$362	2020Q2	12.9%	$255	$154	$409	409
2.5%	Project Management	$283	$171	60.3%	$454	0.0%	$283	$171	$454	2020Q2	12.9%	$320	$193	$512	512
	CONTRACT COST TOTALS:	$19,739	$10,514		**$30,253**		$19,096	$10,114	$29,210			$20,211	$10,772	**$30,983**	30983 checks if the same
															30983

Pg Brk 4

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries NED Alternative 6 — DISTRICT: San Francisco District — PREPARED: 2/10/2017
LOCATION: Santa Cruz and Monterey Counties, CA — POC: CHIEF, COST ENGINEERING, SON HA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

Price Level of Est			2016(Oct - Dec)		Price level date of M2 ==>	2017Q1
Program Year Pri			2016(Oct - Dec)		Program Year Price Level ==>	2017Q1
847.49	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
901.86	847.49	901.86	2020(Jan - Mar)	02	Midpoint 02	2020Q2
867.10	814.82	867.10	2020(Jan - Mar)	06	Midpoint 06	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	848.61	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
903.06	903.06	903.06	2020(Jan - Mar)	11	Midpoint 11	2020Q2
859.84	859.84	859.84	2020(Jan - Mar)	13	Midpoint 13	2020Q2
930.68	930.68	930.68	2020(Jan - Mar)	16	Midpoint 16	2020Q2

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			10-Feb-17 / 1-Oct-16	Program Year (Budget EC): / Effective Price Level Date:			2017 / 1 OCT 16	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	REACH 6. LEFT BANK													
02	UTILITY RELOCATIONS	$424	$149	35.1%	$572	0.0%	$424	$149	$572	2020Q2	6.4%	$451	$158	$609
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$5,109	$4,326	84.7%	$9,435	-6.0%	$4,801	$4,065	$8,866	2020Q2	6.4%	$5,109	$4,326	$9,435
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	MOBILIZATION/DEMOBILIZATION	$82	$18	21.5%	$99	-6.0%	$77	$17	$93	2020Q2	6.4%	$82	$18	$99
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	BUILD NEW LEVEE	$531	$232	43.7%	$762	-6.0%	$499	$218	$716	2020Q2	6.4%	$531	$232	$762
11	BUILD NEW FLOODWALL	$359	$115	31.9%	$474	-6.0%	$338	$108	$445	2020Q2	6.4%	$359	$115	$474
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0

826.13	826.13	841.40	2017(Oct - Dec)	All	**Lands And Damages Midpoint**	**2018Q1**
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	**ENTER Design mid point period**	**2018Q2**
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	**ENTER CONSTRUCTION MIDPOINT**	**2020Q2**
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*

	CONSTRUCTION ESTIMATE TOTALS:	$6,504	$4,839	74.4%	**$11,344**		$6,138	$4,556	$10,694			$6,532	$4,849	$11,380	11380
01	LANDS AND DAMAGES	$1,742	$328	0.0%	$2,070	0.0%	$1,742	$328	$2,070	2018Q1	1.8%	$1,774	$334	$2,108	2108
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$163	$121	74.4%	$284	0.0%	$163	$121	$284	2018Q2	4.6%	$170	$127	$297	297
1.0%	Planning & Environmental Compliance	$65	$48	74.4%	$113	0.0%	$65	$48	$113	2018Q2	4.6%	$68	$51	$119	119
15.0%	Engineering & Design	$976	$726	74.4%	$1,702	0.0%	$976	$726	$1,702	2018Q2	4.6%	$1,021	$759	$1,780	1780
1.0%	Reviews, ATRs, IEPRs, VE	$65	$48	74.4%	$113	0.0%	$65	$48	$113	2018Q2	4.6%	$68	$51	$119	119
1.0%	Life Cycle Updates (cost, schedule, risks)	$65	$48	74.4%	$113	0.0%	$65	$48	$113	2018Q2	4.6%	$68	$51	$119	119
1.0%	Contracting & Reprographics	$65	$48	74.4%	$113	0.0%	$65	$48	$113	2018Q2	4.6%	$68	$51	$119	119
3.0%	Engineering During Construction	$195	$145	74.4%	$340	0.0%	$195	$145	$340	2020Q2	12.9%	$220	$164	$384	384
2.0%	Planning During Construction	$130	$97	74.4%	$227	0.0%	$130	$97	$227	2020Q2	12.9%	$147	$109	$256	256
1.0%	Project Operations	$65	$48	74.4%	$113	0.0%	$65	$48	$113	2018Q2	4.6%	$68	$51	$119	119
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$650	$484	74.4%	$1,134	0.0%	$650	$484	$1,134	2020Q2	12.9%	$734	$546	$1,280	1280
2.0%	Project Operation:	$130	$97	74.4%	$227	0.0%	$130	$97	$227	2020Q2	12.9%	$147	$109	$256	256
2.5%	Project Management	$163	$121	74.4%	$284	0.0%	$163	$121	$284	2020Q2	12.9%	$184	$137	$321	321
	CONTRACT COST TOTALS:	$10,978	$7,200		**$18,178**		$10,612	$6,917	$17,529			$11,268	$7,387	**$18,656**	18656 checks if the same
															18656

Pg Brk 5

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries NED Alternative 6 DISTRICT: San Francisco District PREPARED: 2/10/2017
LOCATION: Santa Cruz and Monterey Counties, CA POC: CHIEF, COST ENGINEERING, SON HA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

		Price Level of Est	2016(Oct - Dec)		**Price level date of M2 ==>**	**2017Q1**
		Program Year Pri	2016(Oct - Dec)		**Program Year Price Level ==>**	2017Q1
847.49	847.49	901.86	2020(Jan - Mar)	02	**Midpoint 02**	**2020Q2**
901.86	847.49	901.86	2020(Jan - Mar)	02	**Midpoint 02**	**2020Q2**
867.10	814.82	867.10	2020(Jan - Mar)	06	**Midpoint 06**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	903.06	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	903.06	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
859.84	859.84	859.84	2020(Jan - Mar)	13	**Midpoint 13**	**2020Q2**
930.68	930.68	930.68	2020(Jan - Mar)	16	**Midpoint 16**	**2020Q2**
826.13	826.13	841.40	2017(Oct - Dec)	All	**Lands And Damages Midpoint**	**2018Q1**
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	**ENTER Design mid point period**	**2018Q2**
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	**ENTER CONSTRUCTION MIDPOINT**	**2020Q2**
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*

Civil Works Work Breakdown Structure		**ESTIMATED COST**				**PROJECT FIRST COST (Constant Dollar Basis)**				**TOTAL PROJECT COST (FULLY FUNDED)**					
		Estimate Prepared:			**10-Feb-17**	Program Year (Budget EC):			2017						
		Effective Price Level:			1-Oct-16	Effective Price Level Date:			1 OCT 16	FULLY FUNDED PROJECT ESTIMATE					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*	
	REACH 7. RIGHT AND LEFT BANKS COMBINED														
02	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	2020Q2	6.4%	$0	$0	$0	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$4,244	$3,594	84.7%	$7,838	-6.0%	$3,988	$3,377	$7,365	2020Q2	6.4%	$4,244	$3,594	$7,838	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$678	$145	21.5%	$823	-6.0%	$637	$137	$774	2020Q2	6.4%	$678	$145	$823	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$6,778	$2,963	43.7%	$9,740	-6.0%	$6,369	$2,784	$9,153	2020Q2	6.4%	$6,778	$2,963	$9,740	
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
	CONSTRUCTION ESTIMATE TOTALS:	$11,700	$6,702	57.3%	**$18,401**		$10,994	$6,298	$17,292			$11,700	$6,702	$18,401	18401
01	LANDS AND DAMAGES	$6,559	$1,261	0.0%	$7,820	0.0%	$6,559	$1,261	$7,820	2018Q1	1.8%	$6,680	$1,284	$7,965	7965
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$292	$167	57.3%	$459	0.0%	$292	$167	$459	2018Q2	4.6%	$305	$175	$480	480
1.0%	Planning & Environmental Compliance	$117	$67	57.3%	$184	0.0%	$117	$67	$184	2018Q2	4.6%	$122	$70	$192	192
15.0%	Engineering & Design	$1,755	$1,005	57.3%	$2,760	0.0%	$1,755	$1,005	$2,760	2018Q2	4.6%	$1,836	$1,051	$2,887	2887
1.0%	Reviews, ATRs, IEPRs, VE	$117	$67	57.3%	$184	0.0%	$117	$67	$184	2018Q2	4.6%	$122	$70	$192	192
1.0%	Life Cycle Updates (cost, schedule, risks)	$117	$67	57.3%	$184	0.0%	$117	$67	$184	2018Q2	4.6%	$122	$70	$192	192
1.0%	Contracting & Reprographics	$117	$67	57.3%	$184	0.0%	$117	$67	$184	2018Q2	4.6%	$122	$70	$192	192
3.0%	Engineering During Construction	$351	$201	57.3%	$552	0.0%	$351	$201	$552	2020Q2	12.9%	$396	$227	$623	623
2.0%	Planning During Construction	$234	$134	57.3%	$368	0.0%	$234	$134	$368	2020Q2	12.9%	$264	$151	$416	416
1.0%	Project Operations	$117	$67	57.3%	$184	0.0%	$117	$67	$184	2018Q2	4.6%	$122	$70	$192	192
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$1,170	$670	57.3%	$1,840	0.0%	$1,170	$670	$1,840	2020Q2	12.9%	$1,321	$757	$2,078	2078
2.0%	Project Operation:	$234	$134	57.3%	$368	0.0%	$234	$134	$368	2020Q2	12.9%	$264	$151	$416	416
2.5%	Project Management	$292	$167	57.3%	$459	0.0%	$292	$167	$459	2020Q2	12.9%	$330	$189	$519	519
	CONTRACT COST TOTALS:	$23,172	$10,777		**$33,949**		$22,466	$10,373	$32,839			$23,708	$11,038	**$34,746**	34746 checks if the same
															34746

Pg Brk 6

****** CONTRACT COST SUMMARY ******

PROJECT: Pajaro River Flood Risk Management Project: Tributaries NED Alternative 6 DISTRICT: San Francisco District PREPARED: 2/10/2017
LOCATION: Santa Cruz and Monterey Counties, CA POC: CHIEF, COST ENGINEERING, SON HA
This Estimate reflects the scope and schedule in report: Pajaro Focused Array of Alternatives

		Price Level of Est	2016(Oct - Dec)		**Price level date of M2 ==>**	**2017Q1**
		Program Year Pri	2016(Oct - Dec)		**Program Year Price Level ==>**	2017Q1
847.49	847.49	901.86	2020(Jan - Mar)	02	**Midpoint 02**	**2020Q2**
901.86	847.49	901.86	2020(Jan - Mar)	02	**Midpoint 02**	**2020Q2**
867.10	814.82	867.10	2020(Jan - Mar)	06	**Midpoint 06**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	903.06	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
903.06	903.06	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**
859.84	859.84	859.84	2020(Jan - Mar)	13	**Midpoint 13**	**2020Q2**
930.68	930.68	930.68	2020(Jan - Mar)	16	**Midpoint 16**	**2020Q2**
826.13	826.13	841.40	2017(Oct - Dec)	All	**Lands And Damages Midpoint**	**2018Q1**
					(This uses the CWCCIS Composite Index escalation factor).	
1.048	1.048	1.096	2018(Jan - Mar)	30	**ENTER Design mid point period**	**2018Q2**
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2
1.048	1.048	1.183	2020(Jan - Mar)	30	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2
1.048	1.048	1.183	2020(Jan - Mar)	31	**ENTER CONSTRUCTION MIDPOINT**	**2020Q2**
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggreagate Constrction Midpoint*	*2020Q2*

Civil Works Work Breakdown Structure		**ESTIMATED COST**				**PROJECT FIRST COST (Constant Dollar Basis)**				**TOTAL PROJECT COST (FULLY FUNDED)**					
		Estimate Prepared:			**10-Feb-17**	Program Year (Budget EC):			2017						
		Effective Price Level:			1-Oct-16	Effective Price Level Date:			1 OCT 16	FULLY FUNDED PROJECT ESTIMATE					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)	
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*	
	REACH 7 (IGNORE)														
02	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
02	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$0	$0	84.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
06	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	MOBILIZATION/DEMOBILIZATION	$0	$0	21.5%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
11	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
13	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
16	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
	CONSTRUCTION ESTIMATE TOTALS:	$0	$0	0.0%	**$0**		$0	$0	$0			$0	$0	$0	0
01	LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
30	PLANNING, ENGINEERING & DESIGN														
2.5%	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Planning & Environmental Compliance	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
15.0%	Engineering & Design	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Reviews, ATRs, IEPRs, VE	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Life Cycle Updates (cost, schedule, risks)	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Contracting & Reprographics	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
3.0%	Engineering During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
2.0%	Planning During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.0%	Project Operations	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
31	CONSTRUCTION MANAGEMENT														
10.0%	Construction Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
2.0%	Project Operation:	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
2.5%	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0

CONTRACT COST TOTALS:	$0	$0	**$0**	$0	$0	$0	$0	$0

$0	0	checks if the same	
	0		

Pg Brk 7

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries NED Alternative 6
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA
PREPARED: 2/10/2017

Price Level of Est 2016(Oct - Dec) **Price level date of M2 ==>** **2017Q1**
Program Year Pri 2016(Oct - Dec) **Program Year Price Level ==>** 2017Q1

							Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
									Estimate Prepared: / Effective Price Level:			10-Feb-17 / 1-Oct-16	Program Year (Budget EC): 2017 / Effective Price Level Date: 1 OCT 16				FULLY FUNDED PROJECT ESTIMATE					
							WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Mid-Point Date P	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O	
								REACH 8. RIGHT BANK (NO IMPROVEMENTS)														
847.49	847.49	901.86	2020(Jan - Mar)	02	**Midpoint 02**	**2020Q2**	**02**	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
901.86	847.49	901.86	2020(Jan - Mar)	02	**Midpoint 02**	**2020Q2**	**02**	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$0	$0	84.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
867.10	814.82	867.10	2020(Jan - Mar)	06	**Midpoint 06**	**2020Q2**	**06**	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**	**11**	MOBILIZATION/DEMOBILIZATION	$0	$0	21.5%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**	**11**	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**	**11**	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**	**11**	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**	**11**	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	903.06	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**	**11**	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	903.06	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**	**11**	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
859.84	859.84	859.84	2020(Jan - Mar)	13	**Midpoint 13**	**2020Q2**	**13**	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
930.68	930.68	930.68	2020(Jan - Mar)	16	**Midpoint 16**	**2020Q2**	**16**	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
								CONSTRUCTION ESTIMATE TOTALS:	$0	$0	0.0%	**$0**		$0	$0	$0			$0	$0	$0	0
826.13	826.13	841.40	2017(Oct - Dec)	All	**Lands And Damages Midpoint**	**2018Q1**	**01**	LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
					(This uses the CWCCIS Composite Index escalation factor).																	
							30	PLANNING, ENGINEERING & DESIGN														
1.048	1.048	1.096	2018(Jan - Mar)	30	**ENTER Design mid point period**	**2018Q2**	*2.5%*	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	*1.0%*	Planning & Environmental Compliance	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	*15.0%*	Engineering & Design	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	*1.0%*	Reviews, ATRs, IEPRs, VE	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2	*1.0%*	Life Cycle Updates (cost, schedule, risks)	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	*1.0%*	Contracting & Reprographics	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2	*3.0%*	Engineering During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggregate Constrction Midpoint	*2020Q2*	*2.0%*	Planning During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	*1.0%*	Project Operations	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
							31	CONSTRUCTION MANAGEMENT														
1.048	1.048	1.183	2020(Jan - Mar)	31	**ENTER CONSTRUCTION MIDPOINT**	**2020Q2**	*10.0%*	Construction Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggregate Constrction Midpoint*	*2020Q2*	*2.0%*	Project Operation:	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggregate Constrction Midpoint*	*2020Q2*	*2.5%*	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
								CONTRACT COST TOTALS:	$0	$0		**$0**		$0	$0	$0			$0	$0	**$0**	0 checks if the same
																						0

Pg Brk 8

**** CONTRACT COST SUMMARY ****

PROJECT: Pajaro River Flood Risk Management Project: Tributaries NED Alternative 6
LOCATION: Santa Cruz and Monterey Counties, CA
This Estimate reflects the scope and schedule in report; Pajaro Focused Array of Alternatives

DISTRICT: San Francisco District
POC: CHIEF, COST ENGINEERING, SON HA
PREPARED: 2/10/2017

Price Level of Est 2016(Oct - Dec) **Price level date of M2 ==>** **2017Q1**
Program Year Pri 2016(Oct - Dec) **Program Year Price Level ==>** 2017Q1

							Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
									Estimate Prepared: / Effective Price Level:			10-Feb-17 / 1-Oct-16	Program Year (Budget EC): 2017 / Effective Price Level Date: 1 OCT 16				FULLY FUNDED PROJECT ESTIMATE					
							WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Mid-Point Date P	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O	
								REACH 8. LEFT BANK (NO IMPROVEMENTS)														
847.49	847.49	901.86	2020(Jan - Mar)	02	**Midpoint 02**	**2020Q2**	**02**	UTILITY RELOCATIONS	$0	$0	35.1%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
901.86	847.49	901.86	2020(Jan - Mar)	02	**Midpoint 02**	**2020Q2**	**02**	ROAD, RAMPS, ABUTMENTS, BRIDGES, CULVERTS	$0	$0	84.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
867.10	814.82	867.10	2020(Jan - Mar)	06	**Midpoint 06**	**2020Q2**	**06**	FISH & WILDLIFE FACILITIES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**	**11**	MOBILIZATION/DEMOBILIZATION	$0	$0	21.5%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**	**11**	DEMOLISH AND REBUILD LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**	**11**	DEMOLISH AND BUILD NEW LEVEE	$0	$0	38.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**	**11**	BUILD NEW LEVEE	$0	$0	43.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	848.61	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**	**11**	BUILD NEW FLOODWALL	$0	$0	31.9%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	903.06	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**	**11**	LOWER LEVEE AND BUILD NEW FLOODWALL	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
903.06	903.06	903.06	2020(Jan - Mar)	11	**Midpoint 11**	**2020Q2**	**11**	FLOOD GATES	$0	$0	48.4%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
859.84	859.84	859.84	2020(Jan - Mar)	13	**Midpoint 13**	**2020Q2**	**13**	PUMPING PLANT	$0	$0	47.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
930.68	930.68	930.68	2020(Jan - Mar)	16	**Midpoint 16**	**2020Q2**	**16**	BANK STABILIZATION	$0	$0	28.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
								CONSTRUCTION ESTIMATE TOTALS:	$0	$0	0.0%	**$0**		$0	$0	$0			$0	$0	$0	0
826.13	826.13	841.40	2017(Oct - Dec)	All	**Lands And Damages Midpoint**	**2018Q1**	**01**	LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
					(This uses the CWCCIS Composite Index escalation factor).																	
							30	PLANNING, ENGINEERING & DESIGN														
1.048	1.048	1.096	2018(Jan - Mar)	30	**ENTER Design mid point period**	**2018Q2**	*2.5%*	Project Management	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	*1.0%*	Planning & Environmental Compliance	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	*15.0%*	Engineering & Design	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	*1.0%*	Reviews, ATRs, IEPRs, VE	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From From ENTER Design mid point period	2018Q2	*1.0%*	Life Cycle Updates (cost, schedule, risks)	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	*1.0%*	Contracting & Reprographics	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.183	2020(Jan - Mar)	30	AGGREGATE CONSTRUCTION MIDPOINT	2020Q2	*3.0%*	Engineering During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.183	2020(Jan - Mar)	30	From Aggregate Constrction Midpoint	*2020Q2*	*2.0%*	Planning During Construction	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.096	2018(Jan - Mar)	30	From ENTER Design mid point period	2018Q2	*1.0%*	Project Operations	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
							31	CONSTRUCTION MANAGEMENT														
1.048	1.048	1.183	2020(Jan - Mar)	31	**ENTER CONSTRUCTION MIDPOINT**	**2020Q2**	*10.0%*	Construction Management	$0	$0	0.0%	0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggregate Constrction Midpoint*	*2020Q2*	*2.0%*	Project Operation:	$0	$0	0.0%	0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
1.048	1.048	1.183	2020(Jan - Mar)	31	*From Aggregate Constrction Midpoint*	*2020Q2*	*2.5%*	Project Management	$0	$0	0.0%	0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	0
								CONTRACT COST TOTALS:	$0	$0		**0**		$0	$0	$0			$0	$0	**$0**	0 checks if the same
																						0