SKOKOMISH RIVER BASIN
MASON COUNTY, WASHINGTON
ECOSYSTEM RESTORATION

APPENDIX K

COST ESTIMATE

Integrated Feasibility Report and Environmental Impact Statement

US Army Corps
of Engineers®
Seattle District

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APPENDX K – COST ENGINEERING

Skokomish River Basin Ecosystem Restoration
Integrated Feasibility Report / Environmental Impact Statement

INTRODUCTION

The purpose of this appendix is to document and present the detailed cost estimate prepared in support of the Skokomish River Basin Feasibility Study. The Skokomish River Basin is located on Hood Canal, a natural fjord-like arm of the Puget Sound and water of national significance. The Skokomish River is the largest source of freshwater to Hood Canal as it flows into Annas Bay and of critical importance in the overall health of Hood Canal. The Skokomish Tribe and Mason County are the local sponsors partnering with the U.S. Army Corps of Engineers for this project.

RECOMMENDED PLAN

DEVELOPMENT

Project scope for the recommended plan was developed by the PDT during the alternative and feasibility phases. Changes were made throughout the development of the Feasibility Phase, including significant reductions in feature scope. The primary focus of the Cost Engineering team was to develop a baseline cost estimate, comprehensive risk analysis, and project schedule.

The cost estimate package was developed in accordance with the requirements laid out in ER 1110-2-1302 "Civil Works Cost Engineering." Specifically, the estimate was developed to a Class 3 level in order to comply with the requirements for a budget estimate that can be used for authorization. Through the authority of the Cost Engineering MCX, the project cost was certified as accurate on August 11, 2015.

The recommended plan for ecosystem restoration includes removal of a levee near the confluence of the North and South Forks of the Skokomish River to allow for year-round fish passage, installation of large woody debris and engineered logjams, a side channel reconnection, and wetland restoration at two sites. This plan reasonably maximizes environmental benefits considering cost effectiveness and incremental cost analyses, significance of outputs, completeness, efficiency, effectiveness and acceptability. A more detailed discussion of project features included in the recommended plan is included in the Feasibility Report/Environmental Impact Statement (FR/EIS) and Engineering Appendix.

FEASIBILITY COST ENGINEERING

PRICE LEVEL

The three categories of cost contained in the Total Project Cost Summary (TPCS) are "Estimated Cost," "Project First Cost," and "Total Project Cost." The estimated cost, which is the cost calculated in MCACES

(MII), is based on a price level of October 2014. The Project First Cost, or in other words the value the project is actually authorized at, is set at October 2015. Lastly, the date point of the Total Project Cost which is the cost the government will pay at the midpoint of construction for each alternative.

Escalation is based on the September 2014 Civil Works Construction Cost Index System (CWCCIS), EM 1110-2-1304.

The cost of the recommended plan is considered fair and reasonable, provided the construction is done by a prudent and well equipped contractor.

COST ESTIMATE STRUCTURE

The cost estimate for the selected plan was prepared by the Cost Engineering Section within Seattle District. The overall structure of the cost estimate is dictated by the Civil Works – Work Breakdown Structure. This structure is followed down to the sub-feature level (e.g. feature 11 Levees and Floodwalls, followed by sub-feature 1101 Levees.) The remainder of the estimate structure is based on the expected construction methodology and phasing techniques as determined by the PDT. Note that all construction work for this project occurs under CWWBS account 06 Fish and Wildlife Facilities, and sub-account Wildlife Facilities and Sanctuaries.

Project features in the total project cost summary (TPCS) are in accordance with the CWWBS.

Contingencies are added to the cost estimates in the TPCS based on the results of the cost and schedule risk analysis performed on November 20, 2014. The risks for all project features were considered and used in development of a total project contingency.

Escalation factors to the Effective Price Level Date and the Fully Funded Project Estimate Amount through the end of construction have also been included as part of the TPCS. The inflation was based on an assumed authorization date of October 2015.

ESTIMATING SCOPE METHODOLOGY

Features of Work

As described above, the recommended plan for ecosystem restoration includes removal of a levee near the confluence of the North and South Forks of the Skokomish River to allow for year-round fish passage, installation of large woody debris and engineered logjams, a side channel reconnection, and wetland restoration at two sites. A more detailed discussion of project features included in the recommended plan follows:

Large Woody Debris (LWD):

This plan component includes placement and installation of LWD in the river channel throughout two miles of river at the upstream end of the study area. This work will be done in a variety of arrangements including single logs secured with boulders, 5-log channel clusters, and larger bar apex engineered

logjams that are secured by wooden piles. These placements are not close to a staging area, and will require double handling in order to be placed in their current locations.

Levee Breaches and Removal:
This plan component includes removal of the 5,400-foot long Confluence Levee in the vicinity of the North Fork and South Fork confluence and diversion of flow from the South Fork into the North Fork through a small diversion channel. Engineered logjams installed at the diversion will aid in directing flows to the North Fork channel and will provide fish habitat. This work will occur through the use of mechanical excavation, with haul to an off-site disposal point. At this time commercial disposal is assumed to be available within 15 miles from the staging area. Depending on the location of the levee, off-road dump trucks and multiple handlings of material will be used.

Wetland Restoration:
Two wetland restoration sites - River Mile 9 and Grange – are included in the recommended plan. An existing agricultural berm will be breached and a new wetland embankment will be constructed landward (south) varying distances. Wetland embankments are expected to be constructed with commercially purchased material, prior to the removal of existing agricultural berms. All wetland embankments will have some overexcavation, and material placement is assumed to occur in six inch lifts of soil. Placement will be done by mechanical excavator, with support from bull dozers and compactors. Top soil and hydroseed will be placed on the newly constructed wetland embankments. Similar to the removed berms and confluence levee removal, some locations will require the use of off-road dump trucks and multiple handlings of material. Purchased fill is currently assumed, however the risk analysis process considers the possibility of material provided by other sources. Elsewhere in the FR/EIS, wetland embankments are referred to as “Wetland Restoration,” due to their larger ecosystem benefits. In order to better document their specific construction requirements, these structures are referred to as “Setback Levees” in this appendix.

Side Channel Reconnection:
This plan component involves excavation of a historical side channel’s inlet and outlet, allowing the mainstem of the Skokomish River to be reconnected to a large wetland area. Significant effort will need to be made in order to get access to the reconnection. Roads out to the work area are in poor condition and will require significant improvement. Other work will include excavation at the inlet and outlet, placement of log clusters, and plantings throughout the restored area.

Estimating Techniques
The majority of the cost items used in the estimate are custom crews based on local labor costs and equipment from the most recent EP 1110-1-8 available for Region VIII. Production rate calculations were done for individual tasks. Vendor quotes for material were obtained assist in determining appropriate costs, and these were evaluated against historical precedent and engineering judgment.

Smaller cost items were estimated through the use of the MII English Costbook. Appropriate care was taken to evaluate costs with consideration for site remoteness and the ease of access for the feature of work.

With regard to overtime, it is currently assumed the contractor will follow a six day per week and ten hours per day schedule. The suitability of this may change based on the feature of work, and will be reevaluated during PED. However, longer hours will likely require site lighting, but more importantly, additional hours will start to impact crew production rates and would likely increase project costs.

The overall production rate for the project was not adjusted. Instead individual tasks were evaluated and modified as necessary. This gives a more exact understanding of the project cost and schedule. However, the risk of large scale impacts to the project's efficiency is evaluated within the Cost Risk Analysis.

PROJECT ACQUISITION STRATEGY

Assumptions were made regarding the project acquisition strategy at this phase of design. Proposal evaluation is estimated to be Best Value not low bidder. While the construction cost estimated to be less than $20M, the project is estimated to be awarded in multiple contract actions through the use of small business or otherwise restricted bidding. With the general scope of this work, it is a reasonable assumption that this project could be a small business targeted project. The risks involved with more restricted bidding strategies are captured in the risk analysis under the Acquisition category.

CONTRACTOR AND INDIRECT COST CONSIDERATIONS

The cost estimator assumed the work is done by a sub contractor which performs the major features of project work. Administration and general work will be accomplished by the prime contractor. This arrangement makes for two levels of contracting and two levels of markup costs (job office overhead, home office overhead, profit, bond, and B&O tax) for most features of the project.

The mark ups used for the Prime and Sub contractor are included as an attachment to this appendix.

PLANNING, ENGINEERING, AND DESIGN

The Planning, Engineering and Design (PED) costs are costs to develop the project from the point the project is approved, to when solicitation is completed. This work includes detailed surveys, soil investigations and preparation of the plans and specifications to guide the contractor to construct the project. These costs were estimated by PDT members with their best professional judgment for the level of effort that would be required.

CONSTRUCTION MANAGEMENT

The Construction Management (CM) costs are determined as a percent of the estimated construction costs. As with the PED costs this percentage was determined through discussions with the PDT and are included in the TPCS reports for each Alternative.

CONTINGENCY

Current regulations require formal analyses of schedule and costs risks for projects over $40 million. However, the cost of this project does not exceed that limit, and an abbreviated risk analysis was done. This process is still intended to capture all significant cost and schedule risks for the project. The risk register is available as an attachment to this appendix.

Contingency for 01 Real Estate costs was determined by Real Estate personnel and contingency for PED and CM costs was determined in consultation with the Project Manager.

The purpose of contingencies is an added cost included in the cost estimate to cover unknowns. Unknowns could include:

- Variations in quantities used for levees and earthwork construction
- Imperfections related to current survey data
- Variations in production rates for different features
- Material availability and locations

PROJECT SCHEDULE

The project schedule for major feature was developed by the cost engineer based on MII calculated durations. Sequencing for the project was based on discussions with the PDT. The project schedule is attached to this appendix. Per discussions with the team biologist there is a presumed construction window of 15 Jul to 15 Sep for all in water work based on an estimated fish window for the river basin. This scheduling consideration was applied to the construction schedules for the recommended plan to provide the most accurate project duration prediction possible at this level of design.

FINAL FEASIBILITY ESTIMATE

The final feasibility cost estimate as presented in the following Total Project Cost Summary (TPCS) for is as follows:

Cost of Skokomish River Basin Ecosystem Restoration
Mason County, Washington
2015 Feasibility Report / Environmental Impact Statement

FY 2016 Price Level $19,664,000
Fully Funded Amount $21,712,000

ATTACHMENTS

CW MCX CERTIFIED TPCS
PROJECT SCHEDULE
MCACES REPORT
CSRA RISK REGISTER

NOTES: NAMING CONVENTIONS

Naming conventions for some features included in the recommended plan have evolved over time. The table below indicates the naming conventions used in the Final FR/EIS compared to those presented in this appendix.

FR/EIS Naming Convention	**Cost Engineering Appendix Naming Convention**
Confluence Levee Removal	Car Body Levee Removal
Upstream Large Woody Debris Installation	Upstream LWD
Wetland Restoration at River Mile 9	RM 9 Levee Breach & Setback
Wetland Restoration at Grange	Grange Levee Setback
Side Channel Reconnection	River Mile 5 Reconnection

Skokomish River GI
Skokomish River General Investigation
Environmental Restoration Project

Estimate Classification: Level 3

PM/Planner: Rachel Mesko
Environmental Lead: Nancy Gleason
Technical Lead: Glenn Kato

Labor: Updated 11-Mar-2015 per Davis-Bacon General Decisions for Mason County

Estimated by	Daniel Lowry, PE, CCC
Designed by	Engineering Division, Seattle District
Prepared by	Cost Engineering Section, Seattle District
Preparation Date	3/13/2015
Effective Date of Pricing	11/14/2014
Estimated Construction Time	Days

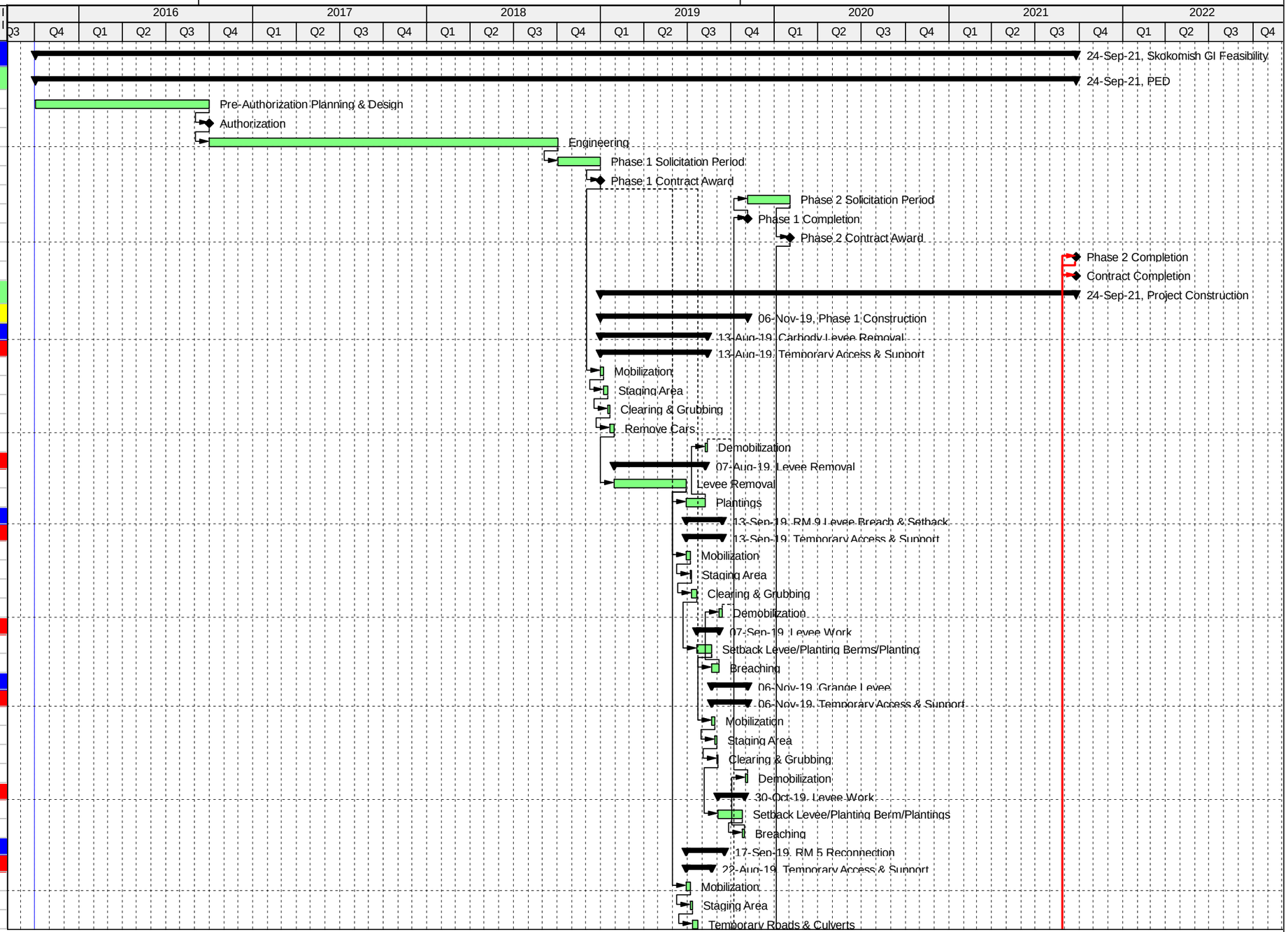
Description	Quantity	UOM	ContractCost	Escalation	Contingency	SIOH	ProjectCost
Project Cost Summary			8,956,981	0	0	0	8,956,981
Skokomish River General Investigation	1.00	EA	8,956,981	0	0	0	8,956,981
Fish and Wildlife Facilities	1.00	EA	8,956,981	0	0	0	8,956,981
Wildlife Facilities & Sanctuary	1.00	EA	8,956,981	0	0	0	8,956,981
Upstream LWD	1.00	EA	2,905,743	0	0	0	2,905,743
Car Body Levee Removal & Breach	15,058.00	BCY	2,018,610	0	0	0	2,018,610
River Mile 9 Levee Breach & Setback	1.00	EA	1,578,798	0	0	0	1,578,798
Grange Levee Setback	1.00	EA	1,602,193	0	0	0	1,602,193
River Mile 5 Reconnection	1.00	EA	851,636	0	0	0	851,636

Labor ID: NLS2012 EQ ID: EP14R08 Currency in US dollars TRACES MII Version 4.2

Description	Quantity	UOM	DirectCost	SubCMU	CostToPrime	PrimeCMU	ContractCost
Contract Cost Summary			4,861,439	1,917,499	6,778,938	2,178,043	8,956,981
Skokomish River General Investigation	1.00	EA	4,861,439	1,917,499	6,778,938	2,178,043	8,956,981
Fish and Wildlife Facilities	1.00	EA	4,861,439	1,917,499	6,778,938	2,178,043	8,956,981
Wildlife Facilities & Sanctuary	1.00	EA	4,861,439	1,917,499	6,778,938	2,178,043	8,956,981
Upstream LWD	1.00	EA	1,576,789	622,205	2,198,995	706,749	2,905,743
Car Body Levee Removal & Breach	15,058.00	BCY	1,095,390	432,244	1,527,634	490,976	2,018,610
River Mile 9 Levee Breach & Setback	1.00	EA	856,792	338,037	1,194,829	383,969	1,578,798
Grange Levee Setback	1.00	EA	870,331	342,652	1,212,983	389,210	1,602,193
River Mile 5 Reconnection	1.00	EA	462,137	182,361	644,497	207,139	851,636

Labor ID: NLS2012 EQ ID: EP14R08 Currency in US dollars TRACES MII Version 4.2

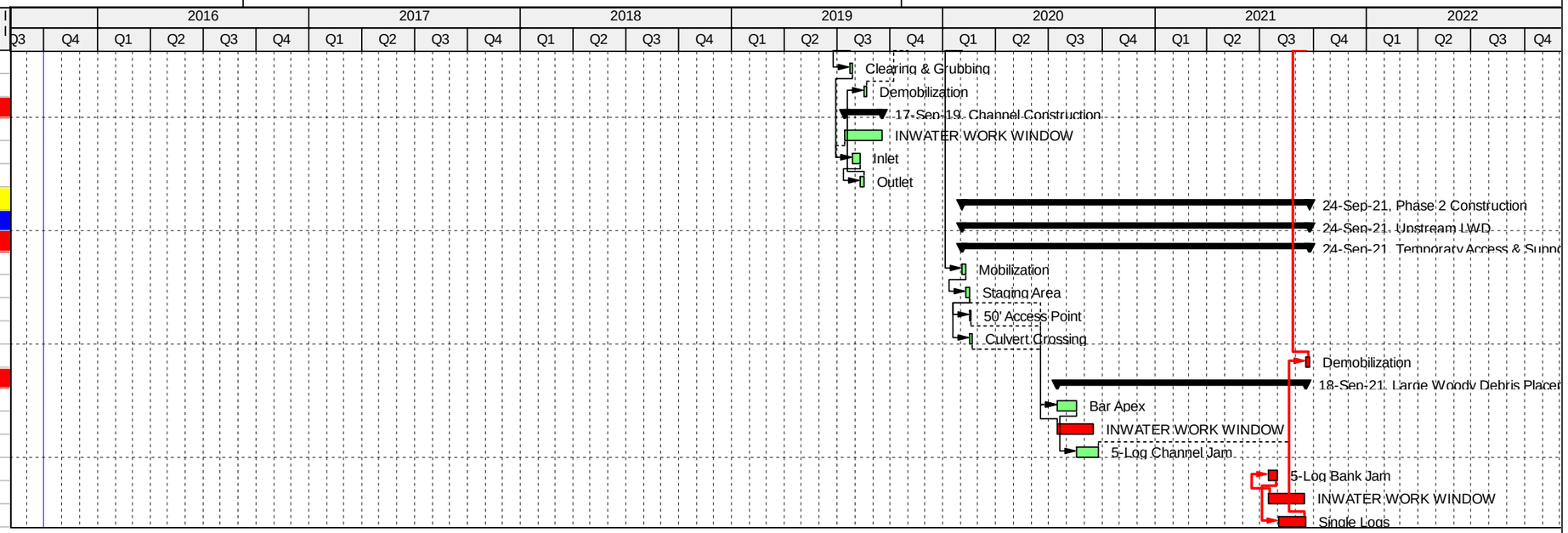
Activity ID	Activity Name
	Skokomish GI Feasibility
	PED
A1000	Pre-Authorization Planning & Design
A1010	Authorization
A1020	Engineering
A1030	Phase 1 Solicitation Period
A1040	Phase 1 Contract Award
A1370	Phase 2 Solicitation Period
A1390	Phase 1 Completion
A1380	Phase 2 Contract Award
A1400	Phase 2 Completion
A1410	Contract Completion
	Project Construction
	Phase 1 Construction
	Carbody Levee Removal
	Temporary Access & Support
	Mobilization
	Staging Area
	Clearing & Grubbing
	Remove Cars
	Demobilization
	Levee Removal
	Levee Removal
	Plantings
	RM 9 Levee Breach & Setback
	Temporary Access & Support
	Mobilization
	Staging Area
	Clearing & Grubbing
	Demobilization
	Levee Work
	Setback Levee/Planting Berms/Planting
	Breaching
	Grange Levee
	Temporary Access & Support
	Mobilization
	Staging Area
	Clearing & Grubbing
	Demobilization
	Levee Work
	Setback Levee/Planting Berm/Plantings
	Breaching
	RM 5 Reconnection
	Temporary Access & Support
	Mobilization
	Staging Area
	Temporary Roads & Culverts



Actual Work | Critical Remaining Work | Summary
Remaining Work | Milestone

TASK filter: All Activities

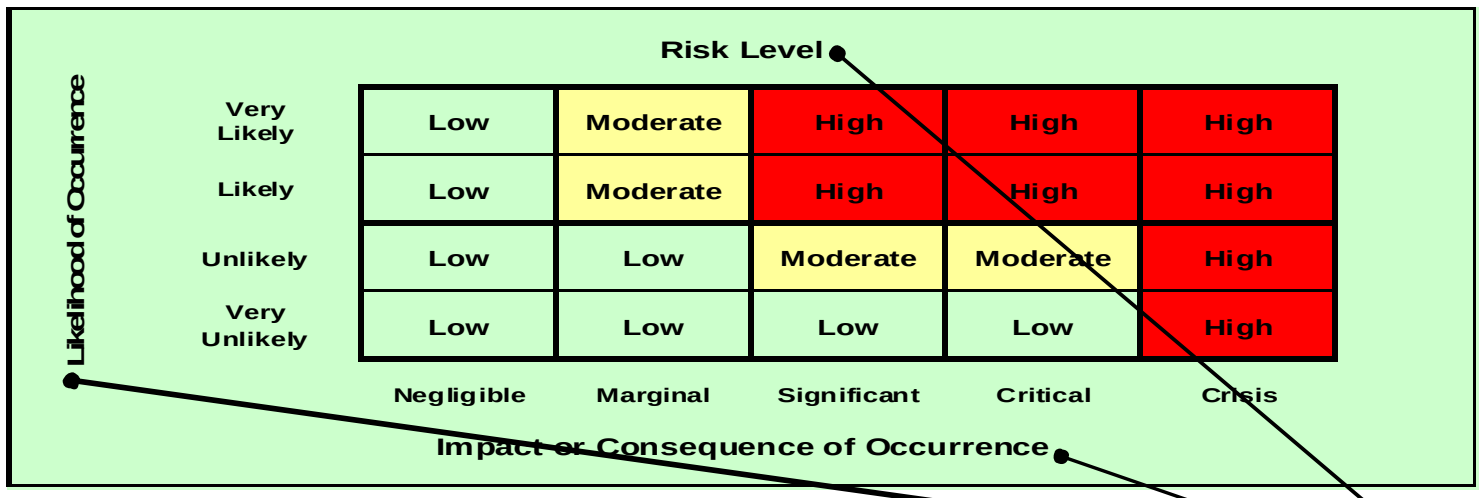
Activity ID	Activity Name
	Clearing & Grubbing
	Demobilization
	Channel Construction
	INWATER WORK WINDOW
	Inlet
	Outlet
	Phase 2 Construction
	Upstream LWD
	Temporary Access & Support
	Mobilization
	Staging Area
	50' Access Point
	Culvert Crossing
	Demobilization
	Large Woody Debris Placement
	Bar Apex
	INWATER WORK WINDOW
	5-Log Channel Jam
	5-Log Bank Jam
	INWATER WORK WINDOW
	Single Logs



Actual Work | Critical Remaining Work | Summary
Remaining Work | Milestone

TASK filter: All Activities

Skokomish River GI - PDT Risk Register



Risk No.	Risk/Opportunity Event	Concerns	PDT Discussions	Project Cost		
				Likelihood*	Impact*	Risk Level*
Contract Risks (Internal Risk Items are those that are generated, caused, or controlled within the PDT's sphere of influence.)						
	PROJECT & PROGRAM MGMT					
PPM-1	Phased Schedule	Could the project be considered for a phased schedule?	Currently considering only two phases. PDT feels like this is likely to occur and individual elements will be separated out. Marginal	Likely	Significant	HIGH
PPM-2	Design-Build	Could the project be considered for Design-Build?	No this is very unlikely and there is no support for it. Complexity is extremely low and design can be managed in house. No further analysis	Very Unlikely	Negligible	LOW
PPM-3	Corps-Sponsor Agreement	Is there agreement between the Corps and the Local Sponsor regarding project intent? If not, what design changes may there be to achieve compromise?	continue to ensure project features are compatible with existing land uses. PDT has strong concurrence on the overall scope and features. No further analysis required.	Very Unlikely	Negligible	LOW
PPM-4	Environmental Outputs	Does the project currently meet environmental output objectives? How might these be adjusted as the project progresses?	Project meets stated objectives within the Feasibility Report. As the team progresses in PED, designs will be modified and refined, but there should be no significant changes.	Very Unlikely	Negligible	LOW
	CONTRACT ACQUISITION RISKS					
CA-1	Restrictive Bidding	Could this project be limited to small businesses or a restrictive MATOC?	business. The estimate already assumes small business management, but very restrictive arrangements may increase cost. The most complex portion of the project will be the LWD debris installation and may present	Very Likely	Critical	HIGH
CA-2	Local Availability	Are there sufficient local contractors that have required skills for this project?	Shelton is probably the closest major population center. Other contractors are likely to be brought in from Aberdeen or Tacoma. This will likely raise costs due to commute times or on-site per diem costs. Shelton area contractors may partner and pursue a joint	Likely	Significant	HIGH
CA-3	Post-award Modifications	Would this project be likely to experience significant contract modifications? What might these be?	substrate will likely need to be adjusted. There is not enough information right now to be sure that wood piles will be suitable (TL-5). Even with design changes, there may still be a risk of installing a pile and encountering resistance and having to install a different pile somewhere else. Channel and LWD: The channel may change in between contract award, and when construction will statrt. May be able to relocate jams, but diverting the channel may be needed. This should be a straightforward excavation of a relatively small channel and allowing the water to divert, but this may need to replicated multiple times. Alternatively, the project could construct one larger diversion, but the PDT	Likely	Significant	HIGH
CA-4	Market Saturation	Could the local construction market be saturated with work?	into CA-2 and there may be the need for per diem for workers and contractor management. See CA-2 for further analysis.	Very Unlikely	Negligible	LOW
CA-5	Available Materials	Will there be any portion of the project materials potentially supplied by the Corps or Local Sponsor? When will the suitability of this be identified?	but this would require substantial lead time. There should be sufficient time to identify availability. Levee fill: there may be some material available from other local sources. The county would provide this material, and this could be all of the levee material required. Soils believes that there wouldn't need to be any processing. There would need to be some road improvements to access the site. There could additional availability if there is a	Likely	Significant	HIGH
	TECHNICAL RISKS					
TL-1	Flood Risks to Construction	Are there risks that there may be construction cost increases due to flood considerations?	H&H conditions will likely change the design considerations of the plan but the cost of these changes is expected to be small. LWD will likely need to be maneuvered based on H&H conditions at construction. Additionally, wood size may be slightly decreased, and there could be reductions in overall cluster size. The designs of the two levee setbacks are not likely to change beyond minor adjustments to	Very Likely	Significant	HIGH

TL-2	Flood Risks to Design	Are there risks that the current design budget may not be sufficient due to flood considerations?	Primarily this risk for landowners downstream of the project area. There is still a large amount of work to be done here. The existing PED design estimate should be sufficient for most of this work. However, there could be some cost increases. The PDT felt confident that design cost estimates accounted for future	Likely	Marginal	MODERATE
TL-3	Utilities and Relocations	No utilities have been identified as part of the project. Could utilities relocations become part of the scope of the project?	did require movement these would be franchise easements and not part of the project. There is one power line in the vicinity of the project foot print. It is not clear if this is a franchise easement or not. Even if its not, the cost should be small. No further analysis required.	Very Unlikely	Negligible	LOW
TL-4	Piling Material	Could pilings be converted to steel due to longevity issues?	precedent for doing this on non-Corps projects. All log jams would need to address concerns about boat navigation (minimal, the river is extremely shallow). There would be concerns about noise impacts to wildlife if they were installed. It is more likely to be acceptable at this location, as compared to a marine situation. Steel piles may be required in lieu of timber piles due to installation concerns in gravels/cobbles. Additionally, buried boulders with chains could be used, and would be	Likely	Significant	HIGH
TL-5	Misc. Design Uncertainty	What sort of design issues and complexities may occur as the project progresses?	Plantings: these are likely to be pretty variable, and there may be some quantity increase if determined necessary to meet objectives. Irrigation: this is unlikely due to the high cost. Levee overtopping: unlikely to have to due any adjustements, and there would be marginal costs in dealing with this. No further analysis	Likely	Marginal	MODERATE
TL-6	Channel LWD Increases	Could design and analysis lead to increases in the amount of LWD clusters at the Channel Reconnection?	H&H may need to increase the amount of woody debris currently placed at the channel reconnection from six total to twelve. Costs would be significant to accomplish this.	Likely	Significant	HIGH
TL-7	Levee Design Certainty	How confident is the team in the levee design? How will the design potentially change as the team progresses and more information is obtained?	The overall shape is well defined, but the riverward side may be adjusted to a 3:1 slope (would be LPP). Per the local sponsor, this would mostly be crossings for local landowners, and should be minor in cost. Height may be adjusted due to changing hydraulic analysis. Levee is currently overbuilt to account for sediment deposition. Alignment of the grange levee may change due to landowner concerns, but the levee fill volume would likely decrease in this situation. Further surveys may increase quantities, and this would most likely be in the 25% range (accounted for elsewhere). The overall cost impact is assumed somewhat marginal, as costs are likely to shift based on feature, and should somewhat balance. From an	Likely	Marginal	MODERATE
TL-8	Hydraulic Uncertainty	How confident is the team in the hydraulics of the future project site? What sort of changes may occur as additional levels of detail are obtained during PED?	this risk is fairly low (unlikely). At most, a foot of increase would occur, (roughly a 25% increase in fill material). Levee armoring is currently conservative. If a change occurred it would be to decrease the amount of armoring, or to change to a less robust system.	Unlikely	Significant	MODERATE
TL-9	Levee Seepage	Levee seepage concerns?	Currently there is a lot of seepage on the backside of levees. Existing substrate has a high permeability. There is not a risk of levee failure due to seeepage. The PDT has stated a cut-off wall will not be incorporated into the design due to high cost. Current seepage is acceptable and mitigation is outside project	Very Unlikely	Marginal	LOW
TL-10	Survey Data	There is not a of LIDAR or survey data available now. How will this affect the project?	The project will be conducting surveys during PED to better determine the overall site conditions.. Could change the levee alignment and height but minimal impacts to overall quantities. A change in height up to the maximum likely of 1 foot would increase fill volume by approximately 25%.	Unlikely	Critical	MODERATE
	LANDS AND DAMAGES RISKS					
LD-1	Induced Flooding	Large woody debris may induce inundation on downstream landowners. The setback berms are sized for 6000cfs is the the possiblity that these will provide less protection that the levees being breeched? What may need to occur to prevent this?	inundation. There may be a modelling error affecting this, but this won't be fully determined until PED phase. To avoid induced the amount of large woody debris may be reduced, but H&H believes this risk is low. Adaptive management may require removal of LWD following construction to minimize impacts. There is a risk that the setback berms will need	Unlikely	Significant	MODERATE

LD-2	Lands Availability	Are all lands and easements available? Can they be acquired by the start date?	No, there is still some issues with acquiring all real estate. Multiple landowners have serious concerns. We will be able to address their concerns, the county has done one on one discussions with landowners and this is expected to continue. Most of the land should be acquirable. The Grange dike has the highest level of concern. This feature may be removed from the project if the footprint is severly curtailed. This will be determined in PED. Construction easements are tied to the land purchases and overall landowner willingness. If a landowner is not willing to sell their land, the easement will not be a significant issue as that portion of the project would be removed and it would no longer require access. LWD installation is an exception and will require access easements without purchases. The landowners in this area are likely to be accepting of the project, as long as their lands are restored to original	Likely	Marginal	MODERATE
	REGULATORY AND ENVIRONMENTAL RISKS					
RE-1	HTRW	Could HTRW be found on the site? What about at the carbody levee?	Have already done a limited phase II HTRW investigation. There were no samples that warranted further investigation. There may be cars within the levee, but we are unlikely to encounter them.	Very Unlikely	Negligible	LOW
RE-2	Archaelogical Items	Could archaeological items of significance be found on the site?	Archy: Danielle Storey. There will be a archaelogical survey during the Feasibility Phase.	Very Unlikely	Negligible	LOW
RE-3	In-water Work	Could fish window or turbidity constraints affect the project? There is a large amount of in-water work at the site. What sort of extra mitigation could be needed?	beyond what is already included in the estimate will be required. In-water work will need to be isolated from the rest of the channel and this is currently assumed. Equipment used on-site will need to use vegetable oil as lubricant. Spill kits will be needed on site. No further analysis. Note that the current schedule exceeds the in-water window by about a week	Very Unlikely	Negligible	LOW
RE-4	Climate Change	Have all appropriate climate change and sea level rise considerations been made?	The included analysis within the report, is expected to be sufficient. Currently there should be no impact due to climate change/sea level rise. There may be some minor analysis in PED, but this is likely to lead	Very Unlikely	Negligible	LOW
RE-5	ESA Consultation	If a new species is listed under ESA what could impact the project?	This is very unlikely to occur, and what mostly entail modfiying construction windows. Cost impacts should be relatively small.	Very Unlikely	Negligible	LOW
RE-6	Plantings	Planting quantities are speculative and have had limited development. Is there the potential for them to change?	Yes the quantities, species types, and sizes all will likely change as additional analysis is done. In particular, the channel reconnection site may require additional soil and confiers.	Likely	Significant	HIGH
	CONSTRUCTION RISKS					
CON-1	Care & Diversion of Water	Could there be unanticipated dewatering/care and diversion of water needs?	Diversions will likely be needed for the LWD placement. This risk is essentially identical to RE-3, no further analysis.	Very Unlikely	Negligible	LOW
CON-2	LWD Access	Could steep riverbank slopes create access issues? Could access roads need to be constructed?	placement. Access will need to be made to allow truck movement. Likely to be a short bridge or wood structure. The cost for several of these would be significant.	Likely	Significant	HIGH
CON-3	Work Restrictions	Could there be work restrictions (hours, noise, in-water, etc)	This will be the biggest issue around the LWD due to the large amount of in-water work. Levee construction work may need to be reduced somewhat to accomadate homeowner concerns, but the cost impacts from this will be negligible. There may be issues with this, but this is unlikely to be a major impediment. Wildlife will need to be avoided, contractor will need to visually survey for bald eagles, but	Unlikely	Marginal	LOW
CON-4	Public Access	Will the site be open to the public during construction? Are there other items that would affect access and staging?	There may be a need for a security guard to prevent equipment vandalism or tampering, but more likely this will be the contractor moving equipment back into secure areas to prevent vandalism. Having a security guard on-site would be quite expensive, potentially a	Likely	Significant	HIGH
CON-5	Site Conditions	Will wet or muddy site conditions impede contractor progress? Will swamp mats be required in areas? What areas will be more problemmatic than others?	The side channel portion of the project is likely to have significant issues with this. The exit end issues will be mostly surrounding the log jams, due to the one lane road. The contractor will likely stage all materials prior to construction. The main LWD placement should be relatively easy due to the gravel nature of the river bed. Car Body and Grange levees may have some issues as well.	Likely	Significant	HIGH
CON-6	Traffic Control	Will truck traffic impact surrounding properties? If so, what will be done for this?	May need to have flaggers on-site for particularly intensive phases of construction. This will not be required for the entire project. There may be some intereference with a bridge construction effort in Skokomish, but this should be completed before construction	Likely	Significant	HIGH
	ESTIMATE AND SCHEDULE RISKS					
EST-1	Civil Quantities	How likely are civil/sitework quantities for the car body levee and site channel entrance to be revised through further analysis?	This likely to occur due to limited level of design. Car body: 25%, side channel entrance: 100%. Much of the project cost is governed by earthwork quantities, and this will have a significant cost.	Very Likely	Significant	HIGH

EST-2	LWD Quantities	How likely are LWD quantities to be revised through further analysis?	which would be extremely expensive. Due to it's cost it would be extremely unlikely to occur. Potentially over 20% of the project construction cost. If this feature is needed, it would require reauthorization. PDT consensus is to not move forward with this feature, and to not consider it further in PED. Requests to include from outside agencies would need to be declined due to cost concerns and this feature	Very Unlikely	Critical	LOW
EST-3	Production Rates	How confident are the production rates?	Production rates could be impacted by both better and worse site conditions, or being able to avoid the large amount of multiple soil handling that is currently expected to occur. Some variation is likely, and the cost may be	Likely	Critical	HIGH
EST-4	Overtime	Will additional overtime or shift work be required?	all work. It is very unlikely that night work or Sunday work could occur. There would be issues with impacts to local residents, as well as the difficulty of working in areas with limted accessibility. If these did happen, costs would increase singnificantly.	Very Unlikely	Significant	LOW
EST-5	Haul Distance Changes	Are all materials within the estimated haul distance?	within a ten mile radius of the project site. The county has previously worked with several local suppliers, and this should not be a significant concern.	Very Unlikely	Negligible	LOW
EST-6	River Mile 9 berm Quantities	How likely are civil/sitework quantities for the setback berms to be revised through further analysis?	This likely to occur due to limited level of design. RM9: 215%. Much of the project cost is governed by earthwork quantities, and this will have a significant cost.	Very Likely	Critical	HIGH
EST-7	Grange berm Quantities	How likely are civil/sitework quantities for the setback berms to be revised through further analysis?	This likely to occur due to limited level of design. Grange: 218%. Much of the project cost is governed by earthwork quantities, and this will have a significant cost.	Very Likely	Crisis	HIGH
	ECONOMICS					
FL-1	Material/Disposal Fees	Could material or disposal rates increase unexpectedly?	There is likely to be some variation. Increase would have significant effects on cost. Note that CA-5 addresses the potential for material being made available from other sources.	Likely	Critical	HIGH
FL-2	Fuel Costs	Could fuel costs increase substantially?	Fuel costs are notoriously variable. It's quite likely there will be significant increases above inflation by the time construction occurs. The overall impact will be marginal, as some of this risk is priced into the baseline estimate.	Very Likely	Marginal	MODERATE
FL-3	Labor Costs	Could labor costs increase substantially?	It's unlikely that major cost increase will occur due to labor rate rise. While increase above the rate of inflation are likely, these should be a marginal increase to the overall cost.	Likely	Significant	HIGH
	Programmatic Risks (External Risk Items are those that are generated, caused, or controlled exclusively outside the PDT's sphere of influence.)					
PR-1	Regulation Changes	Could laws/regulations change and dictate different design requirements? Would we be liable for this or would we be grandfathered in?	grandfathered in to any new regulation. ESA changes can force some modifications, but it's very unlikely that any changes will occur. Water quality regulations may be more restrictive and if this occurs, more intensive C&DW would be needed, such as additional	Unlikely	Negligible	LOW
PR-2	Fish Take	Could there be fish take, and if so what would be done?	There could be fish take. Where culverts installed, these areas will need to be netted off and fish captured. This may lead to some fish death. Outside entities should already be aware that this may occur. It is an accepted risk by others, and no mitigation will be	Very Unlikely	Negligible	LOW
PR-3	Outside Influence	Are there outside entities that may influence design/construction?	LWD types. Resource agencies may want different types of log jams. This could be changing the structure design. Alternatively, the need for LWD could be removed. Very unlikely that we could justify additional wood without affecting inundation. Outside groups currently prefer the arrangement being used and they will be coordinated with during PED in order to assure satisfactory arrangement. There is a higher risk that agencies may desire additional analysis to determine the best possible arrangement. Overall, the risk is expected to relatively low. ent. Overall, the risk is expected to relatively low. Additionally, outside elements may want different levee alignments or larger breaches (potentially doubling the volulme of material removed).	Likely	Critical	HIGH
PR-4	Political Opposition	Could there be political opposition to the project?	This project has been well received at the local, state, and national levels. There are outstanding landowner concerns, but these are	Very Unlikely	Negligible	LOW
PR-5	Resource Agencies	Could there be concerns with the Resource Agencies with regards to construction disturbances of the sites?	term impacts that lead to larger restoration goals. We may reduce cost by not removing parts of the car body levee if there is vegetation that is deemed more valuable than the additional flow thru the area. We may adjust our staging and site access as well to	Very Likely	Significant	HIGH
PR-6	Permitting Issues	Local permits and environmental compliance permits	permits. The only permitting needed will be water quality and coastal zone management. These are not likely to be issues, as they have not been of concern in the past.	Very Unlikely	Negligible	LOW

*Likelihood, Impact, and Risk Level to be verified through market research and analysis (conducted by cost engineer).

1. Risk/Opportunity identified with reference to the Risk Identification Checklist and through deliberation and study of the PDT.
2. Discussions and Concerns elaborates on Risk/Opportunity Events and includes any assumptions or findings (should contain information pertinent to eventual study and
3. Likelihood is a measure of the probability of the event occurring -- **Very Unlikely**, **Unlikely**, **Moderately Likely**, **Likely**, **Very Likely.** The likelihood of the event will be the same
4. Impact is a measure of the event's effect on project objectives with relation to scope, cost, and/or schedule -- **Negligible**, **Marginal**, **Significant**, **Critical**, or **Crisis.** Impacts
5. Risk Level is the resultant of Likelihood and Impact **Low**, **Moderate**, or **High**. Refer to the matrix located at top of page.

6. Variance Distribution refers to the behavior of the individual risk item with respect to its potential effects on Project Cost and Schedule. For example, an item with clearly defined parameters and a solid most likely scenario would probably follow a triangular or normal distribution. A risk item for which the PDT has little data or probability of
7. The responsibility or POC is the entity responsible as the Subject Matter Expert (SME) for action, monitoring, or information on the PDT for the identified risk or opportunity.
8. Correlation recognizes those risk events that may be related to one another. Care should be given to ensure the risks are handled correctly without a "double counting."
9. Affected Project Component identifies the specific item of the project to which the risk directly or strongly correlates.
10. Project Implications identifies whether or not the risk item affects project cost, project schedule, or both. The PDT is responsible for conducting studies for both Project
11. Results of the risk identification process are studied and further developed by the Cost Engineer, then analyzed through the Monte Carlo Analysis Method for Cost

WALLA WALLA COST ENGINEERING MANDATORY CENTER OF EXPERTISE

COST AGENCY TECHNICAL REVIEW

CERTIFICATION STATEMENT

For Project No. 394832

NWS – Skokomish River Basin Feasibility Study

The Skokomish River Basin Feasibility Study, as presented by Seattle 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 August 11, 2015, the Cost MCX certifies the estimated total project cost of:

FY 16 Price Level: $19,664,000
Fully Funded Amount: $21,712,000

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 throughout the life of the project.

CALLAN.KIM.C.1231558221

Digitally signed by CALLAN.KIM.C.1231558221
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=CALLAN.KIM.C.1231558221
Date: 2015.08.11 13:29:56 -07'00'

For Kim C. Callan, PE, CCE, PM
Chief, Cost Engineering MCX
Walla Walla District

****** TOTAL PROJECT COST SUMMARY ******

PROJECT: **Skokomish River Basin Feasibility Study**
PROJECT NO: 394832
LOCATION: Skokomish River Basin, Washington

DISTRICT: NWS Seattle PREPARED: 4/27/2015
POC: CHIEF, COST ENGINEERING, John Dudgeon

This Estimate reflects the scope and schedule in report; Feasibility Report and Appendices

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2016									
						Effective Price Level Date: 1 OCT 15									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: **10/1/2014** ($K)	**TOTAL FIRST COST** ($K)	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*				*M*	*N*	*O*
06	FISH & WILDLIFE FACILITIES	$8,595	$4,211	49%	$12,806	1.5%	$8,720	$4,273	$12,992	$0	$12,992	8.9%	$9,496	$4,653	$14,149
06	Monitoring	$277	$97	35%	$374	2.3%	$283	$99	$383	$0	$383	28.7%	$365	$128	$492
06	Adapative Management	$85	$42	49%	$127	1.5%	$87	$42	$129	$0	$129	8.9%	$94	$46	$141
	CONSTRUCTION ESTIMATE TOTALS:	$8,957	$4,350		$13,307	1.5%	$9,090	$4,414	$13,504	$0	$13,504	9.5%	$9,955	$4,827	$14,782
01	LANDS AND DAMAGES	$1,467	$220	15%	$1,687	1.5%	$1,488	$223	$1,711	$0	$1,711	4.7%	$1,557	$234	$1,791
30	PLANNING, ENGINEERING & DESIGN	$1,713	$832	49%	$2,545	2.3%	$1,752	$851	$2,604	$0	$2,604	13.2%	$1,983	$963	$2,946
31	CONSTRUCTION MANAGEMENT	$1,214	$590	49%	$1,804	2.3%	$1,242	$603	$1,846	$0	$1,846	18.9%	$1,477	$717	$2,194
	PROJECT COST TOTALS:	$13,351	$5,992	45%	$19,343		$13,572	$6,092	**$19,664**	$0	**$19,664**	10.4%	$14,972	$6,741	$21,712

_____ CHIEF, COST ENGINEERING, John Dudgeon

_____ PROJECT MANAGER, Rachel Mesko

_____ CHIEF, REAL ESTATE, Chris Borton

_____ CHIEF, PLANNING, Valerie Ringold

_____ CHIEF, ENGINEERING, JoAnn Walls

_____ CHIEF, OPERATIONS, Elizabeth Coffey

_____ CHIEF, CONSTRUCTION, Arill Berg

_____ CHIEF, CONTRACTING, David Williams

_____ CHIEF, PPMD & DDEPM, Olton Swanson

ESTIMATED FEDERAL COST:	**65%**	**$14,113**
ESTIMATED NON-FEDERAL COST:	**35%**	**$7,599**
ESTIMATED TOTAL PROJECT COST:		**$21,712**

ANNUAL O&M ESTIMATE (LOCAL SPONSOR) **$10**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Skokomish River Basin Feasibility Study
LOCATION: Skokomish River Basin, Washington
This Estimate reflects the scope and schedule in report; Feasibility Report and Appendices

DISTRICT: NWS Seattle
POC: CHIEF, COST ENGINEERING, John Dudgeon
PREPARED: 4/27/2015

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			1-Oct-14	Program Year (Budget EC):			2016					
		Effective Price Level:			1-Oct-14	Effective Price Level Date:			1 OCT 15					
				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	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	Upstream LWD													
06	FISH & WILDLIFE FACILITIES	$2,789	$1,366	49%	$4,155	1.5%	$2,829	$1,386	$4,216	2020Q3	8.9%	$3,081	$1,510	$4,591
06	Monitoring	$89	$31	35%	$120	2.3%	$91	$32	$123	2022Q3	28.7%	$117	$41	$158
06	Adaptive Management	$28	$14	49%	$42	1.5%	$28	$14	$42	2020Q3	8.9%	$31	$15	$46
	CONSTRUCTION ESTIMATE TOTALS:	$2,906	$1,411	49%	**$4,317**		$2,949	$1,432	$4,381			$3,229	$1,566	$4,795
01	LANDS AND DAMAGES	$358	$54	15%	$412	1.5%	$363	$54	$418	2018Q3	4.7%	$380	$57	$437
30	PLANNING, ENGINEERING & DESIGN													
0.8%	Project Management	$24	$12	49%	$36	2.3%	$25	$12	$37	2018Q3	9.9%	$27	$13	$41
0.4%	Planning & Environmental Compliance	$12	$6	49%	$18	2.3%	$13	$6	$19	2018Q3	9.9%	$14	$7	$21
7.7%	Engineering & Design	$223	$108	49%	$332	2.3%	$228	$111	$339	2018Q3	9.9%	$251	$122	$373
2.2%	Reviews, ATRs, IEPRs, VE	$65	$32	49%	$96	2.3%	$66	$32	$99	2018Q3	9.9%	$73	$35	$108
0.3%	Life Cycle Updates (cost, schedule, risks)	$8	$4	49%	$12	2.3%	$8	$4	$12	2018Q3	9.9%	$9	$4	$14
0.7%	Contracting & Reprographics	$19	$9	49%	$29	2.3%	$20	$10	$30	2018Q3	9.9%	$22	$11	$33
5.0%	Engineering During Construction	$145	$71	49%	$216	2.3%	$149	$72	$221	2020Q3	18.9%	$177	$86	$263
2.0%	Planning During Construction	$58	$28	49%	$86	2.3%	$59	$29	$88	2020Q3	18.9%	$71	$34	$105
0.0%	Project Operations	$0	$0	49%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
10.6%	Construction Management	$307	$149	49%	$456	2.3%	$314	$152	$466	2020Q3	18.9%	$373	$181	$554
0.0%	Project Operation:	$0	$0	49%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
3.0%	Project Management	$87	$42	49%	$130	2.3%	$89	$43	$133	2020Q3	18.9%	$106	$51	$158
	CONTRACT COST TOTALS:	$4,214	$1,926		**$6,140**		$4,284	$1,959	$6,242			$4,732	$2,168	**$6,900**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Skokomish River Basin Feasibility Study
LOCATION: Skokomish River Basin, Washington

DISTRICT: NWS Seattle
POC: CHIEF, COST ENGINEERING, John Dudgeon

PREPARED: 4/27/2015

This Estimate reflects the scope and schedule in report; Feasibility Report and Appendices

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			10/1/2014	Program Year (Budget EC):			2016					
		Effective Price Level:			10/1/2014	Effective Price Level Date:			1 OCT 15					
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	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	Car Body Levee Removal													
06	FISH & WILDLIFE FACILITIES	$1,937	$949	49%	$2,886	1.5%	$1,965	$963	$2,928	2020Q3	8.9%	$2,140	$1,049	$3,189
06	Monitoring	$62	$22	35%	$84	2.3%	$63	$22	$86	2022Q3	28.7%	$82	$29	$110
06	Adaptive Management	$19	$9	49%	$29	1.5%	$20	$10	$29	2020Q3	8.9%	$21	$10	$32
	CONSTRUCTION ESTIMATE TOTALS:	$2,019	$980	49%	**$2,999**		$2,048	$995	$3,043			$2,243	$1,088	$3,331
01	LANDS AND DAMAGES	$195	$29	15%	$224	1.5%	$197	$30	$227	2018Q3	4.7%	$207	$31	$238
30	PLANNING, ENGINEERING & DESIGN													
0.8%	Project Management	$17	$8	49%	$25	2.3%	$17	$8	$26	2018Q3	9.9%	$19	$9	$28
0.4%	Planning & Environmental Compliance	$9	$4	49%	$13	2.3%	$9	$4	$13	2018Q3	9.9%	$10	$5	$14
7.7%	Engineering & Design	$155	$75	49%	$230	2.3%	$159	$77	$236	2018Q3	9.9%	$174	$85	$259
2.2%	Reviews, ATRs, IEPRs, VE	$45	$22	49%	$67	2.3%	$46	$22	$69	2018Q3	9.9%	$51	$25	$75
0.3%	Life Cycle Updates (cost, schedule, risks)	$6	$3	49%	$8	2.3%	$6	$3	$9	2018Q3	9.9%	$6	$3	$9
0.7%	Contracting & Reprographics	$14	$7	49%	$20	2.3%	$14	$7	$21	2018Q3	9.9%	$15	$7	$23
5.0%	Engineering During Construction	$101	$49	49%	$150	2.3%	$103	$50	$153	2020Q3	18.9%	$123	$60	$182
2.0%	Planning During Construction	$40	$20	49%	$60	2.3%	$41	$20	$61	2020Q3	18.9%	$49	$24	$73
0.0%	Project Operations	$0	$0	49%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
10.6%	Construction Management	$213	$104	49%	$317	2.3%	$218	$106	$324	2020Q3	18.9%	$259	$126	$385
0.0%	Project Operation:	$0	$0	49%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
3.0%	Project Management	$61	$29	49%	$90	2.3%	$62	$30	$92	2020Q3	18.9%	$74	$36	$109
	CONTRACT COST TOTALS:	$2,873	$1,330		**$4,203**		$2,921	$1,352	$4,273			$3,230	$1,498	**$4,727**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Skokomish River Basin Feasibility Study DISTRICT: NWS Seattle PREPARED: 4/27/2015

LOCATION: Skokomish River Basin, Washington POC: CHIEF, COST ENGINEERING, John Dudgeon

This Estimate reflects the scope and schedule in report; Feasibility Report and Appendices

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			10/1/2014	Program Year (Budget EC):			2016					
		Effective Price Level:			10/1/2014	Effective Price Level Date:			1 OCT 15					
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	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	River Mile 5 Reconnection													
06	FISH & WILDLIFE FACILITIES	$818	$401	49%	$1,218	1.5%	$830	$406	$1,236	2020Q3	8.9%	$903	$443	$1,346
06	Monitoring	$26	$9	35%	$35	2.3%	$27	$9	$36	2020Q3	28.7%	$34	$12	$46
06	Adaptive Management	$8	$4	49%	$12	1.5%	$8	$4	$12	2020Q3	8.9%	$9	$4	$13
	CONSTRUCTION ESTIMATE TOTALS:	$852	$414	49%	**$1,265**		$864	$420	$1,284			$946	$459	$1,405
01	LANDS AND DAMAGES	$175	$26	15%	$201	1.5%	$177	$27	$204	2018Q3	4.7%	$186	$28	$214
30	PLANNING, ENGINEERING & DESIGN													
0.8%	Project Management	$7	$3	49%	$11	2.3%	$7	$4	$11	2018Q3	9.9%	$8	$4	$12
0.4%	Planning & Environmental Compliance	$4	$2	49%	$5	2.3%	$4	$2	$5	2018Q3	9.9%	$4	$2	$6
7.7%	Engineering & Design	$65	$32	49%	$97	2.3%	$67	$33	$99	2018Q3	9.9%	$74	$36	$109
2.2%	Reviews, ATRs, IEPRs, VE	$19	$9	49%	$28	2.3%	$19	$9	$29	2018Q3	9.9%	$21	$10	$32
0.3%	Life Cycle Updates (cost, schedule, risks)	$2	$1	49%	$4	2.3%	$2	$1	$4	2018Q3	9.9%	$3	$1	$4
0.7%	Contracting & Reprographics	$6	$3	49%	$8	2.3%	$6	$3	$9	2018Q3	9.9%	$6	$3	$10
5.0%	Engineering During Construction	$43	$21	49%	$63	2.3%	$44	$21	$65	2020Q3	18.9%	$52	$25	$77
2.0%	Planning During Construction	$17	$8	49%	$25	2.3%	$17	$8	$26	2020Q3	18.9%	$21	$10	$31
0.0%	Project Operations	$0	$0	49%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
10.6%	Construction Management	$90	$44	49%	$134	2.3%	$92	$45	$137	2020Q3	18.9%	$109	$53	$163
0.0%	Project Operation:	$0	$0	49%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
3.0%	Project Management	$26	$12	49%	$38	2.3%	$26	$13	$39	2020Q3	18.9%	$31	$15	$46
	CONTRACT COST TOTALS:	$1,305	$575		**$1,880**		$1,327	$585	$1,911			$1,461	$647	**$2,108**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Skokomish River Basin Feasibility Study
LOCATION: Skokomish River Basin, Washington

DISTRICT: NWS Seattle
POC: CHIEF, COST ENGINEERING, John Dudgeon

PREPARED: 4/27/2015

This Estimate reflects the scope and schedule in report; Feasibility Report and Appendices

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			10/1/2014	Program Year (Budget EC):			2016					
		Effective Price Level:			10/1/2014	Effective Price Level Date:			1 OCT 15					
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	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	RM 9 Levee Breach & Setback													
06	FISH & WILDLIFE FACILITIES	$1,515	$742	49%	$2,257	1.5%	$1,537	$753	$2,290	2020Q3	8.9%	$1,674	$820	$2,494
06	Monitoring	$49	$17	35%	$66	2.3%	$50	$18	$68	2020Q3	28.7%	$65	$23	$87
06	Adaptive Management	$15	$7	49%	$22	1.5%	$15	$7	$23	2020Q3	8.9%	$17	$8	$25
	CONSTRUCTION ESTIMATE TOTALS:	$1,579	$767	49%	**$2,346**		$1,602	$778	$2,380			$1,755	$851	$2,605
01	LANDS AND DAMAGES	$377	$57	15%	$434	1.5%	$383	$57	$440	2018Q3	4.7%	$401	$60	$461
30	PLANNING, ENGINEERING & DESIGN													
0.5%	Project Management	$13	$6	49%	$20	2.3%	$14	$7	$20	2018Q3	9.9%	$15	$7	$22
0.2%	Planning & Environmental Compliance	$7	$3	49%	$10	2.3%	$7	$3	$10	2018Q3	9.9%	$8	$4	$11
4.2%	Engineering & Design	$121	$59	49%	$180	2.3%	$124	$60	$184	2018Q3	9.9%	$136	$66	$203
1.2%	Reviews, ATRs, IEPRs, VE	$35	$17	49%	$52	2.3%	$36	$18	$54	2018Q3	9.9%	$40	$19	$59
0.2%	Life Cycle Updates (cost, schedule, risks)	$4	$2	49%	$7	2.3%	$5	$2	$7	2018Q3	9.9%	$5	$2	$7
0.4%	Contracting & Reprographics	$11	$5	49%	$16	2.3%	$11	$5	$16	2018Q3	9.9%	$12	$6	$18
2.7%	Engineering During Construction	$79	$38	49%	$117	2.3%	$81	$39	$120	2020Q3	18.9%	$96	$47	$143
1.1%	Planning During Construction	$32	$15	49%	$47	2.3%	$32	$16	$48	2020Q3	18.9%	$38	$19	$57
0.0%	Project Operations	$0	$0	49%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
10.6%	Construction Management	$167	$81	49%	$248	2.3%	$171	$83	$253	2020Q3	18.9%	$203	$98	$301
0.0%	Project Operation:	$0	$0	49%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
3.0%	Project Management	$47	$23	49%	$70	2.3%	$48	$24	$72	2020Q3	18.9%	$58	$28	$86
	CONTRACT COST TOTALS:	$2,472	$1,074		**$3,546**		$2,513	$1,092	$3,605			$2,765	$1,207	**$3,972**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Skokomish River Basin Feasibility Study DISTRICT: NWS Seattle PREPARED: 4/27/2015

LOCATION: Skokomish River Basin, Washington POC: CHIEF, COST ENGINEERING, John Dudgeon

This Estimate reflects the scope and schedule in report; Feasibility Report and Appendices

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			10/1/2014	Program Year (Budget EC):			2016					
		Effective Price Level:			10/1/2014	Effective Price Level Date:			1 OCT 15					
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	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	Grange Levee Setback													
06	FISH & WILDLIFE FACILITIES	$1,536	$753	49%	$2,289	1.5%	$1,559	$764	$2,322	2020Q3	8.9%	$1,697	$832	$2,529
06	Monitoring	$51	$18	35%	$69	2.3%	$52	$18	$70	2020Q3	28.7%	$67	$24	$91
06	Adaptive Management	$15	$7	49%	$22	1.5%	$15	$7	$23	2020Q3	8.9%	$17	$8	$25
	CONSTRUCTION ESTIMATE TOTALS:	$1,602	$778	49%	**$2,380**		$1,626	$789	$2,415			$1,781	$863	$2,644
01	LANDS AND DAMAGES	$362	$54	15%	$416	1.5%	$367	$55	$422	2018Q3	4.7%	$384	$58	$442
30	PLANNING, ENGINEERING & DESIGN													
0.5%	Project Management	$13	$7	49%	$20	2.3%	$14	$7	$20	2018Q3	9.9%	$15	$7	$22
0.2%	Planning & Environmental Compliance	$7	$3	49%	$10	2.3%	$7	$3	$10	2018Q3	9.9%	$8	$4	$11
4.2%	Engineering & Design	$123	$60	49%	$183	2.3%	$126	$61	$187	2018Q3	9.9%	$138	$67	$205
1.2%	Reviews, ATRs, IEPRs, VE	$36	$17	49%	$53	2.3%	$37	$18	$54	2018Q3	9.9%	$40	$20	$60
0.2%	Life Cycle Updates (cost, schedule, risks)	$4	$2	49%	$7	2.3%	$5	$2	$7	2018Q3	9.9%	$5	$2	$7
0.4%	Contracting & Reprographics	$11	$5	49%	$16	2.3%	$11	$5	$16	2018Q3	9.9%	$12	$6	$18
2.8%	Engineering During Construction	$80	$39	49%	$119	2.3%	$82	$40	$122	2020Q3	18.9%	$97	$47	$145
1.1%	Planning During Construction	$32	$16	49%	$48	2.3%	$33	$16	$49	2020Q3	18.9%	$39	$19	$58
0.0%	Project Operations	$0	$0	49%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
10.0%	Construction Management	$169	$82	49%	$251	2.3%	$173	$84	$257	2020Q3	18.9%	$206	$100	$305
2.0%	Project Operation:	$0	$0	49%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
2.5%	Project Management	$48	$23	49%	$71	2.3%	$49	$24	$73	2020Q3	18.9%	$58	$28	$87
	CONTRACT COST TOTALS:	$2,487	$1,086		**$3,574**		$2,528	$1,104	$3,633			$2,784	$1,221	**$4,005**

Contingency on Base Estimate	80% Confidence Project Cost
Baseline Estimate Cost (Most Likely) ->	**$8,678,981**
Baseline Estimate Cost Contingency Amount ->	$4,295,598
Baseline Estimate Construction Cost (80% Confidence) ->	**$12,974,579**

Project Contingency	80% Confidence Project Cost
Project Contingency Amount (80% Confidence) ->	**$4,295,598**
Project Contingency Percentage (80% Confidence) ->	**49%**

Project Cost (80% Confidence) ->	**$12,974,579**

- PROJECT CONTINGENCY DEVELOPMENT -

Contingency Analysis

Most Likely Cost Estimate	$8,678,981	
Confidence Level	**Value**	**Contingency**
0%	**$9,562,288**	**$883,307**
5%	**$10,970,775**	**$2,291,795**
10%	**$11,251,062**	**$2,572,082**
15%	**$11,446,809**	**$2,767,829**
20%	**$11,602,967**	**$2,923,986**
25%	**$11,736,798**	**$3,057,817**
30%	**$11,857,340**	**$3,178,359**
35%	**$11,965,935**	**$3,286,954**
40%	**$12,069,118**	**$3,390,137**
45%	**$12,182,751**	**$3,503,771**
50%	**$12,290,177**	**$3,611,197**
55%	**$12,393,037**	**$3,714,056**
60%	**$12,494,725**	**$3,815,744**
65%	**$12,602,722**	**$3,923,741**
70%	**$12,712,330**	**$4,033,350**
75%	**$12,839,182**	**$4,160,201**
80%	**$12,974,579**	**$4,295,598**
85%	**$13,128,789**	**$4,449,808**
90%	**$13,335,564**	**$4,656,584**
95%	**$13,634,744**	**$4,955,763**
100%	**$15,113,450**	**$6,434,470**