US Army Corps of Engineers ®

JOHNSON COUNTY, KENTUCKY SECTION 202 PROJECT

SUPPORTING DOCUMENTATION FOR THE
COST ESTIMATE

VOLUME 5: PROJECT COST ESTIMATE

DECEMBER 2019

U.S. ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT

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1 INTRODUCTION

This section of the report details the preparation of the cost estimate, which contains all appropriate feature accounts, and the development of the implementation schedule for the project.

2 REFERENCES

- ER 1110-1-1300, Cost Engineering Policy & General Requirements, 26 Mar 1993.
- ER 1110-2-1302, Civil Works Cost Engineering, 15 June 2016.
- EI 01D010, Construction Cost Estimates, 1 Sept 1997.
- ER 1110-2-1150, Engineering & Design for Civil Works Projects, 31 Aug 1999.
- ER 37-2-10 Change 89, Accounting And Reporting – Civil Works Activities, 31 Oct 2000.
- EC 11-2-187, Corps Of Engineers Civil Works Direct Program: Program Development Guidance – Fiscal Year 2009, 30 Mar 2007.
- EP 1110-1-8 Volume 2, Construction Equipment Ownership and Operating Expense Schedule – Region II, July 2007.
- EC Bulletin No 2007-17, Application of Cost Risk Analysis Methods to develop Contingencies for Civil Works Total Project Costs, 10 Sep 2007.
- EM 1110-2-1304, Civil Works Construction Cost Index System (CWCCIS), 31 Mar 2008.
- EC 1105-2-410, Review of Decision Documents, 1 July 2008—DRAFT
- ETL 1110-2-573, Construction Cost Estimating Guide for Civil Works, 30 Sept 2008.

3 PROJECT FEATURE ACCOUNTS AND ASSOCIATED SCOPE

3.1 (01) LANDS & DAMAGES

- This feature account covers all costs associated with Real Estate, including lands, easements, rights of way, etc. The cost estimate for this account was provided by the Real Estate PDT team member and inserted into the MII estimate and TPCS. More information can be found in the RE appendix/tab.

3.2 (02) RELOCATIONS

- This feature account covers the relocations of existing utilities impacted by this project. The types and scope of relocations included in this cost estimate are outlined in the table below:

Utility Relocations and Floodwall and levee penetrations.					
Gas Line	Diameter	2"	3"	4"	6"
	Relocation Length	1,390	650		
	# of Penetrations	1	2	4	1
Water Line	Diameter	6"	8"	10"	12"
	Length	500	300	450	375
	# of Penetrations	1	2	0	6
Sanitary Sewer Line	Diameter	6"	8"	10"	14"
	Length	800	990		
	# of Penetrations	0	5	2	2
Storm Sewer	Diameter	24"	30"	60"	
	Length	797	220	570	
	# of Penetrations	13	3	5	
Power	Voltage	Low	Med	High	
	Poles Relocated	6	5	3	

- Also included is the repair/reconstruction of River Rd, which is on the south side of Paint Creek and is assumed to be damaged during construction by hauling/miscellaneous construction activities.
- A conservative length of 1,000 LF of road has been included to be replaced.

3.3 (06) FISH & WILDLIFE FACILITIES

- Environmental mitigation costs are included in this account for the restoration of 13 acres.
- Scope assumptions include clearing & grubbing, the planting of 435 seedlings per acre, as well as covering the remaining area with native grass seed and straw cover in order to aid establishment of grass.

3.4 (11) LEVEES & FLOODWALLS

Levees

- The following reaches of levees are included, as shown on the plan sheets:
    - State Street Levee
    - Flat Rock Branch Levee
    - Blackberry Branch Levee
    - Court House Levee
    - Walnut Avenue Levee

- King's Addition Levee
- All levees have a cut volume that is assumed to be removed and hauled offsite. The replacement volume and the additional fill required are assumed to come from the borrow area outlined in the plan sheets.
- Borrow area material assumed to be acceptable pending some grading/disking/watering of the material to allow it to break down. This effort has been included in the cost estimate.

Floodwalls

- The following reaches of floodwalls are included, as shown on the plan sheets:
  - Main Floodwall
  - Euclid Ave Floodwall
  - Highland Ave Floodwall

- Floodwall lengths were calculated based on the plan sheets and from LRL Structures section.
- Dimensions/qtys also obtained from Structures and validated in qty backup.
- Assumed 3 rows of battered piles, HP 14 x 73, 70' deep, spaced 5' OC along every length.
- Floodwalls 15 ft high and taller are assumed to have a 30 ft deep sheet pile cutoff wall underneath. PZ-22 sheets assumed.
- Excavated material will be replaced as fill material once the floodwall is placed to get the surrounding areas to grade. All excess material hauled offsite.

Alternative #2	**Length (feet)**
Main Wall	
> 6' I-Wall	1,530
10' T-wall	320
15' T-wall	280
28' T-wall	165
Euclid Ave Wall	
> 6' I-Wall	1,716
10' T-wall	2,505
Highland Ave Wall	
> 6' I-Wall	320

Total Floodwalls	
> 6' I-Wall	3,566
10' T-wall	2,825
15' T-wall	280
28' T-wall	165

Road Closures

- There are 4 road closures that will consist of a steel closure gate being constructed across various roadways – Tutor Key Rd., two on Route 40, and Bridge Street.
- Gates vary in height from 3-6 ft. Assumed a weight of 150 Lbs/SF of gate based on previous road closure structures in estimator's experience.
- Additional personnel gate added into this feature so that there can be passage when the gates are closed.

Demolition

- All demolition of buildings required for levee and floodwall alignments have been included in this feature account.
- Building footprints calculated using Adobe area measurements and included in qty backup.
- Buildings assumed to be an average of 15 ft high for volume calculations for haul off and disposal. Apartment building assumed to be 30 ft.

3.5 (15) FLOODWAY CONTROL & DIVERSION STRUCTURES

Interceptor Pipes

- Sizes/Lengths assumed below.
- Assumed Pipe diameter plus 1 ft on each side for roadway cut, 12" deep. Demolish pavement, haul off and dispose.
- Excavate down 4 ft plus pipe diameter.
- Pipe assumed to be corrugated HDPE. Backfill with CLSM up to pavement section.
- Pavement section assumed to be roadway cut width, 10" concrete base, 2" asphalt surface course. #3 dowels every 12" on center both sides of roadway cut.
- Assumed inlets every 100 ft for runs on the North side, and curb and gutter. (Reduce productivity here)
- For all runs sanitary manholes 300 ft.
- Location Pipe Dia Pipe Length
- Mill Branch (S) 3x 36" 300'

Closure Structure

- Based on Isometric provided by Structures. Roughly 90 ft wide by 270 ft long, with three (3) 25' x 25' steel tainter gates.
- Assumed HP 14 x 73 spaced 6.5' OC over the footprint of the base slabs for the approach slab and stilling basin; spaced 5' OC over the footprint of the gate/structure slab. Assumed avg depth 80 ft.
- PZ-22 Sheet pile cutoff underneath main portion of structure (across). Assume 80 ft deep.
- Total Excavation assumed to be 18 ft diameter
- 5,000 psi concrete assumed to be required for entire structure.
- Assumption for construction is that a combi-wall cofferdam will be constructed around the work area.
- Paint Creek will bypass the cofferdam via three (3) 10' x 10' box culverts that will be placed alongside the cofferdam to convey water.
- Access ramps from both the North and South shores will be constructed to allow access. The South access ramp will be placed over the box culverts with an appropriate amount of fill material as cover.
- Excavated material will be hauled offsite for disposal.

3.6 (18) CULTURAL RESOURCES

- There will be a cultural resource survey down and there will be some costs incurred. Depending on the level of involvement from State Historic Preservation Office (SHPO) this cost could be significant. Assumption in the cost estimate is that this will be $1 million which the PDT recognizes could be conservative but at this point in the project this is what the team felt comfortable using.

3.7 (19) BUILDINGS, GROUND & UTILITIES

Non-Structural

- There are 6 structures included in Alternatives 2 & 3 that are assumed to have dry floodproofing measures incorporated. These have been priced out as being performed by a construction contractor.
- The Non-structural elements for Alternative 4 were not priced out as construction; but rather using PVA data for replacement of those structures. More discussion on this is included in Volume 6.

3.8 (20) PERMANENT OPERATING EQUIPMENT

- This feature account is to include the costs for a flood warning and emergency evacuation plan (FWEEP) that will be implemented across the county, with an assumed cost of $1 million
- The FWEEP that will reduce life safety risk associated with flash flooding, secondarily provide important basin inflow data to the Paint Creek Closure Operator, and to assist emergency response capabilities of the local emergency responders. It will include:
    - A written plan that communicates how to operate the Paintsville FRM closure structures during flood emergencies
    - A plan for evacuation in the event of flash flooding or potential design exceedance of levees and/or floodwalls.
    - An automated flood warning system including, data collection, processing, and dissemination system.
    - A study of inundation areas to support the evacuation plan.

3.9 (30) PLANNING, ENGINEERING, AND DESIGN

- The work covered under this account includes project management, project planning, preliminary design, final design, geotechnical and HTRW investigations, hydraulic modeling, preparation of plans & specifications, engineering during construction, coordination efforts, contract advertisement, opening of bids, and contract award. The cost for this account was estimated with input from the project manager, engineering design branch chief, planning chief, and the PDT for all anticipated tasks for this project.

3.10 (31) SUPERVISION AND ADMINISTRATION

- The work covered under this account includes contract supervision, contract administration, construction administration, technical management activities, and District office supervision and administration costs. The cost for this account was estimated with input from the project manager, engineering design branch chief, planning chief, and historical S&A rates from other similar-sized projects.

4 METHODOLOGY

4.1 GENERAL

The cost estimate was prepared in MII, MCACES the 2nd generation, version 4.3 for all feature accounts associated with construction. Certain costs were derived from detail while some were based upon other sources as mentioned below.

4.2 COST METHODOLOGY

4.2.1 Historical Unit Pricing

In some instances, historical cost information was referenced and documented accordingly. These historical references include past contract bid prices for projects of similar design and magnitude and recent government studies and cost estimates.

4.2.2 Quote-in-Place

In some instances, a quote from a subcontractor may have been received that included overhead and profit. In that case, no additional markups were included for subcontractor's overhead.

4.2.3 Detailed MII Cost Estimate

The MII estimating software was used to develop a construction sequence for each item of work and applying detailed line items and crews to perform the work. Crews were developed in correspondence with the work being performed and estimated productivities. Wage rates were taken from a combination of the local Davis Bacon rates. The latest MII equipment database was also used and adjusted for current fuel and energy costs. Material prices were obtained through telephone solicitations with vendors, Internet suppliers, the MII Cost Book, and R.S. MEANS. A summary level report of the MII cost estimate for the Recommended Plan can be found in Attachment A.

4.3 DIRECT COSTS

Direct costs are based on anticipated equipment, labor, and materials necessary to construct this project. Following formulation of the direct cost, a determination is made as to whether the work would be performed by the prime contractor or a subcontractor.

4.3.1 Labor - Wage Determination

Wage rates were taken from the latest Davis-Bacon wage determination. A combination of D-B KY20190043 03/01/2019, Building & KY20190050 05/10/2019, Heavy.

4.3.2 Equipment Costs

The 2016 Equipment database, based on EP 1110-1-8, Construction Equipment Ownership and Operation Expense Schedule, Region II, was used and adjusted for current, local fuel and energy costs.

4.3.3 Vendor Quotes

Vendor quotes have been acquired and documented for the anticipated material costs for most features of work.

4.3.4 Crews

Project specific crews have been developed and applied to the detailed line items as appropriate. Crew members consist of selected complements of labor classifications and equipment pieces assembled to perform specific tasks. Productivity has been assigned to each crew reflective of the expected output per unit of measure for the specific activities listed in the cost estimate. In considering the crews and productivities, the engineer typically referenced other, similar work found in national reference manuals such as R.S. MEANS construction data, the MI Cost book, and other projects developed by USACE.

4.3.5 Quantities

Quantities were developed by USACE for each feature of work. Quantities were checked/verified by the estimator and adjusted to account for construction methodology, shrink, swell, waste, etc. Other associated sub-quantities were also developed by the estimator.

4.4 INDIRECT COSTS

4.4.1 Contract Acquisition Strategy

Through discussions with the Project Manager (PM) & PDT, one contract is planned for the remaining work. The assumption is that the winning Prime contractor would self-perform a small portion (~25%) of the major civil activities, while the remaining work will be subcontracted out.

4.4.2 Prime Contractors

4.4.2.1 Job Office Overhead (FOOH)

Job Office Overhead (JOOH) is estimated by percentage within the estimate for the Prime contractor. The estimate of 15% is based on similar-sized projects and includes such items as project supervision, contractor quality control, contractor field office supplies, personal protective equipment, field engineering, and other incidental field overhead costs.

4.4.2.2 Home Office Overhead (HOOH)

For Home Office Overhead (HOOH) expense, the cost estimate includes an allowance applied as percentage at 8% of direct cost plus field overhead. HOOH includes items such as office rental / ownership costs, utilities, office equipment ownership/maintenance, office staff (managers, accountants, clerical, etc.), insurance, and miscellaneous. In reality, the range of home office overhead can be quite broad and depends largely on the contractor's annual volume of work and the type of work that is generally performed by the contractor.

4.4.2.3 Profit

Profit was included as a running percentage of 10% for Prime based on Estimator judgment.

4.4.2.4 Bond

Bond was included as a running percentage of 1.5% (own work and subcontracted work).

4.4.2.5 Local Occupational Tax

A local occupational tax was included as a running percentage of 2.5% based on PDT input and local regulations.

4.4.3 Subcontractors

4.4.3.1 Overhead

All subcontractor overhead costs are set to 8% JOOH and 8% HOOH (own work and subcontracted work) of direct cost to account their JOOH and HOOH costs. The exception is where the subcontractor has provided a quoted price including overhead. In that case, no additional markups have been included for subcontractor's overhead.

4.4.3.2 Profit

Sub Profit was included as a running percentage of 8% based on estimator judgment.

4.4.4 Escalation

The contract was escalated to the mid-point of construction using CWCCIS, to account for potential inflation during construction. This is included in the TPCS file, not the cost estimate in MII.

4.4.5 Contingency

Contingency was applied at 26% based on the results of the Cost & Schedule Risk Analysis, conducted 6-7 Sep 2019, with updates to specific risks and design features following.

5 TOTAL PROJECT COST SUMMARY

The feasibility-level cost estimate for the Recommended Plan (Alt 2) at the FY20 price level is $110,305,000 (including spent costs for PED). This estimate was escalated over the implementation schedule to generate a fully funded cost estimate in the amount of $116,997,000. The costs for the other alternatives can be found in the TPCS pdfs included in attachment C as follows.

ATTACHMENT A

ALT 2 (RECOMMENDED PLAN) & ALT 3 MII REPORT

Estimated by	Taylor Canfield, PE, CCC LRL-ED-MC (502) 315-6268
Designed by	
Prepared by	Taylor Canfield, PE, CCC LRL-ED-MC (502) 315-6268
Preparation Date	9/13/2019
Effective Date of Pricing	10/1/2019
Estimated Construction Time	1,095 Days

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CWBS Summary 1

Recommended Plan 1

Alternative 2 (Recommended Plan) 1

01 Lands & Damages 1

02 Relocations 1

06 Fish & Wildlife Facilities 1

11 Levees & Floodwalls 1

15 Floodway Control and Diversion Structures 1

18 Cultural Resources 1

19 Buildings, Grounds & Utilities 1

20 Permanent Operating Equipment 1

30 Engineering & Design 1

31 Construction Management 1

Alternative 3 1

01 Lands & Damages 1

02 Relocations 1

06 Fish & Wildlife Facilities 1

11 Levees & Floodwalls 1

15 Floodway Control and Diversion Structures 1

18 Cultural Resources 1

19 Buildings, Grounds & Utilities 1

20 Permanent Operating Equipment 1

30 Engineering & Design 1

31 Construction Management 1

Description	Quantity	UOM	ContractCost	Contingency	ProjectCost
CWBS Summary			**178,247,515.13**	**49,590,452.24**	**227,837,967.37**
Recommended Plan	**1.0000**	**EA**	**178,247,515.13**	**49,590,452.24**	**227,837,967.37**
Alternative 2 (Recommended Plan)	**1.0000**	**LS**	**85,284,381.51**	**23,720,200.82**	**109,004,582.34**
01 Lands & Damages	**1.0000**	**LS**	**5,314,200.00**	**1,328,550.00**	**6,642,750.00**
02 Relocations	**1.0000**	**LS**	**3,033,291.20**	**849,321.54**	**3,882,612.74**
06 Fish & Wildlife Facilities	**1.0000**	**LS**	**419,774.00**	**117,536.72**	**537,310.72**
11 Levees & Floodwalls	**1.0000**	**LS**	**27,080,566.25**	**7,582,558.55**	**34,663,124.79**
15 Floodway Control and Diversion Structures	**1.0000**	**LS**	**31,970,970.80**	**8,951,871.83**	**40,922,842.63**
18 Cultural Resources	**1.0000**	**LS**	**1,000,000.00**	**280,000.00**	**1,280,000.00**
19 Buildings, Grounds & Utilities	**1.0000**	**LS**	**465,579.27**	**130,362.19**	**595,941.46**
20 Permanent Operating Equipment	**1.0000**	**LS**	**1,000,000.00**	**280,000.00**	**1,280,000.00**
30 Engineering & Design	**1.0000**	**LS**	**8,000,000.00**	**2,240,000.00**	**10,240,000.00**
31 Construction Management	**1.0000**	**LS**	**7,000,000.00**	**1,960,000.00**	**8,960,000.00**
Alternative 3	**1.0000**	**LS**	**92,963,133.62**	**25,870,251.41**	**118,833,385.03**
01 Lands & Damages	**1.0000**	**LS**	**5,314,200.00**	**1,328,550.00**	**6,642,750.00**
02 Relocations	**1.0000**	**LS**	**3,033,305.71**	**849,325.60**	**3,882,631.31**
06 Fish & Wildlife Facilities	**1.0000**	**LS**	**419,774.00**	**117,536.72**	**537,310.72**
11 Levees & Floodwalls	**1.0000**	**LS**	**34,759,303.84**	**9,732,605.08**	**44,491,908.91**
15 Floodway Control and Diversion Structures	**1.0000**	**LS**	**31,970,970.80**	**8,951,871.83**	**40,922,842.63**
18 Cultural Resources	**1.0000**	**LS**	**1,000,000.00**	**280,000.00**	**1,280,000.00**
19 Buildings, Grounds & Utilities	**1.0000**	**LS**	**465,579.27**	**130,362.19**	**595,941.46**
20 Permanent Operating Equipment	**1.0000**	**LS**	**1,000,000.00**	**280,000.00**	**1,280,000.00**
30 Engineering & Design	**1.0000**	**LS**	**8,000,000.00**	**2,240,000.00**	**10,240,000.00**
31 Construction Management	**1.0000**	**LS**	**7,000,000.00**	**1,960,000.00**	**8,960,000.00**

ATTACHMENT B

Recommended Plan CSRA

Project Development Stage/Alternative: Feasibility (Recommended Plan) - For Milestone #2

Risk Category: Moderate Risk: Typical Project or Possible Life Safety

Meeting Date: 9/4/2019

Schedule Duration

Jan-2021 (From (Month/Year)) — Jan-2024 (From (Month/Year)) **Schedule Duration:** 36.0 Months — 49% (Schedule Contingency)

80% Finish Date: Jun-2025

	CWWBS	Feature of Work	Contract Cost	% Contingency	$ Contingency	Total
	Risk Not included within CSRA Model					
	01 LANDS AND DAMAGES	01 Lands & Damages	$ 5,314,200	25%	$ 1,328,550	$ 6,642,750
	Risk included within CSRA Model					
1	02 RELOCATIONS	**02 Relocations**	$ 3,033,291	26%	$ 788,656	$ 3,821,947
2	06 FISH AND WILDLIFE FACILITIES	**06 Fish & WIldlife Facilities**	$ 419,774	26%	$ 109,141	$ 528,915
3	11 LEVEES AND FLOODWALLS	**11 Levees & Floodwalls**	$ 27,080,566	26%	$ 7,040,947	$ 34,121,513
4	15 FLOODWAY CONTROL AND DIVERSION STRUCTURES	**15 Floodway Control and Diversion Structures**	$ 31,970,971	26%	$ 8,312,452	$ 40,283,423
5	18 CULTURAL RESOURCE PRESERVATION	**18 Cultural Resources**	$ 1,000,000	26%	$ 260,000	$ 1,260,000
6	19 BUILDINGS, GROUNDS, AND UTILITIES	**19 Buildings, Grounds & Utilities**	$ 465,579	26%	$ 121,051	$ 586,630
7	20 PERMANENT OPERATING EQUIPMENT	**20 Permanent Operating Equipment**	$ 1,000,000	26%	$ 260,000	$ 1,260,000
8	All Other	**Remaining Construction Items**	$ -	0%	$ -	$ -
9	30 PLANNING, ENGINEERING, AND DESIGN	**30 Engineering & Design**	$ 8,000,000	26%	$ 2,080,000	$ 10,080,000
10	31 CONSTRUCTION MANAGEMENT	**31 Construction Management**	$ 7,000,000	26%	$ 1,820,000	$ 8,820,000
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW)				$ -	

Totals					
Real Estate	$ 5,314,200	25%	$ 1,328,550	$ 6,642,750.00
Total Construction Estimate	$ 64,970,182	26%	$ 16,892,247	$ 81,862,429
Total Planning, Engineering & Design	$ 8,000,000	26%	$ 2,080,000	$ 10,080,000
Total Construction Management	$ 7,000,000	26%	$ 1,820,000	$ 8,820,000
Fixed Dollar Risk Equally Distributed	$ -	0%	$ -	$ -
Total	**$ 85,284,382**	**26%**	**$ 22,120,797**	**$ 107,405,179**

Checks OK

											Cost Model			Schedule Model					Cost due to Schedule Risk									
					Project Cost			Project Schedule			Cost Model			Schedule Model					Cost From Schedule			TOTAL Cost		TOTAL Schedule			
Risk #		Risk/Opportunity Event	Risk Event Description	PDT Discussions on Impact and Likelihood	Likelihood	Impact	Risk level	Likelihood	Impact	Risk level	Low Variance (Min)	Likely (C)	High Variance (80%ile)	Low Variance (S) (Min)	Likely (S)	High Variance (S) (80%ile)	Pre/Post Award	Fall/Off	Low Variance (CS) (Min)	Likely Added Cost (CS)	High Variance (CS) (80%ile)	Event Prob (PC)	Simulated Cost (C) + (CS)	Event Prob (PS)	Simulated Sched (S)	Risk Quantification Discussions	Risk Mitigation Measures
Lands and Damages (LD)																												
LD1	0	Additional Easements may be needed.	Additional easement acquisition may be needed to perform work.	Additional easement acquisition may be necessary to perform work, or so that future O&M can be performed.	Unlikely	Marginal	Low	Unlikely	Significant	Medium				0 Months	6 Months	4 Months	Pre	Yes	$0	$0	$324,851	100%	$0	100%	0 Mo		
LD2	0	Real estate acquisitions not completed for interior walls	This may push contract award out if those properties aren't acquired	Cannot award until ALL real estate is acquired.	Possible	Negligible	Low	Possible	Moderate	Medium				0 Months	6 Months	3 Months	Pre	Yes	$0	$0	$243,638	100%	$0	100%	0 Mo		
Environmental and Regulatory																												
ER1	0	Mitigation Scope	Currently 2.3 Acres of mitigation included	Included 13 acres in estimate. Worst-case assumption is that the scope increases by up to 25%, whether it be additional acreage or additional work required within the 13 acres.	Possible	Marginal	Low	Possible	Marginal	Low	$0	$0	$121,901									100%	$0	100%	0 Mo		
ER2	0	Historic structures in the areas will be adversely impacted by construction	Based on initial look there are a number of structures impacted.	Initial thought is $3-6m for Cultural Resources, to be refined further in PED. Uniform from 3-6m, add $1m to base estimate. *Revised by PDT to be roughly $1m, with a potential impact of another $1m (worst case total of $2m). Anything above and beyond this scope would be mitigated with SHPPO and reduced down to a more reasonable amount or different scope.	Possible	Moderate	Medium	Possible	Marginal	Low	$0	$0	$1,000,000									100%	$0	100%	0 Mo		
Contract Acquisition (CA)																												
CA1	0	Best value contract award	Current direction is for low-bid procurement. Possible other procurement methods may be utilized including best value / trade off approach.	Could impact the overall construction costs up to 5%. Assume roughly 25% chance that this occurs, as it is anticipated that there will be adequate competition and the low bidder will not be substantially less competent that the next-lowest.	Possible	Significant	Medium	Possible	Negligible	Low	$0	$0	$3,248,509									25%	$0	100%	0 Mo		
Closure Structure																												
CS1	0	H Pile design	Currently 80 ft in estimate. Max depth will be 35 ft due to rock elevation of EL. 530 and slab EL. Of 564.	Due to rock elevation, piles will be short than in estimate (CHANGE IN ESTIMATE). Spacing at 5' OC is ok. 80/20 split between batter/vertical should be fine based on Structural eval. Chance that middle of the creek is 10 ft deeper to rock; say 50 ft wide is deeper, multiply # of piles in that area to find worst case impact.	Unlikely	Moderate	Low	Unlikely	Negligible	Low	$0	$0	$592,348									100%	$0	100%	0 Mo		
CS2	0	Sheet Pile Cutoff	Currently 80 ft in estimate. Max depth will be 35 ft due to rock elevation of EL. 530 and slab EL. Of 564.	Due to rock elevation, piles will be short than in estimate (CHANGE IN ESTIMATE). Chance that middle of the creek is 10 ft deeper to rock; say 50 ft wide is deeper, multiply # of piles in that area to find worst case impact.	Possible	Negligible	Low	Possible	Negligible	Low	$0	$0	$20,000									100%	$0	100%	0 Mo		
CS3	0	Base slab depth - Entrance and Stilling Basin	3' base slab used in estimate; Could be less	Plans show 2' but estimate will stick with 3' for time being until more design information is available; model possibility that both entrance and stilling basin slabs will be 2' thick as shown. Potential decrease of 1/3 of cost shown for low sensitivity model as triangular.	Likely	Moderate	Medium	Likely	Negligible	Low	-$666,333	$0	$0									100%	$0	100%	0 Mo		
CS4	1	Base slab depth - Closure structure	Estimate assumes larger section across entire width of structure; will be smaller over a small portion	Estimates assumes what is probably the worst case depth/thickness for the slab under the closure structure; team feels this is adequate as worst case risk but feels it is conservative to go forward with this and not carry any opportunity for reduction in the estimate.	Unlikely	Negligible	Low	Unlikely	Negligible	Low												100%	$0	100%	0 Mo		
CS5	0	Pier thickness - Closure structure	Currently shown at 4 ft for outside piers; 5 ft for interior piers	Estimate uses what is shown on the plans; could be as big as 8 ft. Modeled as triangular for 5-8 ft thick. Modeled as an addition of 1-3 feet of thickness based on 5 ft, so 20-60% additional.	Very Likely	Marginal	Medium	Very Likely	Negligible	Low	$558,799	$0	$1,676,398	0 Months	6 Months	1 Months	Pre	No	$0	$0	$40,606	100%	$0	100%	0 Mo		
CS6	1	Tainter gate size	Currently shown at 25' x 25' for 3 gates; could potentially be smaller or larger	Could potentially be 1 gate that's the same size; would also have accompanying flap gates on either side. Team feels like this layout with 3 gates will be as big as the structure could potentially get. Very negligible chance that gates will be larger than this, and potential increase wouldn't be much larger. Team also feels like the potential to drop to 1 gate will be used as a potential cost saving mechanism down the road if needed.	Unlikely	Negligible	Low	Unlikely	Negligible	Low												100%	$0	100%	0 Mo		
CS7	0	Rip Rap armoring of opposite bank of Levisa	Nothing in estimate; potential to add into the estimate because it might be needed	Assumed length of roughly 300 LF based on opening of Paint Creek; assume protection from EL. 598 to EL. 564, difference of 34 ft (slope length of 76 ft); assume 3 ft depth so 2,533 CY. Assume placement by bank, not marine. Added into model but assumed worst-case of double the quantity.	Certain	Marginal	Rebaseline at Basis of Estimate	Certain	Negligible	Rebaseline at Basis of Schedule	$179,530	$0	$179,530									100%	$0	100%	0 Mo		
CS8	1	Baffle Blocks	Add some baffle blocks in	Done	Certain	Marginal	Rebaseline at Basis of Estimate	Certain	Negligible	Rebaseline at Basis of Schedule																	
CS9	1	Crane requirement	No crane on the structure to place/remove the bulkheads in the structure	PDT looked at crane requirements and would be too large to have permanent on the structure. Will be an O&M concern	Unlikely	Marginal	Low	Unlikely	Negligible	Low												100%	$0	100%	0 Mo		
CS10	1	Need for backup generator/redundant power	In case of a power outage during a big event, gates will still need to operate (can be lowered by hand crank). Bulkheads will be placed by crane so no need for power.	Add in something like a 5 MW generator to cover the operation of the tainter gates during any power outage. (Added into estimate)	Certain	Marginal	Rebaseline at Basis of Estimate	Certain	Negligible	Rebaseline at Basis of Schedule												100%	$0	100%	0 Mo		
CS11	1	Operating machinery for gates will be comparable to Bourgeois	Check scope of Bourgeois. Currently based on chain hoists from New Savannah Bluff LKD, which has gates that are 60' x 15'. Should be sufficient for 25' x 25' gates.		Unlikely	Marginal	Low	Unlikely	Negligible	Low												100%	$0	100%	0 Mo		
CS12	0	Cofferdams need to be designed to the top of expected floods for CS construction	Both upstream and downstream cofferdams (or a single connected cofferdam) will need to be high enough that they don't flood from Levisa	Assume cofferdam from EL. 560 to EL. 590 around the work area. Length of 640 ft and 30 ft deep. (Add in the demo/removal of north bank storage units and access roads). Assume potential of 100 LF extra length based on layout.	Certain	Marginal	Rebaseline at Basis of Estimate	Certain	Negligible	Rebaseline at Basis of Schedule	$0	$0	$829,932	0 Months	6 Months	1 Months	Pre	No	$0	$0	$40,606	100%	$0	100%	0 Mo		
CS13	1	Diversion Culvert instead of bypass pumping	Currently estimate shows bypass pumping; team thinks diversion culvert would be more efficient/feasible		Certain	Marginal	Rebaseline at Basis of Estimate	Certain	Negligible	Rebaseline at Basis of Schedule												100%	$0	100%	0 Mo		
CS14	0	Add in flood event risk item for cleanup		Assume maybe $500k-750k per occurrence, and assume a minimum of one and max of 2 events that would occur. Use $500k for one event as low, and $750k for 2 events for high scenario.	Very Likely	Marginal	Medium	Very Likely	Negligible	Low	$500,000	$0	$1,500,000	1 Months	6 Months	2 Months	Post	No	$0	$0	$0	100%	$0	100%	0 Mo		
Floodwall																												
FW1	1	H Pile design	Current estimate does not have piles for flood wall	Add in 4 rows of piles spaced 5 ft OC (assumed battered) and 70 ft depth over length of biggest floodwall. All other floodwall with above grade stem height over 10 ft use 3 rows of piles spaced 7.5 ft OC. *Added into estimate*	Certain	Significant	Rebaseline at Basis of Estimate	Certain	Marginal	Rebaseline at Basis of Schedule												100%	$0	100%	0 Mo		
FW2	0	Sheet Pile Cutoff	Currently have 30 ft depth	Should be ok but geotech will know (check back in a week or two). Max depth of 40 ft based on rock elevation. (Model as triangular)	Possible	Moderate	Medium	Possible	Negligible	Low	$0	$0	$1,804,800									25%	$0	100%	0 Mo		
FW3	0	Pile Driving	Subsurface obstructions may cause pile driving issues	Lack of geotech investigations give uncertainty to obstructions that may be encountered during pile driving. Assume a potential 10-20% reduction in productivity and an additional 5% material waste qty on top of what's assumed in the estimate as worst case scenario. Should be applied to the storage area walls (anything around Paint Creek and Levisa). Total length of H-Pile times the difference in 10% prod. and 5% material add, vs 20% prod. and 5% material add.	Possible	Moderate	Medium	Possible	Negligible	Low	$279,714	$0	$487,271									100%	$0	100%	0 Mo		
FW4	1	Any work within railroad line will need a flagger		This will come up for any work at railroad. Cost of $1k per day added in.	Possible	Marginal	Low	Possible	Negligible	Low												100%	$0	100%	0 Mo		
FW5	1	Floodwall concrete strengths	Floodwall below grade: 4,000 psi Floodwall above grade: 4,500 psi Control structure: 5,000 psi	Modify this in estimate. Changes made in estimate: 5k psi concrete used for all closure structure concrete, and all concrete for floodwalls above 10 ft high. 4k psi concrete used for floodwall below 10 ft and any remaining concrete.	Possible	Marginal	Low	Possible	Negligible	Low												100%	$0	100%	0 Mo		
FW6	1	Railroad tie-ins might be difficult	Tying into railroad abutments has not been looked into but may take some case	May need to take floodwall under the railroad bridge to tie into solid ground for seepage issues. For estimate, assume an additional length of floodwall to go underneath the rail road bridge and tie in. Pile driving reduction for low headroom, confined space, etc. Get qty from Jacob	Possible	Marginal	Low	Possible	Negligible	Low												100%	$0	100%	0 Mo		
FW7	1	Excavation/fill qty for floodwall	Estimate assumes some but modeled qty may be different	Get from Jacob - DONE. Included in estimate as total floodwall excavation/fill.	Possible	Negligible	Low	Possible	Negligible	Low												100%	$0	100%	0 Mo		
FW8	1	Soil condition underneath non-pile-founded walls	Might have to replace fill with suitable in some areas along Paint Creek and Levisa	Would be a cost increase to bring suitable fill. Include in estimate to remove, haul off/dispose, and replace with suitable fill.	Possible	Marginal	Low	Possible	Negligible	Low												100%	$0	100%	0 Mo		
FW9	1	Underground storage tank along flood wall alignment	Near the Depot St bridge, across the creek from cemetary	Removal will be necessary and might be expensive if leaking. Add into estimate. Potential worst case scenario is that its leaking and will need special considerations.	Certain	Moderate	Rebaseline at Basis of Estimate	Certain	Negligible	Rebaseline at Basis of Schedule												100%	$0	100%	0 Mo		

Risk #		Risk/Opportunity Event	Risk Event Description	PDT Discussions on Impact and Likelihood	Project Cost: Likelihood	Project Cost: Impact	Project Cost: Risk Level	Project Schedule: Likelihood	Project Schedule: Impact	Project Schedule: Risk Level	Cost Model: Low Variance (Min)	Cost Model: Likely (C)	Cost Model: High Variance (80%H)	Schedule Model: Low Variance (S) (Min)	Schedule Model: Likely (S)	Schedule Model: High Variance (S) (80%H)	Schedule Model: Pre/Post Award	Schedule Model: Fail/OH	Cost From Schedule: Low Variance (CS) (Min)	Cost From Schedule: Likely Added Cost (CS)	Cost From Schedule: High Variance (CS) (80%H)	TOTAL Cost: Event Prob (PC)	TOTAL Cost: Simulated Cost (C) + (CS)	TOTAL Schedule: Event Prob (PS)	TOTAL Schedule: Simulated Sched (S)	Risk Quantification Discussions	Risk Mitigation Measures
FW10	1	Additional sheet pile needed for fire dept protection	Steep excavation might need protection	Fire Dep sits on "uncontrolled fill" - Jacob Sinkhorn. Team feels armoring will probably be needed to protect the embankment. Assume 80 LF sheet pile wall, 15 ft deep. Add into estimate.	Certain	Moderate	Relook at Basis of Estimate	Certain	Negligible	Relook at Basis of Schedule												100%	$0	100%	0 Mo		
FW11	0	Potential for I-wall lengths to be architecturally finished	If SSHPO raises issues about historic look, might require us to make the concrete floodwalls look nice	Model high scenario as I-Walls required stamped/painted forms with concrete cap. Modeled stamping plus concrete coap over I-wall length; initial estimate came out right at $500k.	Possible	Significant	Medium	Possible	Negligible	Low	$0	$0	$500,000									100%	$0	100%	0 Mo		
FW12	1	Nearest quarries are 1 hour away	All agg prices will be higher than normal due to haul distance	Receieved quotes in Sep 2019 for aggregate delivered to the project site.	Unlikely	Moderate	Low	Unlikely	Negligible	Low												100%	$0	100%	0 Mo		
FW12	1	Nearest concrete suppliers are 20 miles away	All agg/concrete prices will be higher than normal due to haul distance	Receieved quotes in Sep 2019 for concrete delivered to the project site.	Unlikely	Moderate	Low	Unlikely	Negligible	Low												100%	$0	100%	0 Mo		
Levees																											
LV1	0	King's Addition Scope	Qty of material needed may change	500 CY of cut, 1,309 CY of fill. Compacted clay. Truck in from off site (borrow site #1, sheet CS125)	Certain	Negligible	Relook at Basis of Estimate	Certain	Negligible	Relook at Basis of Schedule	$0	$0	$300,000									100%	$0	100%	0 Mo		
LV2	0	Borrow site material quality	Total qty of 9,019 CY needed; might not be enough suitable material in both sites	Worst-case scenario have to truck in all fill for borrow. Might be able to use existing borrow sites but doesn't sound promising. Any real estate purchase for new borrow area would have to be coordinated with RE and could present issues down the road for NEPA considerations.	Certain	Negligible	Relook at Basis of Estimate	Certain	Negligible	Relook at Basis of Schedule	$0	$0	$300,000									100%	$0	100%	0 Mo		
LV3	1	Road Relocation/Closure Scope	Currently have full depth replacement of River Rd and Chessie Ln; more?	This should be the max extent of road replacement	Unlikely	Marginal	Low	Unlikely	Negligible	Low												100%	$0	100%	0 Mo		
LV4	1	Levee overtopping area bigger than identified	Each levee reach has an overtopping area on the plans; potential for this to be the entire protected side slope?	Area could be larger than ientified but probably not the entire protected side slope. Maybe assume double the SY area for each location as worst case.	Possible	Moderate	Medium	Possible	Negligible	Low												100%	$0	100%	0 Mo		
LV5	0	Subgrade soil underneath levees not suitable	Will likely have to either undercut levee a few feet or install sheet pile underneath	After review of levee X-Sec will probaby be fine with inspection trench and degrading levee. Won't need sheet pile.	Possible	Marginal	Low	Possible	Negligible	Low				0 Months	0 Months	2 Months	Pre	No	$0	$0	$81,213	100%	$0	100%	0 Mo		
LV6	0	Inroads qtys incorrect	Inroads qtys may not capture the full extent of excavation and/or qtys of fill correctly	Assume worst case of double qty of excavation and fill that's shown on the drawings	Possible	Moderate	Medium	Possible	Negligible	Low	$0	$0	$500,000	0 Months	0 Months	2 Months	Pre	No	$0	$0	$81,213	100%	$0	100%	0 Mo		
Interceptor Pipes																											
Int1	0	Concrete Pipe needed instead of HDPE	Under certain roadways might need RCP instead of HDPE	Assume 100 LF per line would need concrete pipe in lieu of HDPE. Model another 100 LF ea just in case,	Very Likely	Moderate	High	Very Likely	Marginal	Medium	$0	$0	$500,000									100%	$0	100%	0 Mo		
Int2	1	CLSM needed instead of stone backfill	Stone backfill used in estimate but includde CLSM underneath levees and 15 ft either side	Add into estimate - DONE	Certain	Negligible	Relook at Basis of Estimate	Certain	Negligible	Relook at Basis of Schedule												100%	$0	100%	0 Mo		
Int3	0	Hitting underground lines during construction	Could hit utilities, water lines, storm lines, etc during excavation/construction	Add something in for obstructions encountered during construction. Some assumption per LF or 100 LF maybe.	Certain	Negligible	Relook at Basis of Estimate	Certain	Negligible	Relook at Basis of Schedule				0 Months	0 Months	1 Months	Post	Yes	$0	$0	$197,000	100%	$0	100%	0 Mo		
Non-Structural																											
NS1	1	For Johnson County, scope might be unclear for floodproofing		Suggestion to use buyout costs for everything outside Paintsville. If cost ends up being less than that to floodproof, we will go with that.	Very Likely	Significant	High	Very Likely	Marginal	Medium												100%	$0	100%	0 Mo		
Flood Warning System																											
FWS1	0	Scope Unclear		Need to get with Jacob to incorporate this into the estimate somehow. Put $1m into the estimate; should be plenty, but model an additional $1m in risk as uniform.	Very Likely	Marginal	Medium	Very Likely	Marginal	Medium	$0	$0	$1,000,000									100%	$0	100%	0 Mo		
Estimate and Schedule Risks (ES)																											
ES1	0	Site contraints restricting productivity	Because many areas of the site have tight spacing, productivity may become an issue	Productivity for all items reduced to 90%. Risk item will reflect the difference between 85% factor and 90% factor.	Likely	Marginal	Medium	Likely	Marginal	Medium	$0	$0	$1,219,975	0 Months	0 Months	2 Months	Pre	No	$0	$0	$81,213	100%	$0	100%	0 Mo		
ES2	0	Labor premium due to other high profile projects in the area	Other big projects coming up; may lead to a labor premium being required to keep craft workers.	This project should be a high priority; however, there could be a premium paid above D-B rates for workers to stay on the project if another large project (probably highway) comes on line in the future. Possibility; assume a potential 5-15% increase in labor costs if this were to occur, along with a 40% chance of occurrence.	Possible	Significant	Medium	Possible	Negligible	Low	$536,773	$0	$1,610,318									40%	$0	100%	0 Mo		
ES3	1	Contractor Work Assignments	Estimate currently shows all work subbed out.	*Updated - some work is now shown as being performed by the Prime; roughly 40%. Should be sufficient for a capable Prime but no potential reduction shown.	Possible	Marginal	Low	Possible	Negligible	Low												100%	$0	100%	0 Mo		
ES4	0	Design Budget Overruns	Design budget estimated by section/task may be insufficient	Initial ROM estimate for PED/EDC budget was $8m prior to detailed estimated by section being developed. $8m was based on two years at $4m per year, which the PDT felt was probably the most we could even expend on this project based on FTEs assigned to it. Assume that a worst-case scenario of 15% growth on the detailed estimate would be realized (close to the original $8m cost) but that a minimum of 5% growth would be realized on the budget number. Modeled as triangular.	Very Likely	Negligible	Low	Very Likely	Significant	High	$400,000	$0	$1,200,000									100%	$0	100%	0 Mo		
ES5	1	S&A Budget too Conservative	S&A Budget based on conservative assumption	Assume that the actual S&A budget will be closer to $2-2.5M per year, rather than $3m per year. Assume triangular model and reduction of $1-3M on S&A amount of $9m. *Removed from model as S&A budget was cut to $6m in estimate.	Possible	Marginal	Low	Possible	Negligible	Low												100%	$0	100%	0 Mo		
ES6	0	Mods/Claims	Mods/Claims will occur on constructioncontracts; need to account for them	Initial thought 3-10%. Time growth maybe 3-6 months.	Very Likely	Significant	High	Very Likely	Moderate	High	$1,949,105	$0	$6,497,018	3 Months	0 Months	6 Months	Post	No	$0	$0	$0	100%	$0	100%	0 Mo	Current estimate does not include any work to the wetwell. MSD MSD requested that operation of Western FPS be reviewed and possibly improve the hydraulics inside the wetwell. Likelihood is likely, and cost could reach $2MM, therefore moderate impact. Likely variance is approx. $500M, or 25% of the maximum.	
External Risks (EX)																											
EX1	0	Bid Protest	Possible	Especially with Best Value procurements. Will be a schedule delay of possibly 3-9 months.	Possible	Moderate	Medium	Possible	Negligible	Low				3 Months	0 Months	9 Months	Pre	Yes	$243,638	$0	$730,915	30%	$0	100%	0 Mo	Due to possible weight increase of new replacement pumps. >4% increase would require structural analysis of supports. Some risk possibly mitigated by load testing of cranes during PED. Affected stations include 5th, 10th, 17th, 27th, and 34th street PS's. Minimum is $0 with no cranes being replaced, maximum with all PS's replacement cranes is $1.5MM, with likely being one crane needing replacement at $300MM.	
EX2	0	Bid risk	Risk/Opportunity that bidders will have lower/higher bids than the IGEs for each contract.	Likelihood is almost certain; based on bidding evironment, contract type, assumed contractor risk, will be subjective range that could be realized. *Note* this risk will fall off once proposals come in and contract is awarded. Assume a 2.5-10% spread on top of the construction cost estimate w/triangular model.	Very Likely	Significant	High	Very Likely	Negligible	Low	$1,624,255	$0	$6,497,018									100%	$0	100%	0 Mo		

Contingency on Base Estimate	80% Confidence Project Cost	
Base Estimate (No Real Estate)	$79,970,182	
Baseline Estimate Cost Contingency Amount →	$20,790,458	26%
Baseline Cost (80% Confidence; No RE) →	$100,760,640	

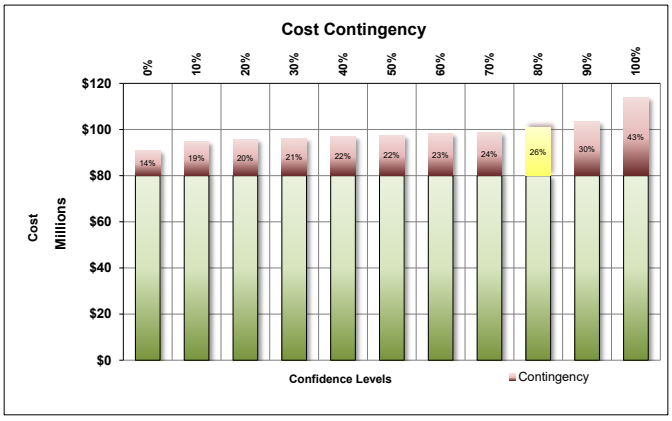
Contingency on Schedule	80% Confidence Project Schedule	
Project Base Schedule Duration →	36.0 Months	
Schedule Contingency Duration →	17.6 Months	49%
Project Schedule Duration (80% Confidence) →	53.6 Months	

Johnson County, Section 202
4-Sep-19

- PROJECT CONTINGENCY DEVELOPMENT -

INITIAL CONSTRUCTION
Contingency Analysis

Base Case Estimate (Excluding 01)	$79,970,182	
Confidence Level	**Contingency Value**	**Contingency**
0%	11,044,931	14%
10%	14,943,142	19%
20%	15,592,844	20%
30%	16,242,545	21%
40%	16,892,247	22%
50%	17,541,949	22%
60%	18,191,651	23%
70%	18,841,353	24%
80%	20,790,458	26%
90%	23,389,265	30%
100%	33,784,494	43%

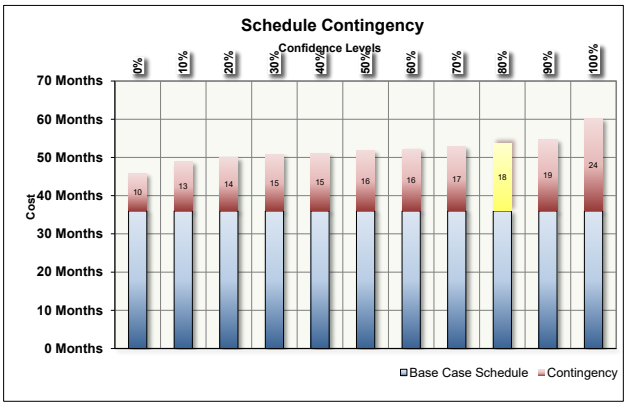


Johnson County, Section 202
4-Sep-19

- SCHEDULE CONTINGENCY (DURATION) DEVELOPMENT -

Contingency Analysis

Base Case Schedule	36.0 Months	
Confidence Level	**Contingency Value**	**Contingency**
0%	10 Months	27%
10%	13 Months	36%
20%	14 Months	39%
30%	15 Months	41%
40%	15 Months	42%
50%	16 Months	44%
60%	16 Months	45%
70%	17 Months	47%
80%	18 Months	49%
90%	19 Months	52%
100%	24 Months	67%



Contingency on Base Estimate		
Base Estimate (No Real Estate)	**$79,970,182**	
Baseline Estimate Cost Contingency Amount →	$20,790,458	**26%**
Baseline Cost (80% Confidence; No RE) →	**$100,760,640**	

Contingency on Schedule		
Project Base Schedule Duration →	**36.0 Months**	
Schedule Contingency Duration →	17.6 Months	49%
Project Schedule Duration (80% Confidence) →	**53.6 Months**	

Johnson County, Section 202
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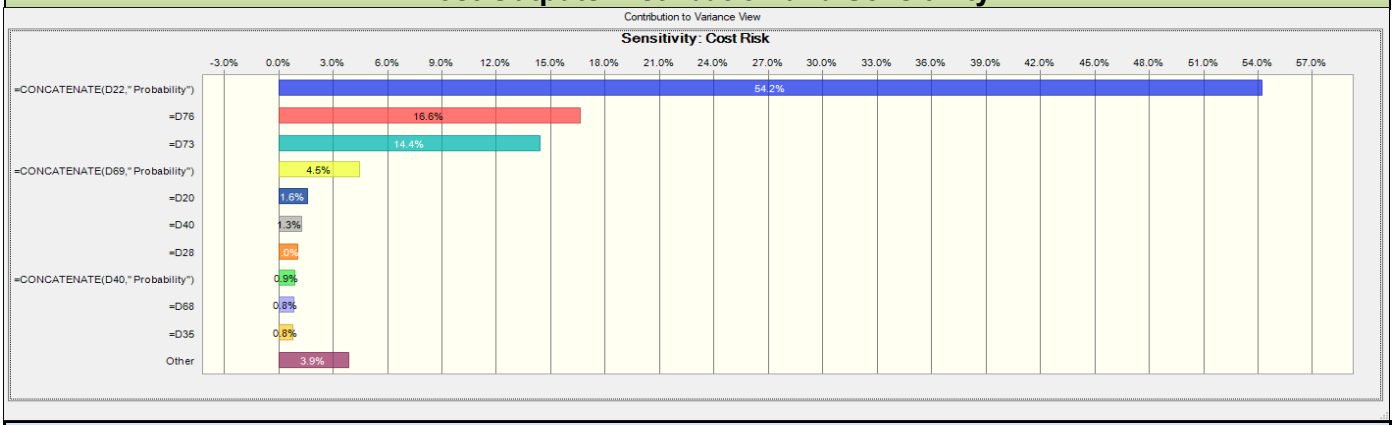
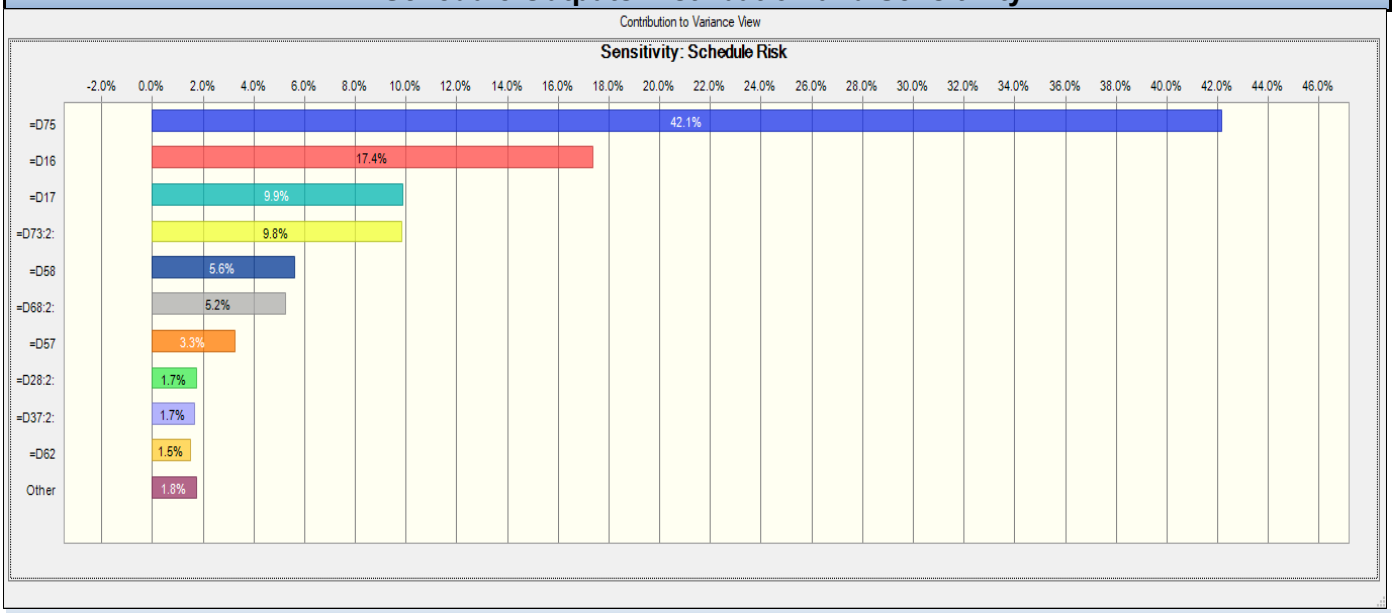
- Cost Outputs Distribution and Sensitivity -



- Schedule Outputs Distribution and Sensitivity -



ATTACHMENT C

ALT 2 (RECOMMENDED PLAN) & ALT 3

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

PROJECT: **Johnson County, Section 202**
PROJECT NO: P2 475556
LOCATION: Paintsville, KY

DISTRICT: **Louisville District** **PREPARED:** **12/6/2019**
POC: **CHIEF, COST ENGINEERING, James Vermillion**

This Estimate reflects the scope and schedule in report; Detailed Project Report, Dec 2019

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2020 Effective Price Level Date: 1 OCT 19									
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-19** ($K)	**TOTAL FIRST COST** ($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	$3,033	$789	26.0%	$3,822	0.0%	$3,033	$789	$3,822	$0	$3,822	6.1%	$3,219	$837	$4,056
06	FISH & WILDLIFE FACILITIES	$420	$109	26.0%	$529	0.0%	$420	$109	$529	$0	$529	6.1%	$445	$116	$561
11	LEVEES & FLOODWALLS	$27,081	$7,041	26.0%	$34,122	0.0%	$27,081	$7,041	$34,122	$0	$34,122	6.1%	$28,738	$7,472	$36,210
15	FLOODWAY CONTROL & DIVERSION STRU	$31,971	$8,312	26.0%	$40,283	0.0%	$31,971	$8,312	$40,283	$0	$40,283	6.1%	$33,928	$8,821	$42,749
18	CULTURAL RESOURCE PRESERVATION	$1,000	$260	26.0%	$1,260	0.0%	$1,000	$260	$1,260	$0	$1,260	6.1%	$1,061	$276	$1,337
19	BUILDINGS, GROUNDS & UTILITIES	$466	$121	26.0%	$587	0.0%	$466	$121	$587	$0	$587	6.1%	$494	$128	$623
20	PERMANENT OPERATING EQUIPMENT	$1,000	$260	26.0%	$1,260	0.0%	$1,000	$260	$1,260	$0	$1,260	6.1%	$1,061	$276	$1,337
	CONSTRUCTION ESTIMATE TOTALS:	$64,970	$16,892		$81,862	0.0%	$64,970	$16,892	$81,862	$0	$81,862	6.1%	$68,947	$17,926	$86,873
01	LANDS AND DAMAGES	$5,314	$1,329	25.0%	$6,643	0.0%	$5,314	$1,329	$6,643	$0	$6,643	2.0%	$5,420	$1,355	$6,776
30	PLANNING, ENGINEERING & DESIGN	$8,000	$2,080	26.0%	$10,080	0.0%	$8,000	$2,080	$10,080	$2,900	$12,980	4.1%	$8,330	$2,166	$13,396
31	CONSTRUCTION MANAGEMENT	$7,000	$1,820	26.0%	$8,820	0.0%	$7,000	$1,820	$8,820	$0	$8,820	12.8%	$7,899	$2,054	$9,952
	PROJECT COST TOTALS:	$85,284	$22,121	25.9%	$107,405		$85,284	$22,121	**$107,405**	$2,900	**$110,305**	6.2%	$90,596	$23,501	$116,997

ESTIMATED TOTAL PROJECT COST: **$116,997**

CHIEF, COST ENGINEERING, James Vermillion

PROJECT MANAGER, Michael Moore

CHIEF, REAL ESTATE, Veronica Hiriams

CHIEF, PLANNING, Amy Babey

CHIEF, ENGINEERING, John Bock

CHIEF, OPERATIONS, Tim Fudge

CHIEF, CONSTRUCTION, Kevin Jefferson

CHIEF, CONTRACTING, Denise Bush

CHIEF, RM, Vicki Vasquez

CHIEF, DPM, Linda Murphy

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

**** CONTRACT COST SUMMARY ****

PROJECT: Johnson County, Section 202
LOCATION: Paintsville, KY
This Estimate reflects the scope and schedule in report; Detailed Project Report, Dec 2019

DISTRICT: Louisville District
POC: CHIEF, COST ENGINEERING, James Vermillion
PREPARED: 12/6/2019

Estimate Prepared: **3-Dec-19**
Effective Price Level: 1-Oct-19

Program Year (Budget EC): 2020
Effective Price Level Date: 1 OCT 19

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*
	Alternative 2 Variation 1 (Recommended)													
02	RELOCATIONS	$3,033	$789	26.0%	$3,822	0.0%	$3,033	$789	$3,822	2023Q1	6.1%	$3,219	$837	$4,056
06	FISH & WILDLIFE FACILITIES	$420	$109	26.0%	$529	0.0%	$420	$109	$529	2023Q1	6.1%	$445	$116	$561
11	LEVEES & FLOODWALLS	$27,081	$7,041	26.0%	$34,122	0.0%	$27,081	$7,041	$34,122	2023Q1	6.1%	$28,738	$7,472	$36,210
15	FLOODWAY CONTROL & DIVERSION STRU	$31,971	$8,312	26.0%	$40,283	0.0%	$31,971	$8,312	$40,283	2023Q1	6.1%	$33,928	$8,821	$42,749
18	CULTURAL RESOURCE PRESERVATION	$1,000	$260	26.0%	$1,260	0.0%	$1,000	$260	$1,260	2023Q1	6.1%	$1,061	$276	$1,337
19	BUILDINGS, GROUNDS & UTILITIES	$466	$121	26.0%	$587	0.0%	$466	$121	$587	2023Q1	6.1%	$494	$128	$623
20	PERMANENT OPERATING EQUIPMENT	$1,000	$260	26.0%	$1,260	0.0%	$1,000	$260	$1,260	2023Q1	6.1%	$1,061	$276	$1,337
	CONSTRUCTION ESTIMATE TOTALS:	$64,970	$16,892	26.0%	**$81,862**		$64,970	$16,892	$81,862			$68,947	$17,926	$86,873
01	LANDS AND DAMAGES	$5,314	$1,329	25.0%	$6,643	0.0%	$5,314	$1,329	$6,643	2021Q1	2.0%	$5,420	$1,355	$6,776
30	PLANNING, ENGINEERING & DESIGN													
2.5%	Project Management	$8,000	$2,080	26.0%	$10,080	0.0%	$8,000	$2,080	$10,080	2021Q1	4.1%	$8,330	$2,166	$10,496
0.0%	Planning & Environmental Compliance	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Engineering & Design	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Reviews, ATRs, IEPRs, VE	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Life Cycle Updates (cost, schedule, risks)	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Contracting & Reprographics	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Engineering During Construction	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Planning During Construction	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Project Operations	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
8.0%	Construction Management	$7,000	$1,820	26.0%	$8,820	0.0%	$7,000	$1,820	$8,820	2023Q1	12.8%	$7,899	$2,054	$9,952
0.0%	Project Operation:	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Project Management	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONTRACT COST TOTALS:	$85,284	$22,121		$107,405		$85,284	$22,121	$107,405			$90,596	$23,501	$114,097

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

PROJECT: **Johnson County, Section 202**
PROJECT NO: P2 475556
LOCATION: Paintsville, KY

DISTRICT: **Louisville District**
POC: **CHIEF, COST ENGINEERING, James Vermillion**

PREPARED: **12/6/2019**

This Estimate reflects the scope and schedule in report; Detailed Project Report, Dec 2019

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2020 Effective Price Level Date: 1 OCT 19									
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-19** ($K)	**TOTAL FIRST COST** ($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	$3,033	$789	26.0%	$3,822	0.0%	$3,033	$789	$3,822	$0	$3,822	6.1%	$3,219	$837	$4,056
06	FISH & WILDLIFE FACILITIES	$420	$109	26.0%	$529	0.0%	$420	$109	$529	$0	$529	6.1%	$445	$116	$561
11	LEVEES & FLOODWALLS	$34,759	$9,037	26.0%	$43,797	0.0%	$34,759	$9,037	$43,797	$0	$43,797	6.1%	$36,887	$9,591	$46,477
15	FLOODWAY CONTROL & DIVERSION STRU	$31,971	$8,312	26.0%	$40,283	0.0%	$31,971	$8,312	$40,283	$0	$40,283	6.1%	$33,928	$8,821	$42,749
18	CULTURAL RESOURCE PRESERVATION	$1,000	$260	26.0%	$1,260	0.0%	$1,000	$260	$1,260	$0	$1,260	6.1%	$1,061	$276	$1,337
19	BUILDINGS, GROUNDS & UTILITIES	$466	$121	26.0%	$587	0.0%	$466	$121	$587	$0	$587	6.1%	$494	$128	$623
20	PERMANENT OPERATING EQUIPMENT	$1,000	$260	26.0%	$1,260	0.0%	$1,000	$260	$1,260	$0	$1,260	6.1%	$1,061	$276	$1,337
	CONSTRUCTION ESTIMATE TOTALS:	$72,649	$18,889		$91,538	0.0%	$72,649	$18,889	$91,538	$0	$91,538	6.1%	$77,095	$20,045	$97,140
01	LANDS AND DAMAGES	$5,314	$1,329	25.0%	$6,643	0.0%	$5,314	$1,329	$6,643	$0	$6,643	2.0%	$5,420	$1,355	$6,776
30	PLANNING, ENGINEERING & DESIGN	$8,000	$2,080	26.0%	$10,080	0.0%	$8,000	$2,080	$10,080	$2,900	$12,980	4.1%	$8,330	$2,166	$13,396
31	CONSTRUCTION MANAGEMENT	$7,000	$1,820	26.0%	$8,820	0.0%	$7,000	$1,820	$8,820	$0	$8,820	12.8%	$7,899	$2,054	$9,952
	PROJECT COST TOTALS:	$92,963	$24,117	25.9%	$117,080		$92,963	$24,117	**$117,080**	$2,900	**$119,980**	6.2%	$98,745	$25,619	$127,264

ESTIMATED TOTAL PROJECT COST: **$127,264**

CHIEF, COST ENGINEERING, James Vermillion

PROJECT MANAGER, Michael Moore

CHIEF, REAL ESTATE, Veronica

CHIEF, PLANNING, Amy Babey

CHIEF, ENGINEERING, John Bock

CHIEF, OPERATIONS, Tim Fudge

CHIEF, CONSTRUCTION, Kevin Jefferson

CHIEF, CONTRACTING, Denise Bush

CHIEF, RM, Vicki Vasquez

CHIEF, DPM, Linda Murphy

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

**** CONTRACT COST SUMMARY ****

PROJECT: Johnson County, Section 202
LOCATION: Paintsville, KY
This Estimate reflects the scope and schedule in report; Detailed Project Report, Dec 2019

DISTRICT: Louisville District
POC: CHIEF, COST ENGINEERING, James Vermillion
PREPARED: 12/6/2019

Estimate Prepared: **3-Dec-19**
Effective Price Level: 1-Oct-19

Program Year (Budget EC): 2020
Effective Price Level Date: 1 OCT 19

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*
	Alternative 3													
02	RELOCATIONS	$3,033	$789	26.0%	$3,822	0.0%	$3,033	$789	$3,822	2023Q1	6.1%	$3,219	$837	$4,056
06	FISH & WILDLIFE FACILITIES	$420	$109	26.0%	$529	0.0%	$420	$109	$529	2023Q1	6.1%	$445	$116	$561
11	LEVEES & FLOODWALLS	$34,759	$9,037	26.0%	$43,797	0.0%	$34,759	$9,037	$43,797	2023Q1	6.1%	$36,887	$9,591	$46,477
15	FLOODWAY CONTROL & DIVERSION STRU	$31,971	$8,312	26.0%	$40,283	0.0%	$31,971	$8,312	$40,283	2023Q1	6.1%	$33,928	$8,821	$42,749
18	CULTURAL RESOURCE PRESERVATION	$1,000	$260	26.0%	$1,260	0.0%	$1,000	$260	$1,260	2023Q1	6.1%	$1,061	$276	$1,337
19	BUILDINGS, GROUNDS & UTILITIES	$466	$121	26.0%	$587	0.0%	$466	$121	$587	2023Q1	6.1%	$494	$128	$623
20	PERMANENT OPERATING EQUIPMENT	$1,000	$260	26.0%	$1,260	0.0%	$1,000	$260	$1,260	2023Q1	6.1%	$1,061	$276	$1,337
	CONSTRUCTION ESTIMATE TOTALS:	$72,649	$18,889	26.0%	**$91,538**		$72,649	$18,889	$91,538			$77,095	$20,045	$97,140
01	LANDS AND DAMAGES	$5,314	$1,329	25.0%	$6,643	0.0%	$5,314	$1,329	$6,643	2021Q1	2.0%	$5,420	$1,355	$6,776
30	PLANNING, ENGINEERING & DESIGN													
2.5%	Project Management	$8,000	$2,080	26.0%	$10,080	0.0%	$8,000	$2,080	$10,080	2021Q1	4.1%	$8,330	$2,166	$10,496
0.0%	Planning & Environmental Compliance	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Engineering & Design	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Reviews, ATRs, IEPRs, VE	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Life Cycle Updates (cost, schedule, risks)	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Contracting & Reprographics	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Engineering During Construction	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Planning During Construction	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Project Operations	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
8.0%	Construction Management	$7,000	$1,820	26.0%	$8,820	0.0%	$7,000	$1,820	$8,820	2023Q1	12.8%	$7,899	$2,054	$9,952
0.0%	Project Operation:	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.0%	Project Management	$0	$0	26.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONTRACT COST TOTALS:	$92,963	$24,117		$117,080		$92,963	$24,117	$117,080			$98,745	$25,619	$124,364

ATTACHMENT D

ANNUALIZED COST SUMMARY

Johnson County 202 Alternatives Summary

Project First Costs, Oct 2019 Price Level - 50 yr project life, 2.75% interest rate				
	Description	**Alternative 2 - Var 1**	**Alternative 3**	**Alternative 4 (Non-Structural)**
Initial Cost	02 Relocations	$3,821,947	$3,821,965	$0
	06 Fish & Wildlife Facilities	$528,915	$528,915	$0
	11 Levees & Floodwalls	$34,121,513	$43,796,723	$0
	15 Floodway Control & Diversion Structures	$40,283,423	$40,283,423	$0
	18 Cultural Resources	$1,260,000	$1,260,000	$0
	19 Buildings, Grounds & Utilities	$586,630	$586,630	$28,277,299
	20 Permanent Operating Equipment	$1,260,000	$1,260,000	$0
	Construction Estimate Totals	***$81,862,429***	***$91,537,656***	***$28,277,299***
	01 Land and Damages	$6,642,750	$6,642,750	$0
	30 Planning, Engineering & Design	$12,980,000	$12,980,000	$7,592,112
	31 Construction Management	$8,820,000	$8,820,000	$3,750,000
	Project Cost Totals	***$110,305,179***	***$119,980,406***	***$39,619,410***
	IDC	$5,208,600	$5,624,600	$2,143,000
	Investment Cost	**$115,513,779**	**$125,605,006**	**$41,762,410**
Annualized Cost	Investment Cost	$4,279,000	$4,653,000	$1,547,000
	Adaptive Monitoring Costs	$0	$0	$0
	Monitoring Costs	$0	$0	$0
	O&M	$213,400	$213,400	$125,000
	Major Rehab	$223,000	$214,000	$0
	Total Annual Cost	**$4,715,400**	**$5,080,400**	**$1,672,000**

ATTACHMENT D

ANNUALIZED COST SUMMARY

Johnson County 202 Alternatives Summary
ANNUAL OPERATION & MAINTENANCE COST ESTIMATE (Oct '19 PL)
Alternatives 2 & 3

YEAR		FUTURE WORTH	PRESENT WORTH FACTOR		PRESENT WORTH
1	$	119,700	0.97324	$	116,496
2	$	119,700	0.94719	$	113,378
3	$	119,700	0.92184	$	110,344
4	$	119,700	0.89717	$	107,391
5	$	131,040	0.87315	$	114,418
6	$	119,700	0.84978	$	101,719
7	$	119,700	0.82704	$	98,997
8	$	119,700	0.80491	$	96,347
9	$	119,700	0.78336	$	93,769
10	$	131,040	0.76240	$	99,905
11	$	119,700	0.74199	$	88,817
12	$	119,700	0.72213	$	86,439
13	$	119,700	0.70281	$	84,126
14	$	119,700	0.68400	$	81,874
15	$	131,040	0.66569	$	87,232
16	$	119,700	0.64787	$	77,551
17	$	119,700	0.63053	$	75,475
18	$	119,700	0.61366	$	73,455
19	$	119,700	0.59723	$	71,489
20	$	131,040	0.58125	$	76,167
21	$	119,700	0.56569	$	67,714
22	$	119,700	0.55055	$	65,901
23	$	119,700	0.53582	$	64,138
24	$	119,700	0.52148	$	62,421
25	$	5,003,460	0.50752	$	2,539,362
26	$	119,700	0.49394	$	59,124
27	$	119,700	0.48072	$	57,542
28	$	119,700	0.46785	$	56,002
29	$	119,700	0.45533	$	54,503
30	$	131,040	0.44314	$	58,070
31	$	119,700	0.43128	$	51,625
32	$	119,700	0.41974	$	50,243
33	$	119,700	0.40851	$	48,898
34	$	119,700	0.39757	$	47,590
35	$	131,040	0.38693	$	50,704
36	$	119,700	0.37658	$	45,076
37	$	119,700	0.36650	$	43,870
38	$	119,700	0.35669	$	42,696
39	$	119,700	0.34714	$	41,553
40	$	131,040	0.33785	$	44,272
41	$	119,700	0.32881	$	39,359
42	$	119,700	0.32001	$	38,305
43	$	119,700	0.31144	$	37,280
44	$	119,700	0.30311	$	36,282
45	$	131,040	0.29500	$	38,656
46	$	119,700	0.28710	$	34,366
47	$	119,700	0.27942	$	33,446
48	$	119,700	0.27194	$	32,551
49	$	119,700	0.26466	$	31,680
50	$	131,040	0.25758	$	33,753
SUM OF PRESENT WORTHS	$	10,970,820		$	5,762,371
TOTAL ANNUAL COST				**$**	**213,400**

NOTES:

INTEREST RATE =	2.750%
PROECT LIFE =	50
CAPITAL RECOVERY FACTOR =	0.03704091950

ATTACHMENT E

OPERATION & MAINTENANCE COST SUMMARY

OPERATION & MAINTENANCE COST ESTIMATE

Priced by Anticipated Year (backup can be found in accompanying spreadsheet)

PROJECT YEAR	Mowing, Inspections, Riprap Spray	Levee Inspections	Minor Levee repairs	Floodwall Waterstop Repair	Floodwall Joint repair	Repairing seals	Wire Rope Replacement	Replace motors and cables	Line Shaft Repair	Grease Line shaft, Mech Components/Bushings	Repair Tainter Gate Arms	TOTAL	TOTAL W/ Contingency (from CSRA)
1	70,000		5,000							20,000		95,000	$ 119,700
2	70,000		5,000							20,000		95,000	$ 119,700
3	70,000		5,000							20,000		95,000	$ 119,700
4	70,000		5,000							20,000		95,000	$ 119,700
5	70,000	9,000	5,000							20,000		104,000	$ 131,040
6	70,000		5,000							20,000		95,000	$ 119,700
7	70,000		5,000							20,000		95,000	$ 119,700
8	70,000		5,000							20,000		95,000	$ 119,700
9	70,000		5,000							20,000		95,000	$ 119,700
10	70,000	9,000	5,000							20,000		104,000	$ 131,040
11	70,000		5,000							20,000		95,000	$ 119,700
12	70,000		5,000							20,000		95,000	$ 119,700
13	70,000		5,000							20,000		95,000	$ 119,700
14	70,000		5,000							20,000		95,000	$ 119,700
15	70,000	9,000	5,000							20,000		104,000	$ 131,040
16	70,000		5,000							20,000		95,000	$ 119,700
17	70,000		5,000							20,000		95,000	$ 119,700
18	70,000		5,000							20,000		95,000	$ 119,700
19	70,000		5,000							20,000		95,000	$ 119,700
20	70,000	9,000	5,000							20,000		104,000	$ 131,040
21	70,000		5,000							20,000		95,000	$ 119,700
22	70,000		5,000							20,000		95,000	$ 119,700
23	70,000		5,000							20,000		95,000	$ 119,700
24	70,000		5,000							20,000		95,000	$ 119,700
25	70,000	9,000	5,000	1,450,000		192,000	50,000	300,000	1,200,000	20,000	675,000	3,971,000	$ 5,003,460
26	70,000		5,000							20,000		95,000	$ 119,700
27	70,000		5,000							20,000		95,000	$ 119,700
28	70,000		5,000							20,000		95,000	$ 119,700
29	70,000		5,000							20,000		95,000	$ 119,700
30	70,000	9,000	5,000							20,000		104,000	$ 131,040
31	70,000		5,000							20,000		95,000	$ 119,700
32	70,000		5,000							20,000		95,000	$ 119,700
33	70,000		5,000							20,000		95,000	$ 119,700
34	70,000		5,000							20,000		95,000	$ 119,700
35	70,000	9,000	5,000							20,000		104,000	$ 131,040
36	70,000		5,000							20,000		95,000	$ 119,700
37	70,000		5,000							20,000		95,000	$ 119,700
38	70,000		5,000							20,000		95,000	$ 119,700
39	70,000		5,000							20,000		95,000	$ 119,700
40	70,000	9,000	5,000							20,000		104,000	$ 131,040
41	70,000		5,000							20,000		95,000	$ 119,700
42	70,000		5,000							20,000		95,000	$ 119,700
43	70,000		5,000							20,000		95,000	$ 119,700
44	70,000		5,000							20,000		95,000	$ 119,700
45	70,000	9,000	5,000							20,000		104,000	$ 131,040
46	70,000		5,000							20,000		95,000	$ 119,700
47	70,000		5,000							20,000		95,000	$ 119,700
48	70,000		5,000							20,000		95,000	$ 119,700
49	70,000		5,000							20,000		95,000	$ 119,700
50	70,000	9,000	5,000							20,000		104,000	$ 131,040
Totals	3,500,000	90,000	250,000	1,450,000	0	192,000	50,000	300,000	1,200,000	1,000,000	675,000	**8,707,000**	**$ 10,970,820**

O&M features of Work	Frequency	area / length	Estimated cost	Annual cost
Levee Mainenace				
Mowing, Inspections, Riprap Spray	8 times a year	7.7 acres + 2.6 Acres, Floodwall and TG Inspections	*	$ 70,000
Rodent Control	annual extermination	7.7 acres	*	
Levee Inspections	every 5 years	30 inspections ($300 each)	$ 9,000	
Minor Levee repairs	annual	100 LF	$ 5,000	
Riprap spray	4 times a year	.8 acres	*	
Flood Wall				
Floodwall inspection	4 times a year	1.3 miles	*	
Floodwall Waterstop Repair	50 years	5680 of wall x 40' monoliths x $10K per monolith	$ 1,450,000	
Floodwall Joint repair	every 10 years	5680' of joints	*	
Tainter gate				
Tainter Gate Inspections	4 times a year	1 structure	*	
Repairing seals	50 years	300 LF of seals (based on Eagle Creek)	$ 192,000	
Repainting Gates	50 years	Included in Line shaft repair cost		
Wire Rope Replacement	25 years		$ 50,000	
Replace motors and cables	50 years	3 motors and 6 cables (Use Cost estimate data)	$ 300,000	
Line Shaft Repair	50 years	3 shafts (400,000 each)	$ 1,200,000	
Grease Line shaft, Mech Components/Bu	4 times per year		$ 20,000	
Repair Tainter Gate Arms	50 years	3 gates (225,000 each)	$ 675,000	

*performed by 1 new full time employee, estimated at 70k including benefits.

ATTACHMENT F

MAJOR REHAB CALCULATION

ATTACHMENT F

MAJOR REHAB CALCULATION

Johnson County 202 Alternatives Summary

Tainter Gate Structure Major Rehab Costs (Oct '19 PL)
Alternatives 2 & 3

Assumption for Major Rehab cost is 25% of the original construction cost of the tainter gate structure will be needed at some point over the next 50 years. Assumed the midpoint of project life (25 years) for this to occur, though it could be at point earlier or later. This rehab would be in addition to the routine maintenance and O&M items that are priced separately.

Subtotal Major Rehab (from CWBS 05 account total):	**$7,992,743**
Construction Contingency:	**$2,078,113**
E&D (Incl. Contingency):	**$1,007,000**
S&A (Incl. Contingency):	**$806,000**
Total Major Rehab:	**$11,883,856**
Total Annualized Major Rehab Cost:	**$223,000**

Full Cost (With E&D/S&A and Contingency)

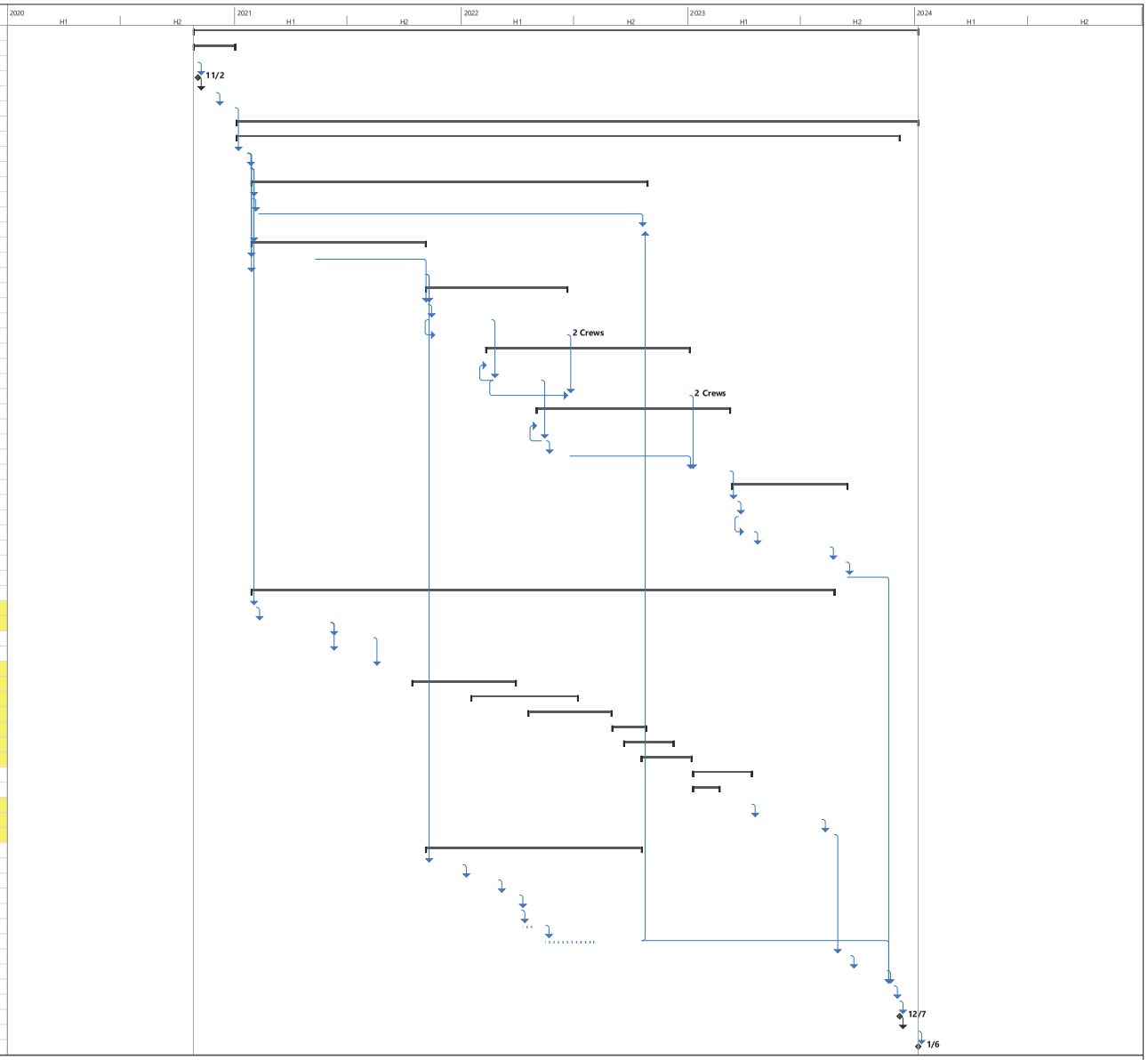
YEAR	Description	FUTURE WORK	PRESENT WORTH FACTOR	PRESENT WORTH
0		$0	1.00000	$0
25		$11,883,856	0.50752	$6,031,309
50	Major Rehab	$0	0.25758	$0
SUM OF PRESENT WORTHS		$11,883,856		$6,031,309
TOTAL ANNUAL COST				**$223,000**

Interest Rate	2.750%
n=50 years	50

ATTACHMENT G

CONSTRUCTION SCHEDULE

ID	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1	Construction Schedule	1167 days	Tue 10/27/20	Sat 1/6/24		
2	**Preconstruction Phase**	**67 days**	**Tue 10/27/20**	**Fri 1/1/21**		
3	Construction Contract Award	5 days	Tue 10/27/20	Mon 11/2/20		
4	Notice to Proceed	0 days	Mon 11/2/20	Mon 11/2/20	3	
5	Generate Contractor Submittals	30 edays	Mon 11/2/20	Wed 12/2/20	4	
6	Review/Approve Submittals	30 edays	Wed 12/2/20	Fri 1/1/21	5	
7	Construction Phase	1098 days	Mon 1/4/21	Sat 1/6/24		
8	Construction Begin	567 days	Mon 1/4/21	Thu 12/7/23		
9	Mobilization/Setup	10 days	Mon 1/4/21	Thu 1/21/21	6	
10	Clear & Grub Site	3 days	Fri 1/22/21	Tue 1/26/21	9	
11	**Borrow Area Prep**	**339 days**	**Thu 1/28/21**	**Thu 10/27/22**		
12	Clear/Grub	2 days	Thu 1/28/21	Fri 1/29/21	10	
13	Excavation/Stripping of Topsoil	5 days	Mon 2/1/21	Mon 2/8/21	12	
14	Cleanup Borrow Area	5 days	Thu 10/20/22	Thu 10/27/22	104,13	
15	**Demolition for Floodwall**	**150 days**	**Thu 1/28/21**	**Thu 11/4/21**	**10**	
16	Apartment Building	56 days	Thu 1/28/21	Mon 5/10/21	9	
17	Structures/Garages	150 days	Thu 1/28/21	Thu 11/4/21	9	
18	**I-Walls**	**120 days**	**Fri 11/5/21**	**Mon 6/20/22**		
19	Excavation	2 days	Fri 11/5/21	Mon 11/8/21	16,17	
20	Drive Sheet Pile	54 days	Tue 11/9/21	Fri 2/18/22	19	
21	Place I-Wall Monolith	113 days	Fri 11/19/21	Mon 6/20/22	20SS+5 days	2 Crews
22	**10-ft Interior T-walls**	**174 days**	**Thu 2/10/22**	**Tue 1/3/23**		
23	Excavation	5 days	Thu 2/10/22	Fri 2/18/22	24SS-5 days	
24	Drive Sheet Pile	43 days	Mon 2/21/22	Mon 5/9/22	20	
25	Place Floodwall Monoliths	105 days	Tue 6/21/22	Tue 1/3/23	24SS+5 days,21	2 Crews
26	**15-ft Interior T-walls**	**166 days**	**Mon 5/2/22**	**Thu 3/9/23**		
27	Excavation	5 days	Mon 5/2/22	Mon 5/9/22	28SS-5 days	
28	Drive Sheet Pile	4 days	Tue 5/10/22	Tue 5/17/22	24	
29	14 x 73 H-Piles	20 days	Thu 5/19/22	Fri 6/24/22	28	
30	Place Floodwall Monoliths	35 days	Thu 1/5/23	Thu 3/9/23	25,29	
31	**Interceptor Pipes**	**99 days**	**Mon 3/13/23**	**Thu 9/14/23**		
32	Cut Road	6 days	Mon 3/13/23	Tue 3/21/23	30	
33	Excavate	13 days	Thu 3/23/23	Thu 4/13/23	32	
34	Place Pipe	9 days	Fri 3/31/23	Mon 4/17/23	33SS+5 days	
35	Backfill	65 days	Tue 4/18/23	Thu 8/17/23	34	
36	Replace Pavement Sections	13 days	Fri 8/18/23	Tue 9/12/23	35	
37	Concrete Curb & Gutter	1 day	Thu 9/14/23	Thu 9/14/23	36	
38	Tainter Gate Structure	499 days	Thu 1/28/21	Thu 8/24/23		
39	Construction Access/Haul Roads	5 days	Thu 1/28/21	Thu 2/4/21	10	
40	Install Cofferdam	64 days	Fri 2/5/21	Fri 6/4/21	39	
41	Dewatering	37 days	Mon 6/7/21	Thu 8/12/21	40	
42	Diversion Culvert - 10'x10' Box Culvert	30 days	Mon 6/7/21	Fri 7/30/21	40	
43	Excavate and Stockpile	31 days	Mon 8/16/21	Tue 10/12/21	41	
44	Entrance Channel Slab	90 days	Thu 10/14/21	Tue 3/29/22		
51	Control Structure Slab	93 days	Mon 1/17/22	Thu 7/7/22		
59	Stilling Basin Slab	72 days	Tue 4/19/22	Tue 8/30/22		
66	Stilling Basin Walls	29 days	Thu 9/1/22	Tue 10/25/22		
72	North Piers	43 days	Tue 9/20/22	Thu 12/8/22		
78	South Piers	44 days	Tue 10/18/22	Fri 1/6/23		
84	**28-ft T-Wall**	**52 days**	**Mon 1/9/23**	**Thu 4/13/23**		
89	**Entrance Channel Retaining Walls**	**23 days**	**Mon 1/9/23**	**Mon 2/20/23**		
95	New Gate Hoists/Machinery	60 days	Mon 12/26/22	Thu 4/13/23	76,82,70	
96	New Gates	60 days	Mon 4/17/23	Fri 8/4/23	95	
97	Gate Testing	10 days	Mon 8/7/23	Thu 8/24/23	96	
98	**Levee Construction**	**184 days**	**Fri 11/5/21**	**Tue 10/18/22**		
99	State Street	31 days	Fri 11/5/21	Mon 1/3/22	17	
100	Flat Rock	31 days	Tue 1/4/22	Tue 3/1/22	99	
101	Blackberry	18 days	Thu 3/3/22	Mon 4/4/22	100	
102	Courthouse	2 days	Tue 4/5/22	Thu 4/7/22	101	
103	Walnut Ave	9 days	Mon 4/11/22	Mon 5/16/22	102	
104	King's Addition	40 days	Tue 5/17/22	Tue 10/18/22	103	
105	Remove Box Culverts	13 days	Fri 8/25/23	Tue 9/19/23	97	
106	Remove Cofferdam	32 days	Thu 9/21/23	Fri 11/17/23	105	
107	Staging Area Restoration	5 days	Mon 11/20/23	Tue 11/28/23	106,37,104	
108	Demob From Site	5 days	Thu 11/30/23	Thu 12/7/23	107	
109	Construction Complete	0 edays	Thu 12/7/23	Thu 12/7/23	108	
110	Project Closeout	30 edays	Thu 12/7/23	Sat 1/6/24	109	
111	Project Complete	0 days	Sat 1/6/24	Sat 1/6/24	110	



Project: JohnsonCty202_TSPSch
Date: Fri 12/6/19

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