

US Army Corps of Engineers®

CHICAGO DISTRICT

MCCOOK LEVEE

MCCOOK, IL

Appendix B: Cost Engineering

March 21, 2018

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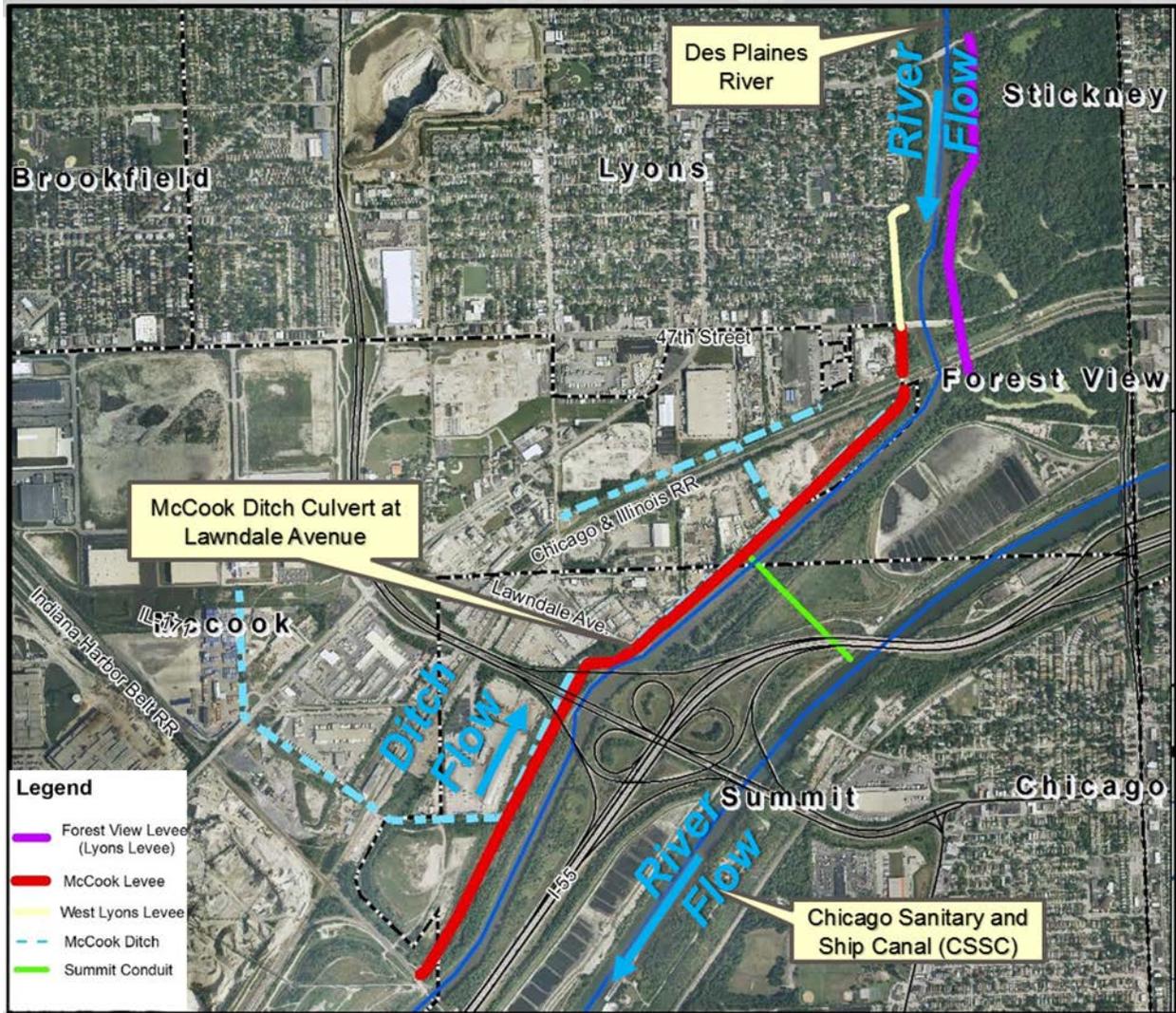
1.0 Project Description

This study was initiated to investigate measures that could potentially resolve flood risks in the communities of McCook, Lyons, and Summit Illinois. While the McCook Levee is providing a line of protection for the neighboring communities, significant flooding was experienced behind the levee during a record flood event in April 2013. The sources of flooding were identified as a combination of levee overtopping and lack of interior drainage capacity behind the levee. Levee assessments conducted by the U.S. Army Corps of Engineers (USACE) have identified stability and seepage issues with the structure in its current condition and the associated risk of levee failure is considered to be high.

2.0 Site Description

The McCook Levee is located in the Villages of McCook and Summit Illinois, which are both in the Illinois Third Congressional District, represented by Daniel Lipinski. The levee is adjacent to the Des Plaines River in the Goose Lake – Des Plaines River (HUC 071200040706) watershed. While the majority of this watershed drains directly to the Des Plaines River, the drainage area attributed to the McCook Ditch, behind the McCook Levee, is redirected to the Chicago Sanitary and Shipping Canal (CSSC) via the Summit Conduit, as described above.

The existing levee was constructed around the turn of the 20th century by the Metropolitan Water Reclamation District of Chicago (MWRDGC), then known as the Metropolitan Sanitary District of Greater Chicago (MSDGC). It is essentially segmented in two sections: the portion south of 47th street known as McCook Levee and the portion north of 47th know as West Lyons Levee.



3.0 Basis of Estimate

Due to the level of Scope and Technical Definition for this Pre-Authorization estimate (Limited-Fair) the Civil Works Estimate currently falls into a Class 3 Estimate, based on ER 1110-2-1302.

Table 1. Civil Works Estimates – Class Level Designation

Project Phase	Scope and Technical Definition		Risk Level	Minimum Estimate Class
Pre-Budget Development (not recommended for reports)	Extremely Limited		Extremely High	5*
Pre-Authorization				
Initial Alternatives	Very Limited		Very High	4*
Feasibility Alternatives	Very Limited		High	4*
Feasibility – Federal Recommended Plan	Limited-Fair		Moderate	3
National Economic Decision (NED)	Limited-Fair		Moderate	3
Locally Preferred Plan (LPP)	Limited-Fair		Moderate	3
Funding Request Decision Documents	Limited-Fair		Moderate	3
Authorization				
Continuing Authorities Program	Limited		Moderate to High	3-4
Civil Emergency Management Program	Limited		Moderate to High	3-4
Alternative Studies	Limited		Moderate to High	3-4
General Re-Evaluation Report	Limited-Fair		Moderate	3
Limited Re-Evaluation Report	Limited-Fair		Moderate	3
Design Documentation Report	Limited-Fair		Moderate	3
Engineering Decision Report	Limited-Fair		Moderate	3
Post Authorization Change Reports	Fair		Moderate	2-3
Other Funding Decision Documents	Limited-Fair		Moderate	3
Preconstruction, Engineering & Design (working estimates)				
PED 30%	Fair		Moderate	3
PED 60%	Fair-Good		Moderate to Low	2
PED 90%	Very Good		Low	1
IGE <100% Design	Fair-Good		Moderate to Low	2
IGE 100% Design	Very Good		Low	1
Construction / Post Award				
Budgets (modifications / claims)	Fair-Good		Moderate to Low	2
IGEs (modifications / claims)	Very Good		Low	1

* Do not use in formal/Chief of Engineer's Reports

Costs were derived utilizing RSMMeans, corollary data from similar Corps projects, vendor quotes, and DOT bid tabs for comparison. RSMMeans crews were adjusted as necessary to meet project conditions such as labor, equipment, and productivity. For the corollary cost data, recent projects in close geographic proximity with similar scope were used when possible to provide the most reasonable comparative costs. Local contractor/vendor quotes were utilized for material cost drivers. Additionally, bid tabs from local DOT were investigated to compare derived unit prices with locally awarded unit prices.

3.1 Basis of Design

The scoping description outlined in the Focused Array of Alternatives (Planning) as well as the construction features outlined in the McCook Levee Feasibility Computation Sheet Version 20171113 (Civil Lead) were used to develop the construction estimate. Hydraulic feature capacity and sizing was developed by CELRC-TS-DH. Refer to Appendix A – Civil Design for further details on design features.

3.2 Basis of Quantities

Quantity takeoffs were provided by the Civil Lead based on the current levee alignment, CADD surface differences, and established cross sections for areas and volumes and were structured according to the alternatives outlined in the scoping documents described in the Basis of Design section. The cost estimator verified the cost driver quantities based on independent estimates from a typical geometric section. CADD quantities were assumed more precise and reliable though the alternative verification method produced reasonably similar quantities.

Quantity assumptions made by Cost Engineering, based on a recent site visit, include debris removal and clearing and grubbing density with up to 24 IN average tree removal diameter identified.

4.0 Construction Estimate

The Construction Features were categorized into Work Breakdown Structure (WBS) Codes for conducting an Abbreviated Risk Analysis (ARA) and populating the Total Project Cost Summary (TPCS) worksheet. The following WBS Feature Codes were utilized and each construction feature grouped per WBS definition.

02 Relocations:

This feature includes removing and relocating, or reconstructing property of others, such as roads, railroads, cemeteries, utilities, buildings, and other structures; and lands or interests purchased for such relocations and conveyed to others, including real estate planning and acquisition expenses. The cost of removal of improvements from the reservoir area for disposal is included in the feature "Reservoirs." All alterations of railroad bridges in accordance with Section 3 of the 1946 Flood Control Act (22 USC 701p) are also included in this feature.

11 Levees and Floodwalls:

This feature includes embankments and walls constructed to protect areas from inundation by overflow from creeks, rivers, lakes, canals, and other bodies of water. This feature consists of such items as: service roads on levee crown or landside berms, road ramps, closure structures, seepage control measures, erosion protection measures on levee slopes and on berms and bank slopes when an integral part of the levees or floodwalls; and drainage facilities, constructed to provide means for the passage of accumulated drainage and seepage water and sewage from the protected area over or through levees and floodwalls, comprising such items as interceptor and collection sewers and ditches, and pressurized sewers and drainage structures, including outfalls through levees or floodwalls. Pumping plants are included in the feature "Pumping Plants." Levees locally called dikes are included in this feature.

19 Buildings, Grounds and Utilities:

This feature includes permanent facilities such as operators' quarters, administration and shop buildings, storage buildings and areas, garage buildings and areas, community buildings, local streets and sidewalks, landscaping, and electric, gas, water, and sewage facilities. Where space in a dam, powerhouse, or other basic structure is used in lieu of construction of any of the above-mentioned buildings, such allocated space is not separated from the basic structure. Communication systems are included in the feature "Permanent Operating Equipment."

Although utility conflicts are not anticipated, construction activity adjacent to the railroad, such as the clay blanket tie-back, was included as part of 02 Relocations due to construction within the railroad right-of-way.

WBS 11 Levees and Floodwalls included the majority of the construction features as well as generalized cost items such as mobilization, temporary construction facilities, traffic control, signage, and flood protection during construction. Major features include: Clearing and grubbing, debris removal, levee earthwork, levee access roads, and as part of erosion protection on the levee slopes, landscaping.

Drainage features such as the Toe Drain, large culverts from McCook Ditch to the Des Plaines, and existing McCook Ditch culvert sluice gate were considered as part of WBS 19.

4.1 Bid Items

1. **Mobilization and Demobilization (MOB/DEMOB)** includes initial project mobilization and final demobilization of construction equipment. Equipment mobilization is generalized and does not consider unique equipment such as boring or crane use. A second MOB/DEMOB item was included to remobilize project equipment during construction to the northern levee portions inaccessible due to crossing railroad tracks.

MOB/DEMOB includes the cost of erosion control silt fencing along the riverside stretch with hay baled check dams intermittently throughout the landside ditch. Erosion control measures have not been specified or quantified and are subject to change.

A survey crew was added included for site layout and establishing control points along the alignment.. Additional survey time may be required as plans and specs develop.

As-built drawings and documentation were included in the MOB/DEMOB cost as well.

The calculated MOB/DEMOB cost is based on a percentage of the overall project cost. Recent similar projects within the Chicago District were used to verify the reasonableness of the percentage of the construction contract cost.

2. **Project and Safety Signs**, cost constitutes full compensation for all labor, equipment, materials, and incidentals necessary to install, maintain signage during construction, and remove upon project completion. Actual sign types and quantities have yet to be determined.
3. **Temporary Construction Facilities** includes fencing and gates for access. Additional measures may be required upon further development of plans and specs (i.e. larger area, additional gates, etc). A construction office trailer assumes the length of construction duration based on MII construction features and is assumed removed during establishment period. Installation and removal cost included.
4. **Temporary Protection and Maintenance of Traffic** accounts for the period during construction that the Contractor will provide construction access and maintain traffic control. Measures for the protection and diversion of traffic may include the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work area, and the erection and maintenance of adequate warning, danger, and direction signs as required by the State and local authorities having jurisdiction.

Additional Traffic Protection and Maintenance may be required near railroad and at intermittent locations along the industrial drive area adjacent to levee.
5. **Clearing and Grubbing** levee area includes clearing woody vegetation on existing Levee and 15' from the toe each side. Accounts for cutting and chipping larger diameter trees and dense grubbing. Shallow chippings to remaining onsite. Assumes burning of smaller woody debris. Production rates reflect limited access and sloping terrain. Crew includes laborers and an operator. Brush chipper and chainsaws implemented with front end loader. Conservative quote from a recent project were used for comparison.
6. **Debris Removal** assumed throughout the area. Based on site visit and observation, concrete debris along embankment, scattered plastic, and metals exist throughout landside ditch. Clean Construction Debris Disposal (CCDD) assumed at McCook Quarry approximately 7 mile round trip from farthest access point of levee.
7. **Construct a new 42" RCP culvert** under the existing levee from McCook ditch to the Des Plaines River by excavating through the levee. The flow line of ditch is assumed above the normal water surface elevation but a cofferdam as well as trench box are included as conservative measures for rain events and unexpected rising ground water or water surface elevations. Dewatering is estimated for draining the existing culvert and ditch to the Des Plaines at the same time and pathway as the proposed culvert. Estimate accounts for a rubber backflow preventer. Cost reflects utilizing existing structural fill, new topsoil hauled in, and establish turfed surface area after seeding.

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8. **Headwall and Sluice Gate for Upstream McCook Ditch (Existing 60" Culvert at Lawndale)** includes construction of a new concrete headwall at the upstream end of the Lawndale culvert. Dewatering by means of bypass pumping included with new headwall construction. A sluice gate was included as a flow regulator and trash rack to prevent debris plugging the partially closed gate. A 60" RMS sluice gate was utilized for cost along with vendor pricing for flared end sections with trash rack.
9. **Toe Drain.** The 5' x 5' stone filled Toe Drain includes geo-fabric underlying stone. Assumes 15% over dig and additional material. Spoils to be stockpiled within 6 miles at sponsor's designated location. Crushed stone quote provided. Dewatering via bypass pumping assumed before and during construction along the landside ditch.
10. **Riverside Riprap, additional Riverside Clay, Regrading Landside Clay, regrade and repair existing stone access path, and Landscaping Restoration** are included as part of Levee Repair/Improvements.
- Riprap is included as riverside armoring. Material pricing was derived from regional vendors. Riprap bedding placement was included in Riprap placement.
- 200lb Geo-synthetic fabric was applied to the riprap base and bedding. Fabric placement was included as part of Riprap placement (productivity adjusted accordingly).
- Riverside Clay from Station 20+00 to 30+00 will have clay built up on the riverside to 2.5:1 slope. After reviewing cross section data from the HEC-RAS model, the existing slopes beyond station 31+00 meet the 2.5:1 requirement. Imported clay is considered to be a cost driver therefore pricing was acquired from multiple contractors with a weighted average used.
- Re-grading areas assumes minimal imported fill utilizing existing material by regrading Station 4+00 to 41+00 to 2.5:1 on the landside. Minimal new clay will be needed in this area based on existing topo, regrade what is there. Contours show between 2:1 and 5:1 average existing slope including up to RR.
- Access path restoration assumes stone dressing the overall surface.
- Landscaping (Restoration and Establishment) includes hydro seeding, erosion control, and establishment of turf both landside and riverside as necessary.
11. **Tiebacks** are based on similar earthwork crews as the main levee repair/improvement crews and activities. A 200' tieback levee constructed to elevation 604 and ties into existing elevation 604 before the adjacent parking lot on Lawndale. The levee tieback will be constructed of clay and surfaced with turf. Plan 3A segmented levee tiebacks utilize the same crews with a user input of surface area for Landscaping/Restoration and cohesive soil fill volume. A concrete sidewalk tieback was included with the West Lyons Levee Alternatives.
- Clay blanket tiebacks (berms) were conceptualized adjacent to the railroad. Similar crew makeup was utilized for construction though productivity levels reduced as part of coordination with the Railroads.
12. **Coordination with Others (Railroad and Utility Impacts)**
- The levee alignment crosses several existing utilities on property or easements owned or controlled by the BNSF Railroad, CN Railroad and Commonwealth Edison. Currently the cost for this item is related to the duration of construction activities and includes designated labor for coordinating with utility members.
13. **Flood Prot. During Construction.** An assumption of standard flood fighting procedures of sandbagging was made.
14. **Performance and Payment Bond** % determined from the Bond Calculator in MII and applied to the Contract Cost.

Cost drivers include Riverside Riprap, Earthwork, Toe Drain, Landscape Restoration & Establishment, and Clearing & Grubbing. Quotes for riprap, stone bedding, and overburden were recently incorporated from

Vulcan Material's McCook Site. Quotes for cohesive fill (clay) were acquired from other sources and used to determine a reasonable cost per cubic yard. Recent site clearing quotes for other projects (gradual slope, larger scale 200-400 acres) were used to compare the clearing estimate for the levee in MII and scaled accordingly. The higher per acre cost for Clearing is reasonable considering the sloping terrain, woody density, and limited access. Landscape restoration includes seeding and erosion control protection. Vendor pricing was applied to the erosion fabric (woven Jute Fabric) cost. Establishment of the turf includes successive watering and mowing where mowing prices from a recent contractor quote was utilized.

4.2 General Conditions and Markups

The estimate further assumes that the prime contractor will perform the earthwork and related work and subcontract out the remaining work. Sub-contractors include Landscaping, Concrete, Clearing & Grubbing, and a Generic Sub for miscellaneous items. Crew productivity levels were reduced as a global construction markup due to limited site access.

A contingency was developed for each WBS Feature Code and respective construction features through an Abbreviated Risk Analysis and applied to the total estimate to account for current design uncertainties that will be refined as the plans and specs are further developed and additional site information gathered. The value was reasonable given the state of design and the number of uncertainties. A comparably scoped and geographically located project (Forest View Levee Feasibility Study) provided a comparable ARA weighted percentage for comparison. Two railroads (CN & BNSF) exists between the McCook and West Lyon's levees and the construction activities near the railroad driving WBS specific contingencies for both studies.

Escalation factors were calculated in the TPCS worksheet and depend on the specific WBS Feature Code. Based on 1Q 2018 FEAS estimate completion date and 3Q 2021 as mid construction, each WBS Feature Code escalation value was calculated per EM 1110-2-1304 30 September 2017 Civil Works Construction Cost Index System (CWCCIS).

The estimate further assumes that other general condition items not otherwise specified in the temporary construction facilities bid item are included in the mobilization & demobilization bid items.

4.3 Miscellaneous Assumptions & Notes

- Contingencies and escalation factors have been intentionally omitted from MII. They are added in the Total Project Cost Summary. Refer to the "Total Project Cost Summary" section of this appendix for further details.
- The estimate assumes minor underground utilities may need to be repaired or relocated though no conflicts have been confirmed by the USACE PDT.
- MII Class B bond table formula used to calculate the bond costs.
- Costs for the 30 & 31 accounts were derived by inputting typical District labor percentage values in the TPCS worksheet along with verified Design and Construction Admin percentages from their respective department chiefs.

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- WBS 01 Lands and Damages costs and contingency provided by Chicago District Real Estate Section. Admin costs related to real estate are included in the 30 account in the TPCS.
 - Equipment rates used are from EP 1110-1-8, Volume 2, 2016.
 - Materials that will become permanent features of the federal project are exempt from state sales tax in Illinois.
 - Davis Bacon Wages 8/30/2017 (Labor Rates)
 - EIA 8/28/2017 Fuel Pricing (U.S. Energy Information Administration Current Fuel Pricing)
 - Vendor/Contractor Quotes include Cost Drivers such as clay, aggregate, rip rap, clearing, RCP, and concrete.
 - Topsoil and spoils assumed to remain on site or stockpiled within a range of 6 miles on sponsor provided land.

4.4 Non-structural Measures

4.4.1 Dry floodproofing

Dry floodproofing was considered for structures in risk of incurring damages during flooding. Dry floodproofing measures are modifications to an existing structure to prevent floodwaters from entering and thus preventing damages above the first floor elevation. The 17 residential structures near the West Lyons levee (see Section 3.5 Formulation and Comparison of Alternative Plans Figures 15) were considered for this non-structural method though several were bi-level or finished basements below grade were 1-3 ft of flooding was anticipated from a 100 yr event (i.e. the typical 3 ft method of floodproofing was considered impractical). An approximate average of \$50K per structure for 3 FT floodproofing, determined from a similar feasibility study (Table 1 from Forest View Levee Feasibility), was a higher cost than the levee repairs itself and would not account for the additional below grade floodproofing necessary for the structures with lower levels.

4.4.2 Elevation

The Forest View Study was utilized again for an approximate range of elevating similar structures at the West Lyons Levee. The web-based cost non-structural cost estimating tool nServo was used to develop modeled construction costs for the scenarios of raising a structure in place. nServo was developed by USACE Huntington District, which has extensive experience with implementing floodproofing projects. At the PDT level the cost engineer was given an averaged data set from economist that consisted of building type, material, square foot area, perimeter, basement existence, number of stories of structure in risk of incurring damages during flooding. This data was used in the creation of a structure classes within nservo, additional assumption were made including number of chimneys, number of entrances, and other details. A 5 foot elevation raise was assumed for every structure to lower the risk of damage. The structure database is connected to a cost database which when a report is ran produces a detailed parametric cost estimate for each structure. The 5 foot elevation raise probably understates the requirements for elevating the West Lyons Levee structures and the cost from Forest View is in the \$100K range per structure (see Table 1) well above the cost of repairing the levee itself.

Category	Code	Square Footage	Perimeter	Building Type	Basement	Stories	Total Structures	Floodproofing (per unit)	Elevation (per unit)
One Story Res (small)	1SRSM	850	125	Masonry	Yes	1	187	\$ 44,567.00	\$ 159,700.88
One Story Res (small)	1SRSW	850	125	Wood/Steel Frame	Yes	1	150	\$ 44,567.00	\$ 94,248.00
One Story Res (medium)	1SRMM	1400	165	Masonry	Yes	1	181	\$ 45,378.25	\$ 130,229.49
One Story Res (medium)	1SRMW	1400	165	Wood/Steel Frame	Yes	1	120	\$ 45,378.25	\$ 102,952.48
One Story Res (large)	1SRLLM	2000	200	Masonry	Yes	1	5	\$ 46,088.10	\$ 149,433.52
Two Story Res (small)	2SRSM	2000	160	Masonry	Yes	2	87	\$ 45,276.85	\$ 130,849.45
Two Story Res (large)	2SRLLM	5000	250	Masonry	Yes	2	26	\$ 47,102.16	\$ 185,698.09
Two Story Res (large)	2SRLLW	5000	250	Wood/Steel Frame	No	2	15	\$ 47,102.16	\$ 118,238.82
One Story Non-Res (small)	1SNRSM	2000	225	Masonry	Yes	1	12	\$ 46,595.13	\$ 160,904.91
One Story Non-Res (small)	1SNRSW	2000	225	Wood/Steel Frame	Yes	1	12	\$ 46,595.13	\$ 115,042.70
One Story Non-Res (medium)	1SNRMM	10000	500	Masonry	Yes	1	20	\$ 52,172.49	\$ 335,100.03
One Story Non-Res (large)	1SNRLLM	60000	1400	Masonry	Yes	1	10	\$ 70,425.68	\$ 966,943.04
Oil Storage	OSS	4000	200	Steel	No	1	36	NA	NA
Legend									
Floodproofing (per unit)		The per unit cost of dry floodproofing							
Elevation (per unit)		The per unit cost of elevating a home in place (assume 5 foot elevation)							

Table 1: Elevation and Floodproofing Cost from Forest View Feasibility Study

4.4.3 Filling Lower Level including Main Floor Addition of Replacement Living Area

Filling the lower level of the structures would be a costly endeavor unto itself but the additional square footage required for mitigation of lost living space would be a significant expense and much greater than the Levee repair alternative. This non-structural measure may be less desirable considering the loss of yard space and furthermore may not meet local codes due to increase impervious area on existing small lots. No further investigation was conducted with this measure.

4.4.4 Acquisition

Purchasing the properties was expected to be more costly than the former measures with market values in the range of \$140-200K per structure (16 residential houses) and over \$500K for the Apartment complex.

Alternative 1A - McCook & Lyons Non-Structural									
Lyons	Map Number	Property Type	Address	PIN	Building SF	Land SF	Est. Market Value	Basement	
	1	Apartment	4620 FISHERMANS TER	18013230440000	--	120,456	\$567,950	--	
	2	Residential	7631 46TH ST	18013230320000	1,279	5,895	\$165,630	Partial and Rec Room	
	3	Residential	7629 46TH ST	18013230310000	1,279	5,895	\$154,050	Partial and Rec Room	
	4	Residential	7634 46TH ST	18013200330000	802	6,762	\$139,300	None	
	5	Residential	7632 46TH ST	18013200340000	802	6,762	\$143,050	None	
	6	Residential	4604 FISHERMANS TER	18013200310000	1,702	7,350	\$178,580	None	
	7	Residential	4541 FISHERMANS TER	18013240260000	960	7,986	\$167,610	Full and Unfinished	
	8	Residential	4545 FISHERMANS TER	18013240380000	824	7,166	\$145,590	Full and Unfinished	
	9	Residential	4549 FISHERMANS TER	18013240390000	1,233	17,006	\$202,760	Full and Rec Room	
	10	Residential	4605 FISHERMANS TER	18013240290000	1,539	6,712	\$190,910	Full and Unfinished	
	11	Residential	4607 FISHERMANS TER	18013240300000	1,260	6,712	\$171,210	Partial and Rec Room	
	12	Residential	4609 FISHERMANS TER	18013240310000	1,215	6,712	\$156,790	Partial and Rec Room	
	13	Residential	4611 FISHERMANS TER	18013240320000	1,215	6,712	\$168,370	Partial and Rec Room	
	14	Residential	4613 FISHERMANS TER	18013240330000	1,215	6,712	\$168,370	Partial and Rec Room	
	15	Residential	4615 FISHERMANS TER	18013240340000	1,260	6,712	\$174,340	Partial and Rec Room	
	16	Residential	4617 FISHERMANS TER	18013240350000	1,260	6,712	\$159,630	Partial and Rec Room	
	17	Residential	4619 FISHERMANS TER	18013240360000	1,260	6,712	\$162,760	Partial and Rec Room	
							Residential Value (Residential)	\$165,559	
							Total Apartment	\$567,950	
							Total Residential	\$2,648,950	
							Grand Total	\$3,216,900	

Table 2: West Lyons Floodplain Structures

Non-structural considerations for the 19 industrial building in the flood plain included wet- or dry-floodproofing, elevation, relocation, or acquisition of the structures. Section 3.5 Formulation and Comparison of Alternative Plans Figures 12, 13, and 14.

5.0 Construction Schedule

A formal construction schedule was developed for the TSP. Based on the MII construction features and cost engineering experience, a construction schedule was developed that takes into account the number of days needed to complete earthwork, including holidays and possible weather concerns for the duration of the project, along with a reasonable date for the award. See the attached gantt chart for a detailed construction schedule.

6.0 Acquisition Plan

A contracting member is currently not on board in the PDT. If the project is awarded to a small business requiring specific criteria such as (Veteran, Minority, Women Owned, etc.) the overhead and anticipated cost is likely to increase due to reduced competition and typical small business overhead. There is a possible negligible impact since no contracting plan has been established, but given the estimated value of the construction contract, the contract solicitations are likely to be restricted to small business. The base estimate already assumes a small business contract though specific contracting criteria is undetermined at this time.

7.0 Risk Assessment

Various risks (uncertainties) include: potentially contaminated soil & related disposal fees, potential shoreline wetland impacts, dewatering duration/methods, risk of opening the levee for new culvert placement and level of protection required, construction costs affiliated working with/near railroads and utilities, specifications for riprap, and clay (structural fill) are incomplete therefore vendor quotes may vary. Contractor's acquisition of clay is becoming increasingly limited in the area and may reflect measurable changes in cost at the time of construction, change of scope due to construction staging area real estate acquisition and the structural integrity of the existing levee are examples of additional risk factors that were considered.

An abbreviated risk analysis (ARA) was performed to develop a contingency for the construction cost estimate. The concerns outlined in the ARA would have a marginal to negligible impact on the project. General concerns include the fact that a contracting member is not currently on the PDT or that the project could potentially not be given small business contract consideration. Project costs have the potential to increase due to modified quantities and scope during the course of the project considering the level of design.

8.0 Operation and Maintenance Cost

O&M cost for the service life of the alternatives was estimated for multiple features and anticipated frequency. Table 3 documents O & M Features based on historical information from inspection team members, cost book items, and DOT bid data.

O&M Feature	Reoccurrence (Years, YR)	Frequency (Times per YR)
Levee Inspection	2	1
Lawndale Sluice Gate, Bypass Flap Gate, and Culvert Inspection	2	1
Gravel Access Road Maintenance & Repair	4	1
Levee Structure Fill/Repair	1.5	1
Debris & Litter Removal	1.5	1
Vermin Control	1.5	1
HMA Pedestrian Path & Access Road Maintenance	1.5	1
Survey, including Settlement Gauges	1	1
Tree and Brush Removal	1	1
Mowing	1	2
<i>Base Year: 2018</i> <i>Federal Discount Rate: 2.375% (FY2018)</i> <i>Price Level: November 2017 (FY2018)</i> <i>Period of Analysis: 50 years</i> <i>Construction estimate includes 30% contingency</i>		

Table 3: O & M Cost

9.0 Alternative Analysis

The cost of alternatives and associated economic analysis of the alternatives, is captured in Table 3 and 4 of the main report Section 3.5.2 Comparison of Alternatives. Alternative 2Ba (West Lyons Levee regrading, clearing, and grubbing of 450' of levee between 47th and 45th) and 3A (McCook Levee Segmented Repair between Lawndale and 47th) were chosen as the lowest cost tentatively selected plan.

9.1 Alternatives

Details and figures regarding each Alternative Plan, as were utilized for the cost development, are depicted in the main report section 3.5 Formulation and Comparison of Alternative Plans.

During the development of the Focused Array of Alternatives, three alternative plans, beyond No Action and Non-Structural, were considered on a conceptual level. Refer to main report Section 3.5 Formulation and Comparison of Alternative Plans Figure 11.

9.1.1 Plan 0A & 0B – No Action.

In the no action plan, no improvements would be made to the levee and no new flood risk management measures would be implemented.

9.1.2 Plan 1A & 1B –Non-Structural.

For Non-structural cost methodology, refer to Section 4.4 Non-structural Measures

9.1.3 Plan 2A- McCook Levee Repair

This plan would bring the existing portion of the levee between Lawndale Ave. and 47th St. into compliance with current USACE design standards by implementing several repairs and constructing a toe drain along a significant portion of the levee to address seepage concerns. Refer to main report Section 3.5 Formulation and Comparison of Alternative Plans Figure 16.

This plan would also include modification of the McCook Ditch by eliminating flow at the existing Culvert under Lawndale Avenue and providing a new outlet or bypass culvert from the McCook Ditch to the Des Plaines River.

This plan would require the construction of tieback levee south of Lawndale Avenue tying into high ground.

9.1.4 Plan 2B-West Lyons Levee Repair

This plan has two subsets 2Ba & 2Bb. 2Ba includes regrading, clearing, and grubbing of 450' of levee between 47th and 45th. Plan 2Bb considers regrading and elevating 870' of levee between 47th and 45th including clearing & grubbing, erosion control, removal and replacement of the pedestrian path with elevated surface, restoration of hardscaping and landscaping. Refer to main report Section 3.5 Formulation and Comparison of Alternative Plans Figure 17.

9.1.5 Plan 3A – McCook Levee Segmented Repair

This plan involves regrading and providing additional clay fill between segments of Lawndale and 47th St. Plan 3A will meet necessary slope requirements, riprap riverside section, grubbing and clearing Lawndale-47th, and provide new 1,500 LF landside toe drain. Block/slug existing 60" culvert and install new 72" RCP culvert to Des Plaines River. Additional 36" culvert installed to drain McCook ditch into the Des Plaines. Two additional tiebacks included to close open ended levee segments. Refer to main report Section 3.5 Formulation and Comparison of Alternative Plans Figure 18.

9.2 Optimization

The Tentatively Selected Plan included selection of the combined McCook and West Lyons Levee's least cost measures during the Alternative Analysis.

Alternative Analysis: Cost of Measures and O&M			
MEAS	DESCRIPTION	ROM	O&M
1A	Non-structural Measures (McCook Levee)	\$0.9M	\$25K
1B	Non-structural Measures (W. Lyons Levee)	\$1.0M	\$15K
2A	Levee Repair South of 47th (McCook Levee)	\$4.2M	\$80K
2Ba	Levee Repair North of 47th (W. Lyons Levee)	\$0.5M	\$25K
2Bb	Levee Elevation and Repair North of 47th (W. Lyons Levee)	\$1.2M	\$25K
3A	Segmented Levee Repairs South of 47th (McCook Levee)	\$3.8M	\$50K

Table 3: Cost of Measures and O&M

10.0 References

U.S. Army Corps of Engineers, 1993, *Engineering and Design Cost Engineering Policy and General Requirements, Engineering Regulation 1110-1-1300*, Department of the Army, Washington D.C., 26 March 1993.

U.S. Army Corps of Engineers, 1999, *Engineering and Design for Civil Works Projects, Engineering Regulation 1110-2-1150*, Department of the Army, Washington D.C., 31 August 1999.

U.S. Army Corps of Engineers, 2008a, *Civil Works Cost Engineering, Engineering Regulation 1110-2-1302*, Department of the Army, Washington D.C., 15 September 2008.

U.S. Army Corps of Engineers, 2008b, *Construction Cost Estimating Guide For Civil Works, Engineering Technical Letter 1110-2-573*, Department of the Army, Washington D.C., 30 September 2008.

11.0 Attachments

11.1 Abbreviated Risk Analysis

11.2 Construction Schedule

DRAFT

Abbreviated Risk Analysis

Project (less than \$40M): **McCook Levee, Illinois Section 205 Flood Risk Management**
 Project Development Stage/Alternative: **Feasibility (Recommended Plan)**
 Risk Category: **Low Risk: Typical Construction, Simple**

Alternative: TSP

Meeting Date: 11/21/2017

Total Estimated Construction Contract Cost = \$ **3,234,179**

	CWWBS	Feature of Work	Estimated Cost	% Contingency	\$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	\$ 100,909	10.00%	\$ 10,091	\$ 111,000
1	02 RELOCATIONS	Construction Activities At/Near Railroad	\$ 196,399	65.08%	\$ 127,814	\$ 324,213
2	02 RELOCATIONS	Utility Impacts	\$ 84,000	22.72%	\$ 19,087	\$ 103,087
3	11 01 LEVEES	MOB/DEMOB & Site Preparation	\$ 203,917	17.42%	\$ 35,517	\$ 239,434
4	11 01 LEVEES	Clearing/Grubbing & Debris Removal	\$ 251,004	15.70%	\$ 39,404	\$ 290,408
5	11 01 LEVEES	Earthwork	\$ 488,267	26.71%	\$ 130,416	\$ 618,683
6	11 01 LEVEES	Rip Rap	\$ 1,371,349	28.36%	\$ 388,965	\$ 1,760,314
7	11 01 LEVEES	Access Paths and PCC Sidewalk Tie-back	\$ 111,098	17.42%	\$ 19,352	\$ 130,449.95
8	11 01 LEVEES	Landscaping and Turf Restoration	\$ 102,441	22.87%	\$ 23,426	\$ 125,866.60
9	11 01 LEVEES	Flood Protection During Construction	\$ 35,878	56.08%	\$ 20,119	\$ 55,996.89
10	19 BUILDINGS, GROUNDS, AND UTILITIES	Toe Drain	\$ 83,418	50.56%	\$ 42,173	\$ 125,591.48
11	19 BUILDINGS, GROUNDS, AND UTILITIES	Hydraulic Structures	\$ 306,408	33.25%	\$ 101,868	\$ 408,275.76
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	\$ 553,241	17.82%	\$ 98,573	\$ 651,814
14	31 CONSTRUCTION MANAGEMENT	Construction Management	\$ 307,247	19.31%	\$ 59,333	\$ 366,580
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW)				\$ -	

Totals						
	Real Estate	\$	100,909	10.0%	\$	111,000.00
	Total Construction Estimate	\$	3,234,179	29.3%	\$	4,182,321
	Total Planning, Engineering & Design	\$	553,241	17.8%	\$	651,814
	Total Construction Management	\$	307,247	19.3%	\$	366,580
	Total Excluding Real Estate	\$	4,094,667	27.0%	\$	1,106,048
					Base	50%
					80%	
	Confidence Level Range Estimate (\$000's)				\$4,095k	\$5,201k

* 50% based on base is at 5% CL.

Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analysis. Must include justification. Does not allocate to Real Estate.)

McCook Levee, Illinois Section 205 Flood Risk Management

Feasibility (Recommended Plan)
Abbreviated Risk Analysis
Meeting Date: 21-Nov-17

		Risk Level				
Very Likely	2	3	4	5	5	
Likely	1	2	3	4	5	
Possible	0	1	2	3	4	
Unlikely	0	0	1	2	3	
	Negligible	Marginal	Moderate	Significant	Critical	

Risk Register

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Management & Scope Growth						40%
PS-1	Construction Activities At/Near Railroad	The levee crosses two railroads. Some preliminary concepts have been discussed but the level of detail is null regarding plans and specs. Potential for scope creep and schedule impacts may exist based on difficulties with coordination and design review with the railroads.	Scope is straight forward though alignment and design may vary as real estate is finalized. A less than ideal subsurface condition may actualize further along in the PED phase or during construction. If unfavorable conditions occur, the result could	Significant	Likely	4
PS-2	Utility Impacts	Utilities have been noted along the Railroad. Conflicts may impact scope.	Coordination with the Railroad and Utility Members may impact project management and present marginal scope changes to rectify	Marginal	Possible	1
PS-3	MOB/DEMOB & Site Preparation	NA	Mobilization and Site Preparation are typical. Protection and Maintenance of traffic may be challenging near 47th but are not expected to impact Scope Growth and Project	Negligible	Unlikely	0
PS-4	Clearing/Grubbing & Debris Removal	Potential for unidentified subsurface debris.	Based on site observations debris removal appears minor and mostly surficial trash. Likelihood of additional debris below surface is unlikely therefore impact expected to be negligible	Negligible	Unlikely	0
PS-5	Earthwork	The scope is conceptually defined in this project feature as it is essentially repairing the levee to Corps standards, though lacks actual design plans and specs. Some risk does exist if poor quality subsurface materials or	Scope is straight forward though alignment and design may vary as real estate is finalized. A less than ideal subsurface condition may actualize further along in the PED phase or during	Negligible	Unlikely	0
PS-6	Rip Rap	Placing Rip Rap in the wet. Cross section detail has not been developed.	Additional subsurface material may require excavation. Further hydraulic analysis may require larger revetment. Impact could be moderate due to the quantities of this	Moderate	Possible	2
PS-7	Access Paths and PCC Sidewalk Tie-back	NA	Paths and sidewalk are based on typical sections and are not expected to deviate from the norm.	Negligible	Unlikely	0
PS-8	Landscaping and Turf Restoration	Requirements for turf seeding and restoration may become more specific such as the variety and species of seed type near existing wetlands.	ts possible the desired seed mix may become more specific and lead to a marginal scope change.	Marginal	Possible	1
PS-9	Flood Protection During Construction	Measures for flood control are assumed and have yet to be scoped.	Requirements for flood control may be more stringent than assumed. Scoping documents will be necessary for further guidance. t is likely the impacts could be significant for a critical	Significant	Likely	4
PS-10	Toe Drain	Toe drain excavation material may be unsuitable for re-use as fill. Sediment may be contaminated.	Scope change is possible providing guidance as to proper disposal if contaminated. Additional testing requirements may be necessary. Conditions for re-use suitability need to be outlined.	Significant	Possible	3
PS-11	Hydraulic Structures	This project is at the AFB level; therefore design of hydraulic structures is preliminary. Extensive dewatering and unexpected subsurface conditions may impact scope	t is possible that there will be minor design changes which could result in a moderate cost change.	Moderate	Possible	2
PS-13	Planning, Engineering, & Design	The major construction features have clearly been identified. Little concern exist on PED cost for this project considering the PDT has a solid reference project directly across the Des Plaines	There is a marginal impact possible due to potential changes throughout Engineering and Design related to the construction features	Marginal	Possible	1
PS-14	Construction Management	The major construction features have clearly been identified. Since CM is percentage of the construction cost, any increases to the estimate caused by scope growth will increase the CM estimate as well.	There is the possibility of impact due to potential changes in construction features, activities, submittal requirements, as well as overall performance period during PED. The impact is	Marginal	Possible	1
Acquisition Strategy						30%
AS-1	Construction Activities At/Near Railroad	Contracting member currently not assigned to PDT and market research has yet to be conducted. Acquisition strategy yet to be determined. If project goes to small business, overhead and markups could increase effecting entire	Possible marginal impact. No contracting plan has been established, although given the estimated value of the construction contract, the contract solicitations are likely to be	Marginal	Possible	1

AS-2	Utility Impacts	Contracting member currently not assigned to PDT and market research has yet to be conducted. Acquisition strategy yet to be determined. If project goes to small business overhead and markups could increase effecting entire	Possible marginal impact. No contracting plan has been established, although given the esimated value of the construction contract the contract solicitations are likely to be	Marginal	Possible	1
AS-3	MOB/DEMOB & Site Preperation	Contracting member currently not assigned to PDT and market research has yet to be conducted. Acquisition strategy yet to be determined. If project goes to small business overhead and markups could increase effecting entire	Possible marginal impact. No contracting plan has been established, although given the esimated value of the construction contract the contract solicitations are likely to be	Marginal	Possible	1
AS-4	Clearing/Grubbing & Debris Removal	Contracting member currently not assigned to PDT and market research has yet to be conducted. Acquisition strategy yet to be determined. If project goes to small business overhead and markups could increase effecting entire	Possible marginal impact. No contracting plan has been established, although given the esimated value of the construction contract the contract solicitations are likely to be	Marginal	Possible	1
AS-5	Earthwork	Contracting member currently not assigned to PDT and market research has yet to be conducted. Acquisition strategy yet to be determined. If project goes to small business overhead and markups could increase effecting entire	Possible marginal impact. No contracting plan has been established, although given the esimated value of the construction contract the contract solicitations are likely to be	Marginal	Possible	1
AS-6	Rip Rap	Contracting member currently not assigned to PDT and market research has yet to be conducted. Acquisition strategy yet to be determined. If project goes to small business overhead and markups could increase effecting entire	Possible marginal impact. No contracting plan has been established, although given the esimated value of the construction contract the contract solicitations are likely to be	Marginal	Possible	1
AS-7	Access Paths and PCC Sidewalk Tie-back	Contracting member currently not assigned to PDT and market research has yet to be conducted. Acquisition strategy yet to be determined. If project goes to small business overhead and markups could increase effecting entire	Possible marginal impact. No contracting plan has been established, although given the esimated value of the construction contract the contract solicitations are likely to be	Marginal	Possible	1
AS-8	Landscaping and Turf Restoration	Contracting member currently not assigned to PDT and market research has yet to be conducted. Acquisition strategy yet to be determined. If project goes to small business overhead and markups could increase effecting entire	Possible marginal impact. No contracting plan has been established, although given the esimated value of the construction contract the contract solicitations are likely to be	Marginal	Possible	1
AS-9	Flood Protection During Construction	Contracting member currently not assigned to PDT and market research has yet to be conducted. Acquisition strategy yet to be determined. If project goes to small business overhead and markups could increase effecting entire	Possible marginal impact. No contracting plan has been established, although given the esimated value of the construction contract the contract solicitations are likely to be	Marginal	Possible	1
AS-10	Toe Drain	Contracting member currently not assigned to PDT and market research has yet to be conducted. Acquisition strategy yet to be determined. If project goes to small business overhead and markups could increase effecting entire	Possible marginal impact. No contracting plan has been established, although given the esimated value of the construction contract the contract solicitations are likely to be	Marginal	Possible	1
AS-11	Hydraulic Structures	Contracting member currently not assigned to PDT and market research has yet to be conducted. Acquisition strategy yet to be determined. If project goes to small business overhead and markups could increase effecting entire	Possible marginal impact. No contracting plan has been established, although given the esimated value of the construction contract the contract solicitations are likely to be	Marginal	Possible	1
AS-13	Planning, Engineering, & Design	Acqisition strategy will have little impact on the PED costs.	There is a possible negligible impact on the PED costs.	Negligible	Possible	0
AS-14	Construction Management	Acqisition strategy will have little impact on the PED costs.	There is a possible negligible impact on the PED costs.	Negligible	Possible	0

Construction Elements			Maximum Project Growth		15%	
CON-1	Construction Activities At/Near Railroad	Schedule Impacts may occur due to coordination with RR	t is likely the impacts would moderately impact JOOH and overall performance period	Moderate	Likely	3
CE-2	Utility Impacts	Schedule Impacts may occur due to coordination with RR and Utility Members. Utility conflicts increase construction schedule or require MODs	Utility coordination is likely though anticipated impacts are negligible	Negligible	Likely	1
CE-3	MOB/DEMOB & Site Preperation	Traffic Control Conflicts	Typical equipment mobilization and temporary construction facilities. Traffic control may impact productivity though marginaly with appropriate signage/devices/flaggers	Marginal	Possible	1
CE-4	Clearing/Grubbing & Debris Removal	NA	No subsurface debris or clearing/grubbing concerns expected	Negligible	Unlikely	0
CE-5	Earthwork	Less than ideal existing levee structure material slated for regrading	More imported fill may be necessary. Impoted fill such as clay is a scarce commodity and would significantly impact cost if additional material required.	Significant	Possible	3
CE-6	Rip Rap	NA	Rip Rap placement is a common construction feature though placing in the wet and within a floodway poses a risk to scheduling and diverting water	Significant	Possible	3
CE-7	Access Paths and PCC Sidewalk Tie-back	NA	These construction elements are straight forward and frequently constructed.	Negligible	Unlikely	0
CE-8	Landscaping and Turf Restoration	Planting within a specified seasonal window may drive schedule and JOOH	Likely the construction schedule will be tailored to a USACE specified planting window. Impacts to cost are expected to be moderate.	Moderate	Likely	3

CE-9	Flood Protection During Construction	Opening the levee for installing hydraulic structures increases exposure	Schedule will likely reflect low flow and flooding probability timeframes. Schedule changes may increase the risk of operating during higher water levels and the impacts to flood	Critical	Possible	4
CE-10	Toe Drain	Dewatering, Contaminated Soils.	dewatering is likely though extent of which largely unknown. Dewatering may have schedule setbacks and significantly impact this feature. Contaminated soils may exist requiring disposal of	Significant	Likely	4
CE-11	Hydraulic Structures	Dewatering.	dewatering is likely though extent of which largely unknown. Dewatering may have schedule setbacks and moderate impacts with this feature	Moderate	Likely	3
CE-13	Planning, Engineering, & Design	Modifications to address construction elements	considering the likelihood of changing site conditions near a floodway the impacts could have design implications	Marginal	Possible	1
CE-14	Construction Management	Modifications to address construction elements	considering the likelihood of changing site conditions near a floodway the impacts could have construction management implications	Marginal	Possible	1

Specialty Construction or Fabrication				Maximum Project Growth		50%
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SC-1	Construction Activities At/Near Railroad	Feature may become a unique construction feature	A conceptual design exists though coordination and approval by the Railroad will be necessary moving forward	Moderate	Possible	2
SC-2	Utility Impacts	NA	Non Specialty	Negligible	Unlikely	0
SC-3	MOB/DEMOB & Site Preparation	NA	Non Specialty	Negligible	Unlikely	0
SC-4	Clearing/Grubbing & Debris Removal	NA	Non Specialty	Negligible	Unlikely	0
SC-5	Earthwork	NA	Non Specialty	Negligible	Unlikely	0
SC-6	Rip Rap	NA	Non Specialty	Negligible	Unlikely	0
SC-7	Access Paths and PCC Sidewalk Tie-back	NA	Non Specialty	Negligible	Unlikely	0
SC-8	Landscaping and Turf Restoration	NA	Non Specialty	Negligible	Unlikely	0
SC-9	Flood Protection During Construction	NA	Although flood protection may be unique to each construction project the means and methods are often replicated.	Negligible	Unlikely	0
SC-10	Toe Drain	Unique construction methods for vertically separating stone layers may be costly and challenging. Cost assumptions may not capture complete methodology	vertically placing and layering various stone gradations can be challenging. As design/scope develops the construction means/methods assumptions will likely change having a	Moderate	Likely	3
SC-11	Hydraulic Structures	Field modified Head Wall for sluice gate and trash rack may drive cost	No design exists for the field modified headwall/sluice gate/trash rack. Actual design could be measurably different than current assumptions. Considering only 1 of these structures is intended	Marginal	Likely	2
SC-13	Planning, Engineering, & Design	Increased cost related to developing unique design/scope	PDT is aware of the need to develop design/scope and realizes a likely impact though overall should remain negligible	Negligible	Likely	1
SC-14	Construction Management	Increased cost related to managing unique design/scope	May require additional QA to monitor construction of these features as well as additional submittal review from the contractor.	Negligible	Likely	1

Technical Design & Quantities				Maximum Project Growth		20%
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T-1	Construction Activities At/Near Railroad	The feature was conceptually discussed though lacks detailed technical design. No topo survey data is available for this location so quantities are based on available information.	Changes are likely as discussions continue with the sponsor and RR and impacts could be significant.	Significant	Likely	4
T-2	Utility Impacts	No design or quantities	Possible impacts could be moderate overall	Moderate	Possible	2

T-3	MOB/DEMOB & Site Preparation	NA	Typical equipment mobilization and temporary construction facilities. Traffic control may impact productivity though marginally with appropriate signage/devices/flaggers	Marginal	Possible	1
T-4	Clearing/Grubbing & Debris Removal	Quantities may slightly vary for overall area	Additional site visits may help refine debris quantity and designating clearing and grubbing areas	Marginal	Possible	1
T-5	Earthwork	Fair level of confidence regarding the quantities for levee repair. Currently, scoping of Levee work is largely conceptualized though lacks plans, specifications and supporting documentation. Without pinned down	The quantities are likely to change, but the reach length of the levee repair is well established therefore the impact should be reduced. The confidence level could be improved by	Moderate	Likely	3
T-6	Rip Rap	Design/Quantities may change due to feasibility level conceptual design	A minor design change could result in moderate quantity change	Moderate	Possible	2
T-7	Access Paths and PCC Sidewalk Tie-back	Design/Quantities may change due to feasibility level conceptual design	Possible changes may occur but these items are not cost drivers, impact would be marginal compared to the overall estimate	Marginal	Possible	1
T-8	Landscaping and Turf Restoration	Design/Quantities may change due to feasibility level conceptual design	Possible changes may occur but these items are not cost drivers, impact would be marginal compared to the overall estimate	Marginal	Possible	1
T-9	Flood Protection During Construction	No quantities or design as of yet	Design/scope will likely change quantities	Moderate	Likely	3
T-10	Toe Drain	Design/Quantities may change due to feasibility level conceptual design	The toe drain is largely conceptual. Ongoing design discussions have resulted in the addition of stone gradation and layering. Further change in design is possible and given the current	Moderate	Possible	2
T-11	Hydraulic Structures	These items are typical construction features and include hydraulic structures such as culverts. Design is straight forward though culvert sizing, type, and related construction features may deviate due to more extensive analysis	Possible changes may occur but these items are not cost drivers, impact would be marginal compared to the overall estimate	Marginal	Possible	1
T-13	Planning, Engineering, & Design	Developing design may change quantities	As design develops and methods for obtaining quantities refined, the overall quantities will likely differ though only anticipated to have negligible impacts overall	Negligible	Likely	1
T-14	Construction Management	Construction observation may change the assumed allowable material quantity	Unexpected subsurface conditions may change the quantities overall by requiring additional excavation and increased imported material	Moderate	Possible	2

Cost Estimate Assumptions				Maximum Project Growth		25%
EST-1	Construction Activities At/Near Railroad	Concept was discussed and rough quantities provided though lacks actual design. Materials are expected to remain on site. If for any reason material is to be relocated or disposed of off site due to contamination, etc. cost change	Minimal design information was discussed for this feature. It is likely that the assumed cost will change and the impact could be significant if the design changes significantly	Significant	Likely	4
EST-2	Utility Impacts	Cost assumptions based on descriptions of existing utilities actual impacts have yet to be determined	It is likely that these cost assumptions would vary resulting in marginal impact	Marginal	Likely	2
EST-3	MOB/DEMOB & Site Preparation	Mobilization and Site preparation assumptions based on typical Corps projects. Cost may vary due to contractor location and staging methodology	Its possible the cost assumptions may change though the impact is only expected to be marginal for these typical items	Marginal	Possible	1
EST-4	Clearing/Grubbing & Debris Removal	Unit pricing may vary per contractor availability and based on changing labor rates	Its possible that these concerns will occur but would result in marginal impact as the value of these unit prices were compared against similarly scoped bid abstracts within regional proximity.	Marginal	Possible	1
EST-5	Earthwork	The derived Unit Costs may not reflect the most up to date vendor quotes, construction means & methods, or production rates. Unit Costs may not capture every aspect of each individual construction feature as part of	Its possible that these concerns will occur but would result in a moderate level impact as the value of these unit prices were compared against similarly scoped bid abstracts within regional	Moderate	Possible	2
EST-6	Rip Rap	Unit pricing may increase due to availability, increased fuel, and labor rates	Its possible that these concerns will occur but would result in a moderate level impact as the value of these unit prices were compared against similarly scoped bid abstracts within regional	Moderate	Possible	2
EST-7	Access Paths and PCC Sidewalk Tie-back	The estimated costs may not reflect current material and labor pricing. Updated labor and material pricing will be necessary	It is likely that these will occur but would only result in a marginal impact as value of these unit prices were compared against derived cost for similar projects and comparable bid abstracts.	Marginal	Likely	2
EST-8	Landscaping and Turf Restoration	Unit pricing based on historical values, fuel, labor, and materials may change cost	Its possible that these concerns will occur but would result in marginal impact as the value of these unit prices were compared against similarly scoped bid abstracts within regional proximity.	Marginal	Possible	1
EST-9	Flood Protection During Construction	After flood protection guidance is developed cost may vary	It is likely that these will occur but would only result in a marginal impact as value of these unit prices were compared against derived cost for similar projects and comparable bid abstracts.	Moderate	Likely	3

EST-10	Toe Drain	The estimated costs may not reflect current material and labor pricing. Updated labor and material pricing will be necessary given the scarcity of the clay material required for levee construction	It is possible that these concerns will occur but would result in a moderate level impact as the value of these unit prices were compared against similarly scoped bid abstracts within regional	Moderate	Possible	2	
EST-11	Hydraulic Structures	Dewatering methods and duration may vary from current assumptions	It is possible that these concerns will occur but would result in marginal impact as the value of these unit prices were compared against similarly scoped bid abstracts within regional proximity.	Marginal	Possible	1	
EST-13	Planning, Engineering, & Design	The PED costs for the estimate were provided by LRC TS-DC based on historical values for the Chicago District.	It is unlikely that PED will have more than a negligible impact on cost.	Negligible	Possible	0	
EST-14	Construction Management	The CM costs for the estimate were provided by LRC TS-C based on historical values for the Chicago District.	It is unlikely that CM will have more than a negligible impact on cost.	Negligible	Possible	0	
External Project Risks						Maximum Project Growth	20%
EX-1	Construction Activities At/Near Railroad	NA	NA	Negligible	Unlikely	0	
EX-2	Utility Impacts	NA	NA	Negligible	Unlikely	0	
EX-3	MOB/DEMOB & Site Preparation	NA	NA	Negligible	Unlikely	0	
EX-4	Clearing/Grubbing & Debris Removal	NA	NA	Negligible	Unlikely	0	
EX-5	Earthwork	Price increases above expected inflation could have an adverse impact on the cost of this item.	This is unlikely to occur though if occurs would likely result in a marginal impact due to the dependence on material pricing	Marginal	Unlikely	0	
EX-6	Rip Rap	Price increases above expected inflation could have an adverse impact on the cost of this item.	This is unlikely to occur though if occurs would likely result in a marginal impact due to the dependence on material pricing	Marginal	Unlikely	0	
EX-7	Access Paths and PCC Sidewalk Tie-back	NA	NA	Negligible	Unlikely	0	
EX-8	Landscaping and Turf Restoration	NA	NA	Negligible	Unlikely	0	
EX-9	Flood Protection During Construction	extreme weather could have an adverse impact on the cost of this item.	flood protection changes due to extreme weather is unlikely considering that is the reasoning for flood protection though if experienced the impact could be significant	Significant	Unlikely	2	
EX-10	Toe Drain	extreme weather could have an adverse impact on the cost of this item.	It is possible elevated water levels could impact the cost of this feature moderately due to scheduling and dewatering requirements	Moderate	Possible	2	
EX-11	Hydraulic Structures	extreme weather could have an adverse impact on the cost of this item.	It is possible elevated water levels could impact the cost of this feature moderately due to scheduling and dewatering requirements	Moderate	Possible	2	
EX-13	Planning, Engineering, & Design	external risks may impact PED costs due to modifications	It is unlikely that the PED will experience these external project risks though the impact would be marginal if realized	Marginal	Unlikely	0	
EX-14	Construction Management	external risks may impact PED costs due to modifications	It is unlikely that the CM will experience these external project risks though the impact would be marginal if realized	Marginal	Unlikely	0	

CONSTRUCTION SCHEDULE

