# PROJECT DEFINITION REPORT

# RS G341 AND CONVEYANCE IMPROVEMENTS

PS ID 100802

JUNE 25, 2014

REVISION #0

sfwmd.gov

# Table of Contents

## Approvals

The signatures in this section of the project definition report should be revised to represent the various areas providing significant resources to the project.

| | |
|---|---|
| **John Mitnik, Bureau Chief, Engineering and Construction** | 6/25/14 **Date** |
| **Joel Arrieta, Bureau Chief, Field Operations North** | 6/30/14 **Date** |

Document prepared by: Jennifer Gent, Extension: 2668

## Project Location

The G341 and Conveyance Improvement Project is part of Restoration Strategies Regional Water Quality Plan and is comprised of canal, levee and related improvements such as pump stations, water control structures, bridges, etc. to the Ocean (L13), Hillsboro (L14/L15), Bolles East (L16), the North New River (L/18/L19/L20), Bolles West (L21), and the Miami (L24/L25) Canals. The Ocean (L13) east of Structure G341, Hillsboro (L14/L15), the North New River (L/18/L19/L20), and the Miami (L24/L25) Canals are part of the Central and Southern Florida Flood Control System (C&SF System) and are located in western Palm Beach County. The Ocean (L13) west of Structure G341, Bolles East (L16), and Bolles West (L21) canals are not considered to be part of the C&SF System but are important to the basins they are located in. All of the canals fall within the West Palm Beach and/or Clewiston Field Station areas of responsibility.

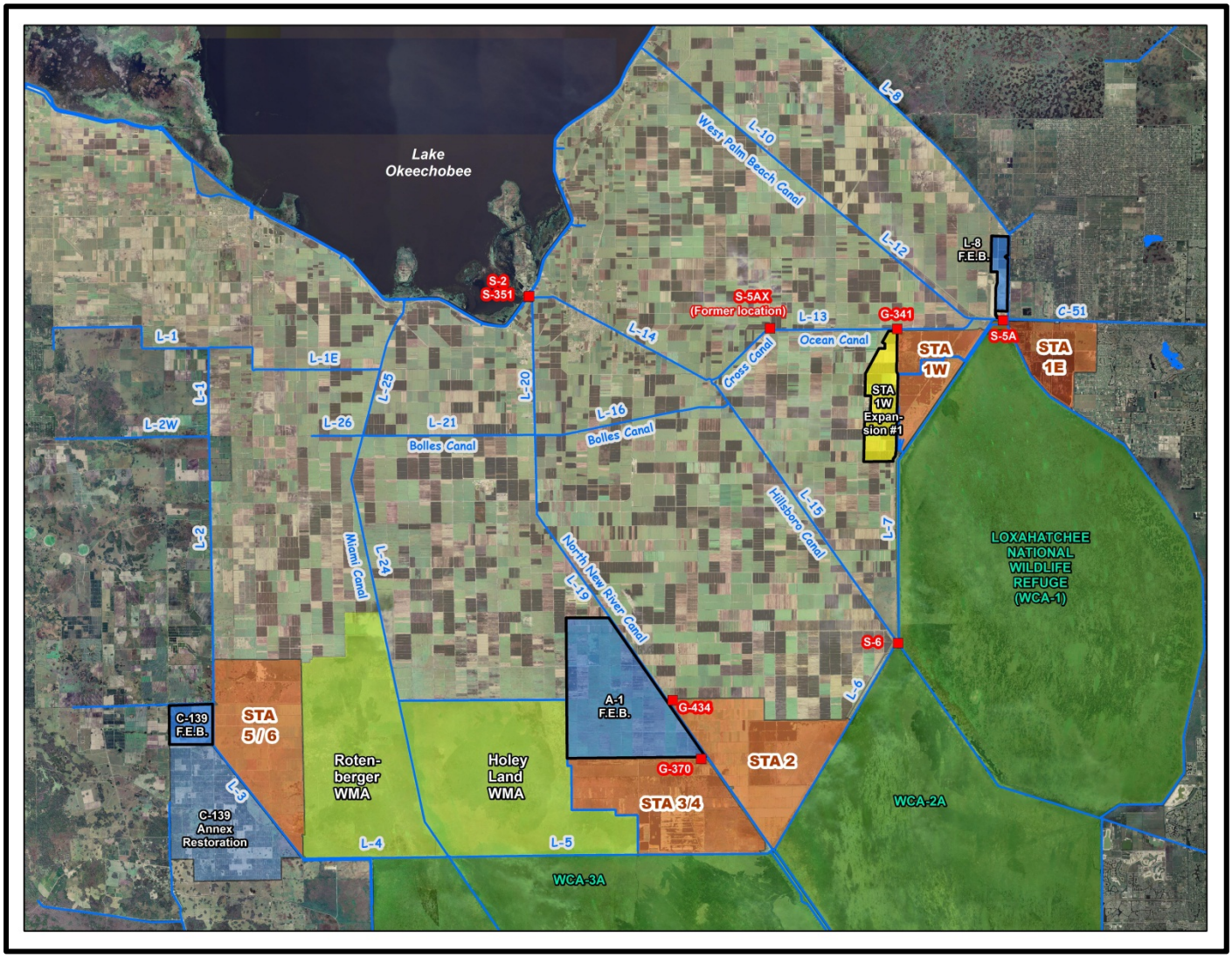


**Figure 1 - Everglades Agricultural Area Regional Canals and STAs**

## Project Description

The Ocean (L13) Canal is comprised of a 12.8 mile reach of canal stretching between the West Palm Beach (L12) Canal on the east and the Hillsboro (L14/L15) Canal on the west. The G341 structure is located in the Ocean (L13) Canal between the S-5A Basin and the S-2/S-6 Basins. The Ocean (L13) Canal was widened and improved back in 2000 from the G341 Divide Structure located at the northwestern corner of Storm Water Treatment Area (STA) 1W to the western confluence with the Hillsboro (L14/L15) Canal. The eastern segment connecting to the West Palm Beach Canal was not widened or improved. Portions of the Ocean (L13) Canal, east of the G341 Structure, have reduced conveyance sections as compared to the western canal section.

The G341 structure is a gated spillway structure with two gates located in the Everglades Agriculture Area of Palm Beach County and was part of STA 2 construction. The main purpose of structure G341 is to divert more water to S-6 Basin for treatment in STA 2. The structure is also used to transfer water in either direction between the S-5A and S-6 basins for flood control and water supply. The original design intent of G341 was to divert up to a maximum of 600 cfs from the intermediate reach between the former location of Structure S5AX and the location of Structure G-341 to the west to STA 2. Structure S5AX was removed from service in 1999. Due to various constraints, the full intent of the structure's design has not been implemented.

From its union with the Ocean (L13) Canal, the Hillsboro (L14) Canal extends north 8.9 miles where it converges with the North New River (L20) Canal at Structure S351 and Pump Station S2 on the rim canal of Lake Okeechobee. The Hillsboro (L15) Canal also runs 14.5 miles south of the connection with the Ocean (L13) Canal to Pump Station S6.

The Bolles East (L16) Canal is comprised of a nine (9) mile reach of canal stretching between the Hillsboro (L15) Canal on the east and the North New River (L19/L20) Canal on the west. The North New River (L20) Canal reaches 6.2 miles north of the Bolles East (L16) Canal where it meets with the Hillsboro (L14) Canal at Structure S351 and Pump Station S2. The North New River (L19) Canal also extends 9.25 miles south of the Bolles East (L16) Canal to the northern limits of the A-1 Flow Equalization Basin (FEB). From this location, the North New River (L18) Canal resumes its' southern reach another 4.8 miles to the inflow canal for STA 2 and Pump Station G434. Continuing south another 3.1 miles brings the North New River (L18) Canal to the inflow canal for STA 3/4 and Pump Station G370.

The proposed project is intended to maximize the designed operations of Structure G341. There are multiple methods that need to be analyzed to identify the most cost effective measures available to fully implement the designed operations for the G341 Structure. The Bolles West (L21) and Miami (L24/L25) canals may also impact the operation of the G341 Structure; this will be determined in future modeling efforts. Some of these alternatives include the widening and deepening of existing canals, improvements to the associated levees and modifications to Pump Stations.

Multiple C&SF System benefits will be provided by the project improvements. System flexibility to move excess flows depending on the location of available storage facilities such as flow equalization basins will

provide needed flood protection. Water quality will be improved with the ability to move water to take advantage of available treatment capacity in STAs located in different basins. Periods of hydration, which improve STA water quality treatment capabilities, may be extended when water is available for transfer.

## Project Scope

During the project advanced planning and design phases, multiple conceptual designs will be developed and analyzed. These alternatives could include operational changes to the C&SF System and/or alternative delivery paths. These alternatives may include, but are not limited to, alternatives that were previously analyzed under the EAA Regional Feasibility Study, ECART, and Restoration Strategies.

Project surveys and geotechnical investigations will be conducted to determine design conditions for additional project facilities such as control structures, pump stations, bridge relocations or other construction activities, which may need to be included as part of the conveyance improvements. Preliminary survey, geotechnical work, and cultural resource investigations were done as part of the EAA conveyance and Regional Treatment (ECART) Project in 2007 and this data can be utilized for this project. Supplemental surveys, geotechnical, and cultural resource investigations for canals not covered will be required. Additional canal sediment investigations will also be required for each canal to be improved to define the canal sediment risk and use during project development.

## Background

The Eastern Flow Path projects are intended to manage basin runoff in a more advantageous manner, by reducing the impacts of storm event driven inflows on the STAs, as well as expanding the effective stormwater treatment area. By additionally modifying the conveyance system in the EAA, the G-341 structure could be utilized consistent with its original design intent to transfer water to STA 2 further expanding the flexibility and efficiency of stormwater treatment.

The Bolles East (L16) Canal was slated to be improved as part of the EAA A1 Storage Reservoir Project, a component of the Comprehensive Everglades Restoration Plan (CERP). A hydraulic study was conducted in 2004 called the *Preliminary Hydraulics Evaluation Report for the Bolles and Cross Canals* to determine the conveyance capacity improvements necessary to provide deliveries to the EAA A1 Reservoir. Although multiple canals were explored in this report by Jacobs MWH Joint Venture, the Bolles East (L16) and North New River (L18/L19/L20) Canals are of particular interest for this project. In addition to sizing the canals to provide deliveries to the reservoir, the study also examined the concept of improved flexibility in the primary C&SF System. The study confirmed that the canal improvements would allow better distribution of water between the STAs. The study also found the expanded canals would provide improved water supply and flood protection for the areas served by the canals. The specific details of the EAA A1 Storage Reservoir Project have changed since this report was finalized and the project currently being constructed in that specific location is called the A-1 FEB.

It was later determined that the preferred option of the investigation involved the development of optimized canal sections for the Bolles East (L-16) Canal that balanced canal section excavation quantities and levee (disposal) requirements and maximized the conveyance capacity within the current right of way (ROW). This option assumed no additional real estate will be purchased to complete the canal improvements and that all improvements fall within the existing ROW; however the ultimate recommendation included the need for right of way for a levee on the south side that would meet the current South Florida Water Management District (District) standards.

The 2004 study included the following recommendations:

**Bolles East (L16) Canal**

- Replacement and enlargement of the hydraulic opening of the farm bridge located 7.57 miles west of the Bolles East (L16) and Hillsboro (L15) Canal confluence.
- Replacement and enlargement of the hydraulic opening on the farm bridge located 7.31 miles west of the Bolles East (L16) and Hillsboro (L15) Canal confluence.
- Replacement and enlargement of the hydraulic opening of the secondary roadway bridge located 6.81 miles west of the Bolles East (L16) and Hillsboro (L15) Canal confluence.
- Replacement and enlargement of the hydraulic opening of the farm bridge located 1.76 miles west of the Bolles East (L16) and Hillsboro (L15) Canal confluence.
- Replacement of the existing culverts under Duda Road from dual 72 inch culverts to a bridge structure or a series of box culverts.
- The canal bottom needs to be dropped approximately 6.0 to 7.0 feet and reshaped into a trapezoid. The necessary flow capacity can be gained in the existing canal section if the side slopes of the channel are maintained as currently existing. However, the south side levee requires extensive expansion to meet District standards and will require at least 75 feet of additional ROW.

**North New River**

- The North New River (L18/L19) Canal has a hump in its channel bottom that starts downstream of the Bolles East (L16) and North New River (L19/L20) confluence. It was found that the conveyance capacity of the Bolles East (L16) Canal is improved if the hump is removed from this location.

Additional flexibility for the primary C&SF System was also examined during the development of the Restoration Strategies suite of alternatives. The objectives of this effort are to provide additional water quality treatment capabilities for flows entering the Water Conservation Areas. The additional flexibility gained from the canal improvements would allow the diversion of excess flows from one area of the EAA to another in order to take advantage of available FEB storage capacity and STA treatment capacity. Inflows into the EAA STAs (STA 1East and 1West, STA 2 and STA 3/4) could, therefore, be managed more advantageously – reducing high stages, enhancing vegetation growth and promoting optimized phosphorus reduction. This project is not intended to divert required inflows or change the water budget for Water Conservation Area 1.

## Permitting

The proposed conveyance project will require several permits and/or approvals from Federal, State and local regulatory agencies. These permit applications will require coordination with the District's Permit Acquisition and Compliance Section. At a minimum, the permit requirements will include Water Quality Certification from the Florida Department of Environmental Protection (FDEP), a Dredge and Fill permit and a 408 review for the C&SF impacts for the 404 Permit from the US Army Corps of Engineers (USACE), a District Dewatering permit, a FDEP National Pollutant Discharge Elimination System (NPDES) construction permit, and local building permit(s). All permits are required prior to construction of the project. The contractor is expected to obtain NPDES, Dewatering, and local permits. Any impacts to existing drainage patterns will be authorized via the USACE 408/404 approval process. The District will be the applicant for all permits except where obtained by the contractor and/or the land owner permittees.

## Right of Way

Numerous Right of Way (R/W) permits are associated with the project. A preliminary review of the Ocean (L13), Bolles East (L16), Hillsboro (L14/L15) and North New River (L18/L19/L20) Canals reveals approximately 202 Right of Way (R/W) Occupancy Permits may be associated with this project. Permits have been issued to utility companies for aerial crossings over canals with poles in the right of way, subaqueous crossings and parallel runs of cable/lines; both aerial and buried. There are 22 permits for bridges including concrete, wood, railroad and culvert type bridges. R/W permits have been issued for culverts, pumps, open channel connections, and levee construction associated with the adjacent agricultural operations in this region. Early coordination with the landowners and permittees is recommended in order to allow sufficient time for removal and/or relocation of their facilities. The District Right of Way staff will assist in identifying facilities that may be within the project boundary, as well as with the removal/relocation process.

## Real Estate

Initial planning efforts show that some of the proposed work along the Ocean (L13), Bolles East (L16), Hillsboro (L14/L15) and North New River (L18/L19/L20) Canals may not be able to be accomplished within the existing rights of way currently held by the District. The exact impact on the right of way will be determined in the future as project options are developed, and zoning or land use changes may be required prior to construction. Easements for construction access or staging may be required from adjacent landowners once detailed construction plans are developed.

## Public Use

No general use by the public takes place on the project canals and associated levees. Landowner access to adjacent agricultural operations may be provided by existing bridges across the various canals and

plans must be developed to maintain or provide temporary access via alternative routes during construction.

## Stakeholder Considerations

Stakeholders for this project include the agricultural landowners who are adjacent to the affected canals and levees, Florida Department of Transportation, South Florida Conservancy District, Palm Beach County, Shawano Drainage District, Glades Electrical Cooperative, Florida Power & Light, Bellsouth Telecommunications, Southern Bell (AT&T), Level 3 Communications LLC, IXC Communications Services, Inc., Nui-City Gas Company of FL, Loxahatchee National Wildlife Refuge, US Fish and Wildlife Service, and the Florida Fish and Wildlife Conservation Commission. Coordination with stakeholders is required regarding relocation of permitted utilities, culverts, pump stations, seepage canals and bridges, as well as drainage impacts during construction.

## Public Outreach

This project will require significant public outreach efforts. Memorandums of Understanding/Agreement and/or easements from adjacent landowners may be required to accommodate relocation of existing facilities (water control structures, pump stations, bridges, levees, etc.). Easements may be required from landowners to accommodate construction activities such as staging areas or fill disposal areas. The District Government and Community Affairs Unit will coordinate the outreach activities and the Real Estate Unit will negotiate necessary construction easements.

## Operations

Coordination with District Operations staff has resulted in identification of the following points which should be considered and evaluated during the project design phase:

- Currently, stages in the Bolles (L16 & L21) Canals recede much more slowly after a storm event than observed recession rates in the Hillsboro (L14/L15) and North New River (L18/L19/L20) Canals. If possible, the proposed conveyance improvements should enable stages in the Bolles (L16 & L21) Canals to recede after a storm event at a rate that is comparable to the recession rates in the Hillsboro (L14/L15) and North New River (L18/L19/L20) Canals. In particular, this should be true over a range of storm events.
- If possible, conveyance restrictions within the Hillsboro (L14/L15) and North New River (L18/L19/L20) Canals should also be addressed since recession rates in these canals will restrict those in the Bolles (L16 & L21) Canals. Additionally, conveyance within the EAA system could be significantly improved by increasing the capacity of the S-6 Pump Station.
- During construction, existing canal conveyance capacities must be maintained specifically in the canals in the C&SF system. The canals associated with the rest of the system conveyance will be managed as best as possible.

- Improvement designs should consider the operational constraints on the G-341 structure. In particular, the maximum water level upstream of G-341 is 12.5 feet NGVD during the wet season. During flood control operations, the maximum downstream stage is 12.5 feet NGVD to protect the S-5A basin. The gates could be opened when S-6 has excess capacity to divert water from the S-5A basin to the S-6 basin. During the water supply operation, the discharge could be in either direction as needed. It should be noted, however, that during Tropical Storm Isaac it was demonstrated that closing G-341 in accordance with the existing operating criteria resulted in upstream stages exceeding the maximum recommended upstream level of 12.5 feet NGVD.
- Flooding can occur along secondary canal reaches that have open-channel connections to the project canals. This is especially true where the levees along a secondary canal have much lower top elevations than the project levee they tie into. Improvements to these secondary levees should be considered.

## Operations and Maintenance

The project is located within the West Palm Beach and Clewiston Field Station areas of responsibility. The two Field Stations will share the operations and maintenance responsibilities for the project after completion. The West Palm Beach Field Station service area extends along the southern bank of the Bolles East (L16) Canal to the eastern bank of the North New River (L19/20) Canal. The Clewiston FS service area begins along the northern bank of the Bolles East (L16) Canal and extends south along the western bank of the North New River (L18/L19) Canal (**Figure 2**).

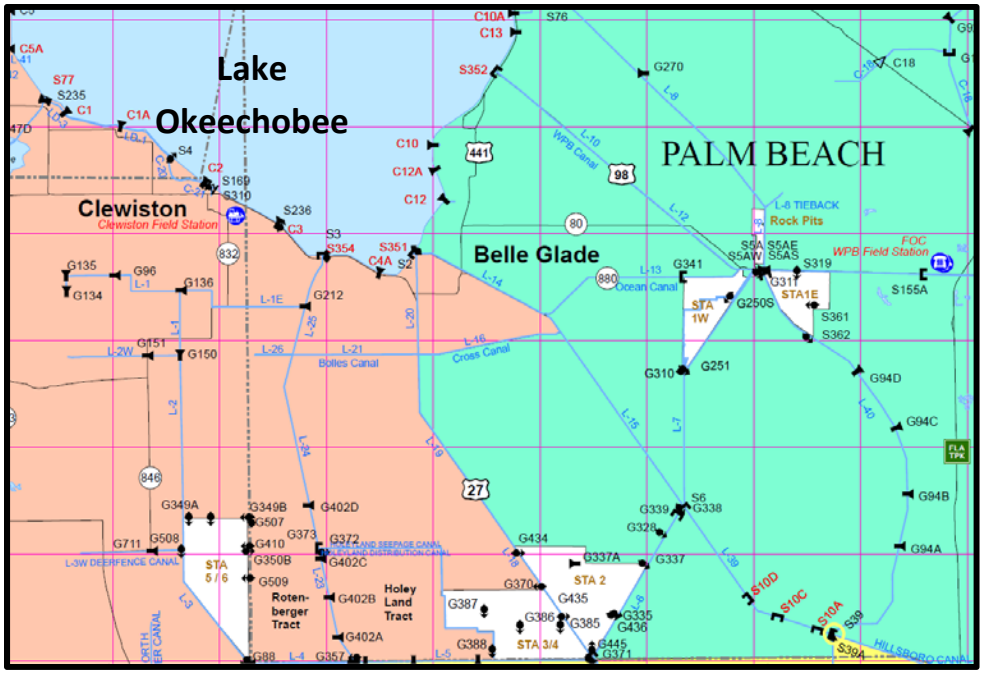


**Figure 2 – West Palm Beach and Clewiston Field Station Areas of Responsibility**

## SCADA, Instrumentation, Telemetry

SCADA, instrumentation and/or telemetry will be required for the project if it is determined that an additional pump station or control structure will be necessary.

## Security

No security features are necessary for this canal conveyance improvement project at this time. If a pump station or control structure is determined to be warranted, security features for this element will be evaluated to comply with District Security Standards. Coordination with the District's Security Unit will be required to ensure District Security compliance.

## Information Technology

No IT features are necessary for this canal conveyance improvement project at this time. If a pump station or control structure is determined to be warranted, IT features for this element will be evaluated to comply with District IT Standards. Coordination with the District's IT Department will be required to ensure District IT compliance.

## Environmental

The project may include or impact existing wetlands or sensitive areas. These areas will be identified during the permitting of the project. A cultural resource assessment (reconnaissance survey at a minimum) along the canal corridors will be required. Coordination with SHPPO or other archaeological agencies will be required. Contractors will be required to take cultural awareness training. The project is not in known Tribal Lands. Contractors will be required to attend Wildlife Training provided by District Permit Acquisition and Compliance staff prior to the commencement of construction activities. The training will also go over contractor requirements such as keeping wildlife logs, posting certain wildlife signage (Ex: Eastern Indigo Snake) and speed limit signs. The District will provide the US Fish and Wildlife Service approved signage files to the Contractor for production. Sediment and soil analysis reports will be conducted to determine suitable uses for the material removed that may be contaminated from areas adjacent to and within the canals.

## Monitoring

At a minimum, turbidity monitoring will be required for the project during and post construction. Depending on pre-constructions surveys, additional monitoring such as environmental monitoring or protected species surveys will be determined prior to construction. An avian protection plan will not be required for this project.

## Commissioning

It is unknown at this time if commissioning is required for this project.

## Lessons Learned

Previous canal dredging projects conducted along the Hillsboro (L19), L3, C23, C4 and C100 Canals may provide useful lessons learned which relate to this canal improvement project.

## Conceptual Alternative Options

During the project advanced planning and design phases, multiple conceptual alternative options will be developed and analyzed. These alternatives could include operational changes to the C&SF System and/or alternative delivery paths. These alternatives may include, but are not limited to, alternatives that were previously analyzed in the Preliminary Hydraulic Evaluation Report for the Bolles and Cross Canals (April 2004), the EAA Regional Feasibility Study (RFS) (October 2005), the technical memorandum for the Preliminary Feasibility Evaluation of Variations to the EAA RFS Alternative 1 completed as part of the ECART Project (July 2007) and/or the early planning phase of the Restoration Strategies initiative.

## Cost Estimates

The project Planning, Engineering and Design costs are roughly estimated to be $9,400,000. This includes approximately $1,300,000 for additional survey work, $1,100,000 for additional geotechnical work, $500,000 for additional modeling work, $400,000 for additional soil/sediment investigations, $100,000 for additional cultural resource surveys and $6,000,000 for design and permitting.

The construction estimate is broken down into multiple parts to facilitate the funding of portions of the project moving forward from east to west.

| Construction Item | Conceptual Cost | Cost Roundup | Year | Year |
|---|---|---|---|---|
| Bolles East (L16) Canal Excavation | $ 24,149,704 | $ 24,200,000 | 2016 | 2018 |
| North New River (L18/L19) Hump Removal | $ 3,433,251 | $ 3,500,000 | 2016 | 2018 |
| Ocean (L13) Canal Widening | $ 4,879,057 | $ 4,900,000 | 2018 | 2020 |
| Hillsboro (L15) Dredging/Expansion | $ 13,059,703 | $ 13,100,000 | 2021 | 2022 |
| Ag Pump Stations & Culvert Replace* | $ 11,032,918 | $ 11,100,000 | 2017 | 2024 |
| Bridge Demolition and Replacement* | $ 8,826,161 | $ 8,900,000 | 2017 | 2024 |
| Pump Statin S6 Expansion | $ 27,113,107 | $ 27,200,000 | 2019 | 2024 |
| | **$ 92,493,901** | **$ 92,900,000** | | |

*Permittee Costs

The total project construction cost is estimated to be $152,300,000 and a breakdown of the costs can be found in Appendix A of this report.

## Recommendations

Early benefits from the conveyance improvements could be realized by addressing the reduced conveyance of the Bolles East (L-16) Canal and eliminating the constrictions in the Ocean (L13) Canal east of G341. Updated survey, geotechnical investigations and modeling of the components of the EAA conveyance system that are in this project should be initiated as soon as possible in order to provide a sound basis for engineering the design. The updated modeling results can be used to identify any gaps in data collection and target early benefits from individual canal segment improvements and quantify benefits (water quality, water supply and flood protection) to be provided by the project. Modeling of the alternatives will determine the most effective way of maximizing the potential of Structure G-341 and a cost benefit analysis would provide useful insight on the alternatives available. Identifying the aspects of the preferred alternative that will require the most lead time early would allow the district to clearly identify the critical path. Project outreach, coordination of facility modifications associated with the large number of existing R/W permits and cultural resource assessments should also be initiated as soon as practical.

This first phase, identified as the Bolles East (L-16) Canal with a project budget of $10,000,000 has been established. With this limited budget, the range of improvements to the canal will depend greatly on the stakeholders and adjacent agricultural property owners' ability to contribute to the project. These contributions may include but are not limited to right of way donations to accommodate the land necessary to increase the conveyance and improve the levees, relocation and/or replacement of permitted utilities, culverts, pump stations, bridges, and seepage canals associated with agricultural use, and/or assistance in excavation and levee construction. Additional alternatives to be discussed include the creation of a special district (F.S. Chapter 298), and/or Legislation budget allocations. Coordination and negotiations will begin early and occur frequently to identify the needs and work through these topics.

## Project Milestones

Project achievement goals correspond to the Consent Order Milestone dates located in the Project Deliverables and Schedule Section of the report.

## Resource Requirements

| List Functions | Skill of Functional Employees | Identify Employees | Total FTEs Required for Complete Project |
|---|---|---|---|
| Engineering | Civil, Geotech, CADD | Jose Guardiario, TBD | TBD |
| Permitting | Scientist | Holly Andreotta, TBD | TBD |
| Project/Construction Manager | PM/CM, CI | Jennifer Gent, TBD | TBD |
| Survey | Surveyor | Howard Ehmke, Robert Schaffer, TBD | TBD |
| Hydro Data Management | Hydraulic Evaluation | Matahel Ansar, Ceyda Polatel, TBD | 0.25 FTE |
| **Total Resource Requirements** | | | **TBD** |

## Project Deliverable and Schedule

The following are the Consent Order Milestone dates.

**G-341 Related Improvements**

| Milestone | Compliance date |
|---|---|
| Complete Land Acquisition | 9/30/2021 |
| Initiate Design | 10/1/2020 |
| Submit State and Federal Permits | 8/1/2021 |
| Complete Design | 7/31/2022 |
| Initiate Construction | 11/30/2022 |
| Construction Status Report | 3/1/2023 |
| Construction Status Report | 3/1/2024 |
| Completion of Construction | 12/31/2024 |

## Project Funding Sources

The RS G341 and Conveyance Improvement Project will be funded through Restoration Strategies Program, Functional Area B199 and the Operations Maintenance and Construction Capital Projects, Functional Areas of CA02, CA04, and CA07 as needed.

## References

Project reference documents, related studies and reports can be found in the Project Overview folder at the following Documentum location:
https://webtop.cerpzone.org/webtop/drl/objectId/0b009f57830b0726

# Photographs

Figure 3 - Structure G341 Looking West at L-13

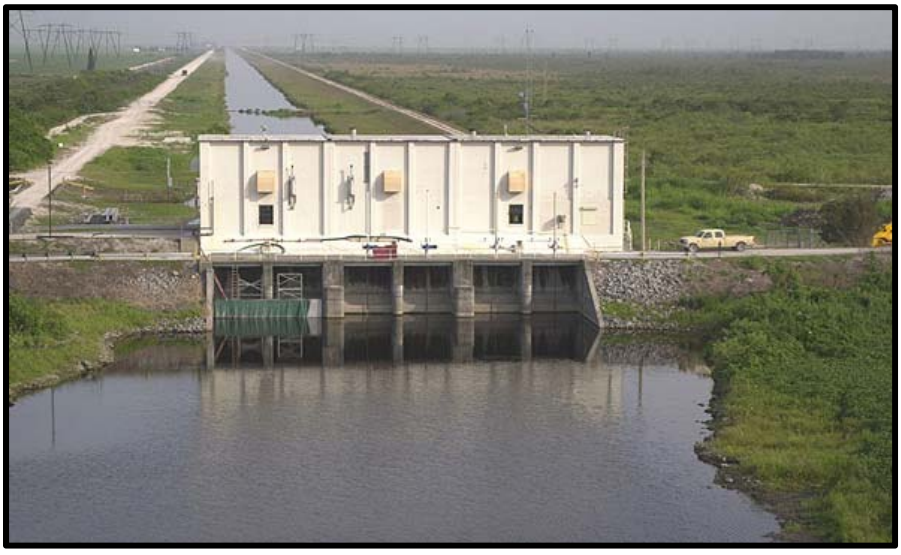

Figure 4 - Structure S6 Looking North at L-15

Figure 5 - Duda Road Looking West at L-16

Figure 6 - Duda Road Looking West at L-16

# Appendix A - Cost Estimate

| Escalated Cost Estimate to Construct The L-16 Bolles East Canal Excavation | | | | |
|---|---|---|---|---|
| **Description** | **Qty.** | **Unit** | **Unit Cost** | **Total** |
| **SITE WORK** | | | | |
| Erosion control, silt fence, adverse conditions, 3' high | 46,992 | L.F. | $1.12 | $52,631 |
| Floating turbidity barriers | 1,440 | L.F. | $14.00 | $20,160 |
| Clear & Grub, Heavy, (Includes minor burning and irrigation demo) | 85 | Acre | $3,025 | $257,125 |
| Light | 28 | Acre | $1,681 | $47,075 |
| Install Temporary Plugs, Includes Dewatering System | 1 | LS | $250,000 | $250,000 |
| Excavation Heavy (75%), including Drilling & Blasting | 546,302 | CY | $14.35 | $7,839,427 |
| Excavation Light (25%) | 182,101 | CY | $4.75 | $864,977 |
| Embankment Work, including hauling, backfill, and compaction work, Heavy (75%) | 297,921 | CY | $16.00 | $4,766,736 |
| Embankment work Light (25%) | 99,367 | CY | $10.00 | $993,670 |
| **Total Direct Cost Project Cost** | | | | **$15,091,801** |
| Mobilization | 10% | | | $1,509,180 |
| Field Office Overhead(FOOH) | 6% | | | $905,508 |
| Home Office Overhead (HOOH) | 3% | | | $452,754 |
| **Subtotal Cost With Overhead** | | | | **$17,959,243** |
| Sales Tax 6.5% of 20% subtotal | 6.5% | | | $233,470 |
| Profit | 5% | | | $897,962 |
| **Construction Cost** | | | | **$19,090,675** |
| Bonds | 1.5% | | | $286,360 |
| Contingency | 25% | | | $4,772,669 |
| **Total Project Construction Cost** | | | | **$24,149,704** |
| | | | **Low Range -5%** | **$22,942,219** |
| | | | **High Range +5%** | **$25,357,190** |

6/9/2014 Estimator: Jack Ismalon

| Conceptual Cost Estimate for The North River (L18/L19) Canal Hump Removal | | | | |
|---|---|---|---|---|
| **Description** | **Qty.** | **Unit** | **Unit Cost** | **Total** |
| **SITE WORK** | | | | |
| Erosion control, silt fence, adverse conditions, 3' high | 72,653 | L.F. | $1.12 | $81,371 |
| Floating turbidity barriers | 1,440 | L.F. | $14.00 | $20,160 |
| Marine equipment rental;barge,800 ton,45' wide x 90' long, including tugboat,diesel,250 H.P. | 6 | Month | $18,000 | $108,000 |
| Drilling & Blasting from a barge | 44,000 | CY | $18 | $792,000 |
| Excavation/Dredging Blasting Material from a barge | 44,000 | CY | $16 | $704,000 |
| Hauling blasting rock, up to 10 miles round trip | 44,000 | CY | $10 | $440,000 |
| **Total Direct Cost Project Cost** | | | | **$2,145,531** |
| Mobilization | 10% | | | $214,553 |
| Field Office Overhead(FOOH) | 6% | | | $128,732 |
| Home Office Overhead (HOOH) | 3% | | | $64,366 |
| **Subtotal Cost With Overhead** | | | | **$2,553,182** |
| Sales Tax 6.5% of 20% subtotal | 6.5% | | | $33,191 |
| Profit | 5% | | | $127,659 |
| **Construction Cost** | | | | **$2,714,033** |
| Bonds | 1.5% | | | $40,710 |
| Contingency | 25% | | | $678,508 |
| **Total Project Construction Cost** | | | | **$3,433,251** |
| | | | **Low Range -5%** | **$3,261,589** |
| | | | **High Range +5%** | **$3,604,914** |

6/9/2014

Estimator: Jack Ismalon

| Conceptual Cost Estimate for Ocean Canal (L-13) Canal Widening | | | | |
|---|---|---|---|---|
| **Description** | **Qty.** | **Unit** | **Unit Cost** | **Total** |
| **SITE WORK** | | | | |
| Erosion control, silt fence, adverse conditions, 3' high | 12,000 | L.F. | $2.54 | $30,480 |
| Floating turbidity barriers | 2,000 | L.F. | $14.00 | $28,000 |
| Clear & Grub, Heavy | 8 | Acre | $3,025 | $24,056 |
| Marine equipment rental;barge,800 ton,45' wide x 90' long, including tugboat,diesel,250 H.P. | 8 | Month | $18,000 | $144,000 |
| Drilling & Blasting from a barge | 64,148 | CY | $18 | $1,154,667 |
| Excavation Blasting Material from a barge | 64,148 | CY | $16 | $1,026,370 |
| Hauling blasting rock, up to 10 miles round trip | 64,148 | CY | $10 | $641,481 |
| **Total Direct Cost Project Cost** | | | | **$3,049,054** |
| Mobilization | 10% | | | $304,905 |
| Field Office Overhead(FOOH) | 6% | | | $182,943 |
| Home Office Overhead (HOOH) | 3% | | | $91,472 |
| **Subtotal Cost With Overhead** | | | | **$3,628,374** |
| Sales Tax 6.5% of 20% subtotal | 6.5% | | | $47,169 |
| Profit | 5% | | | $181,419 |
| **Construction Cost** | | | | **$3,856,962** |
| Bonds | 1.5% | | | $57,854 |
| Contingency | 25% | | | $964,240 |
| **Total Project Construction Cost** | | | | **$4,879,057** |
| | | | **Low Range -5%** | **$4,635,104** |
| | | | **High Range +5%** | **$5,123,010** |

Estimator: Jack Ismalon

6/9/2014

| Conceptual Cost Estimate for Hillsboro Canal Expansion | | | | |
|---|---|---|---|---|
| Description | Qty. | Unit | Unit Cost | Total |
| SITE WORK | | | | |
| Erosion control, silt fence, adverse conditions, 3' high | 12,000 | L.F. | $2.54 | $30,480 |
| Floating turbidity barriers | 2,000 | L.F. | $14.00 | $28,000 |
| Install Temporary Pluges, Includes Dewatering System | 1 | LS | $450,000 | $450,000 |
| Drilling & Blasting | 212,580 | CY | $12 | $2,550,960 |
| Excavation/Dredging Blasting Material | 212,580 | CY | $14 | $2,976,120 |
| Hauling | 212,580 | CY | $10 | $2,125,800 |
| **Total Direct Cost Project Cost** | | | | **$8,161,360** |
| Mobilization | 10% | | | $816,136 |
| Field Office Overhead(FOOH) | 6% | | | $489,682 |
| Home Office Overhead (HOOH) | 3% | | | $244,841 |
| **Subtotal Cost With Overhead** | | | | **$9,712,018** |
| Sales Tax 6.5% of 20% subtotal | 6.5% | | | $126,256 |
| Profit | 5% | | | $485,601 |
| **Construction Cost** | | | | **$10,323,876** |
| Bonds | 1.5% | | | $154,858 |
| Contingency | 25% | | | $2,580,969 |
| **Total Project Construction Cost** | | | | **$13,059,703** |
| | | | Low Range -5% | $12,406,717 |
| | | | High Range +5% | $13,712,688 |

6/9/2014 Estimator: Jack Ismalon

| Escalated Cost Estimate for The Farm Pump Stations & Culvert Replacement | | | | |
|---|---|---|---|---|
| **Description** | **Qty.** | **Unit** | **Unit Cost** | **Total** |
| **Farm Pump stations & Culvert Replacement** | | | | |
| Erosion control, silt fence, adverse conditions, 3' high | 1,200 | L.F. | $2.54 | $3,048 |
| Floating turbidity barriers | 480 | L.F. | $14.00 | $6,720 |
| Replacement and Retrofit to farm Pumps | 8 | EA | $225,000 | $1,800,000 |
| Major culvert Replacements | 11 | EA | $150,000 | $1,650,000 |
| Minor Culvert Replacements | 38 | EA | $45,000 | $1,710,000 |
| Power Supply 7 relocation | 1 | EA | $637,500 | $637,500 |
| Telemetry | 4 | EA | $43,750 | $175,000 |
| Dewatering | 1 | EA | $650,000 | $650,000 |
| Hydro Seeding | 75 | Ecre | $3,500 | $262,500 |
| **Total Direct Cost Project Cost** | | | | **$6,894,768** |
| Mobilization | 10% | | | $689,477 |
| Field Office Overhead(FOOH) | 6% | | | $413,686 |
| Home Office Overhead (HOOH) | 3% | | | $206,843 |
| **Subtotal Cost With Overhead** | | | | **$8,204,774** |
| Sales Tax 6.5% of 20% subtotal | 6.5% | | | $106,662 |
| Profit | 5% | | | $410,239 |
| **Construction Cost** | | | | **$8,721,675** |
| Bonds | 1.5% | | | $130,825 |
| Contingency | 25% | | | $2,180,419 |
| **Total Project Construction Cost** | | | | **$11,032,918** |
| | | | | |
| | | | **Low Range -5%** | **$10,481,273** |
| | | | **High Range +5%** | **$11,584,564** |

6/9/2014 Estimator: Jack Ismalon

| Replacing Five (5) Existing Bridges (20' W x 120), On L-16 Canal | | | | | |
|---|---|---|---|---|---|
| | Description | Qty | Unit | Unit Cost | Total |
| | DEMOLITION | | | | |
| | **Remove Deck** | Hr. Rate | Daily Cost | Days | |
| 4 | Labor | $28 | $896 | 4 | $3,584 |
| 1 | Operators | $37 | $296 | 4 | $1,184 |
| 1 | Demolition Tools | | $380 | 4 | $1,520 |
| 1 | Long Reach Crane | | $3,240 | 4 | $12,960 |
| | **Excavate for Demolition** | | | | |
| 1 | Operator | $37 | $296 | 2 | $592 |
| 1 | Excavator | | $940 | 2 | $1,880 |
| | **Bridge Piles Removal** | | | | |
| 4 | Labors | $28 | $896 | 8 | $7,168 |
| 2 | Operators | $37 | $592 | 8 | $4,736 |
| 1 | Backhoe | | $650 | 8 | $5,200 |
| 1 | Concrete Vibratory hammer | | $420 | 7 | $2,940 |
| 1 | Long Reach Crane | | $3,240 | 5 | $16,200 |
| | **Hauling and Disposal** | | | | |
| 2 | Operators | $37 | $592 | 2 | $1,184 |
| 1 | Truck Driver | $30 | $240 | 2 | $480 |
| 1 | Truck to Haul | | $560 | 2 | $1,120 |
| 1 | Dozer | | $940 | 2 | $1,880 |
| 1 | Loader | | $740 | 2 | $1,480 |
| | **Additional Cost** | | | | |
| 1 | Supervision (Foreman) | $42 | $336 | 20 | $6,720 |
| 1 | Truck Driver | $30 | $240 | 20 | $4,800 |
| 1 | Flat Truck | | $420 | 20 | $8,400 |
| | SITE WORK | | | | |
| | Erosion control, silt fence, adverse conditions, 3' high | 1,200 | L.F. | $1.12 | $1,344 |
| | Floating turbidity barriers | 840 | L.F. | $14.00 | $11,760 |
| | Traffic barriers, temporary precast concrete walls | 400 | L.F. | $52.00 | $20,800 |
| | Vehicle guide rails | 300 | L.F. | $56.00 | $16,800 |
| | Traffic maintenance during project duration | 80 | Day | $360.00 | $28,800 |
| | Soil stabilization, includes scarifying and compaction | 1780 | S.Y. | $10.00 | $17,800 |
| | Base courses, for roadways | 1620 | S.Y. | $16.00 | $25,920 |
| | 2" thick bridge approach asphalt paving | 840 | Ton | $38.00 | $31,920 |
| | Vehicle guide rails, corrugated steel, galvanized steel posts, install metal guide/guard rail | 300 | L.F. | $44.00 | $13,200 |
| | Rip-rap to be relocated on both sides of the bridge | 240 | C.Y. | $75.00 | $18,000 |
| | CONSTRUCTION | | | | |
| | F&I bridge piles | 1680 | L.F. | $72 | $120,960 |
| | Cast-in place Concrete Caps Piers | 6 | Ea. | $14,500 | $87,000 |
| | Cast-in place Concrete Caps End Bent | 2 | Ea. | $24,500 | $49,000 |
| | F&I Precast Bridge Deck | 2400 | S.F. | $38 | $91,200 |
| | Cast-in place Concrete Approach Slabs to both sides of the bridge | 133 | CY | $420 | $56,000 |
| | Concrete Abutment Walls | 1 | L.S. | $65,000 | $65,000 |
| | Concrete Barrier Walls | 240 | L.F. | $85 | $20,400 |
| | | | SUBTOTAL: | | $759,932 |
| | **Total Direct Cost for the Replacement of Five (5) Bridges** | | | | **$3,799,660** |
| | Mobilization | 10% | | | $379,966 |
| | Overhead | 6% | | | $227,980 |
| | **Subtotal Cost With Overhead** | | | | **$4,407,606** |
| | Sales Tax 6.5% of 20% subtotal, Cost With Overhead | 6.5% | | | $57,299 |
| | Profit | 12% | | | $528,913 |
| | **Construction Cost** | | | | **$4,993,817** |
| | Bonds | 1.5% | | | $74,907 |
| | Contingency | 25% | | | $1,248,454 |
| | **Total Project Construction Cost** | | | | **$6,317,179** |
| | | | Low Range -5% | | $6,001,320 |
| | | | High Range +5% | | $6,633,038 |

6/9/2014 Estimator: Jack Ismalon

| Replacing Two (2) Existing Bridges (24' W x 110' L), On L-13 Canal | | | | | |
|---|---|---|---|---|---|
| | Description | Qty | Unit | Unit Cost | Total |
| | **DEMOLITION** | | | | |
| | **Remove Deck** | **Hr. Rate** | **Daily Cost** | **Days** | **Total** |
| 4 | Labor | $28 | $896 | 4 | $3,584 |
| 1 | Operators | $37 | $296 | 4 | $1,184 |
| 1 | Demolition Tools | | $380 | 4 | $1,520 |
| 1 | Long Reach Crane | | $3,240 | 4 | $12,960 |
| | **Excavate for Demolition** | | | | |
| 1 | Operator | $37 | $296 | 2 | $592 |
| 1 | Excavator | | $940 | 2 | $1,880 |
| | **Bridge Piles Removal** | | | | |
| 4 | Labors | $28 | $896 | 8 | $7,168 |
| 2 | Operators | $37 | $592 | 8 | $4,736 |
| 1 | Backhoe | | $650 | 8 | $5,200 |
| 1 | Concrete Vibratory hammer | | $420 | 7 | $2,940 |
| 1 | Long Reach Crane | | $3,240 | 5 | $16,200 |
| | **Hauling and Disposal** | | | | |
| 2 | Operators | $37 | $592 | 2 | $1,184 |
| 1 | Truck Driver | $30 | $240 | 2 | $480 |
| 1 | Truck to Haul | | $560 | 2 | $1,120 |
| 1 | Dozer | | $940 | 2 | $1,880 |
| 1 | Loader | | $740 | 2 | $1,480 |
| | **Additional Cost** | | | | |
| 1 | Supervision (Foreman) | $42 | $336 | 20 | $6,720 |
| 1 | Truck Driver | $30 | $240 | 20 | $4,800 |
| 1 | Flat Truck | | $420 | 20 | $8,400 |
| | **SITE WORK** | | | | |
| | Erosion control, silt fence, adverse conditions, 3' high | 1,200 | L.F. | $1.12 | $1,344 |
| | Floating turbidity barriers | 840 | L.F. | $14.00 | $11,760 |
| | Traffic barriers, temporary precast concrete walls | 400 | L.F. | $52.00 | $20,800 |
| | Vehicle guide rails | 300 | L.F. | $56.00 | $16,800 |
| | Traffic maintenance during project duration | 80 | Day | $360.00 | $28,800 |
| | Soil stabilization, includes scarifying and compaction | 1780 | S.Y. | $10.00 | $17,800 |
| | Base courses, for roadways | 1620 | S.Y. | $16.00 | $25,920 |
| | 2" thick bridge approach asphalt paving | 840 | Ton | $38.00 | $31,920 |
| | Vehicle guide rails, corrugated steel, galvanized steel posts, install metal guide/guard rail | 300 | L.F. | $44.00 | $13,200 |
| | Rip-rap to be relocated on both sides of the bridge | 240 | C.Y. | $75.00 | $18,000 |
| | **CONSTRUCTION** | | | | |
| | F&I bridge piles | 1680 | L.F. | $72 | $120,960 |
| | Cast-in place Concrete Caps Piers | 5 | Ea. | $14,500 | $72,500 |
| | Cast-in place Concrete Caps End Bent | 2 | Ea. | $24,500 | $49,000 |
| | F&I Precast Bridge Deck | 2640 | S.F. | $38 | $100,320 |
| | Cast-in place Concrete Approach Slabs to both sides of the bridge | 133 | CY | $420 | $56,000 |
| | Concrete Abutment Walls | 1 | L.S. | $65,000 | $65,000 |
| | Concrete Barrier Walls | 240 | L.F. | $85 | $20,400 |
| | | | **SUBTOTAL:** | | $754,552 |
| | **Total Direct Cost for the Replacement of Two (2) Bridges** | | | | **$1,509,104** |
| | Mobilization | 10% | | | $150,910 |
| | Overhead | 6% | | | $90,546 |
| | **Subtotal Cost With Overhead** | | | | **$1,750,561** |
| | Sales Tax 6.5% of 20% subtotal, Cost With Overhead | 6.5% | | | $22,757 |
| | Profit | 12% | | | $210,067 |
| | **Construction Cost** | | | | **$1,983,385** |
| | Bonds | 1.5% | | | $29,751 |
| | Contingency | 25% | | | $495,846 |
| | **Total Project Construction Cost** | | | | **$2,508,982** |
| | | | **Low Range -5%** | | **$2,383,533** |
| | | | **High Range +5%** | | **$2,634,431** |

6/9/2014 Estimator: Jack Ismalon

| Conceptual Cost Estimate for Additional 1,000 CFS for S-6 Pump Station Expansion | | | | | |
|---|---|---|---|---|---|
| | Description | Quantity | units | Cost/Unit | Total Cost |
| A. | MISC DREDGING AND EXCAVATION | | | | |
| 1 | Structure | 4267 | CY | $16 | $68,267 |
| 2 | Exit Channel | 6222 | CY | $10 | $62,222 |
| 3 | Approach Channel | 6222 | CY | $10 | $62,222 |
| B. | BACKFILL | | | | |
| 1 | Structural Backfill | 4000 | CY | $12 | $48,000 |
| 2 | Levee Access and Temporary Plugs | 1450 | CY | $8 | $11,600 |
| 3 | Access Ramps | 650 | CY | $12 | $7,800 |
| 4 | Dewatering System | 1 | LS | $450,000 | $450,000 |
| C. | STRUCTURAL STEEL | | | | |
| 1 | Steel Sheet pile (Including Cofferdam) | 440 | TON | $2,100 | $924,000 |
| 2 | Wales | 14 | TON | $2,600 | $36,400 |
| 3 | Anchor Rods | 8 | TON | $3,200 | $25,600 |
| 4 | Concrete Anchors | 60 | CY | $740 | $44,400 |
| 5 | Sheet pile Concrete Cap | 32 | CY | $1,250 | $40,000 |
| D. | CONCRETE | | | | |
| 1 | Foundation Work | 1 | LS | $420,000 | $420,000 |
| 2 | Walls | 540 | CY | $1,220 | $658,800 |
| 3 | Concrete Floor | 720 | CY | $560 | $403,200 |
| 4 | Discharge Sump an Walls | 650 | CY | $1,220 | $793,000 |
| 5 | Pump Station Roof | 320 | CY | $720 | $230,400 |
| 6 | Retaining Wall | 240 | CY | $1,220 | $292,800 |
| 7 | Control Building | 1 | LS | $150,000 | $150,000 |
| E. | PUMP AND EQUIPMENT | | | | |
| 1 | F&I Pumps of 1000 CFS total | 1 | LS | $5,750,000 | $5,750,000 |
| 2 | F&I Motors, Gears, Includes all necessary equipment | 1 | LS | $2,400,000 | $2,400,000 |
| 3 | Electric Works, Includes Emergency Generator | 1 | LS | $580,000 | $580,000 |
| 4 | Discharge Pipes | 1 | LS | $420,000 | $420,000 |
| 5 | Trash Rake system | 1 | LS | $1,475,000 | $1,475,000 |
| 6 | Fuel Tank | 3 | EA | $80,000 | $240,000 |
| 7 | Installation MASCD system including Telemetry System | 1 | LS | $280,000 | $280,000 |
| F. | Riprap and bedding Stone | 3500 | CY | $120 | $420,000 |
| G. | Excavate Inlet & Outlet Canal to the new PS | 1 | LS | $650,000 | $650,000 |
| | Total Direct Cost Project Cost | | | | $16,943,711 |
| | Mobilization | 10% | | | $1,694,371 |
| | Field Office Overhead(FOOH) | 6% | | | $1,016,623 |
| | Home Office Overhead (HOOH) | 3% | | | $508,311 |
| | Subtotal Cost With Overhead | | | | $20,163,016 |
| | Sales Tax 6.5% of 20% subtotal | 6.5% | | | $262,119 |
| | Profit | 5% | | | $1,008,151 |
| | Construction Cost | | | | $21,433,286 |
| | Bonds | 1.5% | | | $321,499 |
| | Contingency | 25% | | | $5,358,322 |
| | **Total Project Construction Cost** | | | | **$27,113,107** |
| | | | | **Low Range -5%** | **$25,757,452** |
| | | | | **High Range +5%** | **$28,468,762** |

6/9/2014

Estimator: Jack Ismalon