



Louisiana Coastal Protection and Restoration Authority

May 2010

AECOM

Permanent Protection System Opinion of Probable Cost Options 1, 2, and 2a

Volume I
Report

Prepared for

Sewerage & Water Board of New Orleans in partnership with the Southeast Louisiana Flood Protection Authority-East, Jefferson Parish Department of Public Works, and the Louisiana Coastal Protection and Restoration Authority

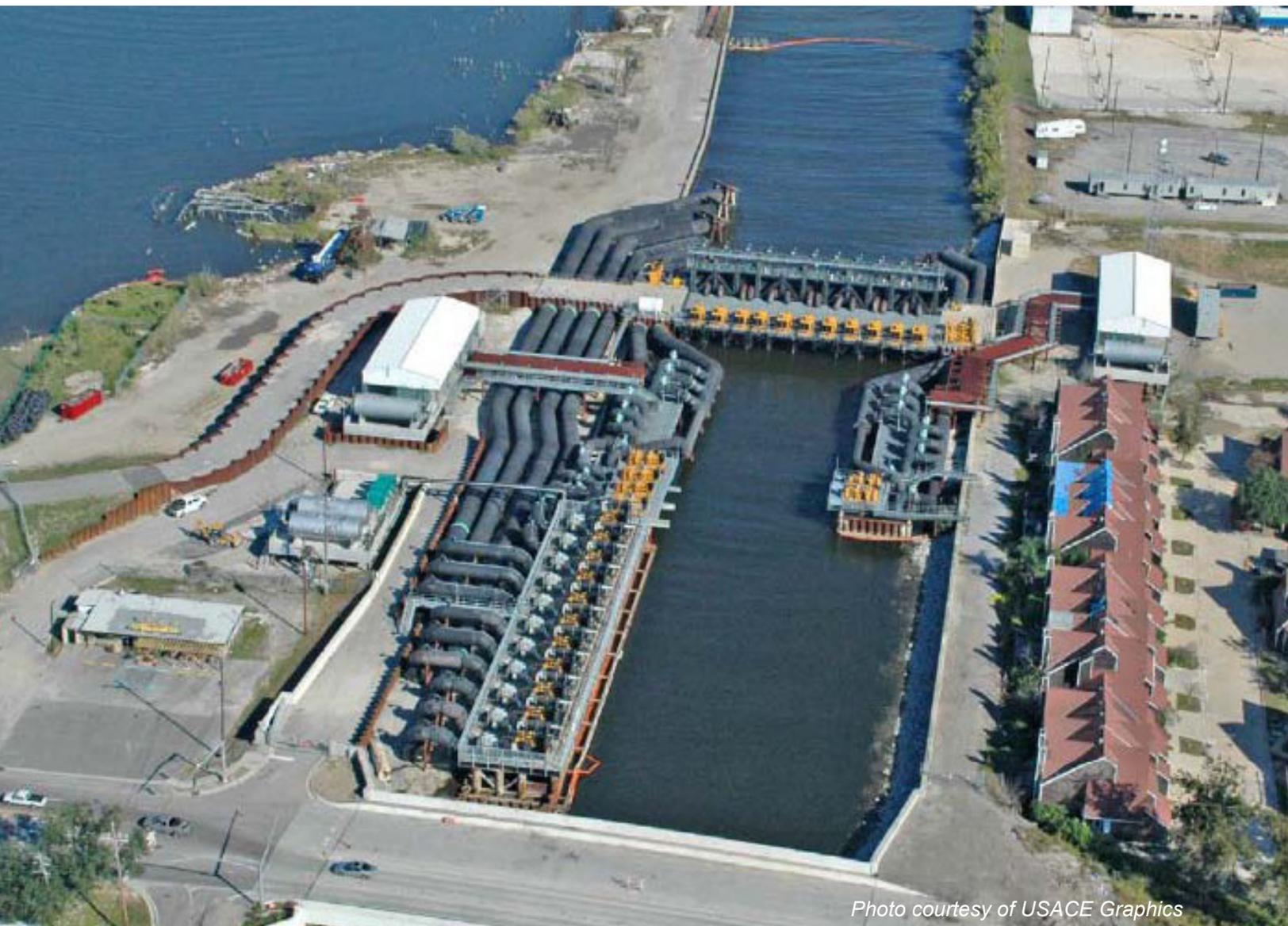


Photo courtesy of USACE Graphics



Water

Prepared for: Sewerage & Water Board
of New Orleans
New Orleans, LA

Prepared by:
AECOM
New Orleans, Louisiana
60149879.0005
May 7, 2010

Permanent Protection System Opinion of Probable Cost Options 1, 2, and 2a

Contents

Executive Summary.....	ES-1
1.0 Option 1 – Construction of New Permanent Gated Pump Stations at the Mouths of the 17th Street, Orleans Avenue, and London Avenue Canals	1-1
1.1 Option 1 - Basis of Opinion of Probable Cost.....	1-3
1.2 Summary of Findings for 17th Street Canal – Option 1.....	1-4
1.2.1 Mechanical and Electrical	1-6
1.2.2 Geotechnical	1-9
1.2.3 Real Estate	1-10
1.3 Summary of Findings for Orleans Avenue Canal – Option 1	1-11
1.3.1 Mechanical and Electrical	1-13
1.3.2 Geotechnical	1-15
1.3.3 Real Estate	1-15
1.4 Summary of Findings for London Avenue Canal – Option 1.....	1-15
1.4.1 Mechanical and Electrical	1-18
1.4.2 Geotechnical	1-19
1.4.3 Real Estate	1-19
1.5 Assumptions.....	1-20
2.0 Option 2 – Construction of New Replacement Pump Stations at the Mouths of the 17th Street, Orleans Avenue, and London Avenue Canals with Deepened Outfall Canals	2-21
2.1 Option 2 - Basis of Opinion of Probable Cost.....	2-22
2.2 Summary of Findings for 17th Street Canal – Option 2.....	2-25
2.2.1 Mechanical and Electrical	2-26
2.2.2 Geotechnical	2-26
2.2.3 Real Estate	2-28
2.3 Summary of Findings for Orleans Avenue Canal – Option 2	2-31
2.3.1 Mechanical and Electrical	2-32
2.3.2 Geotechnical	2-32
2.3.3 Real Estate	2-32
2.4 Summary of Findings for London Avenue Canal – Option 2.....	2-33
2.4.1 Mechanical and Electrical	2-34
2.4.2 Geotechnical	2-34
2.4.3 Real Estate	2-34
2.5 Bridges	2-35

3.0 Option 2a – Construction of New Replacement Pump Stations at the Mouths of the 17th Street, Orleans Avenue, and London Avenue Canals with Deepened Outfall Canals and the Addition of a Pump Station at Hoey’s Basin that Pumps to the Mississippi River 3-37

 3.1 Summary of Findings for 17th Street Canal – Option 2a 3-39

 3.1.1 Mechanical and Electrical3-40

 3.1.2 Geotechnical3-42

 3.1.3 Real Estate3-42

 3.2 Summary of Findings for Orleans Avenue Canal – Option 2a 3-42

 3.3 Summary of Findings for London Avenue Canal – Option 2a 3-43

 3.4 Bridges 3-43

4.0 Conclusions..... 4-44

List of Appendices

- Appendix A Opinion of Probable Cost – Data
- Appendix B Supporting Documentation
 - Pump Station Mechanical/Electrical
 - Canal Cross Sections
 - Real Estate
 - Geotechnical
- Appendix C Bridge Report

List of Tables

- Table 1-1. Existing DPS 6 Major Equipment Option 1
- Table 1-2. Hydraulic Conditions for 17th Street Canal Pump Station
- Table 1-3. Quantity of Pumps Required for 17th Street Canal Pump Station
- Table 1-4. Current Prices for Pump/Motor Equipment – 17th Street Canal Pump Station
- Table 1-5. Generators and Fuel Tanks – 17th Street Canal Pump Station
- Table 1-6. Generalized Pile Capacities
- Table 1-7. Existing DPS 7 Major Equipment
- Table 1-8. Hydraulic Conditions for Orleans Avenue Canal Pump Station
- Table 1-9. Quantity of Pumps Required for Orleans Avenue Canal Pump Station
- Table 1-10. Current Prices for Pump/Motor Equipment – Orleans Avenue Canal Pump Station
- Table 1-11. Generators and Fuel Tanks – Orleans Avenue Canal Pump Station
- Table 1-12. Existing DPS 3 Major Equipment
- Table 1-13. Existing DPS 4 Major Equipment
- Table 1-14. Hydraulic Conditions for London Avenue Canal Pump Station
- Table 1-15. Quantity of Pumps Required for London Avenue Canal Pump Station
- Table 1-16. Current Prices for Pump/Motor Equipment – London Avenue Canal Pump Station
- Table 1-17. Generators and Fuel Tanks – London Avenue Canal Pump Station
- Table 2-1. Conceptual Pump Station Footprint 17th Street Canal – Option 2
- Table 2-2. Conceptual Pump Station Footprint Orleans Avenue Canal – Option 2
- Table 2-3. Conceptual Pump Station Footprint London Avenue Canal – Option 2
- Table 2-4. Bridge Modifications Due to Deepened Canals
- Table 3-1. Conceptual Pump Station Footprint 17th Street Canal – Option 2a
- Table 3-2. Hydraulic Conditions for 17th Street Canal Pump Station
- Table 3-3. Quantity of Pumps Required for 17th Street Canal Pump Station
- Table 3-4. Current Prices for Pump/Motor Equipment – 17th Street Canal Pump Station
- Table 3-5. Generators and Fuel Tanks – 17th Street Canal Pump Station
- Table 3-6. Hydraulic Conditions for Hoey's Basin Pump Station
- Table 3-7. Quantity of Pumps Required for Hoey's Basin Pump Station
- Table 3-8. Current Prices for Pump/Motor Equipment – Hoey's Basin Pump Station
- Table 4-1. Opinion of Probable Cost – Option Summary
- Table 4-2. Option 2 Tunneling – ROM Probable cost

List of Figures

- Figure ES-1. Three Canals Showing Location of DPS 3, 4, 6, and 7
- Figure ES-2. Aerial Vicinity Map of Project Area in the City of New Orleans
- Figure ES-3. Existing ICS Facility at the 17th Street Canal
- Figure 1-1. Existing 17th Street Canal Typical Cross Section
- Figure 1-2. Conceptual Drawing of Adaptable Pump Station With Deep Foundation
- Figure 1-3. Aerial View of DPS 6
- Figure 1-4. Old City Dry Weather Flow
- Figure 1-5. General Schematic Section View of a Vertical Column Pump
- Figure 1-6. Pump Spacing for 17th Street Canal Pump Station
- Figure 1-7. 17th Street Canal Proposed Permanent Protection Location
- Figure 1-8. Aerial View of DPS 7
- Figure 1-9. Pump Spacing for Orleans Avenue Canal Pump Station
- Figure 1-10. Orleans Avenue Canal Proposed Permanent Protection Location
- Figure 1-11. Aerial View of DPS 3
- Figure 1-12. Aerial View of DPS 4
- Figure 1-13. Pump Spacing for London Avenue Canal Pump Station
- Figure 1-14. London Avenue Canal Proposed Permanent Protection Location
- Figure 2-1. Three Canals Showing Location of DPS 3, 6, and 7
- Figure 2-2. Conceptual Drawing of Formed Suction Intake Modified Pump Station
- Figure 2-3. 17th Street Canal Pump Station Conceptual Layout
- Figure 2-4. Existing ICS Facility at 17th Street Canal
- Figure 2-5. DPS 6 17th Street Canal Bypass
- Figure 2-6. 17th Street Canal – Proposed Permanent Protection Location
- Figure 2-7. Conceptual Layout of Pump Station at London Avenue Canal
- Figure 2-8. Existing ICS Facility at Orleans Avenue Canal
- Figure 2-9. Conceptual Layout of the Pump Station Area at London Avenue Canal
- Figure 2-10. Existing ICS Facility at London Avenue Canal
- Figure 2-11. DPS 4 London Avenue Canal Bypass
- Figure 3-1. Three Canals Showing Location of DPS 3, 6, and 7
- Figure 3-2. Hoey's Basin Drainage Area and Proposed Pump Station
- Figure 3-3. Conceptual layout of the Pump Station Area at the 17th Street Canal
- Figure 3-4. Existing ICS Facility at 17th Street Canal

Figure 4-1. GIKEN Equipment Example

Figure 4-2. WADIT Sealant Installation Example

Figure 4-3. HESCO Basket Example

Figure 4-4. Telebelts® Telescopic Conveyor Example

Figure 4-5. Aqua Barrier Example

List of Acronyms

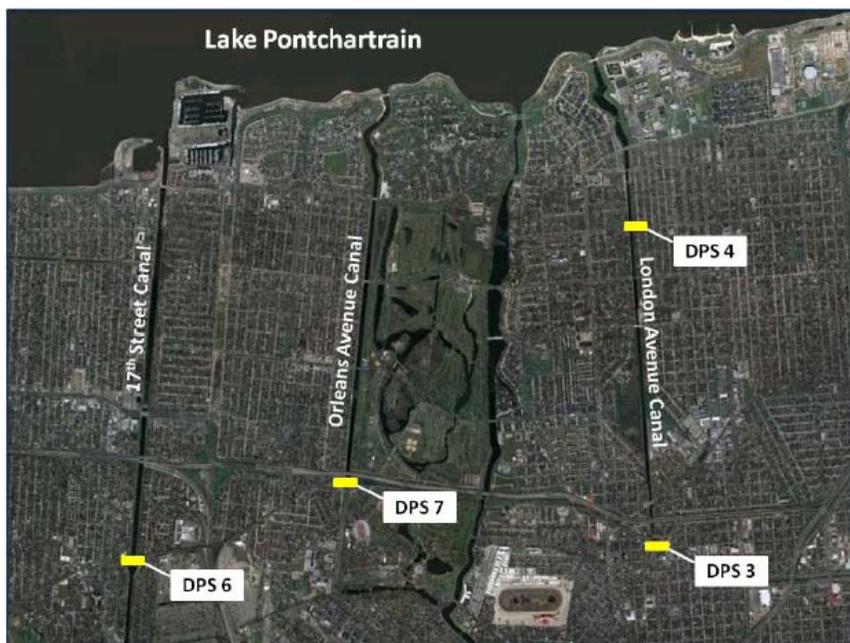
CMU	Concrete Masonry Unit
CPRA	Coastal Protection and Restoration Authority
DPS	Drainage Pump Station
FSI	Formed Suction Intake
HPS	Hurricane Protection System
HVAC	Heating Ventilation and Air Conditioning
ICS	Interim Control Structure
JPDPW Jefferson	Parish Department of Public Works
KCS	Kansas City Southern (Railroad)
MSL	Mean Sea Level
N.O.P.B.	New Orleans Public Belt (Railroad)
NRHP	National Register of Historic Places
NS	Norfolk Southern (Railroad)
PCB Polychlorinate	d Byphenol
ROM	Rough Order of Magnitude
ROW Right-of-Way	
QA Quality	Assurance
QC Quality	Control
SLFPA-E	Southeast Louisiana Flood Protection Authority-East
S&WB	Sewerage & Water Board (of New Orleans)
USACE	United States Army Corps of Engineers

Executive Summary

AECOM was retained by the S&WB and its Client Partners (Jefferson Parish Department of Public Works (JPDPW), Southeast Louisiana Flood Protection Authority-East (SLFPA-E), and the Louisiana Coastal Protection and Restoration Authority (CPRA) to provide an Opinion of Probable Cost for the USACE Options 1, 2 and 2a, with modifications to the approach for Options 2 and 2a.

Much of the rainfall storm water runoff from the City of New Orleans and some from Jefferson Parish is pumped into the 17th Street, Orleans Avenue, and London Avenue outfall canals. These outfall canals connect pump stations located on the interior of the City to Lake Pontchartrain where the storm water is discharged, as shown in Figure ES-1 and Figure ES-2. Levees and floodwalls previously were constructed on both sides of the outfall canals as features of the Lake Pontchartrain and the Vicinity Hurricane Protection System (HPS) Project. During Hurricane Katrina, breaches in floodwalls along the 17th Street and London Avenue outfall canals contributed to flooding in the area. Following Hurricane Katrina, interim control structures (ICS) and pump stations were installed near the mouths of the three outfall canals in order to prevent storm surge in Lake Pontchartrain from entering the canals. To replace the interim control structures, Congress has authorized the design and construction of new permanent control structures and pump stations that will provide permanent storm surge protection from Lake Pontchartrain. The U.S. Army Corps of Engineers (USACE) has identified three options for providing permanent storm surge protection for the outfall canals.

Figure ES-1. Three Canals Showing Location of DPS 3, 4, 6, and 7



Source: Google Earth 2006

The gates at the end of each canal would close only during times of high storm surges from Lake Pontchartrain. In an event where the elevation of the water in Lake Pontchartrain due to storm surge would approach the maximum safe water levels in the outfall canals, the gates would close to prevent storm surge from entering the canals and the proposed lakefront pump stations would receive storm water from the existing upstream S&WB pump station. The new lakefront pump stations would move the storm water from the canal into Lake Pontchartrain. In this scenario, both the new lakefront pump stations and the existing S&WB pump stations would operate concurrently and in series. This would require the new pump stations to operate in close coordination with the existing interior stations to not exceed the safe water elevations in the existing outfall canals. Each new pump station is designed with a deep foundation that eliminates the need for significant foundation modifications if the canal is deepened in the future for accommodating Options 2 or 2a.

Option 2 – Construction of New Replacement Pump Stations at the Mouths of the 17th Street, Orleans Avenue, and London Avenue Canals with Deepened Outfall Canals

The replacement pump stations would be constructed as permanent closures of the canals requiring full time operation of these pump stations. The existing interior S&WB pump stations on the outfall canals would be taken out of commission and bypassed. Storm water would flow to the new replacement pump stations by gravity. Since the new stations would completely separate the canals from Lake Pontchartrain's influence, permanent surge gates would not be required. The outfall canals would be deepened to produce a much lower flow line below the surrounding existing ground elevations. The banks of these canals would be reshaped to lower elevations, essentially reconstructing the outfall canal system. Since the elevations of the flow line in the deepened canals would be below that of the existing ground, the levee and floodwalls along the canals themselves would no longer be required as part of the City's flood protection system, eliminating nearly thirteen miles of levees and floodwalls. The hydraulic grade lines and inverts of each canal would be lowered, substantially. Soil excavation would be up to 20 feet. Under this scenario a seepage cutoff will be required along the entire length of the deepened canal to prevent drawdown of groundwater on the land side of the canals. The deepened canal sections will require bridge modifications for the bridges crossing the canals.

Option 2a – Construction of New Replacement Pump Stations at the Mouths of the 17th Street, Orleans Avenue, and London Avenue Canals with Deepened Outfall Canals and the Addition of a Pump Station at Hoey's Basin that Pumps to the Mississippi River

Option 2a is similar to Option 2 providing permanent pump stations at the Lake Pontchartrain end of deepened outfall canals, with the addition of a new pump station in the Hoey's Basin area of Jefferson Parish to intercept approximately 25 percent of the drainage from the 17th Street Canal and divert the flow directly to the Mississippi River. The Orleans Avenue and London Avenue canals would be the same size as in Option 2. However, the diversion of 25 percent of the flow from the 17th Street Canal will subsequently reduce the required size of the 17th Street Canal and new pump station.

Figure ES-3. Existing ICS Facility at the 17th Street Canal



Source: Bing, 2010

Currently, the ICS facilities are located at the mouths of each outfall canal and are set up similar to the one shown in Figure ES-3.

In each of the three Options (1, 2, and 2a), the existing ICS facility will be demolished and a new pump station and closure structure will be installed. Based on conversations with the USACE, major equipment decommissioned, such as pumps, valves, and generators, will be returned to the government at an unspecified location within a 25-mile radius of the construction site. All concrete, steel, and other miscellaneous construction and demolition debris will be hauled to a construction and demolition debris facility within a 25-mile radius of the construction site.

Current concepts of the proposed pump stations to be installed at the mouths of each canal include adaptability, such that the station can be readily modified in the future to include deepened canals for implementation of Option 2 or Option 2a. Each new pump station is to be designed with a deep foundation that eliminates the need for significant foundation modifications if the canal is deepened in the future to accommodate Options 2 or 2a.

Future modification to the adaptable pump station will include a formed suction intake (FSI) and pump modifications to transition to deeper canal sections provided in Options 2 or 2a.

In Option 1, a gated structure would be placed adjacent to the proposed permanent pump stations and serve as an integral part of the Hurricane Protection System (HPS). Under Options 2 or 2a, storm water will not flow by gravity into Lake Pontchartrain. Therefore, the gated structure is not required, since the water surface elevation in the deepened canals will be lower than the water surface elevation in Lake Pontchartrain.

Based on geotechnical information, positive cutoff of groundwater can be accomplished by installing a cutoff wall. AECOM evaluated use of three types of cutoff walls, including interlocking sheet pile, diaphragm, and modified clay slurry. The sheet pile cutoff option is chosen as the most economical method to obtain groundwater cutoff from the canal. Installation of the sheet pile wall using a GIKEN push type machine is included in this Opinion of Probable Cost to reduce vibration effects on properties near the construction area.

The ability to isolate groundwater effects from the canal provides an avenue to install several different types of canal liner options without buoyant uplift and tie down restraint. AECOM evaluated variations for lining the canals which included a two-foot-thick clay liner, a timber pile supported concrete flume, a concrete liner, and a cellular mat liner. The clay liner appears the most cost-effective lining method for this Opinion of Probable Cost, when applied to all canals. The S&WB Canal Comparison Report in Appendix A indicates the cost of various liner options considered.

The Opinion of Probable Cost for Option 1 was determined to be approximately \$866 million. The Opinion of Probable Cost for Option 2 is approximately \$2.24 billion. The Opinion of Probable Cost for Option 2a is approximately \$2.40 billion. These costs are based on the modifications to the canals outlined, above, and choosing the most economical alternative determined by the total cost for each option for all canals. Detailed cost breakdown and summary of the cost for each option is included in Appendix A.

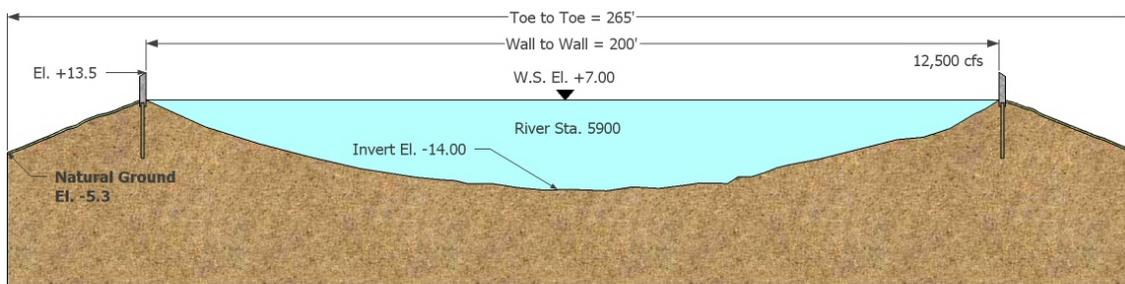
1.0 Option 1 – Construction of New Permanent Gated Pump Stations at the Mouths of the 17th Street, Orleans Avenue, and London Avenue Canals

Option 1 leaves in place the existing floodwalls that flank the three outfall canals. The combined length of the flood wall structure forming the HPS along the outfall canals is approximately 13 miles. The existing interior Sewerage & Water Board (S&WB) pump stations would be left in place to function in their current mode of operation, which is to lift water upstream of each pump station to lake level in each outfall canal. The water will flow into Lake Pontchartrain by gravity. The new permanent lakefront closure structures, equipped with gates, would remain open to allow gravity flow-through drainage during ordinary conditions. In this scenario, the proposed lakefront pump stations at the end of each canal would not operate, since gravity flow would provide transfer of storm water falling inside the protected levee system into Lake Pontchartrain.

During periods of high storm surge in Lake Pontchartrain, the gates would close, in order to “seal off” the interior canal and prevent migration of the storm surge into the protected area of the levee system. In an event when the Lake Pontchartrain storm surge would occur at the same time as the safe water level inside the levee system could be exceeded, the gates would close and the proposed lakefront pump stations would receive storm water from the existing upstream S&WB pump station. These stations would then move the storm water from the canal, into Lake Pontchartrain. In this scenario, both the new lakefront pump stations and the existing S&WB pump stations would operate concurrently.

Normal lake elevations are generally higher than the ground elevations of the areas through which the canals pass. Lake levels generally vary around elevation 0 ft Mean Sea Level (MSL) and surrounding land elevations on the protected side of the levee system are approximately -5 ft MSL. With the gates left open most of the time, the floodwalls that line the perimeter of each canal would remain an integral part of the City's flood protection system, as the water level in Lake Pontchartrain is always above the surrounding natural ground elevation. See the following typical cross section of the 17th Street Canal.

Figure 1-1. Existing 17th Street Canal Typical Cross Section



EXISTING 17th ST. CANAL

Source: Attachment 2: AECOM Scope of Work

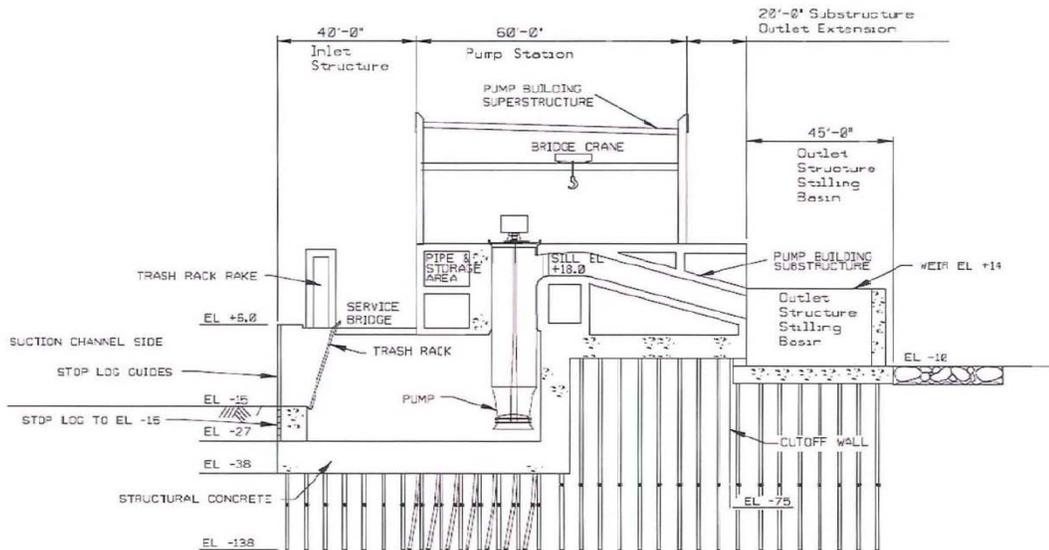
The London Avenue and Orleans Avenue Canals are similar in that the lake elevation is always above the existing ground elevation.

The conceptual drawing in Figure 1-2 shows the adaptable pump station with deep foundation as presented to Congress, and the basis of authorization of funding for placement of the proposed lakefront pump stations. The sill elevation of the discharge on the pumps is set at +18 ft MSL. This elevation prevents backflow of Lake Pontchartrain into the canals during a storm event. Another integral part of the design includes a weir wall with a top elevation of approximately +14 ft MSL. This wall absorbs the energy of large waves and also creates a stilling basin at the discharge. The basin raises the tailwater elevation and increases the efficiency of the pumps by reducing the siphon recovery. Vacuum breaker and valves will break the siphon during pump shut down.

Figure 1-2 Conceptual Drawing of Adaptable Pump Station With Deep Foundation



Option 1 - Adaptable Pump Station



Ver 2.0

6

One Team: Relevant, Ready, Responsive, Reliable

Source: Attachment 3: AECOM Scope of Work

In March of 2010, the USACE announced that a design-build solicitation to implement Option 1 would be advertised in the near future.

Since Option 1 will leave the existing canal and levee system in place, there is no effect on bridges crossing each canal, nor is there an effect on pipeline crossings. Also, there are no modifications required at the existing S&WB interior drainage pump stations (DPS), except the addition of radio

communication between the proposed lakefront pump stations and the existing S&WB DPS facilities to ensure coordinated pumping operations and safe water elevations in each canal. In addition, modifications of the existing interior S&WB DPS facilities are necessary to allow operation of the safe water elevation in the canals at +8.0 ft MSL. Some of the modifications have been implemented by the USACE at DPS 6 and DPS 4; however, modifications are still required at DPS 7 and DPS 3 to allow operation of the canal elevation at +8.0 ft MSL.

1.1 Option 1 - Basis of Opinion of Probable Cost

The enclosed Opinion of Probable Cost is for budgeting purposes only and is an opinion of possible construction costs. This opinion is limited to the conditions existing at issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to, local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events and developing bidding conditions, etc. may affect the accuracy of this opinion. AECOM is not responsible for any variance from this Opinion of Probable Cost or actual prices and conditions obtained.

AECOM used the following items to develop the Basis of Opinion of Probable Cost for Option 1:

1. Permanent Pump Station Construction
 - a) Construction of temporary bypasses for pump station installation
 - b) Construction of permanent gated pump stations at mouths of the 17th Street, Orleans Avenue, and London Avenue Canals
 - c) Closure of temporary bypasses for pump station installation
 - d) Removal of interim control structures and pumps
2. Miscellaneous
 - a) Engineering Design
 - b) Construction Management
 - c) Engineering During Construction
 - d) Contingencies

Temporary bypasses will be constructed at the mouths of each canal to maintain existing flow and operation of the canals during construction. The adaptable pump stations will be installed at the mouths of each of the outfall canals to allow implementation of Options 2 or 2a in the future. No modifications to the existing levee system, bridges, or canal cross section will be required to implement Option 1.

One item that differs in this Opinion of Probable Cost from the estimated cost in documentation prepared by the USACE, is operating the safe water elevation in the canals at elevation +8.0 ft MSL. Prior research and work by the USACE included modification of the existing interior DPS facilities to accommodate a safe water elevation +8.0 ft MSL. The USACE has implemented this modification at select DPS facilities previously; however the modifications were not completed at DPS 3 and DPS 7. An allowance is provided to address probable costs after modifications to DPS 3 and DPS 7 to allow operation at a safe water elevation of 8.0 ft MSL.

After the temporary diversions are in place, a permanent pump station will be installed at the mouth of each canal. The pump station will be considered adaptable as it will enable smooth implementation of Option 2 or Option 2a in the future. Each lakefront pump station will be equipped with a gated structure to allow gravity flow of water from the interior DPS to Lake Pontchartrain.

A breakwater structure made of riprap material will be placed at the mouth of the 17th Street Canal. The proposed pump stations at the London Avenue Canal and the Orleans Avenue Canal are located far enough inside the canal to alleviate wave effects on the pumps, according to reference material from the USACE. See Figure 2-3. An allowance is made in the Opinion of Probable Cost to include the breakwater structure.

After the pump station is in place and operational, the temporary bypass will be closed and removed from service. In addition, the ICS facilities will be dismantled and removed from service. For purposes of this opinion of probable cost, major equipment from each ICS facility, such as pumps, motors, generators, etc. will be transported to a government receiving area within a 25-mile radius of the construction site. The location is not known at this time.

1.2 Summary of Findings for 17th Street Canal – Option 1

DPS 6 is located at the upstream end of the 17th Street Canal and currently lifts drainage water to allow gravity flow from the pump station and discharge to the lake. An aerial view of DPS 6 is shown in Figure 1-3.

Figure 1-3. Aerial View of DPS 6

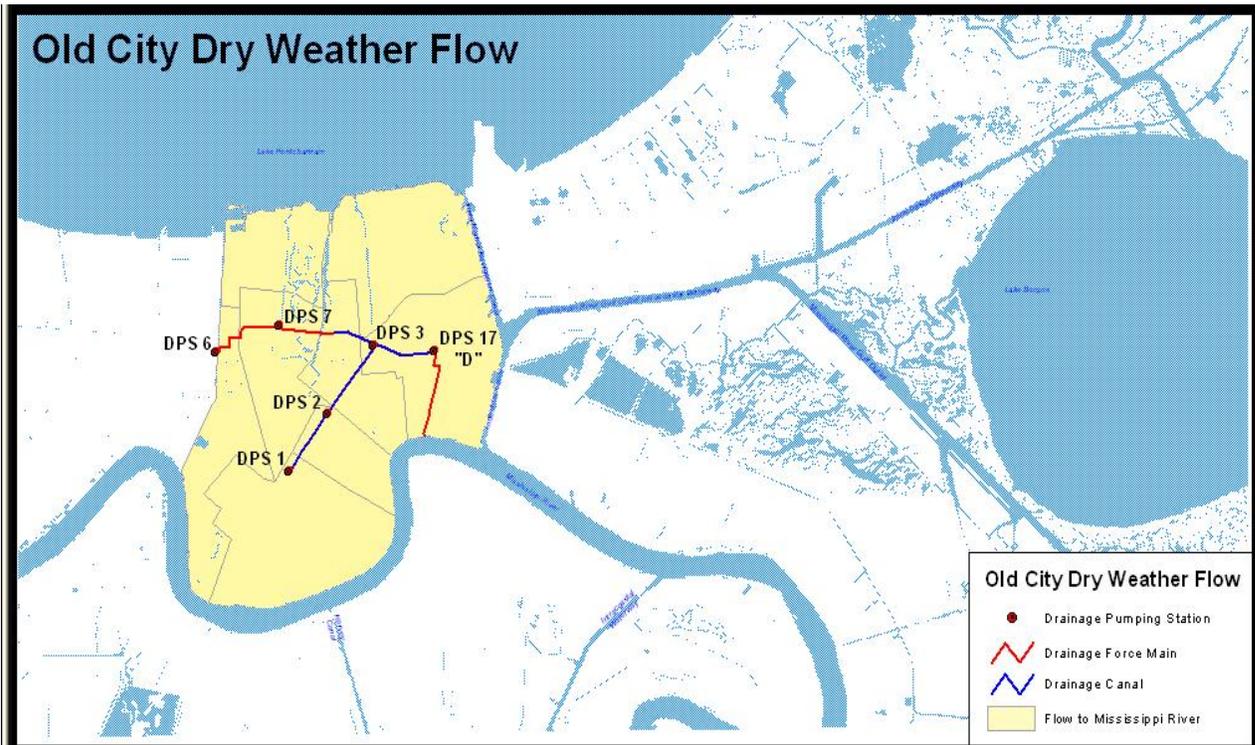


Source: Bing

DPS 6 houses 15 pumps that are all electric-motor driven, some receiving 60-Hertz power from Entergy utility lines and others from the 25-Hertz power system owned and operated by the S&WB. The total pumping capacity for DPS 6 is 9,480 cfs. The station is manned 24 hours a day and has

smaller pumps sized to operate for dry weather flows and larger pumps dedicated to the higher flows experienced during storm events. The dry weather flow pumps discharge into a force main that manifolds with the discharge force main of DPS 7 which then, flows into the Florida Avenue Canal that leads to the intake of DPS 17 (aka DPS “D”). DPS “D” transmits flow, collected from the portion of the City’s drainage system known as “Old City” (i.e., between the 17th Street Canal and Inner Harbor Navigation Canal), to the Mississippi River via a 48-inch cast iron force main. Figure 1-4 shows the configuration of the dry weather flow.

Figure 1-4. Old City Dry Weather Flow



Source: S&WB Systemwide Drainage Network, February 2007

The equipment in DPS 6 is housed in a brick building, which is currently listed on the National Register of Historic Places (NRHP). See Table 1-1 for a summary of the major equipment in DPS 6.

Table 1-1. Existing DPS 6 Major Equipment Option 1

Pump ID	Capacity (cfs)	Notes
A	550	Horizontal pump; 25-Hz power from S&WB
B	550	Horizontal pump; 25-Hz power from S&WB
C	1,000	Horizontal pump; 25-Hz power from S&WB
D	1,000	Horizontal pump; 25-Hz power from S&WB
E	1,000	Horizontal pump; 25-Hz power from S&WB

Table 1-1 cont.

Pump ID	Capacity (cfs)	Notes
F	1,000	Horizontal pump; 25-Hz power from S&WB
G	1,000	Horizontal pump; 25-Hz power from S&WB
H	1,100	Horizontal pump; 60-Hz power from Entergy
I	1,100	Horizontal pump; 60-Hz power from Entergy
V1	250	Vertical pump; 60-Hz power from Entergy
V2	250	Vertical pump; 60-Hz power from Entergy
V3	250	Vertical pump; 60-Hz power from Entergy
V4	250	Vertical pump; 60-Hz power from Entergy
CD1 90		Centrifugal pump for dry weather; 25-Hz power from S&WB
CD2 90		Centrifugal pump for dry weather; 25-Hz power from S&WB
Total	9,480	

Source: ITT Flygt Corporation April 6, 2010

1.2.1 Mechanical and Electrical

For Option 1, the AECOM team's review of the mechanical and electrical aspects of the project focused on evaluating the main mechanical and electrical needs for an "adaptable" permanent pump station at the mouth of the 17th Street Canal. The AECOM team reviewed the previous reports and data generated by the USACE and worked with key equipment manufacturers/suppliers to perform conceptual equipment selections and sizing and obtain current equipment pricing.

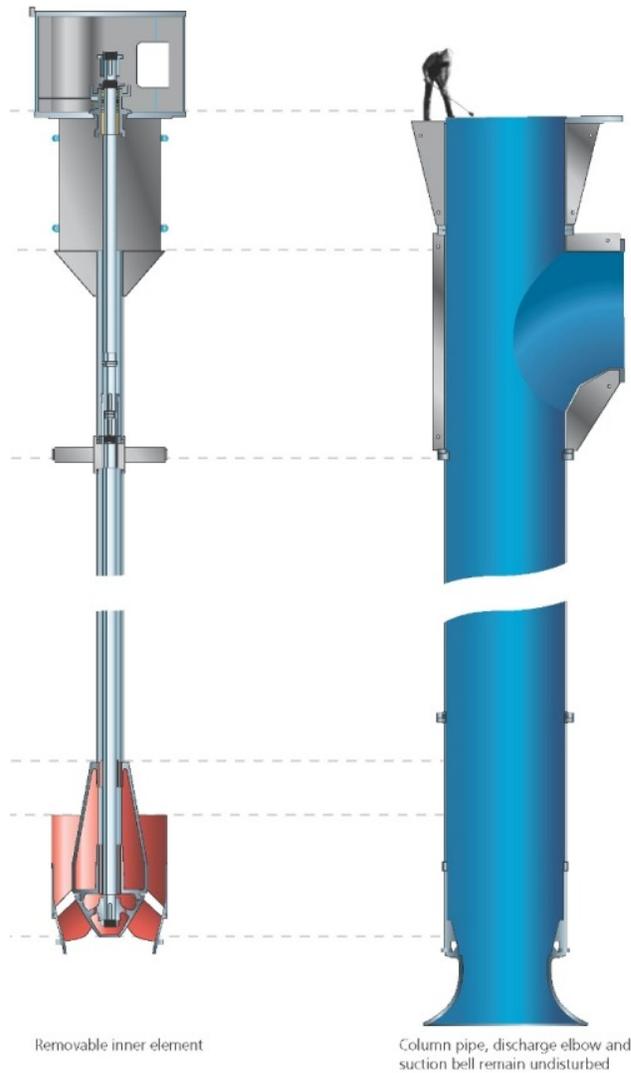
In coordination with the pump manufacturer, three standard sizes/models of ITT Flygt, vertical column pumps were used for the analysis of all stations. In all cases, the evaluation assumed that all pumps would have a Formed Suction Intake (FSI).

It was determined with the pump manufacturer that the multiple hydraulic options/scenarios for a given pump station could be handled by utilizing the same three standard pump sizes and making minor adjustments to the pumps/motors (i.e., speed changes, impeller changes, etc.).

The standard pump models were then used in the evaluation of each pump station to determine the quantity of pumps needed, the spacing required between pumps, the sizing of any associated equipment (such as motors and right angle gears) and ultimately to obtain prices. The three standard pump models include the following; schematic drawings of which are included in Appendix A.

Model 174 x 126 YDD; 1,000 cfs	Model 132 x 84 YDD; 500 cfs	Model 90 x 60 YDD; 250 cfs
--------------------------------	-----------------------------	----------------------------

Figure 1-5. General Schematic Section View of a Vertical Column Pump



Source: ITT Flygt Corporation

The hydraulic conditions used to select equipment for the 17th Street Canal Pump Station are presented in Table 1-2.

Table 1-2. Hydraulic Conditions for 17th Street Canal Pump Station

Required Capacity (cfs)	TDH (ft)
12,500 32	

Source: ITT Flygt Corporation, April 6, 2010

Based on the hydraulic conditions, Table 1-3 summarizes the quantity and combination of standard pumps required for the 17th Street Canal Pump Station. Pump curves are included in Appendix B.

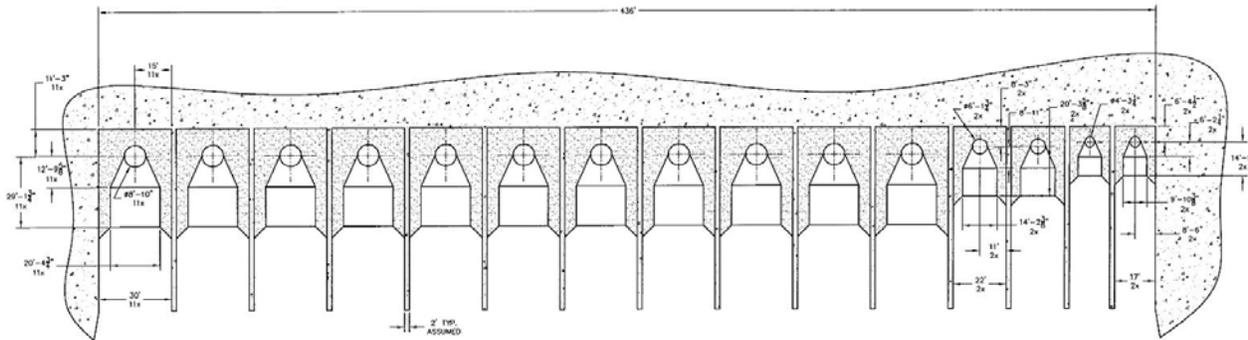
Table 1-3. Quantity of Pumps Required for 17th Street Canal Pump Station

1,000 cfs Pumps	500 cfs Pumps	250 cfs Pumps
11	2	2

Source: ITT Flygt Corporation, April 6, 2010

With the quantity and size of pumps as indicated above, considering Hydraulic Institute standards, the use of FSI and individual bays for each pump, the approximate required width of the pump station for housing the pumps is 436 feet, as shown in Figure 1-6. A larger conceptual drawing is included within Appendix B.

Figure 1-6. Pump Spacing for 17th Street Canal Pump Station



Source: Source: ITT Flygt Corporation, April 6, 2010

A summary of the quantities and current prices obtained from the manufacturer for the pumps, motors, and right angle gears is shown in Table 1-4.

Table 1-4. Current Prices for Pump/Motor Equipment – 17th Street Canal Pump Station

Equipment Item	Quantity	Unit Price	Extended Price
1,000 cfs pump w/FSI	11	\$4,715,000	\$51,865,000
5,000 hp electric motor	11	\$775,000	\$8,525,000
5,000 hp right angle gears	11	\$950,000	\$10,450,000
500 cfs pump w/FSI	2	\$3,175,000	\$6,350,000
2,400 hp electric motor	2	\$290,000	\$580,000
2,000 hp right angle gears	2	\$350,000	\$700,000
250 cfs pump w/FSI	2	\$1,475,000	\$2,950,000
1,300 hp electric motor (direct drive)	2 \$295,000		\$590,000

Source: Source: ITT Flygt Corporation, April 6, 2010

The estimated quantities for generators and fuel tanks are summarized in Table 1-5.

Table 1-5. Generators and Fuel Tanks – 17th Street Canal Pump Station

Equipment Item	Quantity
3MW generator sets	11
20,000 gal double wall fuel tanks	6

Source: Generators: Caterpillar; Fuel Tanks, Southern Tank & MFG, April, 4, 2010

1.2.2 Geotechnical

A cursory review was performed by the AECOM team in conjunction with this effort, specifically of the geotechnical analyses as discussed in the USACE's *90-Day Implementation Study (90-Day Report)*. The AECOM team also provided geotechnical input to the conceptual designs of the pump stations.

Pile Capacity

Deep foundations will be required for various phases of the project including the support of the pump station, uplift resistance for the canals (if groundwater is not controlled), supplemental foundations to the bridges crossing the existing canals, and various other pipe crossings and structures. As such, some generalized pile capacities have been calculated for different pile sizes/types including timber piles, square concrete piles, and steel pipe piles, as shown in Table 1-6. The computed capacities are general in nature and will need to be refined with site-specific geotechnical exploration. The intent is to provide a reasonable assessment of the pile lengths/quantities for estimating purposes. The AECOM team used both the information in the *90-Day Report* and historical information of the area to develop a conservative soil profile for pile capacity calculation.

Table 1-6. Generalized Pile Capacities

Pile Type	Pile Length (ft)	Uplift Capacity (kips)	Compressive Capacity (kips)
12-inch butt diameter, 6-inch tip diameter, 50-ft long timber pile	25	9	10
	50	34	35
12-inch square concrete pile	25	22	28
	50	74	82
	75	153	164
16-inch square concrete pile	25	29	38
	50	94	108
	75	196	214
12-inch diameter steel pipe pile	25	15	18
	50	50	54
	75	103	109
18-inch diameter steel pipe pile	25	23	30
	50	77	88
	75	154	168

Source: Source: ITT Flygt Corporation, April 6, 2010

Temporary sheetpile cantilever walls are planned during various phases of the construction to keep water from Lake Pontchartrain and groundwater out of the excavations during the pump station/canal construction. The actual design of the sheetpile walls will depend on the amount of soil retained, the water levels on both sides of the excavation and soil strength parameters. In general, a “1 up, 2 down” design can be assumed to determine the length of the cantilevered sheetpile wall. For cantilevered walls retaining more than 15 feet of material, a composite section may be required that has the necessary moment capacity.

There are numerous other geotechnical considerations to evaluate during the cost estimate development of Option 1. These include ground vibrations, removal of existing piles, bridge foundations and sequence of construction. Some of these considerations are addressed below.

- **Ground Vibrations.** Construction activities will impose vibration on the adjacent structures. More significant vibration can be induced from pile-driving activities. The vibration should be monitored during all phases of construction. Even though vibrations with peak particle velocities less than 0.1 in/sec will have limited to no impact on structures, they can be perceived by the public as having impact. The results of perceived vibration may result in litigation and other issues that could add delays and cost to the project. Consideration should be given to construction methods that reduce ground vibration to areas adjacent to the project site.
- **Removal of Existing Piles.** The removal of any existing deep foundation element is generally discouraged due to the disturbance of the soils surrounding the existing foundation and potential voids that are created. The soil strength properties are significantly lowered in the areas where foundation elements are removed. Existing foundation elements should be used to supplement the existing design, where feasible.
- **Sequence of Construction.** It is understood that the existing storm protection along the canals must be maintained throughout construction. The sequence of construction must allow for this design constraint. The design of the existing protection was based on certain geometry and soil conditions. Any modification to those parameters, including excavating material near the toe of the existing protection may impact the stability of the existing protection. Supplemental measures should be considered to provide support to the existing protection when developing the construction plan.

1.2.3 Real Estate

Typically, with respect to the construction of public facilities, several options exist for acquisition of the required land for the facilities, both during the construction as well as for the life of the facility. These options can be summarized as follows:

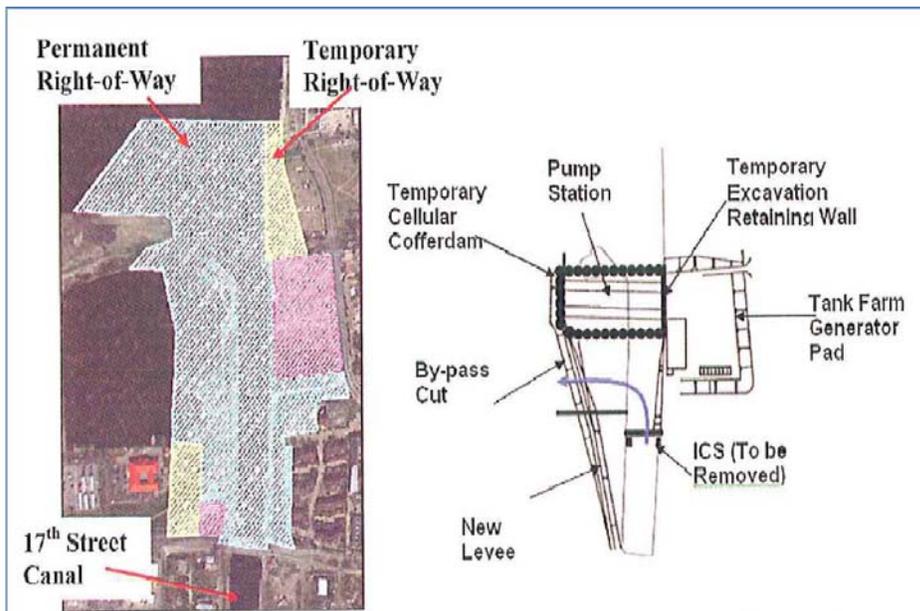
- **Right-of-Way (ROW) Acquisition.** This option involves the acquisition of the right to utilize a specified portion of property for a designated public purpose. Full access and utilization of the surface of the property remains with the owner, with access provided to the easement owner. The value of the acquisition is based on a number of factors, including the size of the taking, the limits of utilization by the owner, and the reduction in value to the remaining portion of the property (if any). ROW may also be donated by the owner without compensation. The value per square foot is calculated at 100 percent of the full value of the property.
- **Temporary/Construction ROW.** This is ROW acquired for temporary utilization, e.g., during construction. Temporary/construction ROWs are typically acquired for a specific duration. Value can be calculated as a percentage of the permanent servitude value. For purposes of

this effort, the value of temporary/construction ROWs were assumed to be 25 percent of the full property value. This is a conservative estimate and can be refined once the exact locations, dimensions, and durations of the acquisitions are known.

- Fee Title Purchase.** This is fee title acquired for permanent utilization when facilities will be above ground level and/or the owner's utilization of the property is lost (e.g., installation of an above ground pump station). Depending on the size and configuration of the space needed, the purchase may be in whole or in part of the entire property. The value (per square foot) is based on the full value of the property. Property may also be donated by the owner without compensation.

In reviewing the real estate needs for Option 1, the focus was on the permanent pump station footprint at the mouth of the canal. The USACE has identified the permanent and temporary land acquisition needs for the permanent pump station at the mouth of the 17th Street Canal in several documents, the latest of which is the *90-Day Report* referenced above. These needs reflect those required for the maximum pump station footprint, as shown in Figure 1-7 from the *90-Day Report*. No ROW cost data was available from the *90-Day Report* or from the USACE.

Figure 1-7. 17th Street Canal Proposed Permanent Protection Location

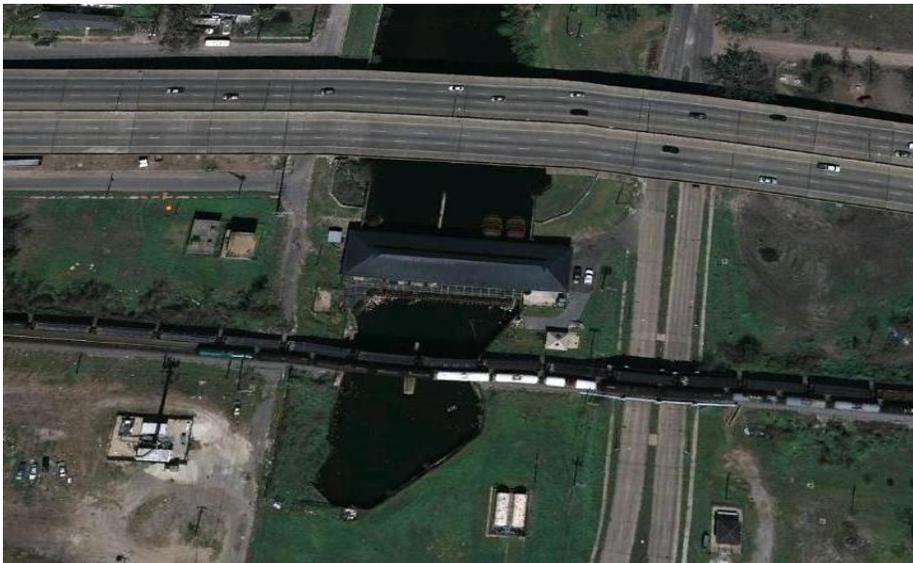


Source: USACE 90-Day Implementation Study, March 2009

Land acquisition needs would be the same as identified in the *90-Day Report* based on the AECOM team footprint size compared to the USACE documentation and pump vendor information. For purposes of this Opinion of Probable Cost, it is assumed that there is no cost for acquiring the permanent and temporary ROW for the permanent pump station, per direction from the S&WB.

1.3 Summary of Findings for Orleans Avenue Canal – Option 1

DPS 7 is located at the upstream end of the Orleans Avenue Canal and currently lifts drainage water to allow gravity flow from the pump station discharge to the lake. An aerial view of DPS 7 is shown in Figure 1-8.

Figure 1-8. Aerial View of DPS 7

Source: Bing

DPS 7 houses five pumps that are all electric-motor driven, some receiving 60-Hertz power from Entergy utility lines and others from the dedicated S&WB 25-Hertz power system. The total pumping capacity for DPS 7 is 2,690 cfs. The station is manned 24 hours a day and has smaller pumps sized to operate for dry weather flows and larger pumps dedicated to the higher flow that is experienced during storm events. The dry weather flow pumps discharge into a force main that manifolds with the discharge forcemain of DPS 6 which then flows into the Florida Avenue Canal leading to the intake of DPS "D". DPS "D" transmits flow, collected from the portion of the City drainage system known as "Old City" (i.e., between the 17th Street Canal and Inner Harbor Navigation Canal), to the Mississippi River via a 48-inch cast iron force main as shown in Figure 1-4.

The equipment in DPS 7 is housed in a brick building that is also listed on the NRHP. See Table 1-7 for a summary of the major equipment in the station.

Table 1-7. Existing DPS 7 Major Equipment

Pump ID	Capacity (cfs)	Notes
A	550	Horizontal pump; 25-Hz power from S&WB
C	1,000	Horizontal pump; 25-Hz power from S&WB
D	1,000	Horizontal pump; 60-Hz power from Entergy
CD1	70	Vertical pump for dry weather; 25-Hz power from S&WB
CD2	70	Vertical pump for dry weather; 25-Hz power from S&WB
Total	2,690	

Source: USACE Conceptual Design Report for Permanent Flood Gates and Pump Stations, July 31, 2006

1.3.1 Mechanical and Electrical

For Option 1, review of the mechanical and electrical aspects of the project focused on evaluating the main mechanical and electrical needs for an “adaptable” permanent pump station at the mouth of the Orleans Avenue Canal. As part of this effort, the AECOM team reviewed the previous reports and data generated by the USACE and worked with key equipment manufacturers/suppliers to perform conceptual equipment selections and sizing and obtain current equipment pricing.

Three standard sizes/models of ITT Flygt, vertical column pumps were used for the analysis of all stations. It was determined with the pump manufacturer that the multiple hydraulic options/scenarios for a given pump station could be handled by utilizing the same three standard pump sizes and making adjustments to the pumps/motors (i.e., speed changes, impeller changes, etc.).

The hydraulic conditions used to select equipment for the Orleans Avenue Canal Pump Station are presented in Table 1-8.

Table 1-8. Hydraulic Conditions for Orleans Avenue Canal Pump Station

Required Capacity (cfs)	TDH (ft)
2,700 32	

Source: ITT Flygt Corporation, April 6, 2010

Based on the hydraulic conditions, Table 1-9 summarizes the quantity and combination of standard pumps required for the Orleans Avenue Canal Pump Station. Pump curves are included within Appendix B.

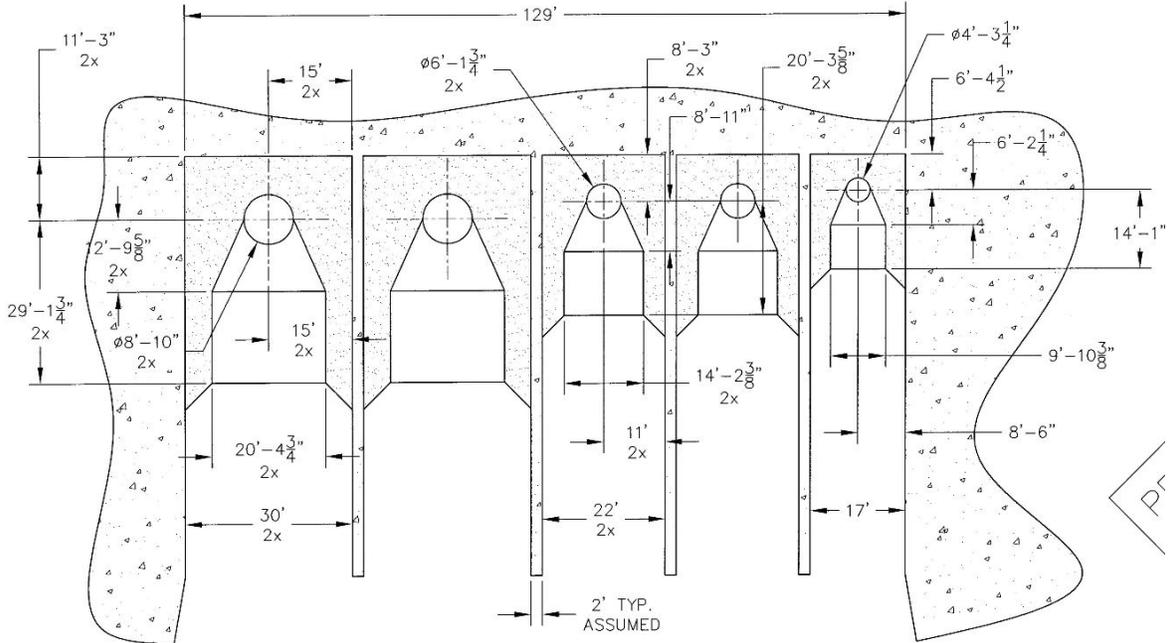
Table 1-9. Quantity of Pumps Required for Orleans Avenue Canal Pump Station

1,000 cfs Pumps	500 cfs Pumps	250 cfs Pumps
2 2 1		

Source: ITT Flygt Corporation, April 6, 2010

With the quantity and size of pumps as indicated above, considering Hydraulic Institute standards, the use of FSI and individual bays for each pump, the approximate required width of the pump station for housing the pumps is 129 feet, as shown in Figure 1-9. A larger conceptual drawing is included in Appendix B.

Figure 1-9. Pump Spacing for Orleans Avenue Canal Pump Station



Source: ITT Flygt Corporation, April 6, 2010

A summary of the quantities and current prices obtained from the manufacturer for the pumps, motors and right angle gears is shown in Table 1-10.

Table 1-10. Current Prices for Pump/Motor Equipment – Orleans Avenue Canal Pump Station

Equipment Item	Quantity	Unit Price	Extended Price
1,000 cfs pump w/FSI	2	\$4,715,000	\$9,430,000
5,000 hp electric motor	2	\$775,000	\$1,550,000
5,000 hp right angle gears	2	\$950,000	\$1,900,000
500 cfs pump w/FSI	2	\$3,175,000	\$6,350,000
2,400 hp electric motor	2	\$290,000	\$580,000
2,400 hp right angle gears	2	\$350,000	\$700,000
250 cfs pump w/FSI	1	\$1,475,000	\$1,475,000
1,000 hp electric motor (direct drive)	1	\$295,000	\$295,000

Source: ITT Flygt Corporation, April 6, 2010

The estimated quantities for generators and fuel tanks are summarized in Table 1-11.

Table 1-11. Generators and Fuel Tanks – Orleans Avenue Canal Pump Station

Equipment Item	Quantity
3MW generator sets	3
20,000 gal double wall fuel tanks	2

Source: Generators: Caterpillar; Fuel Tanks: Southern Tank & MFG, April 20, 2010

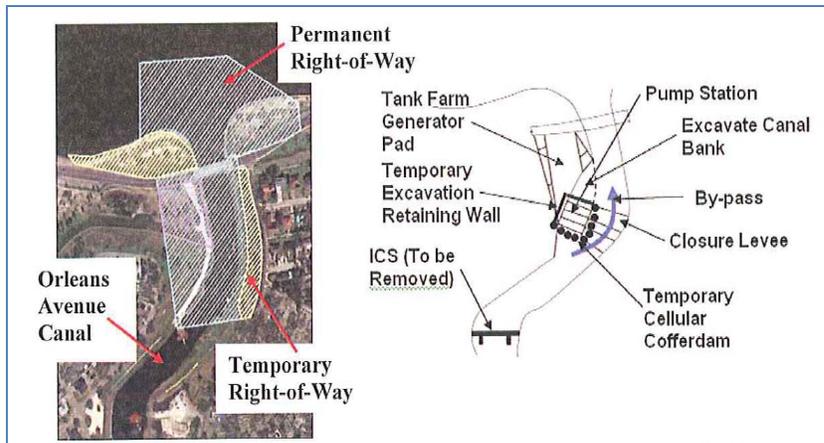
1.3.2 Geotechnical

Geotechnical discussions and recommendations are summarized in Section 1.2 for all outfall canals.

1.3.3 Real Estate

As in Option 1 for the 17th Street Canal, the USACE has identified the permanent and temporary land acquisition needs for the permanent pump station at the mouth of the Orleans Avenue Canal in several documents, the latest of which is the *90-Day Study*. These needs reflect those required for the maximum pump station footprint. The permanent pump station footprint proposed in the *90-Day Study* for the Orleans Avenue Canal is shown in Figure 1-10. No ROW cost data was available from the *90-Day Study* or from the USACE.

Figure 1-10. Orleans Avenue Canal Proposed Permanent Protection Location



Source: USACE, 90-Day Implementation Study, March 2009

Land acquisition needs would be the same as identified in the *90-Day Study* based on the AECOM team footprint size compared to the USACE documentation and pump vendor information. For purposes of the CPRA, it is assumed that there is no cost for acquiring the permanent and temporary ROW for the permanent pump station, per direction from the S&WB.

1.4 Summary of Findings for London Avenue Canal – Option 1

DPS 3 is located at the upstream end of the London Avenue Canal and currently lifts drainage water to allow gravity flow from the pump station discharge to the lake. An aerial view of DPS 3 is shown in Figure 1-11.

Figure 1-11. Aerial View of DPS 3

Source: Bing

DPS 3 houses nine pumps that are all electric-motor driven and all receive 25-Hertz power from the dedicated S&WB system. The total pumping capacity for DPS 3 is 4,260 cfs. The station is manned 24 hours a day and has smaller pumps sized to operate for dry weather flows and larger pumps dedicated to the higher flow that is experienced during storm events. The dry weather-flow pumps discharge into the drainage canal network conveying its flow to the Florida Avenue Canal that leads to the intake of DPS "D". DPS "D" transmits flow, collected from the old part of the City drainage system, to the Mississippi River via a 48-inch cast iron force main as shown in Figure 1-4.

The equipment in DPS 3 are housed in a brick building that is also listed on the NRHP. See Table 1-12 for a summary of the major equipment in the station.

Table 1-12. Existing DPS 3 Major Equipment

Pump ID	Capacity (cfs)	Notes
A	550	Horizontal pump; 25-Hz power from S&WB
B	550	Horizontal pump; 25-Hz power from S&WB
C	1,000	Horizontal pump; 25-Hz power from S&WB
D	1,000	Horizontal pump; 25-Hz power from S&WB
E	1,000	Horizontal pump; 25-Hz power from S&WB
CD1L/1R	80	Combination of two centrifugal pumps (40 cfs each) for dry weather; 25-Hz power from S&WB
CD2L/2R	80	Combination of two centrifugal pumps (40 cfs each) for dry weather; 25-Hz power from S&WB
Total	4,260	

Source: Trigon Technical Memorandum, April 16, 2010

DPS 4 is located approximately at the midpoint of the London Avenue Canal, between DPS 3 and the lake. DPS 4 currently lifts drainage water to allow gravity flow from the pump station discharge to the lake. An aerial view of DPS 4 is shown in Figure 1-12.

Figure 1-12. Aerial View of DPS 4



Source: Bing

DPS 4 houses six pumps that are all electric-motor driven, some receiving 60-Hertz power from Entergy utility lines and others from the dedicated S&WB 25-Hertz power system. The total pumping capacity for DPS 4 is 3,720 cfs. The station is manned 24 hours a day and has smaller pumps sized to operate for dry weather flows and larger pumps dedicated to the higher flow that is experienced during storm events. The dry weather-flow pumps discharge into the drainage canal network conveying its flow to the Florida Avenue Canal that leads to the intake of DPS “D”. DPS “D” transmits flow, collected from the portion of the City drainage system known as “Old City” (i.e., between the 17th Street Canal and Inner Harbor Navigation Canal), to the Mississippi River via a 48-inch cast iron force main as shown in Figure 1-4.

The equipment in DPS 4 is housed in a brick building that is not listed on the NRHP. See Table 1-13 for a summary of the major equipment in the station.

Table 1-13. Existing DPS 4 Major Equipment

Pump ID	Capacity (cfs)	Notes
1	320	Centrifugal pump; 60-Hz power from Entergy
2	320	Centrifugal pump; 60-Hz power from Entergy
C	1,000	Horizontal pump; 25-Hz power from S&WB
D	1,000	Horizontal pump; 25-Hz power from S&WB
E	1,000	Horizontal pump; 25-Hz power from S&WB
CD1	80	Vertical pump for dry weather; 25-Hz power from S&WB
Total	3,720	

Source: ITT Flygt Corporation, April 6, 2010

1.4.1 Mechanical and Electrical

For Option 1, the AECOM team’s review of the mechanical and electrical aspects of the project focused on evaluating the main mechanical and electrical needs for an “adaptable” permanent pump station at the mouth of the London Avenue Canal. As part of this effort, the AECOM team reviewed the previous reports and data generated by the USACE and worked with key equipment manufacturers/suppliers to perform conceptual equipment selections and sizing and obtain current equipment pricing.

Three standard sizes/models of ITT Flygt, vertical column pumps were used for the analysis of all stations. It was determined with the pump manufacturer that the multiple hydraulic options/scenarios for a given pump station could be handled by utilizing the same three standard pump sizes and making minor adjustments to the pumps/motors (i.e., speed changes, impeller changes, etc.).

The hydraulic conditions used to select equipment for the London Avenue Canal Pump Station are presented in Table 1-14.

Table 1-14. Hydraulic Conditions for London Avenue Canal Pump Station

Required Capacity (cfs)	TDH (ft)
9,000 32	

Source: ITT Flygt Corporation, April 6, 2010

Based on the hydraulic conditions, Table 1-15 summarizes the quantity and combination of standard pumps required for the London Avenue Canal Pump Station. Pump curves are included within Appendix B.

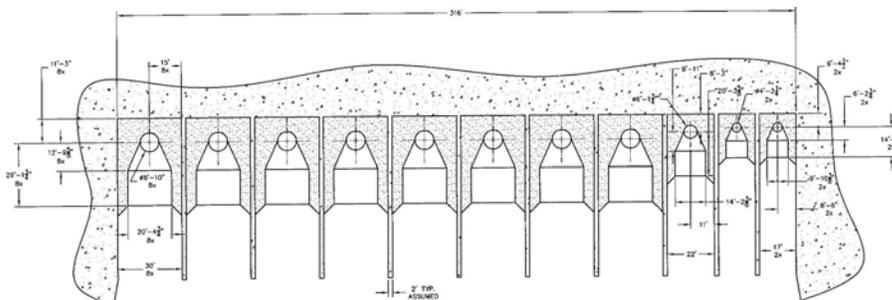
Table 1-15. Quantity of Pumps Required for London Avenue Canal Pump Station

1,000 cfs Pumps	500 cfs Pumps	250 cfs Pumps
8 1 2		

Source: ITT Flygt Corporation, April 6, 2010

With the quantity and size of pumps indicated above, considering Hydraulic Institute standards, and the use of FSI and individual bays for each pump, the approximate required width of the pump station for housing the pumps is 316 feet, as shown in Figure 1-13. A larger conceptual drawing is included within Appendix B.

Figure 1-13. Pump Spacing for London Avenue Canal Pump Station



Source: ITT Flygt Corporation, April 6, 2010

A summary of the quantities and current prices obtained from the manufacturer for the pumps, motors and right angle gears is shown in Table 1-16.

Table 1-16. Current Prices for Pump/Motor Equipment – London Avenue Canal Pump Station

Equipment Item	Quantity	Unit Price	Extended Price
1,000 cfs pump w/FSI	8	\$4,715,000	\$37,720,000
5,000 hp electric motor	8	\$775,000	\$6,200,000
5,000 hp right angle gears	8	\$950,000	\$7,600,000
500 cfs pump w/FSI	1	\$3,175,000	\$3,175,000
2,400 hp electric motor	1	\$290,000	\$290,000
2,400 hp right angle gears	1	\$350,000	\$350,000
250 cfs pump w/FSI	2	\$1,475,000	\$2,950,000
1,300 hp electric motor (direct drive)	2 \$295,000		\$590,000

Source: ITT Flygt Corporation, April 6, 2010

The estimated quantities for generators and fuel tanks are summarized in Table 1-17.

Table 1-17. Generators and Fuel Tanks – London Avenue Canal Pump Station

Equipment Item	Quantity
3MW generator sets	7
20,000 gal double walled fuel tanks	4

Source: Generators: Caterpillar, April 21, 2010; Fuel Tanks: Southern Tank & MFG, April 20, 2010

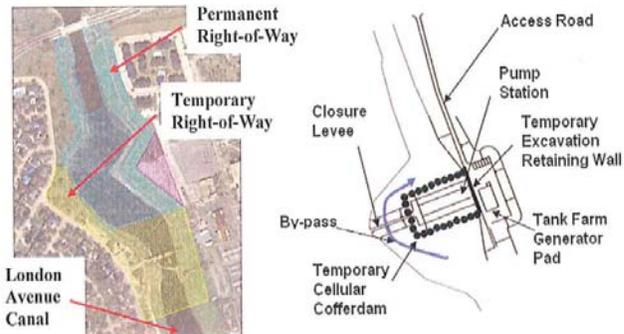
1.4.2 Geotechnical

Geotechnical discussions and recommendations are summarized in Section 1.2 for all outfall canals.

1.4.3 Real Estate

As in Option 1 for the 17th Street Canal, the USACE has identified the permanent and temporary land acquisition needs for the permanent pump station at the mouth of the London Avenue Canal in several documents, the latest of which is the *90-Day Report*. These needs reflect those required for the maximum pump station footprint, as shown in Figure 1-14. No ROW cost data was available from the *90-Day Report* or from the USACE.

Figure 1-14. London Avenue Canal Proposed Permanent Protection Location



Source: USACE, 90-Day Implementation Study, March 2009

Land acquisition needs would be the same as identified in the *90-Day Report* based on the AECOM team footprint size compared to the USACE documentation and pump vendor information. For purposes of this Opinion of Probable Cost, it is assumed that there is no cost for acquiring the permanent and temporary ROW for the permanent pump station, per direction from the S&WB.

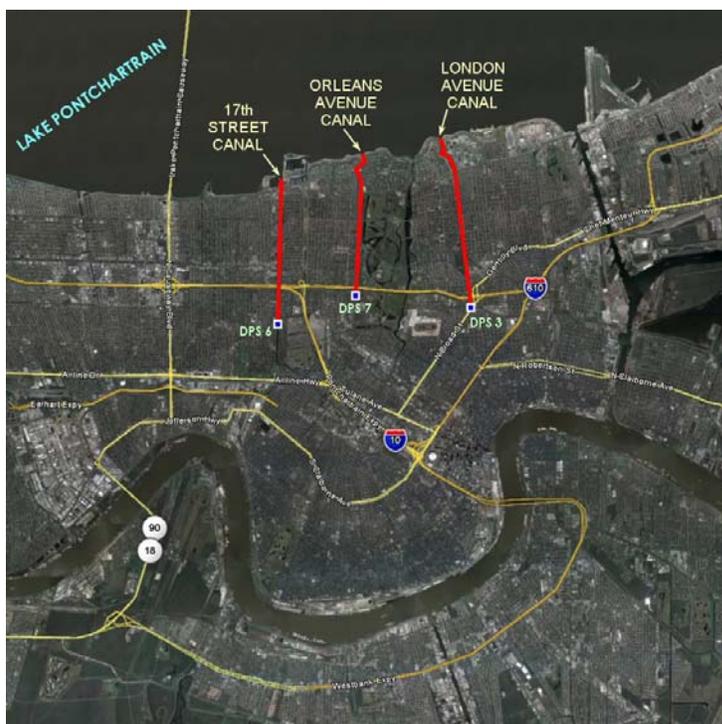
1.5 Assumptions

An itemized list of assumptions is included at the beginning of Appendix A.

2.0 Option 2 – Construction of New Replacement Pump Stations at the Mouths of the 17th Street, Orleans Avenue, and London Avenue Canals with Deepened Outfall Canals

The 17th Street Canal, Orleans Avenue Canal, and the London Avenue Canal drain a major portion of the New Orleans area. A vicinity map showing the canal locations is presented in Figure 2-1.

Figure 2-1. Three Canals Showing Location of DPS 3, 6, and 7



Source: Google Earth 2006

The USACE Option 2 provides proposed lakefront pump stations constructed as permanent closures in the Hurricane Protection System (HPS) inside the mouth of each outfall canal at Lake Pontchartrain. The pump stations for this option are very similar to those mentioned in Option 1, except there will be no gated structure on the Option 2 pump station. Due to the deepened canal section, the elevation of the water surface in each canal will be up to 15 feet below the normal elevation of Lake Pontchartrain; therefore, a gated structure is not required in Option 2. Since there are no gates, full time operation of the Option 2 pump stations will be required, to maintain the safe water elevation in each outfall canal.

The existing interior S&WB pump stations on the outfall canals would be decommissioned. Storm water collected throughout the drainage basin for each canal, would flow to the proposed lakefront pump stations by gravity. The proposed pump stations would completely separate the canals from

Lake Pontchartrain's influence and become an integral part of the levee system. This would allow the canals to be deepened. The banks of the canals would be reshaped to lower elevations, essentially reconstructing the outfall canal system. The levee and floodwalls flanking each outfall canal would no longer be required as part of the HPS (Hurricane Protection System). Option 2 would eliminate nearly 13 miles of levees and floodwalls. The hydraulic grade lines and inverts of each canal would be lowered, substantially, and the safe water operating level in each canal would be lowered below the existing grade of the surrounding land on the protected side of the HPS. Proposed canal cross sections used in preparation of this Opinion of Probable Cost are presented in Appendix B.

In Option 2, the existing Interim Control Structure (ICS) facility located at the mouth of each canal will be removed and decommissioned. The photograph in Figure 2-4 shows the existing interim control structure currently located at the mouth of the 17th Street Canal.

The existing ICS pumps on either side of the canal, gates within the structure across the canal, piping and equipment will be decommissioned. An aerial view of the ICS facility at the 17th Street Canal is shown in Figure 2-4. Figure 2-8 and Figure 2-10 show the existing ICS facilities at the Orleans Avenue Canal and the London Avenue Canal, respectively. Based on conversations with the USACE, this Opinion of Probable Cost assumes that the major equipment items such as pumps, valves and generators will be transferred to a U.S. Government site, located within a 25-mile radius of the construction site. All concrete, steel, and other miscellaneous construction and demolition debris will be hauled to a permitted construction and demolition debris facility within a 25-mile radius of the construction site.

2.1 Option 2 - Basis of Opinion of Probable Cost

AECOM used the following items to develop the Basis of Opinion of Probable Cost for Option 2:

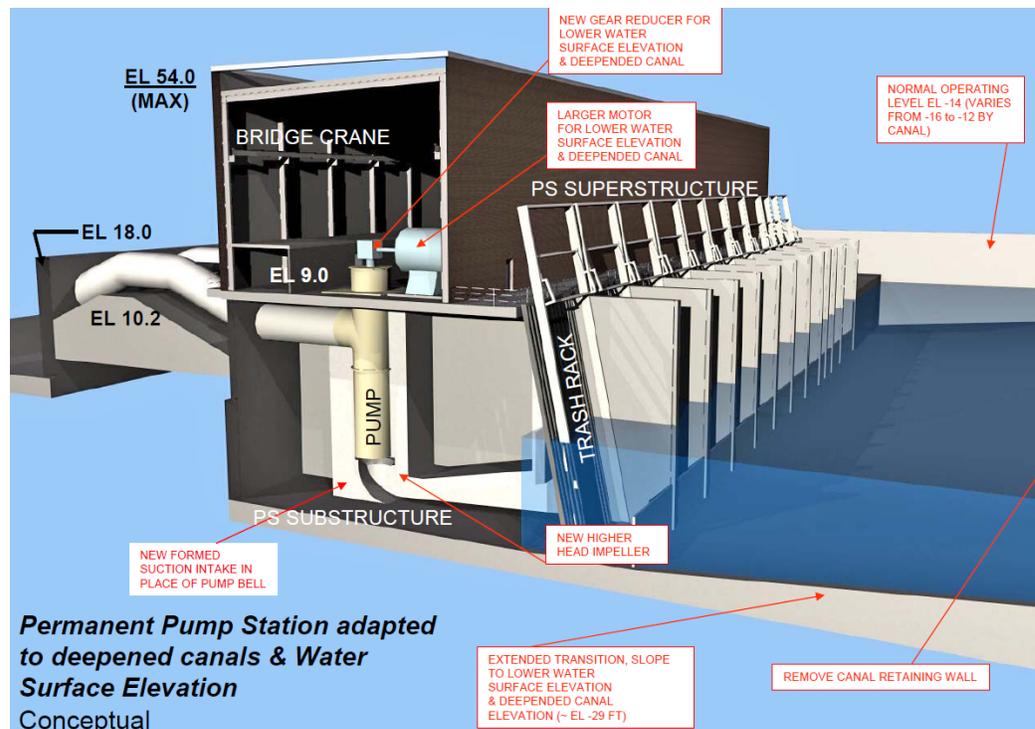
1. Permanent Pump Station Construction
 - a. Construction of Permanent Pump Station Bypasses
 - b. Construction of Permanent Pump Stations at the mouths of the 17th Street, Orleans Avenue, and London Avenue Canals
 - c. Closure of Permanent Pump Station Bypasses
 - d. Removal of Interim Control Structure and Pumps
2. Deepened Canals
 - a. Real Estate
 - b. Construction of most cost-effective solution for deepened canals
 - c. Modifications to Bridges along the three outfall canals
 - d. Removal of Concrete Floodwalls and Steel Sheet Pile Foundations
 - e. Degrade Earthen Levees to Adjacent Ground Elevation
 - f. Construction of Permanent Drainage Canal Bypasses of existing Drainage Pump Stations 3, 4, 6, and 7
 - g. Decommission and Demolish Existing Drainage Pump Stations 3, 4, 6, and 7
 - h. Site Restoration

3. Miscellaneous
 - a. Engineering Design
 - b. Construction Management
 - c. Engineering during Construction
 - d. Contingencies

Pump Stations

In Option 2, the proposed lakefront pump stations will have a formed suction intake (FSI), and the pump system will have increased lift due to the deepened channel and intake basin water elevation. The Option 2 pump station includes the adaptable design presented in Option 1; however, there is no need for the gated structure adjacent to the pump station. The gated structure is not necessary because water will no longer flow by gravity into Lake Pontchartrain, since the canal safe water level will be below the level of Lake Pontchartrain. Under Option 2, the interior drainage pumping station will be decommissioned. In order to accomplish decommissioning for the existing interior DPS facilities, a bypass will be constructed to route canal flow around the DPS. Storm water will flow by gravity through the canal directly to the lakefront pump station. The proposed lakefront pump station will pump the flow into Lake Pontchartrain. A conceptual diagram shown in Figure 2-2 portrays a section of the Option 2 pump station.

Figure 2-2. Conceptual Drawing of Formed Suction Intake Modified Pump Station



Source: USACE documentation, Permanent Canal Closures and Pumps: Operable System Features of the Authorized Permanent Pump Stations, March 2010

In Option 2, the lakefront pump stations would always pump water from the canal into Lake Pontchartrain. There would be no gravity flow into the lake as in Option 1, and hence no gated structure in Option 2.

Normal lake elevations are generally higher than the ground elevations of the areas through which the canals pass. Option 2 canal surface water elevations will normally operate around -10.5 ft MSL to -13 ft MSL. Lake levels generally vary around elevation 0 ft MSL, and surrounding land elevations on the protected side of the levee system is approximately -5 ft MSL.

An advantage to Option 2 that sets it apart from Option 1, is that the deepened canal elevations and lower safe water operating level in the canals allow decommissioning of the approximately 13 miles of levee and floodwalls. In addition, Option 2 eliminates the duplicate existing interior DPS pump stations and coordination issues between the existing DPS and the proposed lakefront pump station described in Option 1.

Construction sequence for the proposed lakefront pump stations in Option 2, will follow a similar methodology as determined in Option 1. Temporary bypasses will be constructed at the mouths of each canal to divert flow around construction operations and the cofferdam during installation of the proposed pump station.

After the temporary diversions are in place, a permanent pump station will be installed at the mouth of each canal. The proposed Option 2 pump station will have a deeper inlet structure to accommodate the deepened canal, and will be similar to the conceptual diagram shown in Figure 2-2. The deepened canal section will smoothly transition into the pump station FSI. The FSI will be a pile-supported concrete structure and will provide laminar flow transition into each pump intake.

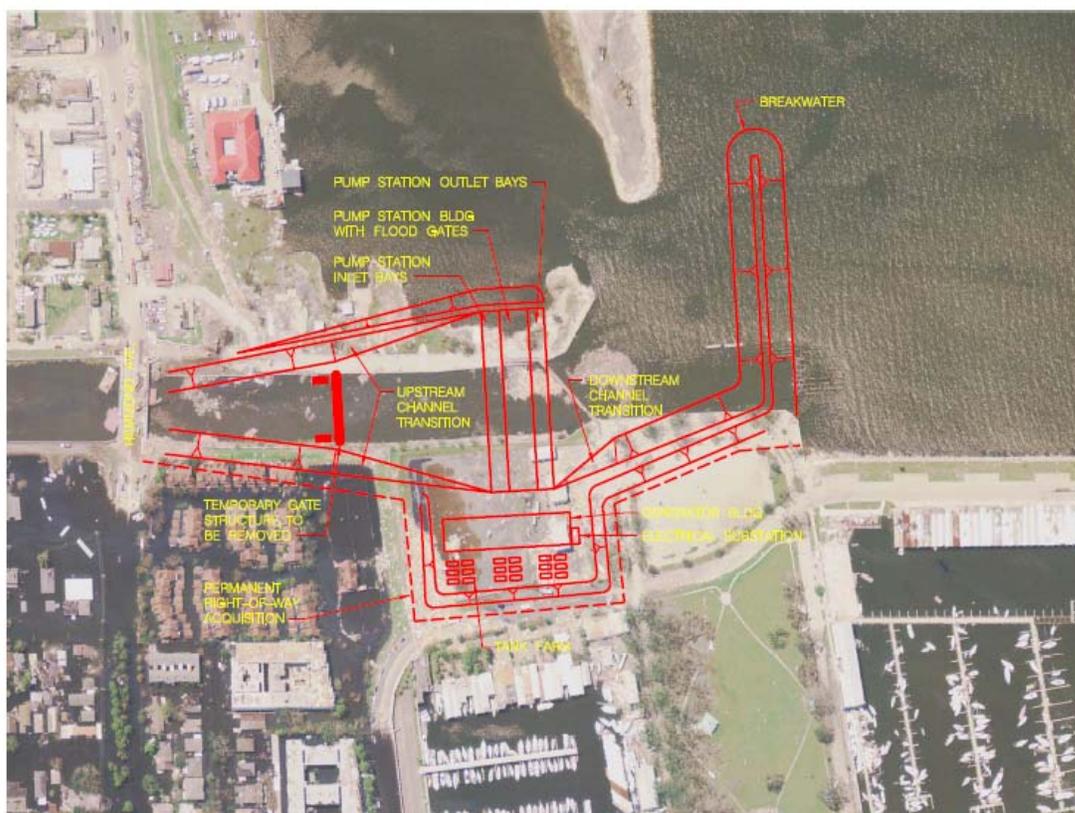
The pump station will be a pile-supported structure with a reinforced concrete foundation and reinforced concrete structural wall sections. The pump station facade will include architectural features to enhance building aesthetics. Two offices, a restroom, HVAC, and kitchen facilities will be included in the building layout. For purposes of this estimate, a 600-square-foot area is included as office space for each pump station. In addition, the pump station will include a crane for maintenance of equipment. Pump spacing and layout will follow Hydraulic Institute standards.

2.2 Summary of Findings for 17th Street Canal – Option 2

Pump Station

Figure 2-3 shows a conceptual layout of the pump station area at the 17th Street Canal.

Figure 2-3. 17th Street Canal Pump Station Conceptual Layout



Source: USACE, Conceptual Design Report for Permanent Flood Gates and Pump Stations, 2006

A breakwater structure shown in Figure 2-3 is not required according to recent information from the USACE. The proposed pump stations are located far enough inside the canal to alleviate wave effects on the pumps. AECOM's Scope of Work for this Opinion of Probable Cost does not include a breakwater structure.

After the pump station at the 17th Street Canal is in place and operational, the temporary bypass will be closed and removed from service. In addition, the Interim Control Structure (ICS) facility, including all pumps, motors, generators, piping, structure, etc. will be dismantled and removed from service. A photograph of the existing ICS facility to be decommissioned is shown in Figure 2-4.

Figure 2-4. Existing ICS Facility at 17th Street Canal



Source: Bing

For purposes of this estimate of probable cost, major equipment from each ICS facility, such as pumps, motors, generators, etc. will be transported to a government receiving area within a 25-mile radius of the construction site. The location is not known at this time.

The conceptual pump station footprint is shown in Table 2-1, based on information from the mechanical pump vendor as well as structural layout and equipment spacing requirements by the Hydraulic Institute.

Table 2-1. Conceptual Pump Station Footprint 17th Street Canal – Option 2

Option 2	Use the larger of these two widths		Width of Gates (ft)	Required Width (ft)
	Width Required by Pumps-Motors (ft)	Width Required by FSI (ft)		
17th Street	436	301	na	440

Source: AECOM

2.2.1 Mechanical and Electrical

As in Option 1, and due to the “adaptable” pump station concept selected, it was determined with the pump manufacturer that the multiple hydraulic options/scenarios for a given pump station could be handled by utilizing the same quantity of the three standard pump sizes and making minor adjustments to the pumps/motors (i.e., speed changes, impeller changes, etc.). As such, the estimated mechanical and electrical requirements for the pump station are the same as presented in Option 1.

2.2.2 Geotechnical

AECOM has developed proposed canal cross sections for Options 2 and 2a. A cursory review was performed by the AECOM Team in conjunction with this effort, specifically of the geotechnical

analyses discussed in the *90-Day Implementation Report*. This review provided geotechnical input to the conceptual designs of the canal cross sections and pump stations developed by AECOM for Option 2 and Option 2a.

The following presents a discussion of the geotechnical issues related to Option 2 in this section, including discussions on the design concepts for the canal cross sections, groundwater cutoff, pile capacity, temporary sheetpile walls and other geotechnical considerations.

Groundwater Cutoff. Excessive seepage into the canal excavation footprint may cause a drawdown in the natural groundwater level outside the limits of the canal. The effect of groundwater drawdown will result in settlement of structures in the vicinity of the canal. To enhance the designs of the two canal conceptual alternatives, groundwater cutoff should be considered. The groundwater cutoff design would extend along the perimeter of the new canals. The purpose of the groundwater cutoff would be to reduce, or “cut-off” inflow of seepage and associated drawdown of the groundwater from outside the canal excavation. The cutoff should extend from the existing ground surface to a layer of low permeability. An extensive field exploration will be required to determine the appropriate depth of this “low-permeability” layer. Based on our experience in the area, it is anticipated that the average depth of the groundwater cutoff will be on the order of 60 feet.

The groundwater cutoff will remove the necessity of deep foundation elements for uplift resistance for the concrete flume alternative. In addition, the cutoff will reduce the required clay liner thickness for the other canal alternative. The canals will still require lining for hydraulic reasons and to provide resistance to potential erosion. Articulated concrete mats or other surface protection can be considered for this purpose.

Three different groundwater cutoff alternatives were evaluated for the site. They include slurry walls, diaphragm walls and steel sheetpiles. These options are discussed further below.

- **Slurry Wall.** The conceptual design of a slurry wall would be a 3-foot-wide trench that would extend to the low-permeability layer. The slurry wall is excavated and the side walls are kept open through the hydraulic pressure of a heavyweight slurry. The slurry generally consists of a cement/bentonite mixture. A slurry wall is generally not treated as a structural element, only as a seepage barrier. Estimated costs for installation of the slurry wall are on the order of \$20/square feet of cross-sectional area. Approximately 500 to 1,000 lineal feet of slurry wall can be installed in a day.
- **Diaphragm Wall.** An alternative to the slurry wall would be a diaphragm wall. The benefit of a diaphragm wall is that it would cut-off the seepage into the canal and excavation and it could be used as a structural element to provide temporary flood protection during construction. The installation of the diaphragm wall is similar to a slurry wall with the exception that concrete and rebars are placed in the excavation. It is estimated that a diaphragm wall for this application would on the order of 2-ft wide and again, extend to the low-permeability layer. Estimated costs for installation of the slurry wall are on the order of \$80/square feet of cross-sectional area, or 4 times the cost of the slurry wall.
- **Steel Sheetpile.** Finally, steel sheetpiles can be installed to cutoff groundwater to the canal excavation. Steel sheetpiles are commonly used for this application in the area. The steel sheetpile can also be used as a structural element in certain applications. The concerns for steel sheetpiling in this area including ground vibrations, which are discussed in the general geotechnical considerations of this report. In addition, the interlocks need to be sealed to limit leakage.

Canal Cross-Sections. Two conceptual cross-sections for each of the outfall canals were provided by AECOM, as shown in Appendix B. A discussion of each alternative is included below.

- **Concrete Flume.** The first design consists of a concrete flume with a design base elevation at approximately -30 ft MSL with a base width of approximately 65 ft. The side slopes of the concrete flume were on the order of 2:Horizontal to 1:Vertical. The design water elevation in the concrete flume is anticipated to be at -14 ft MSL. This design stays within the footprint of the existing outfall canal. The existing groundwater elevation outside the limits of the canal is currently at approximately -5 ft MSL. The Opinion of Probable Cost evaluates all positive groundwater cutoff as well as no groundwater cutoff. The following geotechnical comments are offered if groundwater cutoff is not obtained.
 - The gradient in water elevation from outside the canal to the design water elevation inside the canal will cause an uplift pressure at the base of the concrete flume canal. Based on the current design assumptions, the uplift will be on the order of 1,500 psf at the base of the channel.
 - The calculated uplift pressure will need to be counter-acted through the use of driven piles or other acceptable deep foundation.
 - The concrete lining the base of the canal will need to act both as a pile cap for the uplift piles and as a seepage barrier. The AECOM team anticipates a concrete thickness of at least two feet may be necessary to meet these objectives.
 - Soil nailing has been suggested as a deep foundation alternative to support uplift loads on the side slopes. Soil nailing may be difficult in the geologic environment of the canals. In addition, creep may be a significant issue related to soil nailing in this geologic environment. Creep may compromise the structural integrity of the concrete during the design life of the project.
- **Clay Liner.** The second design concept consists of a drainage canal that is laid back to a stable slope without supplemental measures and incorporates a 2-foot-thick clay liner. The design base elevation of the clay liner option is also at approximately -30 ft MSL with a base width of approximately 90 ft. The side slopes of the clay liner were originally estimated to be on the order of 3:Horizontal to 1:Vertical; however, slope inclinations on the order of 4:Horizontal to 1:Vertical were required to provide a factor of safety of 1.4 at the 17th Street Canal location. Slope inclinations on the order of 2.5:Horizontal to 1:Vertical were required at the Orleans Canal location and slope inclinations on the order of 3.5:Horizontal to 1:Vertical were required at the London Avenue Canal location. The design water elevation in the clay liner option is anticipated to be at -14 ft MSL. To achieve the required cross-section for hydraulics, this design alternative extends outside of the existing protection on the perimeter of the existing outfall canal. As mentioned in the previous section, the existing groundwater elevation outside the limits of the canal is currently at approximately -5 ft MSL. The concept for using a clay liner assumes positive groundwater cutoff is obtained.

2.2.3 Real Estate

As in Option 1, it is assumed that there is no cost for acquiring the permanent and temporary right-of-way for the permanent pump station.

The width of the 17th Street Canal under Option 2 will require additional ROW on both the east and west sides of the canal. For purposes of this evaluation, a 25-foot permanent ROW is assumed for each side of the 17th Street Canal, measured from the toe of the existing levee.

The west side of the 17th Street Canal is bordered by the Orpheum Street ROW. While this ROW is paved for a portion of the route, it appears to be an unpaved ROW for the remainder of the route; this ROW would require verification during the design phase of the project. It is assumed that there is no cost associated with this ROW. However, a number of properties along the western side of the 17th Street Canal may be affected by the widening of the canal and the 25-foot permanent ROW; this may include lack of access resulting from the expansion of the canal in the ROW or significant encroachment on to properties. A conceptual planning level review of current property values in this area was performed (based on recent sales) and estimated average costs per square foot of property were developed.

In addition to residential properties, two significant commercial properties are located on the west side of the 17th Street Canal extremely close to the existing canal ROW near Veterans Boulevard (one to the north and one to the south). The exact location of the 25-foot permanent ROW in relation to these two properties needs to be identified in order to determine the extent of effect on these two properties. Special precautions or adjustment may be needed in order to maintain the safety of the structures on the properties. The cost for the 25-foot permanent ROW along these properties is included in the total for the east side of the canal; however, costs for any special precautions or adjustments with respect to these properties are not included.

The east side of the 17th Street Canal is bordered primarily by residential properties. A conceptual planning level review of current property values in this area was performed (based on recent sales) and estimated average costs per square foot of property were developed.

The Real Estate section in Appendix B includes the calculations and assumptions for the temporary/construction ROW estimated costs. Cost data utilized included property sale price data from 2009 and from the past six months (October 1, 2009 to April 1, 2010); data is referenced by neighborhood areas as indicated in the map "Neighborhoods in Orleans Parish," developed by the Greater New Orleans Community Data Center (gnocdc.org), dated February 3, 2004. Aerial photography of the pump station and canal areas is also included for reference.

With respect to the DPS 6 17th Street Canal Bypass, as shown in Figure 2-5, it is assumed that five properties require fee title purchase in order to accommodate the construction and permanent placement of the bypass structure.

Figure 2-5. DPS 6 17th Street Canal Bypass

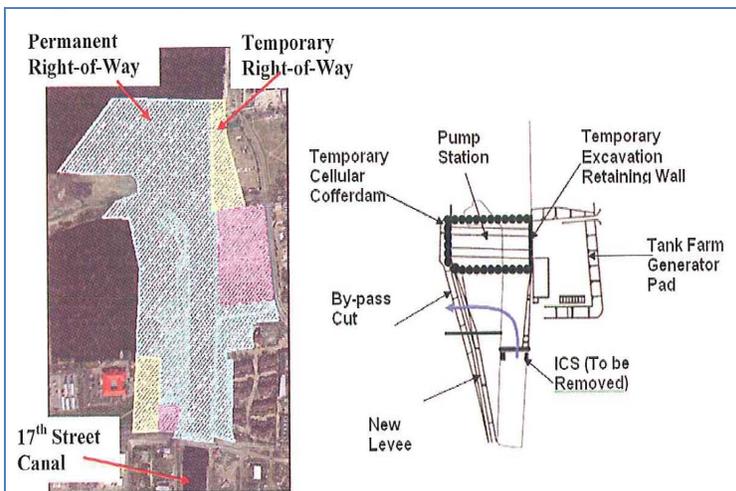


Source: USACE 90-Day Implementation Study. March 13, 2009

This estimated cost may be reduced through further detailed review of the specific properties, acquisition needs, timing and construction sequencing strategies to be utilized. For example, acquisition of ROW on currently unimproved properties will be much less than acquisition of ROW on properties with newly constructed or rehabilitated homes.

In reviewing the real estate needs for Option 2, the focus was on the permanent pump station footprint at the mouth of the canal. The USACE has identified the permanent and temporary land acquisition needs for the permanent pump station at the mouth of the 17th Street Canal in several documents, the latest of which is the *90-Day Report*. These needs reflect those required for the maximum pump station footprint, as shown in Figure 2-6 (from the *90-Day Report*). No ROW cost data was available from the *90-Day Report* or from the USACE.

Figure 2-6. 17th Street Canal – Proposed Permanent Protection Location



Source: USACE, 90-Day Implementation Study, March 2009

Land acquisition needs would be the same as identified in the *90-Day Report* based on the AECOM team footprint size compared to the USACE documentation and pump vendor information. For purposes of this Opinion of Probable Cost, it is assumed that there is no cost for acquiring the permanent and temporary ROW for the permanent pump station, based on meetings with the S&WB.

2.3 Summary of Findings for Orleans Avenue Canal – Option 2

Figure 2-7. Conceptual Layout of Pump Station at London Avenue Canal



Source: USACE, Conceptual Design Report for Permanent Flood Gates and Pump Stations

After the pump station is in place and operational, the temporary bypass will be closed and removed from service. In addition, the Interim Control Structure (ICS) facility at the Orleans Avenue Canal will be dismantled and removed from service. A photograph of the existing ICS facility at the Orleans Avenue Canal is shown in Figure 2-8.

Figure 2-8. Existing ICS Facility at Orleans Avenue Canal



Source: Bing

For purposes of this estimate of probable cost, major equipment from the Orleans Avenue Canal ICS facility, such as pumps, motors, generators, etc. will be transported to a government receiving area within a 25-mile radius of the construction site. The exact location is not known at this time.

The conceptual pump station footprint is shown in Table 2-2, based on information from the mechanical pump vendor and structural and equipment layout requirements of the Hydraulic Institute.

Table 2-2. Conceptual Pump Station Footprint Orleans Avenue Canal – Option 2

Option 2	Use the larger of these two widths		Width of Gates (ft)	Width of Exterior Walls (ft)	Required Width (ft)
	Width Required by Pumps-Motors (ft)	Width Required by FSI (ft)			
Orleans 124		85	na	4	128

Source: AECOM

2.3.1 Mechanical and Electrical

As in Option 1, and due to the “adaptable” pump station concept selected, it was determined with the pump manufacturer that the multiple hydraulic options/scenarios for a given pump station could be handled by utilizing the same quantity of the three standard pump sizes and making minor adjustments to the pumps/motors (i.e., speed changes, impeller changes, etc.). As such, the estimated mechanical and electrical requirements for the pump station are the same as presented in Option 1.

2.3.2 Geotechnical

The geotechnical discussion for the proposed lakefront Orleans Avenue Pump Station is similar to the discussion in Section 2.2.2 of this report for the 17th Street Canal. The pile capacity information and information regarding geotechnical considerations is used in each of the outfall canals when analyzing the deepened canal options for this Opinion of Probable Cost.

2.3.3 Real Estate

As in Option 1, it is assumed that there is no cost for acquiring the permanent and temporary right-of-way for the permanent pump station.

Although the work will be carried out on water (via barges), there remains the need for access to the working barge on a day-to-day basis, whether for removal/hauling of excavated material or delivery of material or equipment to be utilized in the canal work. The width of the Orleans Avenue Canal will allow for access on either the east or the west side of the canal during construction in order to provide for removal/hauling and delivery activities.

The west side of the Orleans Avenue Canal is bordered by public properties or ROW. At the north end of the canal, the property adjacent to the canal is owned by the Orleans Levee District. South of Robert E. Lee Boulevard, the Orleans Avenue ROW is immediately adjacent to the west side of the canal. It is assumed that there is no cost associated with the use of these public properties or ROW.

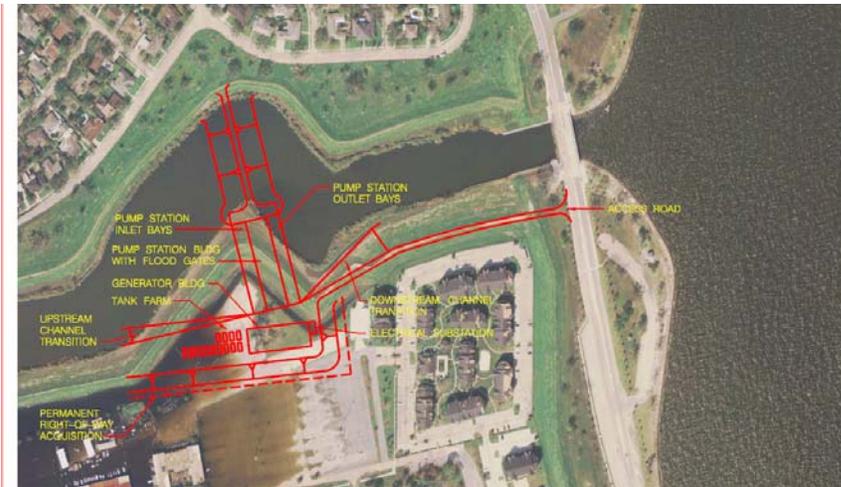
The east side of the Orleans Avenue Canal is likewise bordered by public properties. At the north end of the canal, the property is owned by the Orleans Levee District. The property south of Robert E. Lee Boulevard is owned by City Park/City of New Orleans. It is assumed that there is no cost associated with the use of these public properties.

For Option 2 for the Orleans Avenue Canal, there are no anticipated ROW acquisition costs.

2.4 Summary of Findings for London Avenue Canal – Option 2

Figure 2-9 shows a conceptual layout of the pump station area at the London Avenue Canal.

Figure 2-9. Conceptual Layout of the Pump Station Area at London Avenue Canal



Source: USACE, Conceptual Design for Permanent Flood Gates and Pump Stations, 2006

After the pump station is in place and operational, the temporary bypass will be closed and removed from service. In addition, the Interim Control Structure (ICS) facility will be dismantled and removed from service. A photograph of the existing ICS facility at the London Avenue Canal is shown in Figure 2-10.

Figure 2-10. Existing ICS Facility at London Avenue Canal



Source: Bing

For purposes of this estimate of probable cost, major equipment from the London Avenue Canal ICS facility, such as pumps, motors, generators, etc. will be transported to a government receiving area within a 25-mile radius of the construction site. The location is not known at this time.

The conceptual pump station footprint is shown in Table 2-3, based on information from the mechanical pump vendor and structural and equipment layout requirements of the Hydraulic Institute.

Table 2-3. Conceptual Pump Station Footprint London Avenue Canal – Option 2

Option 2	Use the larger of these two widths		Width of Gates (ft)	Width of Exterior Walls (ft)	Required Width (ft)
	Width Required by Pumps-Motors (ft)	Width Required by FSI (ft)			
London Avenue	316	219	na	4	320

Source: AECOM

2.4.1 Mechanical and Electrical

As in Option 1, and due to the “adaptable” pump station concept selected, it was determined with the pump manufacturer that the multiple hydraulic options/scenarios for a given pump station could be handled by utilizing the same quantity of the three standard pump sizes and making minor adjustments to the pumps/motors (i.e., speed changes, impeller changes, etc.). As such, the estimated mechanical and electrical requirements for the pump station are the same as presented in Option 1.

2.4.2 Geotechnical

The geotechnical discussion for the proposed lakefront London Avenue Pump Station is similar to the discussion in Section 2.2.2 of this report for the 17th Street Canal. The pile capacity information and information regarding geotechnical considerations is used in each of the outfall canals when analyzing the deepened canal options for this Opinion of Probable Cost.

2.4.3 Real Estate

As in Option 1, it is assumed that there is no cost for acquiring the permanent and temporary right-of-way for the permanent pump station.

The west side of the London Avenue Canal is bordered by a combination of residential and public properties. Portions of the property on the western border of the Canal are owned by the Levee Board and Dillard University; other portions are within the London Avenue Street ROW. The public portions of the ROW area were assumed to have no acquisition cost. However, a number of properties along the western side of the London Avenue Canal may be affected by the widening of the canal and the 25-foot permanent ROW; this may include lack of access resulting from the expansion of the canal in the ROW or significant encroachment on to properties. A conceptual planning level review of current property values in this area was performed (based on recent sales) and estimated average costs per square foot of property (lot) were developed.

The east side of the London Avenue Canal also consists of a combination of residential and public properties. The University of New Orleans and Dillard University property are included among those which border the east side of the canal, along with several street ROW. The public portions of the

ROW area were assumed to have no acquisition cost. However, a number of properties along the eastern side of the London Avenue Canal may be affected by the widening of the canal and the 25-foot permanent ROW; this may include lack of access resulting from the expansion of the canal in the ROW or significant encroachment on to properties. As with the west side of the London Avenue Canal, a conceptual planning level review of property values was performed and estimated average costs per square foot were developed.

With respect to the DPS 4 London Avenue Canal Bypass Plan referenced in the *90-Day Implementation Report* (see Figure 2-11), it is assumed that two properties require fee title purchase in order to accommodate the construction and permanent placement of the bypass structure.

This estimated cost may be reduced through further detailed review of the specific properties, acquisition needs, timing and construction sequencing strategies to be utilized. For example, acquisition of ROW on currently unimproved properties will be much less than acquisition of ROW on properties with newly constructed homes.

Figure 2-11. DPS 4 London Avenue Canal Bypass



Source: USACE 90-Day Implementaiton Study, March 2009

2.5 Bridges

When the canals are deepened in Option 2, bridges will be affected. AECOM visually inspected each bridge at each canal crossing to determine whether to modify or replace the bridge. Based on this field and data review, it has been determined that most of the bridges can be modified. The Robert E. Lee Bridge across the Orleans Avenue Canal should be replaced due to its condition assessment at Grade D, according to the New Orleans Department of Public Works, and a field visual evaluation of the bridge. Table 2-4 indicates the decision matrix at each bridge crossing along each canal. An estimated cost is provided for the recommended method to address each bridge. These costs are included in the estimate for this Opinion of Probable Cost.

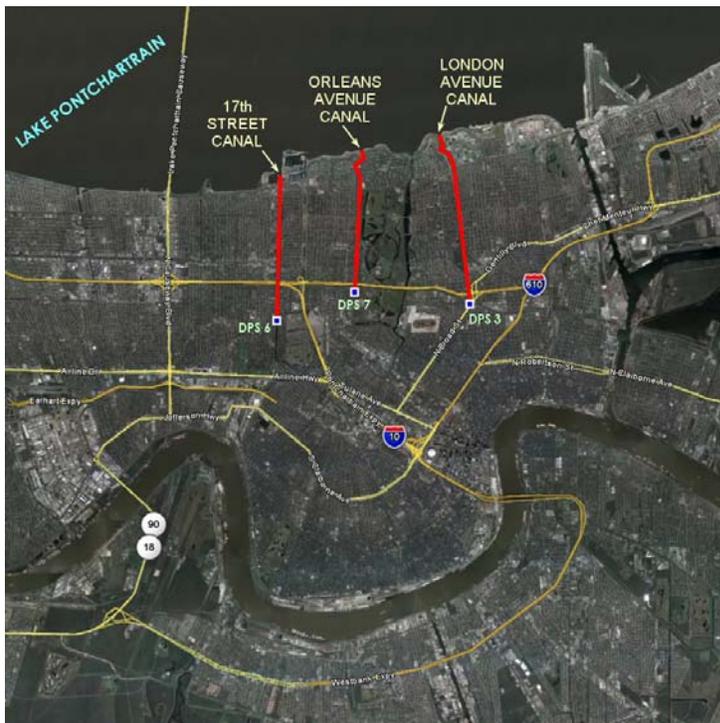
Table 2-4. Bridge Modifications Due to Deepened Canals

17 th St Canal								Recommended	Modification
Bridge #	Roadway	Bridge	Length	Span Arrangement	Width	Structure-type	Bent-type	Modification	Estimated Cost
1	Railroad	Railroad Bridge	285	285	One track	steel	steel	H-Piles	\$ 998,746.88
2	Major HWY	I-10	215	67+81+67	108	concrete	concrete	Helical Piles	\$ 794,769.14
3	Major HWY	I-610	215	67+81+67	83	concrete	concrete	Helical Piles	\$ 613,404.44
4	Major HWY	Veterans-w	228.32	46.66+45+45+45+46.66	50	concrete	concrete	Helical Piles	\$ 398,239.64
5	Major HWY	Veterans-E	228.32	46.66+45+45+45+46.66	50	concrete	concrete	Helical Piles	\$ 398,239.64
6	Minor Road	Hammond	199.99	41+39.33+39.33+39.33+41	81	concrete	concrete	Helical Piles	\$ 926,712.88
Subtotal 17th Street Canal Recommendations									\$ 4,130,112.62
Orleans Canal									
Bridge #	Roadway	Bridge	Length	Span Arrangement	Width	Structure-type	Bent-type	Footing-type	
7	Railroad	Railroad Bridge	140	140	two track	steel	steel	Out of Scope	
8	Major Hwy	I-10	340	170+170	65	steel	concrete	Canal Alignment	
9	Major Hwy	I-610	340	170+170	50	steel	concrete	Modification	
10	Minor Road	Harrison	154.64	39.66+37.66+37.66+39.66	49	concrete	concrete	Helical Piles	\$ 336,250.90
11	Minor Road	Fillmore	178.64	45.66+43.66+43.66+45.66	49	concrete	concrete	Helical Piles	\$ 124,800.00
12	Minor Road	Robert E Lee	139.99	47.33+45.33+47.33	77	concrete	concrete	Helical Piles	\$ 595,836.20
13	Minor Road	Lakeshore	212	53+53+53+53	69	concrete	concrete	Out of Scope	
Subtotal Orleans Avenue Canal Recommendations									\$ 1,056,887.10
London Ave Canal									
Bridge #	Roadway	Bridge	Length	Span Arrangement	Width	Structure-type	Bent-type	Footing-type	
14	Railroad	Railroad Bridge	185	185	two-track	concrete	concrete	Soil Mixture	\$ 740,000.00
15	Major Hwy	I-10	297	83.5+130+83.5	65	concrete	concrete	No Action	
16	Major Hwy	I-610	297	83.5+130+83.5	53	concrete	concrete	No Action	
17	Minor Road	Gentilly	136.666	46.333+44+46.333	91	concrete	concrete	Soil Mixture	\$ 977,373.64
18	Minor Road	Mirabeau	140	20+20+30+30+20+20	71	concrete	concrete	Helical Piles	\$ 592,407.50
19	Minor Road	Fillmore	150	30+30+30+30+30	47	concrete	concrete	Helical Piles	\$ 333,838.00
20	Minor Road	Robert E. lee	180.68	36.34+36+36+36+36.34	35.5	concrete	concrete	Replacement	\$ 481,060.50
21	Minor Road	Leon Simon	187.466	47.9+45.833+45.833+47.9	82	concrete	concrete	Soil Mixture	\$ 265,533.33
22	Minor Road	Lake Shore	170	40+45+45+40	71	concrete	concrete	Out of Scope	
Subtotal London Avenue Recommendations									\$ 3,390,212.97
Total Bridge Recommendation Estimated Costs									\$ 8,577,212.69

3.0 Option 2a – Construction of New Replacement Pump Stations at the Mouths of the 17th Street, Orleans Avenue, and London Avenue Canals with Deepened Outfall Canals and the Addition of a Pump Station at Hoey’s Basin that Pumps to the Mississippi River

The 17th Street Canal, Orleans Avenue Canal, and the London Avenue Canal drain a major portion of the New Orleans area. A vicinity map showing the canal locations is presented in Figure 3-1.

Figure 3-1. Three Canals Showing Location of DPS 3, 6, and 7



Source: Google Earth 2006

Option 2a provides proposed lakefront pump stations constructed as permanent closures in the Hurricane Protection System (HPS) inside the mouth of each outfall canal at Lake Pontchartrain as in Option 2. Option 2a also includes a pump station at Hoey’s Basin which would divert 2500 cfs from the 17th Street Canal and pump it to the Mississippi River. The intention is to reduce the size of the proposed 17th Street Canal enough to where the savings in cost would be greater than the cost of the Pump Station and Pipes at Hoey’s Basin. Figure 3-2 shows the Hoey’s Basin diversion.

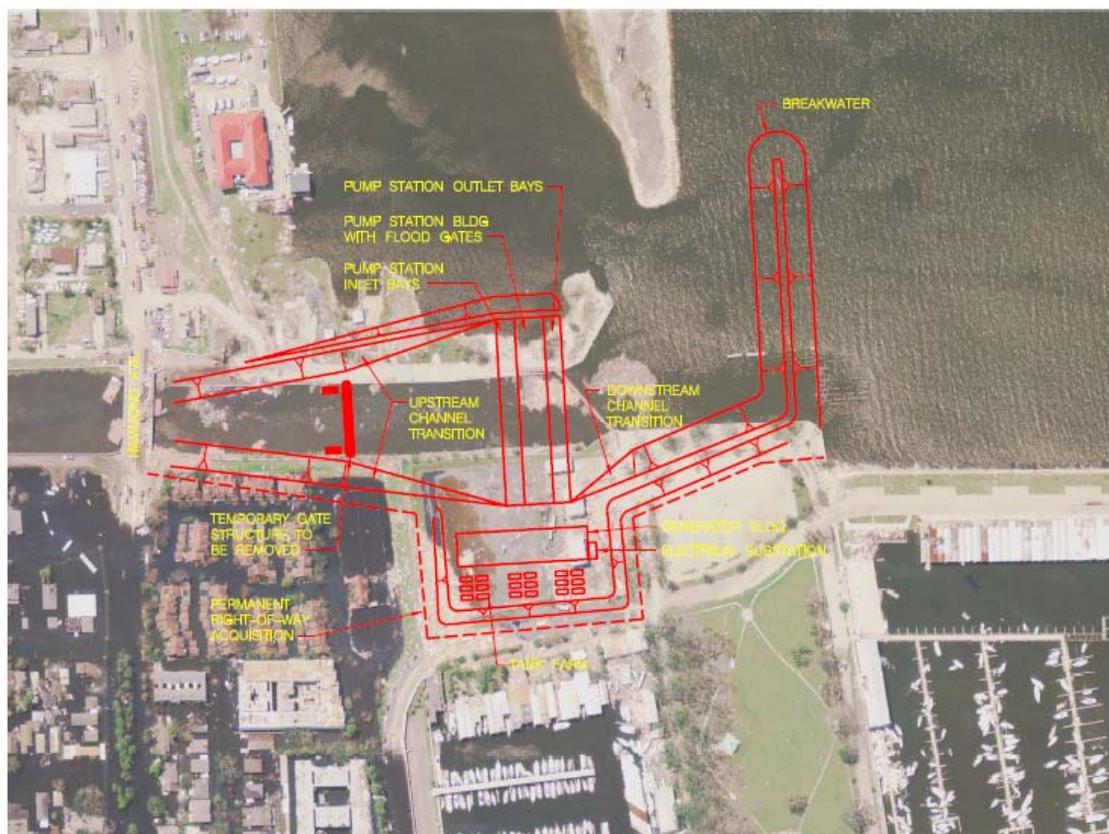
Figure 3-2. Hoey's Basin Drainage Area and Proposed Pump Station



Source: USACE IER#5, June 2009

3.1 Summary of Findings for 17th Street Canal – Option 2a

Figure 3-3. Conceptual layout of the Pump Station Area at the 17th Street Canal



Source: USACE, Conceptual Design Report for Permanent Flood Gates and Pump Stations, 2006

A breakwater structure shown in Figure 3-3 is not required according to recent information from the USACE. The proposed pump station is located far enough inside the canal to alleviate wave effects on the pumps. AECOM's Scope of Work for this Opinion of Probable Cost does not include a breakwater structure.

After the pump station at the 17th Street Canal is in place and operational, the temporary bypass will be closed and removed from service. In addition, the Interim Control Structure (ICS) facility, including all pumps, motors, generators, piping, structure, etc. will be dismantled and removed from service. A photograph of the existing ICS facility to be decommissioned is shown in Figure 3-4.

Figure 3-4. Existing ICS Facility at 17th Street Canal



Source: Bing

For purposes of this Opinion of Probable Cost, major equipment from each ICS facility, such as pumps, motors, generators, etc. will be transported to a government receiving area within a 25-mile radius of the construction site. The location is not known at this time.

The conceptual pump station footprint is shown in Table 3-1, based on information from the mechanical pump vendor and structural and equipment layout requirements of the Hydraulic Institute.

Table 3-1. Conceptual Pump Station Footprint 17th Street Canal – Option 2a

	Use the larger of these two widths			
Option 2a	Width Required by Pumps-Motors (ft)	Width Required by FSI (ft)	Width of Gates (ft)	Required Width (ft)
17th Street	380	263 na 384		

Source: AECOM

In Option 2a, the 17th Street Canal pump station will have a smaller footprint compared to Option 2 because of the reduced capacity of the 17th Street Canal from 12,500 cfs to 10,000 cfs. The additional 2,500 cfs will be diverted to the new pump station at Hoey’s Basin and then pumped to the Mississippi River.

3.1.1 Mechanical and Electrical

The hydraulic conditions used to select equipment for the 17th Street Canal Pump Station are presented in Table 3-2.

Table 3-2. Hydraulic Conditions for 17th Street Canal Pump Station

Required Capacity (cfs)	Estimated TDH (ft)
10,000 30	

Source: ITT Flygt Corporation April 6, 2010

Based on the hydraulic conditions, Table 3-3 summarizes the quantity and combination of standard pumps required for the 17th Street Canal Pump Station. Pump curves are included within Appendix B.

Table 3-3. Quantity of Pumps Required for 17th Street Canal Pump Station

1,000 cfs Pumps	500 cfs Pumps	250 cfs Pumps
9 1		2

Source: ITT Flygt Corporation April 6, 2010

A summary of the quantities and current prices obtained from the manufacturer for the pumps, motors and right angle gears is shown in Table 3-4.

Table 3-4. Current Prices for Pump/Motor Equipment – 17th Street Canal Pump Station

Equipment Item	Qty	Unit Price	Extended Price
1,000 cfs pump w/FSI	9	\$4,715,000	\$42,435,000
5,000 hp electric motor	9	\$775,000	\$6,975,000
5,000 hp right angle gears	9	\$950,000	\$8,550,000
500 cfs pump w/FSI	1	\$3,175,000	\$3,175,000
2,400 hp electric motor	1	\$290,000	\$290,000
2,400 hp right angle gears	1	\$350,000	\$350,000
250 cfs pump w/FSI	2	\$1,475,000	\$2,950,000
1,300 hp electric motor (direct drive)	2	\$295,000	\$590,000

Source: ITT Flygt Corporation, April 2010

The estimated quantities for generators and fuel tanks are summarized in Table 3-5.

Table 3-5. Generators and Fuel Tanks – 17th Street Canal Pump Station

Equipment Item	Quantity
3MW generator sets	10
20,000 gal double wall fuel tanks	5

Source: Generators: Caterpillar April 21,2010; Fuel Tanks: Southern Tank & MFG, April 20, 2010

The hydraulic conditions used to select equipment for the Hoey's Basin Pump Station are presented in Table 3-6.

Table 3-6. Hydraulic Conditions for Hoey's Basin Pump Station

Required Capacity (cfs)	TDH (ft)
2,500 32	

Source: S&WB Scope of Work

Based on the hydraulic conditions, Table 3-7 summarizes the quantity and combination of standard pumps required for the Hoey's Basin Pump Station. Pump curves are included in Appendix B.

Table 3-7. Quantity of Pumps Required for Hoey's Basin Pump Station

1,000 cfs Pumps	250 cfs Pumps
2 2	

Source: ITT Flygt Corporation, April 2010

A summary of the quantities and current prices obtained from the manufacturer for the pumps, motors and right angle gears is shown in Table 3-8.

Table 3-8. Current Prices for Pump/Motor Equipment – Hoey's Basin Pump Station

Equipment Item	Qty	Unit Price	Extended Price
1,000 cfs pump w/FSI	2	\$4,715,000	\$9,430,000
5,000 hp electric motor	2	\$775,000	\$1,550,000
5,000 hp right angle gears	2	\$950,000	\$1,900,000
250 cfs pump w/FSI	2	\$1,475,000	\$2,950,000
1,300 hp electric motor (direct drive)	2	\$295,000	\$590,000

Source: ITT Flygt Corporation, April 2010

3.1.2 Geotechnical

Geotechnical discussions and recommendations for Option 2a are the same as those mentioned in Option 2 in Section 2.2.2.

3.1.3 Real Estate

Real estate acquisitions for Option 2a are the same as Option 2 with the addition of real estate required for the pump station at Hoey's Basin and the discharge pipes to the Mississippi River.

3.2 Summary of Findings for Orleans Avenue Canal – Option 2a

For Option 2a, the findings of Orleans Avenue Canal will follow those in Option 2.

3.3 Summary of Findings for London Avenue Canal – Option 2a

For Option 2a, the findings of London Avenue Canal will follow those in Option 2.

3.4 Bridges

For Option 2a, bridge modifications will reflect those in Option 2.

4.0 Conclusions

AECOM was retained by the S&WB and its Client Partners (JPDPW, SLFPA-E, and CPRA) to provide an Opinion of Probable Cost for Options 1, 2 and 2a.

The schedule to deliver this Opinion of Probable Cost had a duration of 60 days from the Notice to Proceed to submission of the final report to the S&WB and its Client Partners.

The AECOM team reviewed many documents provided by the S&WB; these documents include but are not limited to the following references:

1. USACE Stakeholder Update Permanent Pump Report to Congress, October 2, 2008
2. USACE Final (IER) #5 Permanent Protection System for the Outfall Canals
3. USACE Cost Estimate Permanent Pump Report to Congress, November 21, 2008
4. USACE Conceptual Design Report for Permanent Flood Gates and Pump Stations - Final Report, July 31, 2006
5. USACE 90-Day Implementation Study Final Report, March 13, 2009
6. USACE Report to Congress for Permanent Protection System, August 30, 2007
7. USACE Report to Congress for Permanent Protection System, September 26, 2008 (Revised December 2008)
8. USACE Performance Evaluation of the New Orleans and Southeast Louisiana Hurricane Protection System, Final Report of the IPET
9. Option 2a 2,500 cfs Hoey's Basin Drainage Diversion Design Report, N-Y Associates, July 9, 2007

In addition to the references, S&WB provided the following information:

1. Overview Map
2. Existing Canal Cross-Section
3. Adaptable Pump Station Elevation
4. Outfall Canals Invert & Elevation Data
5. S&WB existing facilities drawings of DPS 3, 6 & 7
6. Option 2 and 2a Water Surface and Canal Invert Elevations Charts
7. Sections of Option 2 Earthen Canals
8. Sections of Option 2 Flume Canals
9. Section of Option 2a Earthen Canal
10. Section of Option 2a Flume Canal

This Opinion of Probable Cost includes pricing for three basic options;

1. Option 1 - New gated permanent pump station at the mouth of each canal
2. Option 2 - New non-gated permanent pump station at the mouth of each canal with deepened outfall canals

3. Option 2a - New non-gated permanent pump station at the mouth of each canal with deepened outfall canals and diversion of 25 percent of the flow in the 17th Street Canal from a new pump station at Hoey's Basin to the Mississippi River

The S&WB provided the following flow rates for each canal. AECOM used these flow rates in developing this Opinion of Probable Cost for all options:

1. 17th Street Canal - 12,500 cfs
2. Orleans Avenue Canal - 2,700 cfs
3. London Avenue Canal - 9,000 cfs

In addition, the Opinion of Probable Cost includes evaluation of four linings for the deepened canals in Options 2 and 2a, as follows:

1. Timber pile supported concrete flume
2. Concrete liner flume with no pile support
3. Prefabricated concrete mat liner
4. Clay liner

A canal liner option summary table is shown in Appendix A. The clay liner alternative is chosen due to its lowest price. The clay liner alternative was used in Options 2 and 2a to develop the total option cost.

Detailed cost breakdown for each option is included in Appendix A. Detailed costs are summarized by option, with further breakdown by canal. Costs are developed based on labor, material, and construction cost local to the New Orleans area. The costs are tabulated in column form indicating take off quantity, labor, material, subcontract, equipment, and real estate. These items are summed in the Total Cost column. The total price column indicates the marked up cost to include items such as overhead and profit, taxes, insurance, etc. The assumptions used to develop the Opinion of Probable Cost are itemized at the beginning of Appendix A.

In developing the Opinion of Probable Cost for Option 1, the AECOM team included the Option 1 concept of installation of a permanent pump station at the mouth of each of the outfall canals. The permanent pump station includes a gated structure to allow gravity flow of water from the protected side of the levee system into Lake Pontchartrain on a routine basis. The gates are closed during a storm surge event where the safe water operating level of +8.0 ft MSL could be exceeded and the permanent pump station removes storm water from the protected side of the HPS into Lake Pontchartrain. This option only provides a new permanent pump station and closure structure in each canal at the lakefront. No modifications are included for the canals, bridges, etc. AECOM understands that the USACE has plans to improve the existing floodwalls along each outfall canal in order to allow operation of the canals at safe water elevation of +8.0 ft MSL. Details of these plans were not made available to AECOM during development of this Opinion of Probable Cost.

An allowance for modifications to provide operation at a safe water elevation of +8.0 ft MSL is included at DPS 3 and DPS 7. Modifications were previously installed by the USACE at DPS 4 and DPS 6.

As mentioned in the report, the existing interior pump stations DPS 3, DPS 6, and DPS 7 are listed on the NRHP. For the purposes of this estimate, consideration is not included for historic preservation

due to the lack of available information. The assumption is made that each station will be removed from service and decommissioned.

Based on geotechnical information, positive shut off of groundwater can be accomplished by installing a cutoff wall. AECOM evaluated use of three types of cutoff walls, including interlocking sheet pile, diaphragm, and modified clay slurry. The sheet pile cutoff option is chosen as the most economical method to obtain groundwater cutoff from the canal. Installation of the sheet pile wall using a GIKEN push type machine is included in this Opinion of Probable Cost to reduce vibration effects on properties near the construction area.

The ability to isolate or cutoff groundwater effects from the canal provides an avenue to evaluate several different types of canal liner options without buoyant uplift and tie down resistant improvements. AECOM looked at variations for lining the canals which included a two-foot-thick clay liner, a timber pile supported concrete flume, a concrete liner, and a cellular concrete mat type liner similar to that manufactured by SHORETEC LLC. The option to utilize the clay liner appears the most economically feasible for this Opinion of Probable Cost, when applied to all canals.

Consideration is given to the method used to deepen the canals in Option 2 and Option 2a, as well as the sequence of construction for each. Work is evaluated as if beginning at the new lakefront pump station and moving toward the existing interior DPS. An interlocking sheetpile cutoff wall will be installed along the entire length of each canal on both sides. The sheetpile cutoff wall will remain in place permanently. Installation of the sheetpile cutoff wall is accomplished using the GIKEN protocol shown in Figure 4-1, or similar method that pushes the sheetpile into place. This method is included to reduce effects of vibration on nearby properties that would be encountered using the standard sheetpile driving method. Sheetpile interlocking joints are sealed with WADIT, similar to Figure 4-2.

Figure 4-1. GIKEN Equipment Example



Source: GIKEN

Figure 4-2. WADIT Sealant Installation Example



Source: WADIT

Next, a temporary 7-foot-tall back up levee composed of HESCO baskets, shown in Figure 4-3 will line each side of each canal along its entire length. The baskets are filled with sand. In difficult to reach areas, a Telebelt® type conveyor system similar to that shown in Figure 4-4 would be used to move the sand material into the HESCO baskets. An Aqua Barrier shown in Figure 4-5 is included to isolate the area of work inside the existing canal. The canal would then be deepened. This operation would move toward the DPS facility, one segment at a time. In the event of rainfall, the Aqua Barrier would be deflated and flow in the canal would proceed to the new lakefront pump station and then pumped into Lake Pontchartrain.

Figure 4-3. HESCO Basket Example



Source: HESCO

Figure 4-4. Telebelts® Telescopic Conveyor Example



Source: Putzmeister

Figure 4-5. Aqua Barrier Example



Source: Water-Inflated Dams

A summary of the Opinion of Probable Cost for each Option is presented in Table 4-1. These costs are based on the modifications to the canals outlined above, and choosing the most economical alternative determined by the least cost for each option for all canals.

Table 4-1. Opinion of Probable Cost – Option Summary

Item	Opinion of Probable Cost (OPC)	OPC Construction Schedule
Option 1	\$866,000,000	36 months
Option 2	\$2,240,000,000	36 months
Option 2a	\$2,400,000,000	36 months

In addition to various canal lining options, AECOM evaluated a deep tunnel alternative to move the water from the existing interior DPS facilities to the new Permanent Pump Station at the mouth of each canal. Table 4-2 indicates tunnel ROM size, length, and probable cost.

Rough Order of Magnitude Cost (ROM) for two 30-foot-diameter tunnels at the 17th Street Canal and the London Avenue Canal and a single 20-foot-diameter tunnel at the Orleans Avenue is evaluated. AECOM based the ROM cost for tunneling on recent tunneling experience and recent construction costs in other areas of the United States. Consideration of soil modification and possible soil freezing during installation is included in the probable cost to address potential groundwater and soft soil situations. The ROM probable cost was determined to be in excess of \$2.6 billion, as shown in Table 4-2 below. In addition to the construction costs for tunneling, during periods of no rain the water inside the tunnel may become stagnant and septic. A means of preventing this situation would need to be evaluated. This ROM probable cost does not address environmental issues related to tunneling. Remedial cost would be in addition to the \$2.6 billion ROM probable cost.

Use of deep tunneling was eliminated from further analyses based on the probable cost exceeding all other options considered.

Table 4-2. Option 2 Tunneling – ROM Probable cost

Canal	Tunnel Size	\$/Linear Foot	Approximate Length (ft)	Total
Pump Stations				\$789,500,000
17th Street Canal Tunnel	2-30 ft diameter	\$35,000	13,000	\$455,000,000
Orleans Avenue Tunnel	1-20 ft diameter	\$15,000	11,600	\$174,000,000
London Avenue Tunnel	2-30 ft diameter	\$35,000	14,000	\$490,000,000
17th Street Canal Canal Restoration	Include DPS 6 Demolition		12,800	\$14,363,000
Orleans Avenue Restoration	Include DPS 7 Demolition		11,080	\$7,096,000

Table 4-2 cont.

Canal	Tunnel Size	\$/Linear Foot	Approximate Length (ft)	Total
London Avenue Restoration	Includes DPS 3, DPS 4 Demolition		15,300	\$8,090,000
	Subtotal ROM Tunneling Cost			\$1,938,049,000
Contingency	30%			\$678,317,150.00
	Total ROM Probable Tunneling Cost			\$2,616,366,150.00



Louisiana Coastal Protection
and Restoration Authority

AECOM

May 2010

Volume II
Appendices

Permanent Protection System Opinion of Probable Cost Options 1, 2, and 2a

Prepared for

Sewerage & Water Board of New Orleans in partnership with the Southeast Louisiana Flood Protection Authority-East, Jefferson Parish Department of Public Works, and the Louisiana Coastal Protection and Restoration Authority



Photo courtesy of USACE Graphics

Appendices Links

Appendix A - Opinion of Probable Cost – Data

Assumptions

Option 1

Option 2

Option 2a

Option 2 and 2a

Canal Liner Alternative Comparison

Appendix B - Supporting Documentation

Pump Station Mechanical/Electrical

Canal Cross Sections

Real Estate

Geotechnical

Appendix C - Bridge Report

Appendix A
Opinion of Probable Cost – Data

May 4, 2010

SUBJECT: Pump Station / Canal Alternates
CLIENT: Sewerage & Water Board of New Orleans
LOCATION: City of New Orleans, LA.
PROJECT NO: 60149879
CONTRACT NO:

Opinion of Probable Construction Cost

1. Opinion of Probable Construction Cost Estimate is prepared at the request of the AECOM New Orleans, LA. office.
2. Estimate is based on numerous Corps of Engineer's documents, reference AECOM job file folder 60149879.
3. Estimate includes pricing for three options;
 - a. Option 1 New Permanent Gated Pump Stations
 - b. Option 2 Replacement Pump Stations & Deepened Outfall Canals
 - c. Option 2A Replacement Pump Stations & Deepened Outfall Canals with New Pump Station at Hoey's Basin.
4. No Addendums have been issued.
5. All pricing is based on current pricing.
6. Escalation has been calculated at 2% per year to mid-point of construction.
7. Sales Tax on materials is included at the local rate of 9%.
8. Contractor's Overhead & Profit are included at the total rate of 12%.
9. Builders Risk insurance is included at the rate of 0.5%.
10. General Contractor's Performance & Payment Bond is included at the rate of 1.5%.
11. Design – Build insurance is included at the rate of 2.0%.
12. Engineering and design costs are included at the rate of 6%.
13. Client representative management is included at the rate of 5%.
14. Engineering construction field support is included at the rate of 3%.
15. Construction field design changes and field construction change orders are included at the total rate of 3%.
16. Wage Rates are based on prevailing wage rates, Louisiana DB 2010, Mod 22, 02/12/10.
17. Work Week – (5) five eight hour days / week. No overtime is included for hourly craft workers or for site supervision.
18. Liquidated damages are not included.

19. Building permits to be provided at no cost. The cost of any Federal, State, Regional or Local permits if required, are excluded.
20. Any hazardous materials including but not limited to lead, asbestos, PCB's, contaminated soil, contaminated water; treatment, disposal and soil remediation are excluded for all interim Pump Stations and Canals.
21. An allowance for asbestos and lead paint removal is included for the demolition of Pump Stations 3, 4, 6, & 7.
22. An allowance for temporary pipeline bypasses is included.
23. An allowance for temporary dewatering is included.
24. Estimate includes steel shoring, sheet piles and cofferdams as required.
25. Odor controls if required are excluded.
26. An allowance for soil and concrete testing are included. All other inspections for civil, structural, field testing and laboratory testing are all excluded. Third party tests & inspections if required are by others. Contractor QA/QC services are included.
27. Temporary chain fencing is included. Site security services are excluded.
28. Anticipated construction start date is 1Q 2012 with a duration of 36 months.
29. Provisions for existing utility conflict connection costs for utilities are included. Utility fees are not included.
30. An allowance for utility relocations and repairs is included.
31. The Client will provide at no additional cost, site yards within close proximity to the project. These yards will be utilized for storage of materials and provide sufficient space for construction operations.
32. A construction contingency of 35% is included.
33. Safety supplies and safety equipment are included at the rate of 0.5% which is calculated on field craft labor only.
34. Small tools and equipment are included at the rate of 2.0% which is calculated on field craft labor only.
35. Consumables are included at the rate of 2.0% which is calculated on field craft labor only.
36. Mobilization costs are included at the rate of 2%.
37. Provisions for landscape repair and site restoration is included.
38. Provisions for protection of endangered species or animals are not included.
39. For the purposes of this report, historical considerations have not been included in the Opinion of Probable Cost.
40. New generator buildings and electrical substation & transmission are included.
41. Generator Buildings for all options include a 3' thick concrete mat slab.
42. All construction debris to be disposed at a licensed local landfill, non-hazardous materials only.
43. Salvage value for all demolished equipment and materials is excluded.

44. When applicable recycled materials such as concrete, steel, mechanical equipment to be disposed off-site at licensed recycling facilities.
45. Real estate allowances are included for property acquisitions at the canals for 17th, Orleans, London Canals at \$10M each for a total allowance of \$30M.
46. No real estate allowances are included for property acquisitions at the permanent pump stations, 17th, Orleans, and London Canals. Right of ways have been acquired by the City.
47. A real estate allowance of a total of \$5M is included for property acquisitions at Hoey's Basin for the impoundment, pump station, canal and force main.
48. All new pump stations include an allowance for 2 offices (600 SF) total.
49. Pump stations include treated timber piles 14" diameter, 5' o/c, 60' long for the pump station structure, inlet & outlet structures.
50. Pump structures for Option 1A, (17th Street, Orleans, and London Canals) are based on concrete mat slabs 12' thick and exterior walls 6' thick & 20' high. Superstructure level all structures are based on CMU walls with brick facing 25' high. Roof structure is based on structural steel with steel decking and a membrane roofing system.
51. Pump structures for Options 2 & 2A, (17th Street, Orleans, London Canals, Hoey's Basin) are based on concrete mat slabs 10' thick and exterior walls 4' thick & 20' high. Superstructure level all structures are based on CMU walls with brick facing 25' high. Roof structure is based on structural steel with steel decking and a membrane roofing system.
52. Estimate includes 11 sluice flood gates for 17th Street Canal Pump Station, 4 gates for Orleans Canal Pump Station, 13 gates for London Canal Pump Station and 4 gates for Hoey's Basin Pump Station.
53. An allowance of \$5M is included for modifications at DPS 3 and DPS 7 in order to increase the safe water elevation to +8.0 ft MSL.
54. Allowances for environmental studies are excluded.
55. Four canal options were estimated; earthen, concrete lined, timber piles with concrete liner and pre-fabricated concrete mats with membrane liner. The most cost effective canal option was the earthen canal option which is included as part of estimate for Options 2 & 2A. All of the different canal estimate options are included under separate cover in the report.
56. Breakwater structure is not included in the estimate.

The enclosed Opinion of Probable Cost is only an opinion of possible construction costs for budgeting purposes. This opinion is limited to the conditions existing at issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to; local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events and developing bidding conditions, etc. may affect the accuracy of this estimate. AECOM is not responsible for any variance from this Opinion of Probable Cost or actual prices and conditions obtained.

Option 1

Sewerage & Water Board of New Orleans
City of New Orleans, LA.
Opinion of Probable Construction Cost

Project name	New Orleans PS Alts New Orleans LA USA
Client	New Orleans S&WB
Engineer	AECOM
Estimator	Dan Schottlander CPE
Labor rate table	Louisiana DB 2010
Equipment rate table	Equipment - ETI
Job size	1 LS
Duration	36 Mos
Bid date	4/22/2012 5:00 PM
Project Division Office	Water AECOMUSA New Orleans
Principal Party Estimating Office	Ron Schumann PE Newport Beach, CA.
Contract Type I	ROM
Contract II	LS
EST Class Level	1
Est Purpose	OPCC
FY Estimate	2010
Est Number	10-024
Notes	<p>Opinion of Probable of Construction Cost for conceptual Alternate Pump Station Designs for the City of New Orleans, LA.</p> <p>Three Design Options: Option 1 - New Pump Stations at 17th, Orleans & London Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals & Deepened Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals, Deepened Canals & new PS at Hoey's Basin</p> <p>Scope of work includes; Erosion & traffic controls, sitework, earthwork, shoring, pump stations, canals, site restoration. Estimated construction start date 1Q 2012. Escalation is calculated to midpoint of construction. Project is prevailing wage. Liquidated Damages are not included. Estimated construction period 1095 calendar days.</p> <p>The enclosed Opinion of Probable Construction Cost is only an opinion of possible construction costs for budgeting purposes. This opinion is limited to the conditions existing at issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to; local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events and developing bidding conditions, etc. may affect the accuracy of this estimate. AECOM is not responsible for any variance from this estimate or actual prices and conditions obtained.</p>
Report format	Sorted by 'Job Phase/Option/Canal/Structure' 'Canal' summary Allocate addons

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price
Option 1 New Gated Pump Station								
17th St Ave Canal		6,695,489	112,089,694	75,430,020	8,782,463		202,997,667	436,456,822
GR General Requirements		760,149	52,466	1,100,000	96,693		2,009,307	4,451,152
London Ave Canal		5,039,652	77,548,131	48,840,440	6,518,430		137,946,653	296,743,011
Orleans Ave Canal		2,921,536	28,403,611	24,323,925	3,975,556		59,624,628	128,006,431
Option 1 New Gated Pump Station		15,416,826	218,093,902	149,694,385	19,373,142		402,578,255	865,657,416
New Permanent Gated Pump Stations	1.00 LS	15,416,826	218,093,902	149,694,385	19,373,142		402,578,255	865,657,416

Partial Totals

Description	Amount	Totals	Hours	Rate	Cost Basis	Cost per Unit	Percent of Total
Labor	33,135,260		588,748 hrs			33,135,259.810 /LS	3.83%
Material	474,875,109					474,875,109.270 /LS	54.86%
Subcontract	315,464,195					315,464,194.870 /LS	36.44%
Equipment	42,182,853		243,805 hrs			42,182,852.520 /LS	4.87%
Real Estate							
Client Subtotal	865,657,417	865,657,417				865,657,417.000 /LS	100.00
Partial Total		865,657,417				865,657,417.000 /LS	

Sewerage & Water Board of New Orleans
City of New Orleans, LA.
Opinion of Probable Construction Cost

Project name	New Orleans PS Alts New Orleans LA USA
Client	New Orleans S&WB
Engineer	AECOM
Estimator	Dan Schottlander CPE
Labor rate table	Louisiana DB 2010
Equipment rate table	Equipment - ETI
Job size	1 LS
Duration	36 Mos
Bid date	4/22/2012 5:00 PM
Project Division Office	Water AECOMUSA New Orleans
Principal Party Estimating Office	Ron Schumann PE Newport Beach, CA.
Contract Type I	ROM
Contract II	LS
EST Class Level	1
Est Purpose	OPCC
FY Estimate	2010
Est Number	10-024
Notes	<p>Opinion of Probable of Construction Cost for conceptual Alternate Pump Station Designs for the City of New Orleans, LA.</p> <p>Three Design Options: Option 1 - New Pump Stations at 17th, Orleans & London Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals & Deepened Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals, Deepened Canals & new PS at Hoey's Basin</p> <p>Scope of work includes; Erosion & traffic controls, sitework, earthwork, shoring, pump stations, canals, site restoration. Estimated construction start date 1Q 2012. Escalation is calculated to midpoint of construction. Project is prevailing wage. Liquidated Damages are not included. Estimated construction period 1095 calendar days.</p> <p>The enclosed Opinion of Probable Construction Cost is only an opinion of possible construction costs for budgeting purposes. This opinion is limited to the conditions existing at issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to; local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events and developing bidding conditions, etc. may affect the accuracy of this estimate. AECOM is not responsible for any variance from this estimate or actual prices and conditions obtained.</p>
Report format	Sorted by 'Job Phase/Option/Canal/Structure' 'Structure' summary Allocate addons

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price
Option 1 New Gated Pump Station								
17th St Ave Canal								
01 Pump Station		6,695,489	112,089,694	75,430,020	8,782,463		202,997,667	436,456,822
03 Breakwater				0			0	0
17th St Ave Canal		6,695,489	112,089,694	75,430,020	8,782,463		202,997,667	436,456,822
GR General Requirements								
04 Miscellaneous		760,149	52,466	1,100,000	96,693		2,009,307	4,451,152
GR General Requirements		760,149	52,466	1,100,000	96,693		2,009,307	4,451,152
London Ave Canal								
01 Pump Station		5,039,652	77,548,131	48,840,440	6,518,430		137,946,653	296,743,011
London Ave Canal		5,039,652	77,548,131	48,840,440	6,518,430		137,946,653	296,743,011
Orleans Ave Canal								
01 Pump Station		2,921,536	28,403,611	24,323,925	3,975,556		59,624,628	128,006,431
Orleans Ave Canal		2,921,536	28,403,611	24,323,925	3,975,556		59,624,628	128,006,431
Option 1 New Gated Pump Station								
		15,416,826	218,093,902	149,694,385	19,373,142		402,578,255	865,657,416
New Permanent Gated Pump Stations	1.00 LS	15,416,826	218,093,902	149,694,385	19,373,142		402,578,255	865,657,416

Partial Totals

Description	Amount	Totals	Hours	Rate	Cost Basis	Cost per Unit	Percent of Total
Labor	33,135,260		588,748 hrs			33,135,259.810 /LS	3.83%
Material	474,875,109					474,875,109.270 /LS	54.86%
Subcontract	315,464,195					315,464,194.870 /LS	36.44%
Equipment	42,182,853		243.805 hrs			42,182,852.520 /LS	4.87%
Real Estate							
Client Subtotal	865,657,417	865,657,417				865,657,417.000 /LS	100.00
Partial Total		865,657,417				865,657,417.000 /LS	

**Sewerage & Water Board of New Orleans
City of New Orleans, LA.
Opinion of Probable Construction Cost**

Project name	New Orleans PS Alts New Orleans LA USA
Client	New Orleans S&WB
Engineer	AECOM
Estimator	Dan Schottlander CPE
Labor rate table	Louisiana DB 2010
Equipment rate table	Equipment - ETI
Job size	1 LS
Duration	36 Mos
Bid date	4/22/2012 5:00 PM
Project Division Office	Water AECOMUSA New Orleans
Principal Party Estimating Office	Ron Schumann PE Newport Beach, CA.
Contract Type I	ROM
Contract II	LS
EST Class Level	1
Est Purpose	OPCC
FY Estimate	2010
Est Number	10-024
Notes	<p>Opinion of Probable of Construction Cost for conceptual Alternate Pump Station Designs for the City of New Orleans, LA.</p> <p>Three Design Options: Option 1 - New Pump Stations at 17th, Orleans & London Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals & Deepened Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals, Deepened Canals & new PS at Hoey's Basin</p> <p>Scope of work includes; Erosion & traffic controls, sitework, earthwork, shoring, pump stations, canals, site restoration. Estimated construction start date 1Q 2012. Escalation is calculated to midpoint of construction. Project is prevailing wage. Liquidated Damages are not included. Estimated construction period 1095 calendar days.</p> <p>The enclosed Opinion of Probable Construction Cost is only an opinion of possible construction costs for budgeting purposes. This opinion is limited to the conditions existing at issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to; local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events and developing bidding conditions, etc. may affect the accuracy of this estimate. AECOM is not responsible for any variance from this estimate or actual prices and conditions obtained.</p>
Report format	Sorted by 'Job Phase/Option/Canal/Structure' 'Detail' summary Combine items Print sort level notes

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
Option 1 New Gated Pump Station									
17th St Ave Canal									
01 Pump Station									
Miscellaneous	1.00 ls	25,000	25,000	25,000	25,000	-	100,000	214,989	Allowance
Miscellaneous	1.00 ls	-	0	200,000	-	-	200,000	421,478	Allowance
Geophysical Survey	5.00 day	-	8,250	-	-	-	8,250	17,963	Verification & location of existing site utilities.
3 - Man survey Crew	120.00 day	114,841	9,000	-	12,000	-	135,841	291,185	
Temporary Construction Roads - 8"gravel	20,000.00 sf	36,000	50,400	-	10,600	-	97,000	209,767	
Dump Truck Semi	1,500.00 hr	21,816	75,000	-	69,000	-	165,816	360,173	Off-site disposal. 2 hr R/T.Disposal fee \$100 per load.
Demolition Debris Removal- Transport To Landfill	500.00 ton	0	-	7,500	0	-	7,500	15,805	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	500.00 ton	0	-	27,500	0	-	27,500	57,953	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	500.00 ton	0	-	16,000	0	-	16,000	33,718	
Demo Generator Buildings	14,400.00 sf	62,667	-	0	23,040	-	85,707	184,110	
Demo Process Piping & Mechanical Systems	14,400.00 sf	13,731	-	0	9,831	-	23,561	50,753	
Demo Process Electrical Systems	14,400.00 sf	13,731	-	0	9,831	-	23,561	50,753	
Demo Horizontal Screw Pump	6.00 ea	15,256	-	0	10,923	-	26,179	56,392	
Demo Constant Duty Pump	6.00 ea	15,256	-	0	10,923	-	26,179	56,392	
Demo No.8 B.W.G Steel Tanks	16.00 ea	2,543	-	0	1,821	-	4,363	9,399	
Demo Transformers	12.00 ea	7,628	-	0	5,462	-	13,090	28,196	
Demo Emergency Generator Sets w/Fuel Oil Storage Tanks	16.00 ea	20,342	-	0	14,564	-	34,906	75,189	
Demo Mechanical Buildings	21,760.00 sf	57,058	-	0	40,852	-	97,910	210,906	
Demo Discharge & Suction Pipes 7" - 12.5' Dia.	2,725.00 lf	4,331	-	0	3,101	-	7,431	16,007	
Demo Mass Concrete	44,277.00 cy	481,716	-	-	1,271,529	-	1,753,245	3,798,227	****
Break Concrete On Site & Send To Recycler	32,000.00 cy	30,096	96,000	-	51,084	-	177,180	384,586	
Trucking Demo Materials	500.00 hr	7,272	-	-	20,125	-	27,397	59,363	
Dewatering - Well Point System Installation & 1st mo.	1,000.00 lf	66,175	150	-	24,925	-	91,250	196,040	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
Dewatering - Well Point System Monthly Rental	11,000.00 lf	319,720	1,100	-	-	-	320,820	685,760	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
By-pass piping	1.00 ls	59,074	25,000	-	75,000	-	159,074	344,002	Allowance
Dewatering - Local	1.00 ls	59,074	27,500	-	825,000	-	911,574	1,982,487	
Dewatering - Dredge Material	14,222.00 cy	140,024	35,555	-	88,888	-	264,467	570,246	
12" Pump & Hoses	180.00 day	27,356	45,000	-	45,000	-	117,356	254,435	
Load out	14,222.00 cy	15,306	-	0	24,709	-	40,014	86,514	
Bldg Exc Earth-Dozer	28,935.00 cy	62,080	-	-	58,296	-	120,377	259,623	Berm Removal
Bldg Exc Earth-Loader/Trucks	28,935.00 cy	57,171	144,675	-	57,110	-	258,956	561,561	Berm removal & soil disposal hauling
Bldg Exc Wetland-Backhoe/Truck	14,222.00 cy	29,425	-	-	60,926	-	90,351	195,553	Mat pad excavation for permanent pump station.
Site Fill Earth-Loader/Truck	28,750.00 cy	55,240	-	-	100,949	-	156,190	337,876	Berms
Fill Earth Stockpile - Dozer/Compactor	28,750.00 cy	25,023	560,625	-	56,805	-	642,453	1,397,869	Berms - import material
Bldg Fill Earth-Loader/Truck	3,555.00 cy	18,784	55,458	-	34,327	-	108,569	235,646	
Bldg Fill Rock-Dozer	53,750.00 cy	203,924	*	-	179,551	-	383,475	826,818	****
Fill Rock Loader/Rock Truck	53,750.00 cy	154,913	1,131,975	-	447,539	-	1,734,427	3,770,325	
Gravel Base - Roads	430.00 cy	567	10,062	-	1,287	-	11,916	25,924	
Rip Rap Machine Place	50,000.00 sf	73,395	500,000	-	88,900	-	662,295	1,439,138	
Rip Rap Hand Place Loose	15,000.00 sf	284,955	300,000	-	-	-	584,955	1,262,276	
Sandbags	2,500.00 ea	7,500	7,500	-	-	-	15,000	32,361	
Silt Fence	1,000.00 lf	568	5,775	-	500	-	6,843	14,877	Sediment controls. Includes chain link fence & poles.
Filter Fabric	1,000.00 sy	710	1,925	-	-	-	2,635	5,708	
Stone Check Dams	200.00 cy	142	7,425	-	0	-	7,567	16,470	
Geotextile (woven 200#) for Liner System	1,000.00 sy	167	3,150	-	160	-	3,477	7,564	
Sub - Sheeplining	50,000.00 sf	-	-	1,500,000	-	-	1,500,000	3,161,082	1000 lf x 50' deep
Treated Wood Piles 14"	744,120.00 vf	2,332,423	19,905,210	-	3,953,427	-	26,191,060	56,934,810	****
Bituminous Base Course 2"	1,500.00 sy	-	-	10,800	-	-	10,800	22,760	
Bituminous Binder Course 2"	1,500.00 sy	-	-	10,800	-	-	10,800	22,760	
Utility Piping Subcontractor - Tie-ins Relocations Repairs	1.00 ls	-	-	100,000	-	-	100,000	210,739	Allowance
8' Chain Link Fence	1,500.00 lf	-	-	37,500	-	-	37,500	79,027	
Sub - Concrete	99,660.00 cy	-	-	34,881,000	-	-	34,881,000	73,507,811	****
Sub - Masonry Subcontr	50,900.00 sf	-	-	1,018,000	-	-	1,018,000	2,145,321	
Standard Brick Arch	50,900.00 sf	*	*	381,750	-	-	381,750	804,495	
Purchase Structural Steel	900.00 in	-	531,000	-	-	-	531,000	1,156,193	
Structural Steel Erection	900.00 in	527,893	-	-	360,180	-	888,073	1,912,564	
Steel Roof Deck 18 ga. 1-1/2"	175,492.00 sf	35,944	236,598	-	3,390	-	275,932	599,373	
Gal Steel Floor Grating 1.50"	45,300.00 sf	13,065	90,600	-	-	-	103,665	225,197	
Misc. Metal	27,500.00 lb	264,385	19,525	-	-	-	283,910	607,607	
Sub - Finish Carpentry - Offices	600.00 sf	-	-	75,000	-	-	75,000	158,054	Allowance - 2 offices 15x20' ea
FRP Weirs	500.00 lf	6,489	25,000	-	5,000	-	36,489	79,192	
Sub - Waterproofing	57,320.00 sf	-	-	57,320	-	-	57,320	120,796	
Roof Deck Insulation 1.50"	175,492.00 sf	64,434	112,666	-	-	-	177,100	383,037	
Sub - Fireproofing	175,492.00 sf	-	-	219,365	-	-	219,365	462,287	
Sub - Membrane Roofing	175,492.00 sf	-	-	877,460	-	-	877,460	1,849,149	
Roof Hatch 2'6" x 4'6"	5.00 ea	69	2,000	-	-	-	2,069	4,503	
Roof Hatch 5'0" x 5'0"	5.00 ea	1,970	6,125	-	-	-	8,095	17,547	
Roof Vents	13.00 ea	720	650	-	-	-	1,370	2,954	
Sub - HM Doors & Frames	2.00 ls	-	-	50,000	-	-	50,000	105,369	

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
01 Pump Station									
Overhead Doors Elec Operated	8.00 ea	-	-	18,400	-	-	18,400	38,776	
Waterproofing Paint System	113,300.00 sf	-	-	141,625	-	-	141,625	298,459	
Sub - Special Coatings	2.00 ls	-	-	400,000	-	-	400,000	842,955	
Alum Louvers Pneumatic	5,000.00 sf	32,446	40,000	-	-	-	72,446	156,445	
Equipment Unloading	25.00 ea	46,858	6,250	-	26,563	-	79,671	171,600	
Equipment Rigging / Rough Set - Medium	25.00 ea	14,057	8,750	-	7,969	-	30,776	66,449	
Equipment Rigging / Rough Set - Heavy	25.00 ea	18,743	12,500	-	18,150	-	49,393	106,799	
Equipment - Final Setting Grout Base	75.00 ea	29,811	18,750	-	-	-	48,561	104,544	
Pumps Motors & Gears	1.00 ls	59,623	82,010,000	-	25,000	-	82,094,623	178,749,485	15 ea
VFDs for Pumps	11.00 ea	437,232	3,850,000	-	165,000	-	4,452,232	9,676,749	
Gates	13.00 ea	63,996	1,216,345	-	65,000	-	1,345,341	2,926,771	****
36" Butterfly Valve Wafer Type	11.00 ea	6,498	275,000	-	-	-	281,498	612,671	
48" Butterfly Valve Wafer Type	11.00 ea	8,664	550,000	-	-	-	558,664	1,216,082	
Sub - Cathodic Protection	1.00 ls	-	-	250,000	-	-	250,000	526,847	
Sub - Cathodic Protection	1.00 ls	-	-	150,000	-	-	150,000	316,108	
Instrumentation & Control	1.00 ls	*	-	1,000,000	-	-	1,000,000	2,107,388	
Instrumentation & Control	1.00 ls	-	-	150,000	-	-	150,000	316,108	
Sub - Hoists & Cranes	1.00 ls	-	-	350,000	-	-	350,000	737,586	
Sub - Hoists & Cranes	1.00 ls	-	-	200,000	-	-	200,000	421,478	
Mechanical Subcontractor	1.00 ls	-	-	5,000,000	-	-	5,000,000	10,536,941	
Mechanical Subcontractor	1.00 ls	-	-	100,000	-	-	100,000	210,739	
HVAC subcontract	1.00 ls	-	-	350,000	-	-	350,000	737,586	
HVAC subcontract	1.00 ls	-	-	100,000	-	-	100,000	210,739	
Fuel Tanks	6.00 ea	*	-	450,000	-	-	450,000	948,325	
Electrical Subcontractor	1.00 ls	-	-	15,000,000	-	-	15,000,000	31,610,824	
Electrical Subcontractor	1.00 ls	-	-	1,275,000	-	-	1,275,000	2,686,920	
Generator Subcontractor	11.00 ea	-	-	11,000,000	-	-	11,000,000	23,181,271	3 mgw each
Site demolition chain link fence w/ barbed wire, 3 strands	500.00 lf	1,025	-	-	1,332	-	2,357	5,091	
Site demolition cut off timber piles to 2' below grade	3,724.00 ea	38,165	-	-	18,620	-	56,785	122,116	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, shore driven	200.00 lf	40,162	18,480	-	149,310	-	207,952	451,186	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, barge driven	200.00 lf	60,243	27,720	-	223,965	-	311,928	676,779	
01 Pump Station		6,695,489	112,089,694	75,430,020	8,782,463		202,997,666	436,456,822	
03 Breakwater									
Breakwater Rock	1.00 ls	*	*	0	*	-	0	0	NIC
03 Breakwater				0			0	0	
17th St Ave Canal		6,695,489	112,089,694	75,430,020	8,782,463		202,997,667	436,456,822	
GR General Requirements									
04 Miscellaneous									
Specialty Permits	1.00 ea	-	1	-	-	-	1	2	All permits are at no cost.
Prints & Records	12.00 set	-	1,500	-	-	-	1,500	3,266	
Prints & Records	6.00 set	-	750	-	-	-	750	1,633	
Prints & Records	50.00 set	-	6,250	-	-	-	6,250	13,609	
Prints & Records	6.00 set	-	750	-	-	-	750	1,633	
Prints & Records	6.00 set	-	750	-	-	-	750	1,633	
Prints & Records	6.00 set	-	750	-	-	-	750	1,633	
Administrative	200.00 mh	4,000	-	-	-	-	4,000	13,790	
Administrative	200.00 mh	4,000	-	-	-	-	4,000	13,790	
Project Engineer	350.00 mh	15,698	-	-	-	-	15,698	54,115	
CADD	600.00 mh	21,600	-	-	-	-	21,600	74,464	
Project Engineer	1,100.00 mh	49,335	-	-	-	-	49,335	170,077	
Procurement	600.00 mh	21,000	0	-	-	-	21,000	72,395	
Project Manager	40.00 mh	2,102	-	-	-	-	2,102	7,246	
Project Manager	100.00 mh	5,255	-	-	-	-	5,255	18,116	Pre-construction only. All professional staff costs part of GC's.
Project Manager	50.00 mh	2,628	0	-	-	-	2,628	9,058	
Project Manager	400.00 mh	21,020	-	-	-	-	21,020	72,464	
Project Manager	50.00 mh	2,628	-	-	-	-	2,628	9,058	
Project Manager	50.00 mh	2,628	-	-	-	-	2,628	9,058	
Project Manager	50.00 mh	2,628	-	-	-	-	2,628	9,058	
Project Manager	25.00 mh	1,314	-	-	-	-	1,314	4,529	
Project Manager	50.00 mh	2,628	-	-	-	-	2,628	9,058	
QC Manager	84.00 wk	216,458	-	-	21,241	-	237,699	500,247	
QC Specialist	6,240.00 mh	224,640	21,840	-	39,676	-	286,156	605,102	
Field Sampler	795.00 day	160,590	19,875	-	35,775	-	216,240	457,991	a 4 yr. degreed, w/ 2 yr. experience
Material Testing - ls	1.00 ls	-	-	100,000	-	-	100,000	210,739	
Soil Testing - ls	1.00 ls	-	-	500,000	-	-	500,000	1,053,694	
Concrete Testing - ls	1.00 ls	-	-	500,000	-	-	500,000	1,053,694	
04 Miscellaneous		760,149	52,466	1,100,000	96,693		2,009,307	4,451,152	
GR General Requirements		760,149	52,466	1,100,000	96,693		2,009,307	4,451,152	
London Ave Canal									
01 Pump Station									
Miscellaneous	1.00 ls	-	-	150,000	-	-	150,000	316,108	Allowance
DPS Modifications	1.00 ls	-	-	5,000,000	-	-	5,000,000	10,536,941	Allowance
Miscellaneous	1.00 ls	25,000	25,000	25,000	25,000	-	100,000	214,989	Allowance
Geophysical Survey	5.00 day	-	8,250	-	-	-	8,250	17,963	Verification & location of existing site utilities.
3 - Man survey Crew	120.00 day	114,841	9,000	-	12,000	-	135,841	291,185	
Temporary Construction Roads - 8"gravel	20,000.00 sf	36,000	50,400	-	10,600	-	97,000	209,767	
Dump Truck Semi	1,120.00 hr	16,289	56,000	-	51,520	-	123,809	268,929	Off-site disposal. 2 hr R/T.Disposal fee

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
01 Pump Station									
Dump Truck Semi	1,120.00 hr	16,289	56,000	-	51,520	-	123,809	268,929	\$100 per load.
Demolition Debris Removal- Transport To Landfill	400.00 ton	0	-	6,000	0	-	6,000	12,644	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	400.00 ton	0	-	22,000	0	-	22,000	46,363	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	400.00 ton	0	-	12,800	0	-	12,800	26,975	
Demo Generator Buildings	14,400.00 sf	62,667	-	0	23,040	-	85,707	184,110	
Demo Process Piping & Mechanical Systems	14,400.00 sf	13,731	-	0	9,831	-	23,561	50,753	
Demo Process Electrical Systems	14,400.00 sf	13,731	-	0	9,831	-	23,561	50,753	
Demo Horizontal Screw Pump	4.00 ea	10,171	-	0	7,282	-	17,453	37,595	
Demo Constant Duty Pump	4.00 ea	10,171	-	0	7,282	-	17,453	37,595	
Demo No.8 B.W.G Steel Tanks	4.00 ea	636	-	0	455	-	1,091	2,350	
Demo Transformers	4.00 ea	2,543	-	0	1,821	-	4,363	9,399	
Demo Emergency Generator Sets w/Fuel Oil Storage Tanks	4.00 ea	5,085	-	0	3,641	-	8,726	18,797	
Demo Mechanical Buildings	10,000.00 sf	26,221	-	0	18,774	-	44,996	96,924	
Demo Discharge & Suction Pipes 7" - 12.5' Dia.	4,600.00 lf	7,310	-	0	5,234	-	12,544	27,021	
Demo Mass Concrete	42,055.00 cy	457,542	-	-	1,207,719	-	1,665,260	3,607,617	****
Break Concrete On Site & Send To Recycler	42,055.00 cy	39,552	126,165	-	67,136	-	232,853	505,430	
Trucking Demo Materials	400.00 hr	5,818	-	-	16,100	-	21,918	47,490	
Dewatering - Well Point System Installation & 1st mo.	1,000.00 lf	66,175	150	-	24,925	-	91,250	196,040	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
Dewatering - Well Point System Monthly Rental	11,000.00 lf	319,720	1,100	-	-	-	320,820	685,760	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
By-pass piping	1.00 ls	59,074	25,000	-	75,000	-	159,074	344,002	Allowance
Dewatering - Local	1.00 ls	59,074	27,500	-	825,000	-	911,574	1,982,487	
Dewatering - Dredge Material	10,667.00 cy	105,023	26,668	-	66,669	-	198,359	427,704	
12" Pump & Hoses	180.00 day	27,356	45,000	-	45,000	-	117,356	254,435	
Load out	10,667.00 cy	11,480	-	-	18,532	-	30,012	64,889	
Bldg Exc Earth-Dozer	28,935.00 cy	62,080	-	-	58,296	-	120,377	259,623	Berm Removal
Bldg Exc Earth-Loader/Trucks	28,935.00 cy	57,171	144,675	-	57,110	-	258,956	561,561	Berm removal & soil disposal hauling
Bldg Exc Wetland-Backhoe/Truck	10,667.00 cy	22,070	-	-	45,697	-	67,767	146,671	Mat pad excavation for permanent pump station.
Site Fill Earth-Loader/Truck	23,000.00 cy	44,192	-	-	80,759	-	124,952	270,300	Berms
Fill Earth Stockpile - Dozer/Compactor	23,000.00 cy	20,018	448,500	-	45,444	-	513,962	1,118,295	Berms - import material
Bldg Fill Earth-Loader/Truck	2,667.00 cy	14,092	41,605	-	25,753	-	81,450	176,784	
Bldg Fill Rock-Dozer	48,000.00 cy	182,109	-	-	160,343	-	342,452	738,367	****
Fill Rock Loader/Rock Truck	48,000.00 cy	138,341	1,010,880	-	399,663	-	1,548,884	3,366,988	
Gravel Base - Roads	430.00 cy	567	10,062	-	1,287	-	11,916	25,924	
Rip Rap Machine Place	45,000.00 sf	66,056	450,000	-	80,010	-	596,066	1,295,224	
Rip Rap Hand Place Loose	14,000.00 sf	265,958	280,000	-	-	-	545,958	1,178,124	
Sandbags	3,000.00 ea	9,000	9,000	-	-	-	18,000	38,833	
Silt Fence	1,000.00 lf	568	5,775	-	500	-	6,843	14,877	
Filter Fabric	1,000.00 sy	710	1,925	-	-	-	2,635	5,708	
Stone Check Dams	200.00 cy	142	7,425	-	-	-	7,567	16,470	
Geotextile (woven 200#) for Liner System	1,000.00 sy	167	3,150	-	160	-	3,477	7,564	
Sub - Sheetpiling	40,000.00 sf	-	-	1,200,000	-	-	1,200,000	2,528,866	800 lf x 50' deep
Treated Wood Piles 14"	408,960.00 vf	1,281,873	10,939,680	-	2,172,759	-	14,394,312	31,290,732	****
Bituminous Base Course 2"	1,500.00 sy	-	-	10,800	-	-	10,800	22,760	
Bituminous Binder Course 2"	1,500.00 sy	-	-	10,800	-	-	10,800	22,760	
Utility Piping Subcontractor - Tie-ins Relocations Repairs	1.00 ls	-	-	100,000	-	-	100,000	210,739	Allowance
8' Chain Link Fence	1,500.00 lf	-	-	37,500	-	-	37,500	79,027	
Sub - Concrete	58,587.00 cy	-	-	20,505,450	-	-	20,505,450	43,212,945	****
Sub - Masonry Subcontr	38,800.00 sf	-	-	776,000	-	-	776,000	1,635,333	
Standard Brick Arch	38,800.00 sf	-	-	291,000	-	-	291,000	613,250	
Purchase Structural Steel	700.00 tn	-	413,000	-	-	-	413,000	899,261	
Structural Steel Erection	700.00 tn	410,584	-	-	280,140	-	690,724	1,487,550	
Steel Roof Deck 18 ga. 1-1/2"	96,820.00 sf	19,830	130,533	-	1,870	-	152,233	330,678	
Gal Steel Floor Grating 1.50"	36,500.00 sf	10,527	73,000	-	-	-	83,527	181,450	
Misc. Metal	22,000.00 lb	211,508	15,620	-	-	-	227,128	486,086	
Sub - Finish Carpentry - Offices	600.00 sf	-	-	75,000	-	-	75,000	158,054	Allowance - 2 offices 15'x20' ea
FRP Weirs	500.00 lf	6,489	25,000	-	5,000	-	36,489	79,192	
Sub - Waterproofing	46,440.00 sf	-	-	46,440	-	-	46,440	97,867	
Roof Deck Insulation 1.50"	96,820.00 sf	35,548	62,158	-	-	-	97,707	211,324	
Sub - Fireproofing	96,820.00 sf	-	-	121,025	-	-	121,025	255,047	
Sub - Membrane Roofing	96,820.00 sf	-	-	484,100	-	-	484,100	1,020,187	
Roof Hatch 2'6" x 4'6"	4.00 ea	55	1,600	-	-	-	1,655	3,602	
Roof Hatch 5'0" x 5'0"	4.00 ea	1,576	4,900	-	-	-	6,476	14,037	
Roof Vents	11.00 ea	609	550	-	-	-	1,159	2,500	
Sub - HM Doors & Frames	2.00 ls	-	-	50,000	-	-	50,000	105,369	
Overhead Doors Elec Operated	8.00 ea	-	-	18,400	-	-	18,400	38,776	
Waterproofing Paint System	86,500.00 sf	-	-	108,125	-	-	108,125	227,861	
Sub - Special Coatings	1.00 ls	-	-	180,000	-	-	180,000	379,330	
Sub - Special Coatings	1.00 ls	-	-	200,000	-	-	200,000	421,478	
Alum Louvers Pneumatic	5,000.00 sf	32,446	40,000	-	-	-	72,446	156,445	
Equipment Unloading	20.00 ea	37,487	5,000	-	21,250	-	63,737	137,280	
Equipment Rigging / Rough Set - Medium	20.00 ea	11,246	7,000	-	6,375	-	24,621	53,160	
Equipment Rigging / Rough Set - Heavy	20.00 ea	14,995	10,000	-	14,520	-	39,515	85,439	
Equipment - Final Setting Grout Base	60.00 ea	23,849	15,000	-	-	-	38,849	83,635	
Pumps Motors Gears	1.00 ls	59,623	58,285,000	-	25,000	-	58,369,623	127,090,948	10 ea

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
01 Pump Station									
VFDs for Pumps	8.00 ea	317,987	2,800,000	-	120,000	-	3,237,987	7,037,636	
Gates	2.00 ea	9,846	187,130	-	10,000	-	206,976	450,272	60 ft clear opening
Gates	13.00 ea	63,996	1,082,770	-	65,000	-	1,211,766	2,635,926	
36" Butterfly Valve Wafer Type	8.00 ea	4,726	200,200	-	-	-	204,726	445,579	
48" Butterfly Valve Wafer Type	8.00 ea	6,301	400,000	-	-	-	406,301	884,423	
Sub - Cathodic Protection	1.00 ls	-	-	135,000	-	-	135,000	284,497	
Sub - Cathodic Protection	1.00 ls	-	-	200,000	-	-	200,000	421,478	
Instrumentation & Control	1.00 ls	-	-	135,000	-	-	135,000	284,497	
Instrumentation & Control	1.00 ls	-	-	750,000	-	-	750,000	1,580,541	
Sub - Hoists & Cranes	1.00 ls	-	-	180,000	-	-	180,000	379,330	
Sub - Hoists & Cranes	1.00 ls	-	-	300,000	-	-	300,000	632,216	
Mechanical Subcontractor	1.00 ls	-	-	80,000	-	-	80,000	168,591	
Mechanical Subcontractor	1.00 ls	-	-	4,000,000	-	-	4,000,000	8,429,553	
HVAC subcontract	1.00 ls	-	-	80,000	-	-	80,000	168,591	
HVAC subcontract	1.00 ls	-	-	300,000	-	-	300,000	632,216	
Fuel Tanks	4.00 ea	-	-	300,000	-	-	300,000	632,217	
Electrical Subcontractor	1.00 ls	-	-	1,150,000	-	-	1,150,000	2,423,497	
Emergency Generator Subcontractor	1.00 ls	-	-	1,800,000	-	-	1,800,000	3,793,299	
Electrical Subcontractor	1.00 ls	-	-	10,000,000	-	-	10,000,000	21,073,883	
Site demolition chain link fence w/ barbed wire, 3 strands	500.00 lf	1,025	-	-	1,332	-	2,357	5,091	
Site demolition cut off timber piles to 2' below grade	1,830.00 ea	18,754	-	-	9,150	-	27,904	60,009	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, shore driven	100.00 lf	20,081	9,240	-	74,655	-	103,976	225,593	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, barge driven	200.00 lf	60,243	27,720	-	223,965	-	311,928	676,779	
01 Pump Station		5,039,652	77,548,131	48,840,440	6,518,430		137,946,653	296,743,011	
London Ave Canal		5,039,652	77,548,131	48,840,440	6,518,430		137,946,653	296,743,011	
Orleans Ave Canal									
01 Pump Station									
Miscellaneous	1.00 ls	-	0	75,000	-	-	75,000	158,054	Allowance
DPS Modifications	1.00 ls	*	*	5,000,000	*	-	5,000,000	10,536,941	Allowance
Miscellaneous	1.00 ls	25,000	25,000	25,000	25,000	-	100,000	214,989	Allowance
Geophysical Survey	5.00 day	-	8,250	-	-	-	8,250	17,963	Verification & location of existing site utilities.
3 - Man survey Crew	100.00 day	95,701	7,500	-	10,000	-	113,201	242,654	
Temporary Construction Roads - 8"gravel	20,000.00 sf	36,000	50,400	-	10,600	-	97,000	209,767	
Dump Truck Semi	485.00 hr	7,054	24,250	-	22,310	-	53,614	116,456	Off-site disposal. 2 hr R/T. Disposal fee \$100 per load.
Demolition Debris Removal- Transport To Landfill	250.00 ton	0	-	3,750	0	-	3,750	7,903	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	250.00 ton	0	-	13,750	0	-	13,750	28,977	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	250.00 ton	0	-	8,000	0	-	8,000	16,859	
Demo Generator Buildings	14,400.00 sf	62,667	-	0	23,040	-	85,707	184,110	
Demo Process Piping & Mechanical Systems	14,400.00 sf	13,731	-	0	9,831	-	23,561	50,753	
Demo Process Electrical Systems	14,400.00 sf	13,731	-	0	9,831	-	23,561	50,753	
Demo Horizontal Screw Pump	4.00 ea	10,171	-	0	7,282	-	17,453	37,595	
Demo Constant Duty Pump	4.00 ea	10,171	-	0	7,282	-	17,453	37,595	
Demo No.8 B.W.G Steel Tanks	4.00 ea	636	-	0	455	-	1,091	2,350	
Demo Transformers	4.00 ea	2,543	-	0	1,821	-	4,363	9,399	
Demo Emergency Generator Sets w/Fuel Oil Storage Tanks	4.00 ea	5,085	-	0	3,641	-	8,726	18,797	
Demo Mechanical Buildings	2,500.00 sf	6,555	-	0	4,694	-	11,249	24,231	
Demo Discharge & Suction Pipes 7" - 12.5' Dia.	1,500.00 lf	2,384	-	0	1,707	-	4,091	8,811	
Demo Mass Concrete	35,798.00 cy	389,468	-	-	1,028,033	-	1,417,501	3,070,870	****
Break Concrete On Site & Send To Recycler	35,798.00 cy	33,668	107,394	-	57,147	-	198,209	430,232	
Trucking Demo Materials	250.00 hr	3,636	-	-	10,063	-	13,699	29,682	
Dewatering - Well Point System Installation & 1st mo.	1,000.00 lf	66,175	150	-	24,925	-	91,250	196,040	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
Dewatering - Well Point System Monthly Rental	11,000.00 lf	319,720	1,100	-	-	-	320,820	685,760	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
By-pass piping	1.00 ls	59,074	25,000	-	75,000	-	159,074	344,002	Allowance
Dewatering - Local	1.00 ls	59,074	27,500	-	825,000	-	911,574	1,982,487	
Dewatering - Dredge Material	4,625.00 cy	45,536	11,563	-	28,906	-	86,005	185,444	
12" Pump & Hoses	180.00 day	27,356	45,000	-	45,000	-	117,356	254,435	
Load out	4,625.00 cy	4,977	-	0	8,035	-	13,013	28,135	
Bldg Exc Earth-Dozer	28,935.00 cy	62,080	-	-	58,296	-	120,377	259,623	Berm Removal
Bldg Exc Earth-Loader/Trucks	28,935.00 cy	57,171	144,675	-	57,110	-	258,956	561,561	Berm removal & soil disposal hauling
Bldg Exc Wetland-Backhoe/Truck	4,625.00 cy	9,569	-	-	19,813	-	29,382	63,594	Mat pad excavation for permanent pump station.
Site Fill Earth-Loader/Truck	14,375.00 cy	27,620	-	-	50,475	-	78,095	168,398	Berms
Fill Earth Stockpile - Dozer/Compactor	14,375.00 cy	12,512	280,313	-	28,402	-	321,227	698,934	Berms - import material
Bldg Fill Earth-Loader/Truck	1,156.00 cy	6,108	18,034	-	11,162	-	35,304	76,626	
Bldg Fill Rock-Dozer	39,375.00 cy	149,386	-	-	131,532	-	280,918	605,692	****
Fill Rock Loader/Rock Truck	39,375.00 cy	113,483	829,238	-	327,848	-	1,270,569	2,761,982	
Gravel Base - Roads	430.00 cy	567	10,062	-	1,287	-	11,916	25,924	
Rip Rap Machine Place	40,000.00 sf	58,716	400,000	-	71,120	-	529,836	1,151,310	
Rip Rap Hand Place Loose	12,500.00 sf	237,463	250,000	-	-	-	487,463	1,051,897	
Sandbags	2,500.00 ea	7,500	7,500	-	-	-	15,000	32,361	
Silt Fence	1,000.00 lf	568	5,775	-	500	-	6,843	14,877	
Filter Fabric	1,000.00 sy	710	9	1,925	-	-	2,635	5,708	
Stone Check Dams	200.00 cy	142	7,425	-	-	-	7,567	16,470	
Geotextile (woven 200#) for Liner System	1,000.00 sy	167	3,150	-	160	-	3,477	7,564	

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
01 Pump Station									
Sub - Sheeting	25,000.00 sf	-	-	750,000	-	-	750,000	1,580,541	500 lf x 50' deep
Treated Wood Piles 14"	79,365.00 vf	248,767	2,123,014	-	421,657	-	2,793,438	6,072,450	****
Bituminous Base Course 2"	1,500.00 sy	-	-	10,800	-	-	10,800	22,760	
Bituminous Binder Course 2"	1,500.00 sy	-	-	10,800	-	-	10,800	22,760	
Utility Piping Subcontractor - Tie-ins Relocations Repairs	1.00 ls	-	-	100,000	-	-	100,000	210,739	Allowance
8' Chain Link Fence	1,500.00 lf	-	-	37,500	-	-	37,500	79,027	
Sub - Concrete	14,760.00 cy	-	-	5,166,000	-	-	5,166,000	10,886,768	****
Sub - Masonry Subcontr	16,950.00 sf	-	-	339,000	-	-	339,000	714,405	
Standard Brick Arch	16,950.00 sf	-	-	127,125	-	-	127,125	267,902	
Purchase Structural Steel	350.00 in	-	206,500	-	-	-	206,500	449,631	
Structural Steel Erection	350.00 in	205,292	-	-	140,070	-	345,362	743,775	
Steel Roof Deck 18 ga. 1-1/2"	17,772.00 sf	3,640	23,960	-	343	-	27,943	60,698	
Gal Steel Floor Grating 1.50"	5,000.00 sf	1,442	10,000	-	-	-	11,442	24,856	
Misc. Metal	10,000.00 lb	96,140	7,100	-	-	-	103,240	220,948	
Sub - Finish Carpentry - Offices	600.00 lf	-	-	75,000	-	-	75,000	158,054	Allowance - 2 offices 15x20' ea
FRP Weirs	500.00 lf	6,489	25,000	-	5,000	-	36,489	79,192	
Sub - Waterproofing	21,350.00 sf	-	-	21,350	-	-	21,350	44,993	
Roof Deck Insulation 1.50"	5,000.00 sf	1,836	3,210	-	-	-	5,046	10,913	
Sub - Fireproofing	5,000.00 sf	-	-	6,250	-	-	6,250	13,171	
Sub - Membrane Roofing	5,000.00 sf	-	-	25,000	-	-	25,000	52,685	
Roof Hatch 2'6"x 4'6"	1.00 ea	14	400	-	-	-	414	901	
Roof Hatch 5'0" x 5'0"	1.00 ea	394	1,225	-	-	-	1,619	3,509	
Roof Vents	2.00 ea	111	100	-	-	-	211	455	
Sub - HM Doors & Frames	2.00 ls	-	-	50,000	-	-	50,000	105,369	
Overhead Doors Elec Operated	2.00 ea	-	-	4,600	-	-	4,600	9,694	
Waterproofing Paint System	10,000.00 sf	-	-	12,500	-	-	12,500	26,342	
Sub - Special Coatings	1.00 ls	-	-	200,000	-	-	200,000	421,478	
Sub - Special Coatings	1.00 ls	-	-	100,000	-	-	100,000	210,739	
Alum Louvers Pneumatic	1,000.00 sf	6,489	8,000	-	-	-	14,489	31,289	
Equipment Unloading	9.00 ea	16,869	2,250	-	9,563	-	28,681	61,776	
Equipment Rigging / Rough Set - Medium	9.00 ea	5,061	3,150	-	2,869	-	11,079	23,922	
Equipment Rigging / Rough Set - Heavy	9.00 ea	6,748	4,500	-	6,534	-	17,782	38,448	
Equipment - Final Setting Grout Base	27.00 ea	10,732	6,750	-	-	-	17,482	37,636	
Pumps Motors Gears	1.00 ls	59,623	22,280,000	-	25,000	-	22,364,623	48,694,083	5 ea
VFDs for Pumps	2.00 ea	79,497	700,000	-	30,000	-	809,497	1,759,409	
Gates	4.00 ea	19,691	333,160	-	20,000	-	372,851	811,054	
Gates	2.00 ea	9,846	187,130	-	10,000	-	206,976	450,272	40 ft clear opening
36" Butterfly Valve Wafer Type	2.00 ea	1,181	50,000	-	-	-	51,181	111,395	
48" Butterfly Valve Wafer Type	2.00 ea	1,575	100,000	-	-	-	101,575	221,106	
Sub - Cathodic Protection	2.00 ls	-	-	150,000	-	-	150,000	316,108	
Instrumentation & Control	1.00 ls	-	-	1,000,000	-	-	1,000,000	2,107,388	
Instrumentation & Control	1.00 ls	-	-	75,000	-	-	75,000	158,054	
Sub - Hoists & Cranes	1.00 ls	-	-	200,000	-	-	200,000	421,478	
Sub - Hoists & Cranes	1.00 ls	-	-	150,000	-	-	150,000	316,108	
Mechanical Subcontractor	1.00 ls	-	-	1,500,000	-	-	1,500,000	3,161,082	
Mechanical Subcontractor	1.00 ls	-	-	50,000	-	-	50,000	105,369	
HVAC subcontract	1.00 ls	-	-	200,000	-	-	200,000	421,478	
HVAC subcontract	1.00 ls	-	-	50,000	-	-	50,000	105,369	
Fuel Tanks	2.00 ea	-	-	150,000	-	-	150,000	316,108	20,000 gal. double containment
Electrical Subcontractor	1.00 ls	-	-	5,000,000	-	-	5,000,000	10,536,941	
Electrical Subcontractor	1.00 ls	-	-	637,500	-	-	637,500	1,343,460	
Generator Subcontractor	3.00 ea	-	-	3,000,000	-	-	3,000,000	6,322,165	3 mgw each
Site demolition chain link fence w/ barbed wire, 3 strands	500.00 lf	1,025	-	-	1,332	-	2,357	5,091	
Site demolition cut off timber piles to 2' below grade	1,452.00 ea	14,881	-	-	7,260	-	22,141	47,613	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, shore driven	100.00 lf	20,081	9,240	-	74,655	-	103,976	225,593	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, barge driven	200.00 lf	60,243	27,720	-	223,965	-	311,928	676,779	
01 Pump Station		2,921,536	28,403,611	24,323,925	3,975,556		59,624,628	128,006,431	
Orleans Ave Canal		2,921,536	28,403,611	24,323,925	3,975,556		59,624,628	128,006,431	
Option 1 New Gated Pump Station		15,416,826	218,093,902	149,694,385	19,373,142		402,578,255	865,657,416	
New Permanent Gated Pump Stations	1.00 LS	15,416,826	218,093,902	149,694,385	19,373,142		402,578,255	865,657,416	

Partial Totals

Description	Amount	Totals	Hours	Rate	Cost Basis	Cost per Unit	Percent of Total
Labor	15,416,826		588,748 hrs			15,416,826.130 /LS	1.78%
Material	218,093,902					218,093,902.090 /LS	25.19%
Subcontract	149,694,385					149,694,385.100 /LS	17.29%
Equipment	19,373,142		243,805 hrs			19,373,141.900 /LS	2.24%
Real Estate							
Subtotal	402,578,255	402,578,255				402,578,255.000 /LS	46.51
Mobilization	8,051,565			2.00 %	C	8,051,565.100 /LS	0.93%
Professional Labor Overhead	213,922			135.00 %	C	213,922.010 /LS	0.02%
Sales Tax	21,372,034			9.00 %	C	21,372,033.960 /LS	2.47%
Safety Equipment & Supplies	154,168			1.00 %	C	154,168.260 /LS	0.02%
Consumables	293,134			2.00 %	C	293,133.550 /LS	0.03%
Small Tools & Equipment	293,134			2.00 %	C	293,133.550 /LS	0.03%
Bond on Subcontractors	2,993,888			2.00 %	C	2,993,887.700 /LS	0.35%
Subtotal	33,371,845	435,950,100				435,950,100.000 /LS	3.86

Partial Totals

General Contingency	26,157,006		6.00 %	T	26,157,005,960 /LS	3.02%
GC Total	26,157,006	462,107,106			462,107,106.000 /LS	3.02
Contingency - Construction	138,632,132		30.00 %	T	138,632,131,600 /LS	16.01%
Total Contingency	138,632,132	600,739,238			600,739,238.000 /LS	16.01
Escalation	42,051,747		7.00 %	T	42,051,746,580 /LS	4.86%
Total Escalation	42,051,747	642,790,985			642,790,985.000 /LS	4.86
Contractor Overhead & Profit	64,279,098		10.00 %	T	64,279,098,350 /LS	7.43%
Total OH&P	64,279,098	707,070,083			707,070,083.000 /LS	7.43
Builder's Risk Insurance	3,535,350		0.50 %	T	3,535,350,410 /LS	0.41%
Design Build Insurance	14,141,402		2.00 %	T	14,141,401,640 /LS	1.63%
Performance & Payment Bond	10,606,051		1.50 %	T	10,606,051,230 /LS	1.23%
Total bonds & Insurance	28,282,803	735,352,886			735,352,886.000 /LS	3.27
Engineering Design	44,121,173		6.00 %	T	44,121,173,110 /LS	5.10%
Final Construction Support	22,060,582		3.00 %	T	22,060,586,550 /LS	2.55%
Engineering Support	66,181,760	801,534,646			801,534,646.000 /LS	7.65
Client Rep Management	40,076,732		5.00 %	T	40,076,732,240 /LS	4.63%
Constr Design Changes/FCOs	24,046,039		3.00 %	T	24,046,039,340 /LS	2.78%
Client Subtotal	64,122,771	865,657,417			865,657,417.000 /LS	7.41
Partial Total		865,657,417			865,657,417.000 /LS	

Option 2

Sewerage & Water Board of New Orleans
City of New Orleans, LA.
Opinion of Probable Construction Cost

Project name	New Orleans PS Alts New Orleans LA USA
Client	New Orleans S&WB
Engineer	AECOM
Estimator	Dan Schottlander CPE
Labor rate table	Louisiana DB 2010
Equipment rate table	Equipment - ETI
Job size	1 LS
Duration	36 Mos
Bid date	4/22/2012 5:00 PM
Project Division Office	Water AECOMUSA New Orleans
Principal Party Estimating Office	Ron Schumann PE Newport Beach, CA.
Contract Type I	ROM
Contract II	LS
EST Class Level	1
Est Purpose	OPCC
FY Estimate	2010
Est Number	10-024
Notes	<p>Opinion of Probable of Construction Cost for conceptual Alternate Pump Station Designs for the City of New Orleans, LA.</p> <p>Three Design Options: Option 1 - New Pump Stations at 17th, Orleans & London Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals & Deepened Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals, Deepened Canals & new PS at Hoey's Basin</p> <p>Scope of work includes; Erosion & traffic controls, sitework, earthwork, shoring, pump stations, canals, site restoration. Estimated construction start date 1Q 2012. Escalation is calculated to midpoint of construction. Project is prevailing wage. Liquidated Damages are not included. Estimated construction period 1095 calendar days.</p> <p>The enclosed Opinion of Probable Construction Cost is only an opinion of possible construction costs for budgeting purposes. This opinion is limited to the conditions existing at issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to; local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events and developing bidding conditions, etc. may affect the accuracy of this estimate. AECOM is not responsible for any variance from this estimate or actual prices and conditions obtained.</p>
Report format	Sorted by 'Job Phase/Option/Canal/Structure' 'Canal' summary Allocate addons

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price
Option 2 New Pump Station & Canals								
17th St Ave Canal		24,625,048	184,201,465	155,047,797	32,912,003	39,803,726	436,590,039	927,581,171
GR General Requirements		1,033,042	74,136	1,650,000	134,531		2,891,709	6,414,652
London Ave Canal		28,238,485	158,397,596	144,216,566	33,681,223	22,520,712	387,054,581	821,203,413
Orleans Ave Canal		18,843,436	88,886,586	91,451,422	24,136,019	5,453,726	228,771,190	484,445,206
Option 2 New Pump Station & Canals		72,740,010	431,559,783	392,365,785	90,863,776	67,778,164	1,055,307,518	2,239,644,442
Replacement Pump Stations & Deepened Canals	1.00 LS	72,740,010	431,559,783	392,365,785	90,863,776	67,778,164	1,055,307,518	2,239,644,442

Partial Totals

Description	Amount	Totals	Hours	Rate	Cost Basis	Cost per Unit	Percent of Total
Labor	152,225,690		2,065,387 hrs			152,225,689.610 /LS	6.80%
Material	934,291,000					934,290,999.890 /LS	41.72%
Subcontract	815,840,531					815,840,530.630 /LS	36.43%
Equipment	196,249,131		1,647,448 hrs			196,249,131.240 /LS	8.76%
Real Estate	141,038,091					141,038,090.560 /LS	6.30%
Client Subtotal	2,239,644,443	2,239,644,443				2,239,644,443.000 /LS	100.00
Partial Total		2,239,644,443				2,239,644,443.000 /LS	

Sewerage & Water Board of New Orleans
City of New Orleans, LA.
Opinion of Probable Construction Cost

Project name	New Orleans PS Alts New Orleans LA USA
Client	New Orleans S&WB
Engineer	AECOM
Estimator	Dan Schottlander CPE
Labor rate table	Louisiana DB 2010
Equipment rate table	Equipment - ETI
Job size	1 LS
Duration	36 Mos
Bid date	4/22/2012 5:00 PM
Project Division Office	Water AECOMUSA New Orleans
Principal Party Estimating Office	Ron Schumann PE Newport Beach, CA.
Contract Type I	ROM
Contract II	LS
EST Class Level	1
Est Purpose	OPCC
FY Estimate	2010
Est Number	10-024
Notes	<p>Opinion of Probable of Construction Cost for conceptual Alternate Pump Station Designs for the City of New Orleans, LA.</p> <p>Three Design Options: Option 1 - New Pump Stations at 17th, Orleans & London Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals & Deepened Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals, Deepened Canals & new PS at Hoey's Basin</p> <p>Scope of work includes; Erosion & traffic controls, sitework, earthwork, shoring, pump stations, canals, site restoration. Estimated construction start date 1Q 2012. Escalation is calculated to midpoint of construction. Project is prevailing wage. Liquidated Damages are not included. Estimated construction period 1095 calendar days.</p> <p>The enclosed Opinion of Probable Construction Cost is only an opinion of possible construction costs for budgeting purposes. This opinion is limited to the conditions existing at issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to; local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events and developing bidding conditions, etc. may affect the accuracy of this estimate. AECOM is not responsible for any variance from this estimate or actual prices and conditions obtained.</p>
Report format	Sorted by 'Job Phase/Option/Canal/Structure' 'Structure' summary Allocate addons

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	
Option 2 New Pump Station & Canals									
17th St Ave Canal									
01 Pump Station		6,035,806	107,109,189	60,901,780	7,948,655		181,995,431	391,443,335	
02 Canal		18,589,242	77,092,276	94,146,017	24,963,348	39,803,726	254,594,608	536,137,835	
03 Breakwater				0			0	0	
17th St Ave Canal		24,625,048	184,201,465	155,047,797	32,912,003	39,803,726	436,590,039	927,581,171	
GR General Requirements									
04 Miscellaneous		1,033,042	74,136	1,650,000	134,531		2,891,709	6,414,652	
GR General Requirements		1,033,042	74,136	1,650,000	134,531		2,891,709	6,414,652	
London Ave Canal									
01 Pump Station		4,684,869	74,459,487	45,655,556	6,092,649		130,892,561	281,385,589	
02 Canal		23,553,615	83,938,110	98,561,009	27,588,574	22,520,712	256,162,021	539,817,824	
London Ave Canal		28,238,485	158,397,596	144,216,566	33,681,223	22,520,712	387,054,581	821,203,413	
Orleans Ave Canal									
01 Pump Station		2,889,327	27,780,624	17,009,060	3,901,524		51,580,534	110,912,016	
02 Canal		15,954,109	61,105,963	74,442,362	20,234,495	5,453,726	177,190,655	373,533,190	
Orleans Ave Canal		18,843,436	88,886,586	91,451,422	24,136,019	5,453,726	228,771,190	484,445,206	
Option 2 New Pump Station & Canals									
		72,740,010	431,559,783	392,365,785	90,863,776	67,778,164	1,055,307,518	2,239,644,442	
Replacement Pump Stations & Deepened Canals		1.00 LS	72,740,010	431,559,783	392,365,785	90,863,776	67,778,164	1,055,307,518	2,239,644,442

Partial Totals

Description	Amount	Totals	Hours	Rate	Cost Basis	Cost per Unit	Percent of Total
Labor	152,225,690		2,065,387 hrs			152,225,689.610 /LS	6.80%
Material	934,291,000					934,290,999.890 /LS	41.72%
Subcontract	815,840,531					815,840,530.630 /LS	36.43%
Equipment	196,249,131		1,647,448 hrs			196,249,131.240 /LS	8.76%
Real Estate	141,038,091					141,038,090.560 /LS	6.30%
Client Subtotal	2,239,644,443	2,239,644,443				2,239,644,443.000 /LS	100.00
Partial Total		2,239,644,443				2,239,644,443.000 /LS	

**Sewerage & Water Board of New Orleans
City of New Orleans, LA.
Opinion of Probable Construction Cost**

Project name	New Orleans PS Alts New Orleans LA USA
Client	New Orleans S&WB
Engineer	AECOM
Estimator	Dan Schottlander CPE
Labor rate table	Louisiana DB 2010
Equipment rate table	Equipment - ETI
Job size	1 LS
Duration	36 Mos
Bid date	4/22/2012 5:00 PM
Project Division Office	Water AECOMUSA New Orleans
Principal Party Estimating Office	Ron Schumann PE Newport Beach, CA.
Contract Type I	ROM
Contract II	LS
EST Class Level	1
Est Purpose	OPCC
FY Estimate	2010
Est Number	10-024
Notes	<p>Opinion of Probable of Construction Cost for conceptual Alternate Pump Station Designs for the City of New Orleans, LA.</p> <p>Three Design Options: Option 1 - New Pump Stations at 17th, Orleans & London Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals & Deepened Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals, Deepened Canals & new PS at Hoey's Basin</p> <p>Scope of work includes; Erosion & traffic controls, sitework, earthwork, shoring, pump stations, canals, site restoration. Estimated construction start date 1Q 2012. Escalation is calculated to midpoint of construction. Project is prevailing wage. Liquidated Damages are not included. Estimated construction period 1095 calendar days.</p> <p>The enclosed Opinion of Probable Construction Cost is only an opinion of possible construction costs for budgeting purposes. This opinion is limited to the conditions existing at issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to; local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events and developing bidding conditions, etc. may affect the accuracy of this estimate. AECOM is not responsible for any variance from this estimate or actual prices and conditions obtained.</p>
Report format	Sorted by 'Job Phase/Option/Canal/Structure' 'Detail' summary Combine items Print sort level notes

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
Option 2 New Pump Station & Canals									
17th St Ave Canal									
01 Pump Station									
Miscellaneous	1.00 ls	25,000	25,000	25,000	25,000	-	100,000	214,809	
Miscellaneous	1.00 ls	-	-	200,000	-	-	200,000	421,118	Allowance
Geophysical Survey	5.00 day	-	8,250	-	-	-	8,250	17,949	Verification & location of existing site utilities.
3 - Man survey Crew	120.00 day	114,841	9,000	-	12,000	-	135,841	290,941	
Temporary Construction Roads - 8"gravel	20,000.00 sf	36,000	50,400	-	10,600	-	97,000	209,592	
Dump Truck Semi	1,500.00 hr	21,816	75,000	-	69,000	-	165,816	359,875	Off-site disposal. 2 hr R/T.Disposal fee \$100 per load.
Demolition Debris Removal- Transport To Landfill	500.00 ton	-	-	7,500	-	-	7,500	15,792	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	500.00 ton	-	-	27,500	-	-	27,500	57,904	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	500.00 ton	-	-	16,000	-	-	16,000	33,689	
Demo Generator Buildings	14,400.00 sf	62,667	-	-	23,040	-	85,707	183,956	
Demo Process Piping & Mechanical Systems	14,400.00 sf	13,731	-	-	9,831	-	23,561	50,711	
Demo Process Electrical Systems	14,400.00 sf	13,731	-	-	9,831	-	23,561	50,711	
Demo Horizontal Screw Pump	6.00 ea	15,256	-	-	10,923	-	26,179	56,345	
Demo Constant Duty Pump	6.00 ea	15,256	-	-	10,923	-	26,179	56,345	
Demo No.8 B.W.G Steel Tanks	16.00 ea	2,543	-	-	1,821	-	4,363	9,391	
Demo Transformers	12.00 ea	7,628	-	-	5,462	-	13,090	28,173	
Demo Emergency Generator Sets w/Fuel Oil Storage Tanks	16.00 ea	20,342	-	-	14,564	-	34,906	75,127	
Demo Mechanical Buildings	21,760.00 sf	57,058	-	-	40,852	-	97,910	210,730	
Demo Discharge & Suction Pipes 7" - 12.5' Dia.	2,725.00 lf	4,331	-	-	3,101	-	7,431	15,994	
Demo Mass Concrete	44,277.00 cy	481,716	-	-	1,271,529	-	1,753,245	3,795,079	****
Break Concrete On Site & Send To Recycler	32,000.00 cy	30,096	96,000	-	51,084	-	177,180	384,268	
Trucking Demo Materials	500.00 hr	7,272	-	-	20,125	-	27,397	59,314	
Dewatering - Well Point System Installation & 1st mo.	1,000.00 lf	66,175	150	-	24,925	-	91,250	195,876	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
Dewatering - Well Point System Monthly Rental	11,000.00 lf	319,720	1,100	-	-	-	320,820	685,184	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
By-pass piping	1.00 ls	59,074	25,000	-	75,000	-	159,074	343,716	Allowance
Dewatering - Local	1.00 ls	59,074	27,500	-	825,000	-	911,574	1,980,850	
Dewatering - Dredge Material	14,222.00 cy	140,024	35,555	-	88,888	-	264,467	569,771	
12" Pump & Hoses	180.00 day	27,356	45,000	-	45,000	-	117,356	254,224	
Load out	14,222.00 cy	15,306	-	-	24,709	-	40,014	86,443	
Bldg Exc Earth-Dozer	28,935.00 cy	62,080	-	-	58,296	-	120,377	259,407	Berm Removal
Bldg Exc Earth-Loader/Trucks	28,935.00 cy	57,171	144,675	-	57,110	-	258,956	561,096	Berm removal & soil disposal hauling
Bldg Exc Wetland-Backhoe/Truck	14,222.00 cy	29,425	-	-	60,926	-	90,351	195,390	Mat pad excavation for permanent pump station.
Site Fill Earth-Loader/Truck	28,750.00 cy	55,240	-	-	100,949	-	156,190	337,595	Berms
Fill Earth Stockpile - Dozer/Compactor	28,750.00 cy	25,023	560,625	-	56,805	-	642,453	1,396,715	Berms - import material
Bldg Fill Earth-Loader/Truck	3,555.00 cy	18,784	55,458	-	34,327	-	108,569	235,451	
Bldg Fill Rock-Dozer	53,750.00 cy	203,924	-	-	179,551	-	383,475	826,129	****
Fill Rock Loader/Rock Truck	53,750.00 cy	154,913	1,131,975	-	447,539	-	1,734,427	3,767,210	
Gravel Base - Roads	430.00 cy	567	10,062	-	1,287	-	11,916	25,902	
Rip Rap Machine Place	50,000.00 sf	73,395	500,000	-	88,900	-	662,295	1,437,948	
Rip Rap Hand Place Loose	15,000.00 sf	284,955	300,000	-	-	-	584,955	1,261,226	
Sandbags	2,500.00 ea	7,500	7,500	-	-	-	15,000	32,334	
Silt Fence	1,000.00 lf	568	5,775	-	500	-	6,843	14,864	Sediment controls. Includes chain link fence & poles.
Filter Fabric	1,000.00 sy	710	1,925	-	-	-	2,635	5,704	
Stone Check Dams	200.00 cy	142	7,425	-	-	-	7,567	16,457	
Geotextile (woven 200#) for Liner System	1,000.00 sy	167	3,150	-	160	-	3,477	7,557	
Sub - Sheetpiling	50,000.00 sf	-	-	1,500,000	-	-	1,500,000	3,158,389	1000 lf x 50' deep
Treated Wood Piles 14"	605,520.00 vf	1,897,985	16,197,660	-	3,217,060	-	21,312,705	46,291,843	****
Bituminous Base Course 2"	1,500.00 sy	-	-	10,800	-	-	10,800	22,740	
Bituminous Binder Course 2"	1,500.00 sy	-	-	10,800	-	-	10,800	22,740	
Utility Piping Subcontractor - Tie-ins Relocations Repairs	1.00 ls	-	-	100,000	-	-	100,000	210,559	Allowance
8' Chain Link Fence	1,500.00 lf	-	-	37,500	-	-	37,500	78,960	
Sub - Concrete	70,562.00 cy	-	-	24,696,700	-	-	24,696,700	52,001,186	****
Sub - Masonry Subcontr	47,350.00 sf	-	-	947,000	-	-	947,000	1,993,996	
Standard Brick Arch	47,350.00 sf	-	-	355,125	-	-	355,125	747,749	
Purchase Structural Steel	800.00 in	-	472,000	-	-	-	472,000	1,026,880	
Structural Steel Erection	800.00 in	469,238	-	-	320,160	-	789,398	1,698,640	
Steel Roof Deck 18 ga. 1-1/2"	50,150.00 sf	10,272	67,612	-	969	-	78,853	171,140	
Gal Steel Floor Grating 1.50"	50,150.00 sf	14,464	100,300	-	-	-	114,764	249,102	
Misc. Metal	19,500.00 lb	187,473	13,845	-	-	-	201,318	430,487	
Sub - Finish Carpentry - Offices	600.00 sf	-	-	75,000	-	-	75,000	157,919	Allowance - 2 offices 15x20' ea
FRP Weirs	500.00 lf	6,489	25,000	-	5,000	-	36,489	79,126	
Sub - Waterproofing	54,480.00 sf	-	-	54,480	-	-	54,480	114,713	
Roof Deck Insulation 1.50"	144,536.00 sf	53,068	92,792	-	-	-	145,860	315,209	
Sub - Fireproofing	144,536.00 sf	-	-	180,670	-	-	180,670	380,417	
Sub - Membrane Roofing	144,536.00 sf	-	-	722,680	-	-	722,680	1,521,707	
Roof Hatch 2'6" x 4'6"	5.00 ea	69	2,000	-	-	-	2,069	4,499	
Roof Hatch 5'0" x 5'0"	5.00 ea	1,970	6,125	-	-	-	8,095	17,532	
Roof Vents	15.00 ea	831	750	-	-	-	1,581	3,406	
Sub - HM Doors & Frames	2.00 ls	-	-	50,000	-	-	50,000	105,280	

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
01 Pump Station									
Overhead Doors Elec Operated	8.00 ea	-	-	18,400	-	-	18,400	38,743	
Waterproofing Paint System	113,300.00 sf	-	-	141,625	-	-	141,625	298,205	
Sub - Special Coatings	2.00 ls	-	-	400,000	-	-	400,000	842,237	
Alum Louvers Pneumatic	5,000.00 sf	32,446	40,000	-	-	-	72,446	156,315	
Equipment Unloading	25.00 ea	46,858	6,250	-	26,563	-	79,671	171,457	
Equipment Rigging / Rough Set - Medium	25.00 ea	14,057	8,750	-	7,969	-	30,776	66,394	
Equipment Rigging / Rough Set - Heavy	25.00 ea	18,743	12,500	-	18,150	-	49,393	106,710	
Equipment - Final Setting Grout Base	75.00 ea	29,811	18,750	-	-	-	48,561	104,457	
Pumps Motors Gears	1.00 ls	59,623	82,010,000	-	25,000	-	82,094,623	178,602,600	15 ea
VFDs for Pumps	11.00 ea	437,232	3,850,000	-	165,000	-	4,452,232	9,668,754	
Gates	2.00 ea	9,846	187,130	-	10,000	-	206,976	449,901	60 ft clear opening
36" Butterfly Valve Wafer Type	11.00 ea	6,498	275,000	-	-	-	281,498	612,165	
48" Butterfly Valve Wafer Type	11.00 ea	8,664	550,000	-	-	-	558,664	1,215,079	
Sub - Cathodic Protection	1.00 ls	-	-	250,000	-	-	250,000	526,398	
Sub - Cathodic Protection	1.00 ls	-	-	150,000	-	-	150,000	315,839	
Instrumentation & Control	1.00 ls	-	-	1,000,000	-	-	1,000,000	2,105,592	
Instrumentation & Control	1.00 ls	-	-	150,000	-	-	150,000	315,839	
Sub - Hoists & Cranes	1.00 ls	-	-	350,000	-	-	350,000	736,957	
Sub - Hoists & Cranes	1.00 ls	-	-	200,000	-	-	200,000	421,119	
Mechanical Subcontractor	1.00 ls	-	-	4,000,000	-	-	4,000,000	8,422,370	
Mechanical Subcontractor	1.00 ls	-	-	100,000	-	-	100,000	210,559	
HVAC subcontract	1.00 ls	-	-	300,000	-	-	300,000	631,678	
HVAC subcontract	1.00 ls	-	-	100,000	-	-	100,000	210,559	
Fuel Tanks	6.00 ea	-	-	450,000	-	-	450,000	947,517	20,000 gal. double containment
Electrical Subcontractor	1.00 ls	-	-	12,000,000	-	-	12,000,000	25,267,110	
Electrical Subcontractor	1.00 ls	-	-	1,275,000	-	-	1,275,000	2,684,630	
Generator Subcontractor	11.00 ea	-	-	11,000,000	-	-	11,000,000	23,161,517	3 mgw each
Site demolition chain link fence w/ barbed wire, 3 strands	500.00 lf	1,025	-	-	1,332	-	2,357	5,087	
Site demolition cut off timber piles to 2' below grade	3,724.00 ea	38,165	-	-	18,620	-	56,785	122,014	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, shore driven	200.00 lf	40,162	18,480	-	149,310	-	207,952	450,813	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, barge driven	200.00 lf	60,243	27,720	-	223,965	-	311,928	676,219	
01 Pump Station		6,035,806	107,109,189	60,901,780	7,948,655		181,995,430	391,443,335	
02 Canal									
Bridge Modifications - 17th Street - RR	1.00 ls	-	-	1,000,000	-	-	1,000,000	2,105,593	
Site Restoration - Allowance	1.00 ls	-	-	500,000	-	-	500,000	1,052,796	
Real Estate Easement Aquisitions	1.00 ls	-	-	-	-	34,350,000	34,350,000	71,640,102	Allowance
Miscellaneous	1.00 ls	-	-	140,000	-	-	140,000	294,783	
Bridge Modifications - 17th Street - I-10/6-110 Hwy	1.00 ls	-	-	1,410,000	-	-	1,410,000	2,968,885	
Bridge Modifications - 17th Street - Veterans Blvd	1.00 ls	-	-	800,000	-	-	800,000	1,684,474	
Bridge Modifications - 17th Street - Hammond Hwy	1.00 ls	-	-	927,000	-	-	927,000	1,951,884	
Miscellaneous	0.00 ls	-	25	-	-	-	25	54	
Dredge and Upland disposal	1,529,837.00 cy	-	-	36,425,419	-	-	36,425,419	75,211,705	Cost supported by 2010 cost analysis issued by USACE includes data from LA. Size and Type of dredging operation is contractors means and method
Construction Fence	25,600.00 lf	-	204,800	-	-	-	204,800	441,306	Installation and Removal
Trucking - Excavate Material Non Dredged 1 hr Round Trip	1.00 ls	-	-	1,300,000	-	-	1,300,000	2,684,258	
Crawler Crane 200 ton	8,000.00 hr	328,904	-	-	1,936,000	-	2,264,904	4,854,134	
20x30 barge (Used for By-Pass Pumping Station)	792.00 day	-	-	-	1,188,000	-	1,188,000	2,559,919	
20x30 barge (Used to transport dredged material to off load / load out stagingarea)	2,322.00 day	-	-	-	3,483,000	-	3,483,000	7,505,216	Barges used to move dredged materials to off load / load out area
Demolition Debris Removal- Transport To Landfill	24,893.00 ton	-	-	373,395	-	-	373,395	786,218	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	12,446.00 ton	-	-	684,530	-	-	684,530	1,441,341	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	12,446.00 ton	-	-	398,272	-	-	398,272	838,599	
Demolition Debris Removal- Transport To Landfill	400.00 ton	-	-	6,000	-	-	6,000	12,634	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	200.00 ton	-	-	11,000	-	-	11,000	23,162	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	200.00 ton	-	-	6,400	-	-	6,400	13,476	
Demolition Debris Removal	48,778.00 cy	2,985,760	-	-	2,869,707	-	5,855,467	12,378,580	
Demolition and Relocation of Existing Utilities Crossing	1.00 ls	3,000,000	500,000	-	1,750,000	-	5,250,000	11,072,772	
Demo Masonry Building	23,499.00 sf	102,264	-	-	37,598	-	139,862	300,193	
Demo Process Piping & Mechanical Systems	23,499.00 sf	22,406	-	-	16,043	-	38,449	82,753	
Demo Process Electrical Systems	23,499.00 sf	22,406	-	-	16,043	-	38,449	82,753	
Demo Bridge Crane	3.00 ea	3,814	-	-	2,731	-	6,545	14,086	
Demo Horizontal Screw Pump	9.00 ea	22,884	-	-	16,385	-	39,269	84,518	
Demo Constant Duty Pump	4.00 ea	10,171	-	-	7,282	-	17,453	37,563	
Demo No.8 B.W.G Steel Tanks	13.00 ea	2,066	-	-	1,479	-	3,545	7,630	
Demo Transformers	3.00 ea	1,907	-	-	1,365	-	3,272	7,043	
Demo Emergency Generator Sets w/Fuel Oil Storage Tanks	2.00 ea	2,543	-	-	1,821	-	4,363	9,391	
Demo Exhaust Silencers	2.00 ea	318	-	-	228	-	545	1,174	
Demo Steel Suction Screen w/Cleaning Equipment	10,474.00 sf	27,464	-	-	19,664	-	47,128	101,433	
Demo Discharge & Suction Pipes 7" - 12.5' Dia.	600.00 lf	954	-	-	683	-	1,636	3,522	
Demo Concrete Slab On Grade 12"-18"	2,774.00 cy	36,694	-	-	93,623	-	130,317	282,048	
Demo Concrete Susp Slab 12"-18"	1,029.00 cy	20,417	-	-	52,093	-	72,510	156,936	
Demo Concrete Walls 12"-18" w/ Footings	7,572.00 cy	205,951	-	-	543,624	-	749,575	1,622,532	
Demo Mass Concrete	618.00 cy	6,724	-	-	17,747	-	24,471	52,970	
Demolition Concrete Levee Walls 7' high. Expose Existing Sheet Pile Wall	25,600.00 lf	3,635,200	-	-	550,400	-	4,185,600	8,728,372	
Demo Roofing - Copper Standing Seam	32,693.00 sf	13,713	-	-	-	-	13,713	29,285	
Demo Gutters- Copper	570.00 lf	1,594	-	-	475	-	2,069	4,437	
Demo Downspouts- Copper	660.00 vf	1,845	-	-	550	-	2,395	5,137	

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
02 Canal									
Demo Steel Beams & Columns (377 tons)	525.00 ea	28,130	-	-	26,913	-	55,042	118,624	
Demo Steel Beams @ Bar Screen Framing (72 tons)	76.00 ea	4,072	-	-	3,896	-	7,968	17,172	
Demo Steel Trusses	30.00 ea	4,822	-	-	4,614	-	9,436	20,336	
Break Concrete On Site & Send To Recycler	20,145.00 cy	18,946	60,435	-	32,159	-	111,540	241,909	
Trucking Demo Materials	2,500.00 hr	36,360	-	-	100,625	-	136,985	292,268	
Asbestos Abatement - sub	1.00 ls	-	-	70,000	-	-	70,000	147,391	Allowance
Lead Abatement - sub	1.00 ls	-	-	70,000	-	-	70,000	147,391	Allowance
Site Yard Rental	3.00 ls	-	-	360,000	-	-	360,000	743,333	12 months - 2 yards
8' Aqua-Barrier-Useable	800.00 lf	2,274	208,000	-	946	-	211,220	454,958	Price is for 8' high aqua-barrier (monthly rental rate) and does not include installation. Barrier is capable of controlling up to 7' of standing water and sediment depth. Typical size 8' high x 100' long. Material price includes freight. Used to keep water put of canal construction zone.
6 foot Hesco Basket (RDFW) C3315 3x3x15	2,560.00 ea	-	1,926,758	-	-	-	1,926,758	4,151,805	Price is for 7' high portadam barrier and includes shipping. Barrier is capable of controlling up to 6' of standing water and sediment depth. Price doesn't include installation.
6 foot Hesco Basket (RDFW) C4315 4x3x3	2,560.00 ea	-	2,023,347	-	-	-	2,023,347	4,359,936	Price is for 7' high portadam barrier and includes shipping. Barrier is capable of controlling up to 6' of standing water and sediment depth. Price doesn't include installation.
By-pass piping	1.00 ls	29,537	15,000	-	35,000	-	79,537	171,858	Allowance
Dewatering - Local	1.00 ls	19,691	2,500	-	75,000	-	97,191	210,661	
Dewatering - Dredge Material	2,315.00 cy	22,793	5,788	-	14,469	-	43,049	92,745	
12" Pump & Hoses	60.00 day	9,119	15,000	-	15,000	-	39,119	84,741	
24" Pump & Hoses	516.00 day	19,605	258,000	-	-	-	277,605	596,618	
Rough Grade Balance of Site	476,444.44 sy	156,704	-	-	166,756	-	323,460	684,460	
Fine Grade Balance of Site	545,991.00 sy	165,955	-	-	-	-	165,955	344,326	
Load out	2,315.00 cy	2,491	-	-	4,022	-	6,513	14,071	
Load out Concrete	120,600.00 cy	129,789	-	-	209,526	-	339,314	720,776	
Site Load Out Excavated Soils	1,678,069.60 cy	3,031,380	-	-	5,145,441	5,453,726	13,630,547	28,637,944	
Canal and Embankment Excavation - Land	718,696.29 cy	1,635,676	-	-	3,386,727	-	5,022,403	10,691,489	
Canal and Embankment Excavation - Muck	740,503.70 cy	505,592	-	-	1,046,847	-	1,552,439	3,304,770	
Site Fill Clay-Dozer	294,400.00 cy	1,116,936	19,136,000	-	983,439	-	21,236,375	45,671,076	
Site Fill Blasted Rock-Dozer	120,000.00 cy	662,513	3,159,000	-	483,535	-	4,305,047	9,223,574	
Fill Sand-Loader/Truck - Hesco Baskets (RDFW) 150 lft per Day	46,933.32 cy	61,252	438,827	-	40,334	-	540,413	1,159,589	Crew comprised of Loader/Operator and two labors. approximately 150 liner feet per day. Use of a telabell to place material in Hesco Baskets where Loader access is limited.
Orange Protection Fence Fence	25,600.00 lf	15,562	59,136	-	-	-	74,698	159,716	
Hydroseeding	1,280,000.00 sf	22,989	70,400	-	8,000	-	101,389	216,634	
Permanent Steel Sheeting 60' Deep by GVR System (Influent GW Barrier)	1,536,000.00 sf	-	48,967,680	9,216,000	-	-	58,183,680	124,545,552	Modified from Database per Giken and Blue Iron LLC information of Installation per GVR Method
Permanent Steel Sheeting 60' Deep Sealant (Influent GW Barrier)	682,667.00 lf	-	-	2,048,001	-	-	2,048,001	4,228,741	Modified from Database per Giken and Blue Iron LLC information Material and application to seal joints
Remove Existing Sheetpiling (Pull Out or Cut Off) Random Lengths 30' to 60'	1,536,000.00 sf	-	-	38,400,000	-	-	38,400,000	79,288,847	Unknown Sheetpile walls, length and types may vary, cost is a rough estimate to remove, cutoff or redrive to acceptable e.v.
Site demolition concrete pavement, 10" depth	20,907.00 sf	23,046	-	-	15,680	-	38,727	83,331	
Site demolition, hydrodemolition, concrete pavement, 18" - 24" depth	119,438.00 sf	168,524	-	-	114,660	-	283,185	609,353	
Site demolition concrete retaining walls & footings	719.00 cy	19,022	-	-	17,256	-	36,278	78,165	
Site demolition concrete box channel slabs & walls	1,703.00 cy	45,054	-	-	40,872	-	85,926	185,138	
Site demolition asphalt pavement & curb, 4" to 6" thick	3,572.00 sy	4,081	-	-	6,651	-	10,732	23,184	
Site demolition highway guard rails & barriers, timber, 4" x 8"	200.00 lf	402	-	-	133	-	535	1,148	
Site demolition guard rails & barriers, median barrier, box beam, 6" x 8"	400.00 lf	2,829	-	-	426	-	3,255	6,968	
Site demolition chain link fence w/ barbed wire, 3 strands	1,000.00 lf	2,050	-	-	2,664	-	4,714	10,173	
Site demolition cut off timber piles to 2' below grade	6,916.00 ea	70,877	-	-	34,580	-	105,457	226,597	
Site demolition remove railroad trestle 18" dia. steel piles	57.00 ea	1,168	-	-	1,140	-	2,308	4,975	
Site demolition remove railroad trestle steel beams (141 tons)	71.00 ea	3,638	-	-	3,550	-	7,188	15,493	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, shore driven	150.00 lf	30,122	13,860	-	111,983	-	155,964	338,110	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, barge driven	200.00 lf	60,243	27,720	-	223,965	-	311,928	676,219	
		18,589,242	77,092,276	94,146,017	24,963,347	39,803,726	254,594,608	536,137,835	
03 Breakwater									
Breakwater Rock - Allowance	1.00 ls	-	19	0	-	-	0	0	NIC
03 Breakwater				0			0	0	

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
17th St Ave Canal		24,625,048	184,201,465	155,047,797	32,912,003	39,803,726	436,590,039	927,581,170	
GR General Requirements									
04 Miscellaneous									
Specialty Permits	1.00 ea	-	1	-	-	-	1	2	All permits are at no cost.
Prints & Records	92.00 set	-	11,500	-	-	-	11,500	25,019	
Administrative	600.00 mh	12,000	-	-	-	-	12,000	41,347	
Project Engineer	700.00 mh	31,395	-	-	-	-	31,395	108,174	
CADD	800.00 mh	28,800	-	-	-	-	28,800	99,233	
Project Engineer	1,500.00 mh	67,275	-	-	-	-	67,275	231,802	
Procurement	900.00 mh	31,500	-	-	-	-	31,500	108,536	
Project Manager	1,280.00 mh	67,264	-	-	-	-	67,264	231,764	****
CQC Manager	84.00 wk	216,458	-	-	21,241	-	237,699	499,820	
CQC Specialist	9,360.00 mh	336,960	32,760	-	59,514	-	429,234	906,882	
Field Sampler	1,195.00 day	241,390	29,875	-	53,775	-	325,040	687,843	a 4 yr. degedred, w/ 2 yr. experience
Material Testing - ls	1.00 ls	-	-	150,000	-	-	150,000	315,839	
Soil Testing - ls	1.00 ls	-	-	750,000	-	-	750,000	1,579,194	
Concrete Testing - ls	1.00 ls	-	-	750,000	-	-	750,000	1,579,194	
04 Miscellaneous		1,033,042	74,136	1,650,000	134,531		2,891,709	6,414,652	
GR General Requirements		1,033,042	74,136	1,650,000	134,531		2,891,709	6,414,652	
London Ave Canal									
01 Pump Station									
Miscellaneous	1.00 ls	-	-	150,000	-	-	150,000	315,839	Allowance
Miscellaneous	1.00 ls	25,000	25,000	25,000	25,000	-	100,000	214,809	
Geophysical Survey	5.00 day	-	8,250	-	-	-	8,250	17,949	Verification & location of existing site utilities.
3 - Man survey Crew	120.00 day	114,841	9,000	-	12,000	-	135,841	290,941	
Temporary Construction Roads - 8"gravel	20,000.00 sf	36,000	50,400	-	10,600	-	97,000	209,592	
Dump Truck Semi	1,120.00 hr	16,289	56,000	-	51,520	-	123,809	268,707	Off-site disposal. 2 hr R/T. Disposal fee \$100 per load.
Demolition Debris Removal- Transport To Landfill	400.00 ton	-	-	6,000	-	-	6,000	12,634	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	400.00 ton	-	-	22,000	-	-	22,000	46,323	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	400.00 ton	-	-	12,800	-	-	12,800	26,952	
Demo Generator Buildings	14,400.00 sf	62,667	-	-	23,040	-	85,707	183,956	
Demo Process Piping & Mechanical Systems	14,400.00 sf	13,731	-	-	9,831	-	23,561	50,711	
Demo Process Electrical Systems	14,400.00 sf	13,731	-	-	9,831	-	23,561	50,711	
Demo Horizontal Screw Pump	4.00 ea	10,171	-	-	7,282	-	17,453	37,563	
Demo Constant Duty Pump	4.00 ea	10,171	-	-	7,282	-	17,453	37,563	
Demo No.8 B.W.G Steel Tanks	4.00 ea	636	-	-	455	-	1,091	2,348	
Demo Transformers	4.00 ea	2,543	-	-	1,821	-	4,363	9,391	
Demo Emergency Generator Sets w/Fuel Oil Storage Tanks	4.00 ea	5,085	-	-	3,641	-	8,726	18,782	
Demo Mechanical Buildings	10,000.00 sf	26,221	-	-	18,774	-	44,996	96,843	
Demo Discharge & Suction Pipes 7" - 12.5' Dia.	4,600.00 lf	7,310	-	-	5,234	-	12,544	26,999	
Demo Mass Concrete	42,055.00 cy	457,542	-	-	1,207,719	-	1,665,260	3,604,626	****
Break Concrete On Site & Send To Recycler	42,055.00 cy	39,552	126,165	-	67,136	-	232,853	505,012	
Trucking Demo Materials	400.00 hr	5,818	-	-	16,100	-	21,918	47,451	
Dewatering - Well Point System Instillation & 1st mo.	1,000.00 lf	66,175	150	-	24,925	-	91,250	195,876	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
Dewatering - Well Point System Monthly Rental	11,000.00 lf	319,720	1,100	-	-	-	320,820	685,184	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
By-pass piping	1.00 ls	59,074	25,000	-	75,000	-	159,074	343,716	Allowance
Dewatering - Local	1.00 ls	59,074	27,500	-	825,000	-	911,574	1,980,850	
Dewatering - Dredge Material	10,667.00 cy	105,023	26,668	-	66,669	-	198,359	427,348	
12" Pump & Hoses	180.00 day	27,356	45,000	-	45,000	-	117,356	254,224	
Load out	10,667.00 cy	11,480	-	-	18,532	-	30,012	64,835	
Bldg Exc Earth-Dozer	28,935.00 cy	62,080	-	-	58,296	-	120,377	259,407	Berm Removal
Bldg Exc Earth-Loader/Trucks	28,935.00 cy	57,171	144,675	-	57,110	-	258,956	561,096	Berm removal & soil disposal hauling
Bldg Exc Wetland-Backhoe/Truck	10,667.00 cy	22,070	-	-	45,697	-	67,767	146,550	Mat pad excavation for permanent pump station.
Site Fill Earth-Loader/Truck	23,000.00 cy	44,192	-	-	80,759	-	124,952	270,076	Berms
Fill Earth Stockpile - Dozer/Compactor	23,000.00 cy	20,018	448,500	-	45,444	-	513,962	1,117,372	Berms - import material
Bldg Fill Earth-Loader/Truck	2,667.00 cy	14,092	41,605	-	25,753	-	81,450	176,638	
Bldg Fill Rock-Dozer	48,000.00 cy	182,109	-	-	160,343	-	342,452	737,752	****
Fill Rock Loader/Rock Truck	48,000.00 cy	138,341	1,010,880	-	399,663	-	1,548,884	3,364,206	
Gravel Base - Roads	430.00 cy	567	10,062	-	1,287	-	11,916	25,902	
Rip Rap Machine Place	45,000.00 sf	66,056	450,000	-	80,010	-	596,066	1,294,153	
Rip Rap Hand Place Loose	14,000.00 sf	265,958	280,000	-	-	-	545,958	1,177,144	
Sandbags	3,000.00 ea	9,000	9,000	-	-	-	18,000	38,801	
Silt Fence	1,000.00 lf	568	5,775	-	500	-	6,843	14,864	
Filter Fabric	1,000.00 sy	710	1,925	-	-	-	2,635	5,704	
Stone Check Dams	200.00 cy	142	7,425	-	-	-	7,567	16,457	
Geotextile (woven 200#) for Liner System	1,000.00 sy	167	3,150	-	160	-	3,477	7,557	
Sub - Sheetpiling	40,000.00 sf	-	-	1,200,000	-	-	1,200,000	2,526,711	800 lf x 50' deep
Treated Wood Piles 14"	341,760.00 vf	1,071,237	9,142,080	-	1,815,733	-	12,029,050	26,127,461	****
Bituminous Base Course 2"	1,500.00 sy	-	-	10,800	-	-	-	22,740	
Bituminous Binder Course 2"	1,500.00 sy	-	-	10,800	-	-	-	22,740	
Utility Piping Subcontractor - Tie-ins Relocations Repairs	1.00 ls	-	-	100,000	-	-	100,000	210,559	Allowance
8' Chain Link Fence	1,500.00 lf	-	20	37,500	-	-	37,500	78,960	
Sub - Concrete	42,204.00 cy	-	-	14,771,400	-	-	14,771,400	31,102,549	****
Sub - Masonry Subcontr	36,250.00 sf	-	-	725,000	-	-	725,000	1,526,555	

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
01 Pump Station									
Standard Brick Arch	36,250.00 sf			271,875	-	-	271,875	572,458	
Purchase Structural Steel	700.00 ln	-	413,000	-	-	-	413,000	898,520	
Structural Steel Erection	700.00 ln	410,584	-	-	280,140	-	690,724	1,486,310	
Steel Roof Deck 18 ga. 1-1/2"	11,500.00 sf	2,355	15,504	-	222	-	18,082	39,245	
Gal Steel Floor Grating 1.50"	11,500.00 sf	3,317	23,000	-	-	-	26,317	57,122	
Misc. Metal	19,500.00 lb	187,473	13,845	-	-	-	201,318	430,487	
Sub - Finish Carpentry - Offices	600.00 sf	-	-	75,000	-	-	75,000	157,919	Allowance - 2 offices 15'x20' ea
FRP Weirs	500.00 lf	6,489	25,000	-	5,000	-	36,489	79,126	
Sub - Waterproofing	44,400.00 sf	-	-	44,400	-	-	44,400	93,488	
Roof Deck Insulation 1.50"	80,705.00 sf	29,632	51,813	-	-	-	81,444	176,004	
Sub - Fireproofing	80,705.00 sf	-	-	100,881	-	-	100,881	212,415	
Sub - Membrane Roofing	80,705.00 sf	-	-	403,525	-	-	403,525	849,659	
Roof Hatch 2'6"x 4'6"	1.00 ea	14	400	-	-	-	414	900	
Roof Hatch 5'0" x 5'0"	1.00 ea	394	1,225	-	-	-	1,619	3,506	
Roof Vents	3.00 ea	166	150	-	-	-	316	681	
Sub - HM Doors & Frames	2.00 ls	-	-	50,000	-	-	50,000	105,280	
Overhead Doors Elec Operated	4.00 ea	-	-	9,200	-	-	9,200	19,371	
Waterproofing Paint System	11,500.00 sf	-	-	14,375	-	-	14,375	30,268	
Sub - Special Coatings	1.00 ls	-	-	200,000	-	-	200,000	421,118	
Sub - Special Coatings	1.00 ls	-	-	180,000	-	-	180,000	379,007	
Alum Louvers Pneumatic	2,000.00 sf	12,978	16,000	-	-	-	28,978	62,526	
Equipment Unloading	19.00 ea	35,612	4,750	-	20,188	-	60,550	130,307	
Equipment Rigging / Rough Set - Medium	19.00 ea	10,684	6,650	-	6,056	-	23,390	50,460	
Equipment Rigging / Rough Set - Heavy	19.00 ea	14,245	9,500	-	13,794	-	37,539	81,100	
Equipment - Final Setting Grout Base	57.00 ea	22,657	14,250	-	-	-	36,907	79,387	
Pumps Motors Gears	1.00 ls	59,623	58,285,000	-	25,000	-	58,369,623	126,986,128	10 ea
VFDs for Pumps	8.00 ea	317,987	2,800,000	-	120,000	-	3,237,987	7,031,821	
Gates	2.00 ea	9,846	187,130	-	10,000	-	206,976	449,901	60 ft clear opening
36" Butterfly Valve Wafer Type	8.00 ea	4,726	200,000	-	-	-	204,726	445,211	
48" Butterfly Valve Wafer Type	8.00 ea	6,301	400,000	-	-	-	406,301	883,694	
Sub - Cathodic Protection	1.00 ls	-	-	225,000	-	-	225,000	473,758	
Sub - Cathodic Protection	1.00 ls	-	-	135,000	-	-	135,000	284,255	
Instrumentation & Control	1.00 ls	-	-	800,000	-	-	800,000	1,684,474	
Instrumentation & Control	1.00 ls	-	-	135,000	-	-	135,000	284,255	
Sub - Hoists & Cranes	1.00 ls	-	-	325,000	-	-	325,000	684,318	
Sub - Hoists & Cranes	1.00 ls	-	-	180,000	-	-	180,000	379,007	
Mechanical Subcontractor	1.00 ls	-	-	4,000,000	-	-	4,000,000	8,422,370	
Mechanical Subcontractor	1.00 ls	-	-	80,000	-	-	80,000	168,447	
HVAC subcontract	1.00 ls	-	-	325,000	-	-	325,000	684,318	
HVAC subcontract	1.00 ls	-	-	80,000	-	-	80,000	168,447	
Fuel Tanks	4.00 ea	-	-	300,000	-	-	300,000	631,678	20,000 gal. double containment
Electrical Subcontractor	1.00 ls	-	-	12,500,000	-	-	12,500,000	26,319,906	
Electrical Subcontractor	1.00 ls	-	-	1,150,000	-	-	1,150,000	2,421,431	
Generator Subcontractor	7.00 ea	-	-	7,000,000	-	-	7,000,000	14,739,147	3 mgw each
Site demolition chain link fence w/ barbed wire, 3 strands	500.00 lf	1,025	-	-	1,332	-	2,357	5,087	
Site demolition cut off timber piles to 2' below grade	1,830.00 ea	18,754	-	-	9,150	-	27,904	59,598	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, shore driven	100.00 lf	20,081	9,240	-	74,655	-	103,976	225,406	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, barge driven	200.00 lf	60,243	27,720	-	223,965	-	311,928	676,219	
01 Pump Station		4,684,869	74,459,487	45,655,556	6,092,649		130,892,561	281,385,589	
02 Canal									
Bridge Modifications - London Ave. - RR	1.00 ls	-	*	740,000	-	-	740,000	1,558,138	
Miscellaneous	1.00 ls	-	-	65,000	-	-	65,000	136,864	Allowance
Miscellaneous	1.00 ls	-	-	10,000	-	-	10,000	21,056	Allowance
Bridge Modifications - London Ave. - Gentry Blvd	1.00 ls	-	-	977,500	-	-	977,500	2,058,217	
Bridge Modifications - London Ave. - Mirabeau	1.00 ls	-	-	592,500	-	-	592,500	1,247,564	
Bridge Modifications - London Ave. - Filmore Ave	1.00 ls	-	-	335,000	-	-	335,000	705,373	
Bridge Modifications - London Ave. - Robert E Lee Blvd	1.00 ls	-	-	481,000	-	-	481,000	1,012,790	
Bridge Modifications - London Ave. - Leon C Simon Blvd	1.00 ls	-	-	266,000	-	-	266,000	560,088	
Real Estate Easement Aquisitions	1.00 ls	-	-	-	-	18,050,000	18,050,000	37,644,944	Allowance
Dredge and Upland disposal	1,405,629.00 cy	-	-	33,468,026	-	-	33,468,026	69,105,240	Cost supported by 2010 cost analysis issued by USACE includes data from LA. Size and Type of dredging operation is contractors means and method
Site Restoration - Allowance	1.00 ls	-	-	500,000	-	-	500,000	1,052,796	
Construction Fence	30,600.00 lf	-	244,800	-	-	-	244,800	527,498	Installation and Removal
Trucking - Excavate Material Non Dredged 1 hr Round Trip	2.00 ls	-	-	2,600,000	-	-	2,600,000	5,368,516	
Crawler Crane 200 ton	11,000.00 hr	452,243	-	-	2,662,000	-	3,114,243	6,674,434	
20x30 barge (Used for By-Pass Pumping Station)	792.00 day	-	-	-	1,188,000	-	1,188,000	2,559,919	
20x30 barge (Used to transport dredged material to off load / load out stagingarea)	3,096.00 day	-	-	-	4,644,000	-	4,644,000	10,006,955	Barges used to move dredged materials to off load / load out area
Demolition Debris Removal- Transport To Landfill	1,830.00 ton	-	-	27,450	-	-	27,450	57,798	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	915.00 ton	-	-	50,325	-	-	50,325	105,964	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	915.00 ton	-	-	29,280	-	-	29,280	61,652	
Demolition Debris Removal- Transport To Landfill	100.00 ton	-	-	1,500	-	-	1,500	3,158	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	50.00 ton	-	-	2,750	-	-	2,750	5,790	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	50.00 ton	-	-	1,600	-	-	1,600	3,369	
Demolition Debris Removal- Transport To Landfill	568.00 ton	-	-	8,520	-	-	8,520	17,940	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	284.00 ton	-	-	15,620	-	-	15,620	32,889	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	284.00 ton	-	-	9,088	-	-	9,088	19,136	

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
02 Canal									
Demolition Debris Removal- Transport To Landfill	100.00 ton			1,500			1,500	3,158	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	50.00 ton			2,750			2,750	5,790	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	50.00 ton			1,600			1,600	3,369	
Demolition Debris Removal	54,403.00 cy	3,330,073			3,200,637		6,530,710	13,806,058	
Demolition and Relocation of Existing Utilities Crossing	1.00 ls	3,000,000	500,000		1,750,000		5,250,000	11,072,772	
Demo Masonry Building	10,812.00 sf	29,408			10,812		40,220	86,325	
Demo Process Piping & Mechanical Systems	10,812.00 sf	6,873			1,730		8,603	18,441	
Demo Process Electrical Systems	10,812.00 sf	6,873			1,730		8,603	18,441	
Demo Bridge Crane	1.00 ea	1,271			910		2,182	4,695	
Demo Horizontal Screw Pump	5.00 ea	12,713			9,103		21,816	46,954	
Demo Vertical Submersible Pump	2.00 ea	15,892			11,378		27,270	58,693	
Demo No.8 B.W.G Steel Tanks	7.00 ea	1,112			796		1,909	4,108	
Demo Transformers	6.00 ea	3,814			2,731		6,545	14,086	
Demo Emergency Generator Sets w/Fuel Oil Storage Tanks	1.00 ea	1,589			1,138		2,727	5,869	
Demo Steel Suction Screen w/Cleaning Equipment	2,160.00 sf	5,664			4,055		9,719	20,918	
Demo Discharge & Suction Pipes 7" - 12.5' Dia.	440.00 lf	699			501		1,200	2,582	
Demo Masonry Building	1,584.00 sf	4,308			1,584		5,892	12,647	
Demo Process Piping & Mechanical Systems	1,584.00 sf	1,007			253		1,260	2,702	
Demo Process Electrical Systems	1,584.00 sf	1,007			253		1,260	2,702	
Demo Bridge Crane	2.00 ea	2,543			1,821		4,363	9,391	
Demo Horizontal Screw Pump	2.00 ea	5,085			3,641		8,726	18,782	
Demo Constant Duty Pump	2.00 ea	5,085			3,641		8,726	18,782	
Demo No.8 B.W.G Steel Tanks	4.00 ea	636			455		1,091	2,348	
Demo Rotary Converter	1.00 ea	318			228		545	1,174	
Demo Transformers	3.00 ea	1,907			1,365		3,272	7,043	
Demo Emergency Generator Sets w/Fuel Oil Storage Tanks	1.00 ea	1,271			910		2,182	4,695	
Demo Exhaust Silencers	1.00 ea	159			114		273	587	
Demo Steel Suction Screen w/Cleaning Equipment	2,084.00 sf	5,465			3,913		9,377	20,182	
Demo Discharge & Suction Pipes 7" - 12.5' Dia.	298.00 lf	474			339		813	1,749	
Demo Concrete Slab On Grade 12"-18"	1,118.00 cy	14,789			37,733		52,521	113,673	
Demo Concrete Susp Slab 12"-18"	337.00 cy	6,687			17,061		23,747	51,397	
Demo Concrete Slab On Grade 12"-18"	150.00 cy	1,984			5,063		7,047	15,251	
Demo Concrete Susp Slab 12"-18"	68.00 cy	1,349			3,443		4,792	10,371	
Demo Concrete Flume 12" Thick	7,500.00 cy	900,698			843,750		1,744,448	3,686,904	
Demo Concrete Walls 12"-18"	1,570.00 cy	51,243			94,200		145,443	314,375	
Demo Mass Concrete	440.00 cy	4,787			12,636		17,423	37,713	
Demo Concrete Walls 12"-18"	97.00 cy	3,166			8,357		11,523	24,942	
Demo Mass Concrete	176.00 cy	1,915			5,054		6,969	15,085	
Demolition Concrete Levee Walls 7' high, Expose Existing Sheet Pile Wall	58,300.00 lf	8,278,600			1,253,450		9,532,050	19,877,504	
Demo Roofing - Slate Shingles	16,949.00 sf	3,199					3,199	6,832	
Demo Gutters- Copper	504.00 lf	1,409			420		1,829	3,923	
Demo Downspouts- Copper	279.00 vf	780			232		1,013	2,172	
Demo Steel Beams & Columns (16 tons)	17.00 ea	911			871		1,782	3,841	
Demo Steel Beams & Columns (17 tons)	18.00 ea	964			923		1,887	4,067	
Demo Steel Trusses	27.00 ea	4,340			4,152		8,492	18,302	
Break Concrete On Site & Send To Recycler	8,234.00 cy	7,744	24,702		13,145		45,591	98,877	
Trucking Demo Materials	2,500.00 hr	36,360			100,625		136,985	292,268	
Asbestos Abatement - sub	1.00 ls			32,500			32,500	68,432	Allowance
Asbestos Abatement - sub	1.00 ls			5,000			5,000	10,528	Allowance
Lead Abatement - sub	1.00 ls			32,500			32,500	68,432	Allowance
Lead Abatement - sub	1.00 ls			5,000			5,000	10,528	Allowance
Site Yard Rental	3.00 ls			360,000			360,000	743,333	12 months - 2 yards
8" Aqua-Barrier-Useable	1,600.00 lf	4,549	416,000		1,892		422,440	909,916	Price is for 8' high aqua-barrier (monthly rental rate) and does not include installation. Barrier is capable of controlling up to 7' of standing water and sediment depth. Typical size 8' high x 100' long. Material price includes freight. Used to keep water put of canal construction zone.
6 foot Hesco Basket (RDFW) C3315 3x3x15	3,060.00 ea		2,303,078				2,303,078	4,962,705	Price is for 7' high portadam barrier and includes shipping. Barrier is capable of controlling up to 6' of standing water and sediment depth. Price doesn't include installation. Linear Foot price is based on cost for one months rental.
6 foot Hesco Basket (RDFW) C4315 4x3x3	3,060.00 ea		2,418,532				2,418,532	5,211,486	Price is for 7' high portadam barrier and includes shipping. Barrier is capable of controlling up to 6' of standing water and sediment depth. Price doesn't include installation. Linear Foot price is based on cost for one months rental.
By-pass piping	1.00 ls	29,537	15,000		35,000		79,537	171,858	Allowance
Dewatering - Local	1.00 ls	19,691	2,500		75,000		97,191	210,661	
Dewatering - Dredge Material	2,315.00 cy	22,793	5,788		14,469		43,049	92,745	
By-pass piping	1.00 ls	29,537	15,000		35,000		79,537	171,858	Allowance

22

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
02 Canal									
Dewatering - Local	1.00 ls	19,691	2,500	-	75,000	-	97,191	210,661	
Dewatering - Dredge Material	2,315.00 cy	22,793	5,788	-	14,469	-	43,049	92,745	
12" Pump & Hoses	120.00 day	18,237	30,000	-	30,000	-	78,237	169,483	
24" Pump & Hoses	516.00 day	19,605	258,000	-	-	-	277,605	596,618	
Rough Grade Balance of Site	433,500.00 sy	142,580	-	-	151,725	-	294,305	622,766	
Fine Grade Balance of Site	474,500.00 sy	144,225	-	-	-	-	144,225	299,240	
Load out	4,630.00 cy	4,983	-	-	8,044	-	13,027	28,142	
Load out Concrete	380,800.00 cy	409,813	-	-	661,587	-	1,071,400	2,275,882	
Site Load Out Excavated Soils	1,375,603.55 cy	2,484,985	-	-	4,217,994	4,470,712	11,173,690	23,476,057	
Canal and Embankment Excavation - Land	800,403.00 cy	1,821,632	-	-	3,771,755	-	5,593,387	11,906,976	
Canal and Embankment Excavation -Muck	395,024.00 cy	269,710	-	-	558,444	-	828,154	1,762,940	
Site Fill Clay-Dozer Sta. 0 + 00 to 20 + 25	34,500.00 cy	130,891	2,242,500	-	115,247	-	2,488,638	5,352,079	
Site Fill Clay-Dozer Sta. 20 + 25 to 153 + 00	209,130.00 cy	793,427	13,593,450	-	698,596	-	15,085,472	32,442,908	
Site Fill Blasted Rock-Dozer	97,905.00 cy	540,528	2,577,349	-	394,504	-	3,512,380	7,525,283	
Fill Sand-Loader/Truck - Hesco Baskets (RDFW) 150 lft per Day	56,100.00 cy	73,215	524,535	-	48,212	-	645,962	1,386,071	Crew comprised of Loader/Operator and two labors. approximately 150 liner feet per day. Use of a telabell to place material in Hesco Baskets where Loader access is limited.
Orange Protection Fence Fence	30,600.00 lf	18,602	70,686	-	-	-	89,288	190,911	
Hydroseeding	1,530,000.00 sf	27,478	84,150	-	9,563	-	121,191	258,946	
Permanent Steel Sheetting 60' Deepby GVR System (Influnent GW Barrier)	1,836,000.00 sf	-	58,531,680	11,016,000	-	-	69,547,680	148,870,855	
Permanent Steel Sheetting 60' Deep Sealant (Influnent GW Barrier)	816,000.00 lf	-	-	2,448,000	-	-	2,448,000	5,054,664	Modified from Databse per Giken and Blue Iron LLC information Material and application to seal joints
Remove Existing Sheetpiling (Pull Out or Cut Off) Random Lengths 30' to 60'	1,779,000.00 sf	-	-	44,475,000	-	-	44,475,000	91,832,590	Unknown Sheetpile walls, length and types may vary, cost is a rough estimate to remove, cutoff or redrive to exceptable e.v.
Site demolition concrete pavement, 10" depth	4,071.00 sf	4,488	-	-	3,053	-	7,541	16,226	
Site demolition, hydrodemolition, concrete pavement, 18" - 24" depth	9,020.00 sf	12,727	-	-	8,659	-	21,386	46,019	
Site demolition concrete retaining walls & footings	1,120.00 cy	29,631	-	-	67,200	-	96,831	209,478	
Site demolition concrete box channel slabs & walls	1,130.00 cy	4,983	-	-	12,713	-	17,695	38,298	
Site demolition, hydrodemolition, concrete pavement, 18" - 24" depth	12,517.00 sf	13,798	-	-	9,388	-	23,186	49,890	
Site demolition concrete retaining walls & footings	471.00 cy	12,461	-	-	31,793	-	44,253	95,778	
Site demolition concrete box channel slabs & walls	384.00 cy	10,159	-	-	25,920	-	36,079	78,087	
Site demolition asphalt pavement & curb, 4" to 6" thick	200.00 sy	228	-	-	372	-	601	1,298	
Site demolition highway guard rails & barriers, timber, 4" x 8"	300.00 lf	603	-	-	200	-	802	1,722	
Site demolition guard rails & barriers, median barrier, box beam, 6" x 8"	300.00 lf	2,121	-	-	320	-	2,441	5,226	
Site demolition chain link fence w/ barbed wire, 3 strands	272.00 lf	558	-	-	725	-	1,282	2,767	
Site demolition cut off timber piles to 2' below grade	1,611.00 ea	16,510	-	-	8,055	-	24,565	52,783	
Site demolition chain link fence w/ barbed wire, 3 strands	200.00 lf	410	-	-	533	-	943	2,035	
Site demolition cut off timber piles to 2' below grade	1,838.00 ea	18,836	-	-	9,190	-	28,026	60,221	
Site demolition remove sheet piling	4,992.00 sf	2,558	-	-	2,496	-	5,054	10,893	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, shore driven	180.00 lf	36,146	16,632	-	134,379	-	187,157	405,731	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, barge driven	400.00 lf	120,487	55,440	-	447,930	-	623,857	1,352,438	
02 Canal		23,553,615	83,938,110	98,561,009	27,588,574	22,520,712	256,162,020	539,817,824	
London Ave Canal		28,238,485	158,397,596	144,216,566	33,681,223	22,520,712	387,054,581	821,203,413	
Orleans Ave Canal									
01 Pump Station									
Miscellaneous	1.00 ls	-	-	75,000	-	-	75,000	157,919	Allowance
Miscellaneous	1.00 ls	25,000	25,000	25,000	25,000	-	100,000	214,809	
Geophysical Survey	5.00 day	-	8,250	-	-	-	8,250	17,949	Verification & location of existing site utilities.
3 - Man survey Crew	120.00 day	114,841	9,000	-	12,000	-	135,841	290,941	
Temporary Construction Roads - 8"gravel	20,000.00 sf	36,000	50,400	-	10,600	-	97,000	209,592	
Dump Truck Semi	485.00 hr	7,054	24,250	-	22,310	-	53,614	116,360	Off-site disposal. 2 hr R/T.Disposal fee \$100 per load.
Demolition Debris Removal- Transport To Landfill	250.00 ton	-	-	3,750	-	-	3,750	7,896	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	250.00 ton	-	-	13,750	-	-	13,750	28,952	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	250.00 ton	-	-	8,000	-	-	8,000	16,845	
Demo Generator Buildings	14,400.00 sf	62,667	-	-	23,040	-	85,707	183,956	
Demo Process Piping & Mechanical Systems	14,400.00 sf	13,731	-	-	9,831	-	23,561	50,711	
Demo Process Electrical Systems	14,400.00 sf	13,731	-	-	9,831	-	23,561	50,711	
Demo Horizontal Screw Pump	4.00 ea	10,171	-	-	7,282	-	17,453	37,563	
Demo Constant Duty Pump	4.00 ea	10,171	-	-	7,282	-	17,453	37,563	
Demo No.8 B.W.G Steel Tanks	4.00 ea	636	-	-	455	-	1,091	2,348	
Demo Transformers	4.00 ea	2,543	-	-	1,821	-	4,363	9,391	
Demo Emergency Generator Sets w/Fuel Oil Storage Tanks	4.00 ea	5,085	-	-	3,641	-	8,726	18,782	
Demo Mechanical Buildings	2,500.00 sf	6,556	-	-	4,694	-	11,249	24,211	
Demo Discharge & Suction Pipes 7" - 12.5' Dia.	1,500.00 lf	2,384	-	-	1,707	-	4,091	8,804	
Demo Mass Concrete	35,798.00 cy	389,468	-	-	1,028,033	-	1,417,501	3,068,325	****
Break Concrete On Site & Send To Recycler	35,798.00 cy	33,668	107,394	-	57,147	-	198,209	429,876	
Trucking Demo Materials	250.00 hr	3,636	-	-	10,063	-	13,699	29,657	
Dewatering - Well Point System Instillation & 1st mo.	1,000.00 lf	66,175	150	-	24,925	-	91,250	195,876	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
Dewatering - Well Point System Monthly Rental	11,000.00 lf	319,720	1,100	-	-	-	320,820	685,184	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
By-pass piping	1.00 ls	59,074	25,000	-	75,000	-	159,074	343,716	Allowance

23

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
01 Pump Station									
Dewatering - Local	1.00 ls	59,074	27,500	-	825,000	-	911,574	1,980,850	
Dewatering - Dredge Material	4,625.00 cy	45,536	11,563	-	28,906	-	86,005	185,290	
12" Pump & Hoses	180.00 day	27,356	45,000	-	45,000	-	117,356	254,224	
Load out	4,625.00 cy	4,977	-	-	8,035	-	13,013	28,111	
Bldg Exc Earth-Dozer	28,935.00 cy	62,080	-	-	58,296	-	120,377	259,407	Berm Removal
Bldg Exc Earth-Loader/Trucks	28,935.00 cy	57,171	144,675	-	57,110	-	258,956	561,096	Berm removal & soil disposal hauling
Bldg Exc Wetland-Backhoe/Truck	4,625.00 cy	9,569	-	-	19,813	-	29,382	63,541	Mat pad excavation for permanent pump station.
Site Fill Earth-Loader/Truck	14,375.00 cy	27,620	-	-	50,475	-	78,095	168,798	Berms
Fill Earth Stockpile - Dozer/Compactor	14,375.00 cy	12,512	280,313	-	28,402	-	321,227	698,358	Berms - import material
Bldg Fill Earth-Loader/Truck	1,156.00 cy	6,108	18,034	-	11,162	-	35,304	76,563	
Bldg Fill Rock-Dozer	39,375.00 cy	149,386	-	-	131,532	-	280,918	605,188	****
Fill Rock Loader/Rock Truck	39,375.00 cy	113,483	829,238	-	327,848	-	1,270,569	2,759,700	
Gravel Base - Roads	430.00 cy	567	10,062	-	1,287	-	11,916	25,902	
Rip Rap Machine Place	40,000.00 sf	58,716	400,000	-	71,120	-	529,836	1,150,359	
Rip Rap Hand Place Loose	12,500.00 sf	237,463	250,000	-	-	-	487,463	1,051,021	
Sandbags	2,500.00 ea	7,500	7,500	-	-	-	15,000	32,334	
Silt Fence	1,000.00 lf	568	5,775	-	500	-	6,843	14,864	
Filter Fabric	1,000.00 sy	710	1,925	-	-	-	2,635	5,704	
Stone Check Dams	200.00 cy	142	7,425	-	-	-	7,567	16,457	
Geotextile (woven 200#) for Liner System	1,000.00 sy	167	3,150	-	160	-	3,477	7,558	
Sub - Sheetpiling	25,000.00 sf	-	-	750,000	-	-	750,000	1,579,194	500 lf x 50' deep
Treated Wood Piles 14"	68,865.00 vf	215,855	1,842,139	-	365,872	-	2,423,866	5,264,711	****
Bituminous Base Course 2"	1,500.00 sy	-	-	10,800	-	-	10,800	22,740	
Bituminous Binder Course 2"	1,500.00 sy	-	-	10,800	-	-	10,800	22,740	
Utility Piping Subcontractor - Tie-ins Relocations Repairs	1.00 ls	-	-	100,000	-	-	100,000	210,559	Allowance
8' Chain Link Fence	1,500.00 lf	-	-	37,500	-	-	37,500	78,960	
Sub - Concrete	12,180.00 cy	-	-	4,263,000	-	-	4,263,000	8,976,141	****
Sub - Masonry Subcontr	16,050.00 sf	-	-	321,000	-	-	321,000	675,895	
Standard Brick Arch	16,050.00 sf	-	-	120,375	-	-	120,375	253,461	
Purchase Structural Steel	350.00 tn	-	206,500	-	-	-	206,500	449,260	
Structural Steel Erection	350.00 tn	205,292	-	-	140,070	-	345,362	743,155	
Steel Roof Deck 18 ga. 1-1/2"	5,000.00 sf	1,024	6,741	-	97	-	7,862	17,063	
Gal Steel Floor Grating 1.50"	5,000.00 sf	1,442	10,000	-	-	-	11,442	24,836	
Misc. Metal	10,000.00 lb	96,140	7,100	-	-	-	103,240	220,763	
Sub - Finish Carpentry - Offices	600.00 sf	-	-	75,000	-	-	75,000	157,919	Allowance - 2 offices 15'x20' ea
FRP Weirs	500.00 lf	6,489	25,000	-	5,000	-	36,489	79,126	
Sub - Waterproofing	18,360.00 sf	-	-	18,360	-	-	18,360	38,659	
Roof Deck Insulation 1.50"	15,540.00 sf	5,706	9,977	-	-	-	15,682	33,890	
Sub - Fireproofing	15,540.00 sf	-	-	19,425	-	-	19,425	40,901	
Sub - Membrane Roofing	15,540.00 sf	-	-	77,700	-	-	77,700	163,605	
Roof Hatch 2'6" x 4'6"	1.00 ea	14	400	-	-	-	414	900	
Roof Hatch 5'0" x 5'0"	1.00 ea	394	1,225	-	-	-	1,619	3,506	
Roof Vents	2.00 ea	111	100	-	-	-	211	454	
Sub - HM Doors & Frames	2.00 ls	-	-	50,000	-	-	50,000	105,280	
Overhead Doors Elec Operated	2.00 ea	-	-	4,600	-	-	4,600	9,686	
Waterproofing Paint System	10,000.00 sf	-	-	12,500	-	-	12,500	26,320	
Sub - Special Coatings	1.00 ls	-	-	200,000	-	-	200,000	421,119	
Sub - Special Coatings	1.00 ls	-	-	100,000	-	-	100,000	210,559	
Alum Louvers Pneumatic	1,000.00 sf	6,489	8,000	-	-	-	14,489	31,263	
Equipment Unloading	9.00 ea	16,869	2,250	-	9,563	-	28,681	61,724	
Equipment Rigging / Rough Set - Medium	9.00 ea	5,061	3,150	-	2,869	-	11,079	23,902	
Equipment Rigging / Rough Set - Heavy	9.00 ea	6,748	4,500	-	6,534	-	17,782	38,416	
Equipment - Final Setting Grout Base	27.00 ea	10,732	6,750	-	-	-	17,482	37,605	
Pumps Motors Gears	1.00 ls	59,623	22,280,000	-	25,000	-	22,364,623	48,653,920	5 ea
VFDs for Pumps	2.00 ea	79,497	700,000	-	30,000	-	809,497	1,757,955	
Gates	2.00 ea	9,846	187,130	-	10,000	-	206,976	449,901	40 ft clear opening
36" Butterfly Valve Wafer Type	2.00 ea	1,181	50,000	-	-	-	51,181	111,303	
48" Butterfly Valve Wafer Type	2.00 ea	1,575	100,000	-	-	-	101,575	220,923	
Sub - Cathodic Protection	1.00 ls	-	-	125,000	-	-	125,000	263,199	
Sub - Cathodic Protection	1.00 ls	-	-	75,000	-	-	75,000	157,919	
Instrumentation & Control	1.00 ls	-	-	500,000	-	-	500,000	1,052,796	
Instrumentation & Control	1.00 ls	-	-	75,000	-	-	75,000	157,919	
Sub - Hoists & Cranes	1.00 ls	-	-	250,000	-	-	250,000	526,398	
Sub - Hoists & Cranes	1.00 ls	-	-	150,000	-	-	150,000	315,839	
Mechanical Subcontractor	1.00 ls	-	-	1,000,000	-	-	1,000,000	2,105,593	
Mechanical Subcontractor	1.00 ls	-	-	50,000	-	-	50,000	105,280	
HVAC subcontract	1.00 ls	-	-	150,000	-	-	150,000	315,839	
HVAC subcontract	1.00 ls	-	-	50,000	-	-	50,000	105,280	
Fuel Tanks	2.00 ea	-	-	150,000	-	-	150,000	315,839	20,000 gal. double containment
Electrical Subcontractor	1.00 ls	-	-	3,500,000	-	-	3,500,000	7,369,574	
Electrical Subcontractor	1.00 ls	-	-	637,500	-	-	637,500	1,342,315	
Emergency Generator Subcontractor	1.00 ls	-	-	1,000,000	-	-	1,000,000	2,105,592	
Generator Subcontractor	3.00 ea	-	-	3,000,000	-	-	3,000,000	6,316,777	3 mgw each
Site demolition chain link fence w/ barbed wire, 3 strands	500.00 lf	1,025	-	-	1,332	-	2,357	5,087	
Site demolition cut off timber piles to 2' below grade	1,452.00 ea	14,881	-	-	7,260	-	22,141	47,574	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, shore driven	100.00 lf	20,081	9,240	-	74,655	-	103,976	225,406	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, barge driven	200.00 lf	60,243	27,720	-	223,965	-	311,928	676,219	

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
01 Pump Station		2,889,327	27,780,624	17,009,060	3,901,524		51,580,534	110,912,016	
02 Canal									
Bridge Modifications - Orleans Ave. - I-10	1.00 ls	-	*	1,410,000	-	-	1,410,000	2,968,885	
Miscellaneous	1.00 ls	-	-	62,000	-	-	62,000	130,547	
Bridge Modifications - Orleans Ave. - Harrison Ave	1.00 ls	-	-	336,000	-	-	336,000	707,479	
Bridge Modifications - Orleans Ave. - Filmore Ave	1.00 ls	-	-	125,000	-	-	125,000	263,199	
Bridge Modifications - Orleans Ave. - Robert E Lee Blvd	1.00 ls	-	-	596,000	-	-	596,000	1,254,933	
Real Estate Easement Aquisitions	1.00 ls	-	-	-	-	0	0	0	Allowance
Dredge and Upland disposal	890,093.33 cy	-	-	21,193,122	-	-	21,193,122	43,759,850	Cost supported by 2010 cost analysis issued by USACE includes data from LA. Size and Type of dredging operation is contractors means and method
Site Restoration - Allowance	1.00 ls	-	-	500,000	-	-	500,000	1,052,796	
Construction Fence	22,160.00 lf	-	177,280	-	-	-	177,280	382,005	Installation and Removal
Trucking - Excavate Material Non Dredged 1 hr Round Trip	1.00 ls	-	-	1,300,000	-	-	1,300,000	2,684,258	
Crawler Crane 200 ton	8,000.00 hr	328,904	-	-	1,936,000	-	2,264,904	4,854,134	
20x30 barge (Used for By-Pass Pumping Station)	792.00 day	-	-	-	1,188,000	-	1,188,000	2,559,919	
20x30 barge (Used to transport dredged material to off load / load out stagingarea)	2,322.00 day	-	-	-	3,483,000	-	3,483,000	7,505,216	Barges used to move dredged materials to off load / load out area
Demolition Debris Removal- Transport To Landfill	2,388.00 ton	-	-	35,820	-	-	35,820	75,422	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	1,194.00 ton	-	-	65,670	-	-	65,670	138,274	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	1,194.00 ton	-	-	38,208	-	-	38,208	80,451	
Demolition Debris Removal- Transport To Landfill	3,558.00 ton	-	-	53,370	-	-	53,370	112,375	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	1,779.00 ton	-	-	97,845	-	-	97,845	206,022	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	1,779.00 ton	-	-	56,928	-	-	56,928	119,867	
Demolition Debris Removal	48,778.00 cy	2,985,760	-	-	2,869,707	-	5,855,467	12,378,580	
Demolition and Relocation of Existing Utilities Crossing	1.00 ls	3,000,000	500,000	-	1,750,000	-	5,250,000	11,072,772	
Demo Masonry Building	10,481.00 sf	28,507	-	-	10,481	-	38,988	83,682	
Demo Process Piping & Mechanical Systems	10,481.00 sf	6,662	-	-	4,770	-	11,433	24,606	
Demo Process Electrical Systems	10,481.00 sf	6,662	-	-	4,770	-	11,433	24,606	
Demo Bridge Crane	1.00 ea	1,271	-	-	910	-	2,182	4,695	
Demo Horizontal Screw Pump	5.00 ea	12,713	-	-	9,103	-	21,816	46,954	
Demo Vertical Submersible Pump	2.00 ea	5,085	-	-	3,641	-	8,726	18,782	
Demo No.8 B.W.G Steel Tanks	7.00 ea	1,112	-	-	796	-	1,909	4,109	
Demo Transformers	6.00 ea	3,814	-	-	2,731	-	6,545	14,086	
Demo Emergency Generator Sets w/Fuel Oil Storage Tanks	1.00 ea	1,589	-	-	1,138	-	2,727	5,869	
Demo Steel Suction Screen w/Cleaning Equipment	4,347.00 sf	11,398	-	-	8,161	-	19,560	42,098	
Demo Discharge & Suction Pipes 7" - 12.5' Dia.	440.00 lf	699	-	-	501	-	1,200	2,582	
Demo Concrete Slab On Grade 12"-18"	1,118.00 cy	14,789	-	-	37,733	-	52,521	113,673	
Demo Concrete Susp Slab 12"-18"	337.00 cy	6,687	-	-	17,061	-	23,747	51,397	
Demo Concrete Walls 12"-18"	1,570.00 cy	51,243	-	-	135,260	-	186,503	403,704	
Demo Mass Concrete	616.00 cy	6,702	-	-	17,690	-	24,392	52,799	
Demolition Concrete Levee Walls 7' high, Expose Existing Sheet Pile Wall	27,905.19 lf	3,962,536	-	-	599,961	-	4,562,498	9,514,330	
Demo Roofing - Slate Shingles	14,459.00 sf	2,729	-	-	-	-	2,729	5,828	
Demo Gutters- Copper	411.00 lf	1,149	-	-	342	-	1,492	3,199	
Demo Downspouts- Copper	213.00 vf	596	-	-	177	-	773	1,658	
Demo Steel Beams & Columns (33 tons)	35.00 ea	1,875	-	-	1,794	-	3,669	7,908	
Demo Steel Trusses	20.00 ea	3,215	-	-	3,076	-	6,291	13,557	
Break Concrete On Site & Send To Recycler	6,640.00 cy	6,245	19,920	-	10,600	-	36,765	79,736	
Trucking Demo Materials	1,900.00 hr	27,634	-	-	76,475	-	104,109	222,124	
Asbestos Abatement - sub	1.00 ls	-	-	31,000	-	-	31,000	65,273	Allowance
Lead Abatement - sub	1.00 ls	-	-	31,000	-	-	31,000	65,273	Allowance
Site Yard Rental	3.00 ls	-	-	360,000	-	-	360,000	743,333	12 months - 2 yards
8' Aqua-Barrier-Useable	800.00 lf	2,274	208,000	-	946	-	211,220	454,958	Price is for 8' high aqua-barrier (monthly rental rate) and does not include installation. Barrier is capable of controlling up to 7' of standing water and sediment depth. Typical size 8' high x 100' long. Material price includes freight. Used to keep water put of canal construction zone.
6 foot Hesco Basket (RDFW) C3315 3x3x15	2,216.00 ea	-	1,667,850	-	-	-	1,667,850	3,593,907	Price is for 7' high portadam barrier and includes shipping. Barrier is capable of controlling up to 6' of standing water and sediment depth. Price doesn't include installation.
6 foot Hesco Basket (RDFW) C4315 4x3x3	2,216.00 ea	-	1,751,460	-	-	-	1,751,460	3,774,070	Linear Foot price is based on cost for one months rental. Price is for 7' high portadam barrier and includes shipping. Barrier is capable of controlling up to 6' of standing water and sediment depth. Price doesn't include installation.
By-pass piping	1.00 ls	29,537	15,000	-	35,000	-	79,537	171,858	Allowance
Dewatering - Local	1.00 ls	19,691	2,500	-	75,000	-	97,191	210,661	
Dewatering - Dredge Material	2,315.00 cy	22,793	5,788	-	14,469	-	43,049	92,745	
12" Pump & Hoses	60.00 day	9,119	15,000	-	15,000	-	39,119	84,741	

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
02 Canal									
24" Pump & Hoses	516.00 day	19,605	258,000	-	-	-	277,605	596,618	
Rough Grade Balance of Site	199,440.00 sy	65,597	-	-	69,804	-	135,401	286,515	
Fine Grade Balance of Site	199,440.00 sy	60,620	-	-	-	-	60,620	125,776	
Load out	2,315.00 cy	2,491	-	-	4,022	-	6,513	14,071	
Load out Concrete	207,345.00 cy	223,143	-	-	360,233	-	583,376	1,239,214	
Site Load Out Excavated Soils	1,678,069.60 cy	3,031,380	-	-	5,145,441	5,453,726	13,630,547	28,637,944	
Canal and Embankment Excavation - Land	151,016.00 cy	343,696	-	-	711,636	-	1,055,332	2,246,548	
Canal and Embankment Excavation -Muck	45,304.80 cy	30,933	-	-	64,047	-	94,980	202,189	
Site Fill Clay-Dozer	152,904.00 cy	580,109	9,938,760	-	510,774	-	11,029,642	23,720,415	
Site Fill Blasted Rock-Dozer	137,884.44 cy	761,252	3,629,808	-	555,599	-	4,946,659	10,598,228	
Fill Sand-Loader/Truck - Hesco Baskets (RDFW) 150 lft per Day	40,626.68 cy	53,021	379,859	-	34,915	-	467,795	1,003,770	Crew comprised of Loader/Operator and two labors. approximately 150 liner feet per day, Use of a telabett to place material in Hesco Baskets where Loader access is limited.
Orange Protection Fence Fence	22,160.00 lf	13,471	51,190	-	-	-	64,661	138,254	
Hydroseeding	1,108,000.00 sf	19,899	60,940	-	6,925	-	87,764	187,524	
Permanent Steel Sheeting 60" Deepby GVR System (Influent GW Barrier)	1,329,600.00 sf	-	42,387,648	7,977,600	-	-	50,365,248	107,809,744	
Permanent Steel Sheeting 60" Deep Sealant (Influent GW Barrier)	590,933.00 lf	-	-	1,772,799	-	-	1,772,799	3,660,500	Modified from Databse per Giken and Blue Iron LLC information Material and application to seal joints
Remove Existing Sheetpiling (Pull Out or Cut Off) Random Lengths 30' to 60'	1,536,000.00 sf	-	-	38,400,000	-	-	38,400,000	79,288,847	Unknown Sheetpile walls, length and types may vary, cost is a rough estimate to remove, cutoff or redrive to exceptable e.v.
Site demolition, hydrodemolition, concrete pavement, 18" - 24" depth	17,132.00 sf	37,770	-	-	25,698	-	63,468	136,570	
Site demolition concrete retaining walls & footings	1,779.00 cy	47,065	-	-	120,083	-	167,147	361,762	
Site demolition concrete box channel slabs & walls	25.00 cy	661	-	-	1,688	-	2,349	5,084	
Site demolition asphalt pavement & curb, 4" to 6" thick	100.00 sy	114	-	-	186	-	300	649	
Site demolition highway guard rails & barriers, timber, 4" x 8"	200.00 lf	402	-	-	133	-	535	1,148	
Site demolition guard rails & barriers, median barrier, box beam, 6" x 8"	200.00 lf	1,414	-	-	213	-	1,627	3,484	
Site demolition chain link fence w/ barbed wire, 3 strands	800.00 lf	1,640	-	-	2,131	-	3,771	8,139	
Site demolition cut off timber piles to 2' below grade	1,611.00 ea	16,510	-	-	8,055	-	24,565	52,783	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, shore driven	100.00 lf	20,081	9,240	-	74,655	-	103,976	225,406	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, barge driven	200.00 lf	60,243	27,720	-	223,965	-	311,928	676,219	
02 Canal		15,954,109	61,105,963	74,442,362	20,234,495	5,453,726	177,190,655	373,533,190	
Orleans Ave Canal		18,843,436	88,886,586	91,451,422	24,136,019	5,453,726	228,771,190	484,445,206	
Option 2 New Pump Station & Canals		72,740,010	431,559,783	392,365,785	90,863,776	67,778,164	1,055,307,518	2,239,644,442	
Replacement Pump Stations & Deepened Canals	1.00 LS	72,740,010	431,559,783	392,365,785	90,863,776	67,778,164	1,055,307,518	2,239,644,442	

Partial Totals

Description	Amount	Totals	Hours	Rate	Cost Basis	Cost per Unit	Percent of Total
Labor	72,740,010		2,065,387 hrs			72,740,010.310 /LS	3.25%
Material	431,559,783					431,559,783.450 /LS	19.27%
Subcontract	392,365,785					392,365,785.000 /LS	17.52%
Equipment	90,863,776		1,647,448 hrs			90,863,775.640 /LS	4.06%
Real Estate	67,778,164					67,778,163.950 /LS	3.03%
Subtotal	1,055,307,518	1,055,307,518				1,055,307,518.000 /LS	47.12
Mobilization	21,106,150			2.00 %	C	21,106,150.370 /LS	0.94%
Professional Labor Overhead	321,616			135.00 %	C	321,615.900 /LS	0.01%
Sales Tax	47,018,120			9.00 %	C	47,018,120.320 /LS	2.10%
Safety Equipment & Supplies	727,400			1.00 %	C	727,400.100 /LS	0.03%
Consumables	316,109			2.00 %	C	316,109.450 /LS	0.01%
Small Tools & Equipment	316,109			2.00 %	C	316,109.450 /LS	0.01%
Bond on Subcontractors	2,784,916			2.00 %	C	2,784,916.350 /LS	0.12%
Subtotal	72,590,420	1,127,897,938				1,127,897,938.000 /LS	3.24
General Conditions	67,673,876			6.00 %	T	67,673,876.420 /LS	3.02%
GC Total	67,673,876	1,195,571,814				1,195,571,814.000 /LS	3.02
Contingency - Construction	358,671,545			30.00 %	T	358,671,545.010 /LS	16.01%
Total Contingency	358,671,545	1,554,243,359				1,554,243,359.000 /LS	16.01
Escalation	108,797,035			7.00 %	T	108,797,035.320 /LS	4.86%
Total Escalation	108,797,035	1,663,040,394				1,663,040,394.000 /LS	4.86
Contractor Overhead & Profit	166,304,040			10.00 %	T	166,304,039.700 /LS	7.43%
Total OH&P	166,304,040	1,829,344,434				1,829,344,434.000 /LS	7.43
Builder's Risk Insurance	9,146,722			0.50 %	T	9,146,722.180 /LS	0.41%
Deson Build Insurance	36,586,889			2.00 %	T	36,586,888.730 /LS	1.63%
Performance & Pavment Bond	27,440,167			1.50 %	T	27,440,166.550 /LS	1.23%
Total bonds & Insurance	73,173,778	1,902,518,212				1,902,518,212.000 /LS	3.27
Engineering Design	114,151,093			6.00 %	T	114,151,092.850 /LS	5.10%
Final Construction Support	57,075,546			3.00 %	T	57,075,546.430 /LS	2.55%
Engineering Support	171,226,639	2,073,744,851				2,073,744,851.000 /LS	7.65
Client Rep Management	103,687,243			5.00 %	T	103,687,242.670 /LS	4.63%
Constr Design Channels/Flood	62,212,346			3.00 %	T	62,212,345.600 /LS	2.78%
Client Subtotal	165,899,589	2,239,644,440				2,239,644,440.000 /LS	7.41
Partial Total	2,239,644,440	2,239,644,440				2,239,644,440.000 /LS	26

Option 2a

Sewerage & Water Board of New Orleans
City of New Orleans, LA.
Opinion of Probable Construction Cost

Project name	New Orleans PS Alts New Orleans LA USA
Client	New Orleans S&WB
Engineer	AECOM
Estimator	Dan Schottlander CPE
Labor rate table	Louisiana DB 2010
Equipment rate table	Equipment - ETI
Job size	1 LS
Duration	36 Mos
Bid date	4/22/2012 5:00 PM
Project Division Office	Water AECOMUSA New Orleans
Principal Party Estimating Office	Ron Schumann PE Newport Beach, CA.
Contract Type I	ROM
Contract II	LS
EST Class Level	1
Est Purpose	OPCC
FY Estimate	2010
Est Number	10-024
Notes	<p>Opinion of Probable of Construction Cost for conceptual Alternate Pump Station Designs for the City of New Orleans, LA.</p> <p>Three Design Options: Option 1 - New Pump Stations at 17th, Orleans & London Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals & Deepened Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals, Deepened Canals & new PS at Hoey's Basin</p> <p>Scope of work includes; Erosion & traffic controls, sitework, earthwork, shoring, pump stations, canals, site restoration. Estimated construction start date 1Q 2012. Escalation is calculated to midpoint of construction. Project is prevailing wage. Liquidated Damages are not included. Estimated construction period 1095 calendar days.</p> <p>The enclosed Opinion of Probable Construction Cost is only an opinion of possible construction costs for budgeting purposes. This opinion is limited to the conditions existing at issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to; local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events and developing bidding conditions, etc. may affect the accuracy of this estimate. AECOM is not responsible for any variance from this estimate or actual prices and conditions obtained.</p>
Report format	Sorted by 'Job Phase/Option/Canal/Structure' 'Canal' summary Allocate addons

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price
Option 2A New Pump Station, Canals & Hoey's Basin								
17th St Ave Canal		22,066,148	161,043,912	146,838,545	28,914,288	37,797,851	396,660,743	841,857,005
GR General Requirements		1,291,818	90,701	2,062,500	168,220		3,613,238	8,010,788
Hoey's Basin		7,495,179	62,958,060	35,517,203	3,844,244	3,327,920	113,142,606	242,916,359
London Ave Canal		28,217,891	158,396,096	146,016,566	33,677,029	22,520,712	388,828,293	824,922,355
Orleans Ave Canal		18,843,436	88,886,611	90,451,422	24,136,019	5,453,726	227,771,215	482,410,240
Option 2A New Pump Station, Canals & Hoey's Basin		77,914,471	471,375,380	420,886,236	90,739,799	69,100,209	1,130,016,096	2,400,116,748
Replacement Pump Stations, Deepened Canals, New PS at Hoey's Basin	1.00 LS							

Partial Totals

Description	Amount	Totals	Hours	Rate	Cost Basis	Cost per Unit	Percent of Total
Labor	163,483,011		2,137,252 hrs			163,483,011.430 /LS	6.81%
Material	1,020,794,445					1,020,794,445.320 /LS	42.53%
Subcontract	875,996,092					875,996,091.700 /LS	36.50%
Equipment	196,069,031		1,659,114 hrs			196,069,031.130 /LS	8.17%
Real Estate	143,774,168					143,774,167.930 /LS	5.99%
Client Subtotal	2,400,116,747	2,400,116,747				2,400,116,747.000 /LS	100.00
Partial Total		2,400,116,747				2,400,116,747.000 /LS	

Sewerage & Water Board of New Orleans
City of New Orleans, LA.
Opinion of Probable Construction Cost

Project name	New Orleans PS Alts New Orleans LA USA
Client	New Orleans S&WB
Engineer	AECOM
Estimator	Dan Schottlander CPE
Labor rate table	Louisiana DB 2010
Equipment rate table	Equipment - ETI
Job size	1 LS
Duration	36 Mos
Bid date	4/22/2012 5:00 PM
Project Division Office	Water AECOMUSA New Orleans
Principal Party Estimating Office	Ron Schumann PE Newport Beach, CA.
Contract Type I	ROM
Contract II	LS
EST Class Level	1
Est Purpose	OPCC
FY Estimate	2010
Est Number	10-024
Notes	<p>Opinion of Probable of Construction Cost for conceptual Alternate Pump Station Designs for the City of New Orleans, LA.</p> <p>Three Design Options: Option 1 - New Pump Stations at 17th, Orleans & London Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals & Deepened Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals, Deepened Canals & new PS at Hoey's Basin</p> <p>Scope of work includes; Erosion & traffic controls, sitework, earthwork, shoring, pump stations, canals, site restoration. Estimated construction start date 1Q 2012. Escalation is calculated to midpoint of construction. Project is prevailing wage. Liquidated Damages are not included. Estimated construction period 1095 calendar days.</p> <p>The enclosed Opinion of Probable Construction Cost is only an opinion of possible construction costs for budgeting purposes. This opinion is limited to the conditions existing at issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to; local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events and developing bidding conditions, etc. may affect the accuracy of this estimate. AECOM is not responsible for any variance from this estimate or actual prices and conditions obtained.</p>
Report format	Sorted by 'Job Phase/Option/Canal/Structure' 'Structure' summary Allocate addons

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price
Option 2A New Pump Station, Canals & Hoey's Basin								
17th St Ave Canal								
01 Pump Station		5,504,468	85,405,986	55,649,920	7,217,389		153,777,763	330,237,765
02 Canal		16,561,680	75,637,926	91,188,624	21,696,899	37,797,851	242,882,980	511,619,240
03 Breakwater				0			0	0
17th St Ave Canal		22,066,148	161,043,912	146,838,545	28,914,288	37,797,851	396,660,743	841,857,005
GR General Requirements								
04 Miscellaneous		1,291,818	90,701	2,062,500	168,220		3,613,238	8,010,788
GR General Requirements		1,291,818	90,701	2,062,500	168,220		3,613,238	8,010,788
Hoey's Basin								
01 Pump Station		7,495,179	62,958,060	35,517,203	3,844,244	1,327,920	111,142,606	238,747,831
02 Canal						2,000,000	2,000,000	4,168,528
Hoey's Basin		7,495,179	62,958,060	35,517,203	3,844,244	3,327,920	113,142,606	242,916,359
London Ave Canal								
01 Pump Station		4,664,276	74,457,987	47,455,556	6,088,454		132,666,273	284,943,027
02 Canal		23,553,615	83,938,110	98,561,009	27,588,574	22,520,712	256,162,021	539,979,328
London Ave Canal		28,217,891	158,396,096	146,016,566	33,677,029	22,520,712	388,828,293	824,922,355
Orleans Ave Canal								
01 Pump Station		2,889,327	27,780,624	16,009,060	3,901,524		50,580,534	108,739,223
02 Canal		15,954,109	61,105,988	74,442,362	20,234,495	5,453,726	177,190,680	373,671,017
Orleans Ave Canal		18,843,436	88,886,611	90,451,422	24,136,019	5,453,726	227,771,215	482,410,240
Option 2A New Pump Station, Canals & Hoey's Basin								
		77,914,471	471,375,380	420,886,236	90,739,799	69,100,209	1,130,016,096	2,400,116,748
Replacement Pump Stations, Deepened Canals, New PS at Hoey's Basin								
	1.00 LS	77,914,471	471,375,380	420,886,236	90,739,799	69,100,209	1,130,016,096	2,400,116,748

Partial Totals

Description	Amount	Totals	Hours	Rate	Cost Basis	Cost per Unit	Percent of Total
Labor	163,483,011		2,137,252 hrs		163,483,011.430	/LS	6.81%
Material	1,020,794,445				1,020,794,445.320	/LS	42.53%
Subcontract	875,996,092				875,996,091.700	/LS	36.50%
Equipment	196,069,031		1,659,114 hrs		196,069,031.130	/LS	8.17%
Real Estate	143,774,168				143,774,167.930	/LS	5.99%
Client Subtotal	2,400,116,747	2,400,116,747			2,400,116,747.000	/LS	100.00
Partial Total		2,400,116,747			2,400,116,747.000	/LS	

Sewerage & Water Board of New Orleans
City of New Orleans, LA.
Opinion of Probable Construction Cost

Project name	New Orleans PS Alts New Orleans LA USA
Client	New Orleans S&WB
Engineer	AECOM
Estimator	Dan Schottlander CPE
Labor rate table	Louisiana DB 2010
Equipment rate table	Equipment - ETI
Job size	1 LS
Duration	36 Mos
Bid date	4/22/2012 5:00 PM
Project Division Office	Water AECOMUSA New Orleans
Principal Party Estimating Office	Ron Schumann PE Newport Beach, CA.
Contract Type I	ROM
Contract II	LS
EST Class Level	1
Est Purpose	OPCC
FY Estimate	2010
Est Number	10-024
Notes	<p>Opinion of Probable of Construction Cost for conceptual Alternate Pump Station Designs for the City of New Orleans, LA.</p> <p>Three Design Options: Option 1 - New Pump Stations at 17th, Orleans & London Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals & Deepened Canals Option 2A - New Pump Stations at 17th, Orleans & London Canals, Deepened Canals & new PS at Hoey's Basin</p> <p>Scope of work includes; Erosion & traffic controls, sitework, earthwork, shoring, pump stations, canals, site restoration. Estimated construction start date 1Q 2012. Escalation is calculated to midpoint of construction. Project is prevailing wage. Liquidated Damages are not included. Estimated construction period 1095 calendar days.</p> <p>The enclosed Opinion of Probable Construction Cost is only an opinion of possible construction costs for budgeting purposes. This opinion is limited to the conditions existing at issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to; local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events and developing bidding conditions, etc. may affect the accuracy of this estimate. AECOM is not responsible for any variance from this estimate or actual prices and conditions obtained.</p>
Report format	Sorted by 'Job Phase/Option/Canal/Structure' 'Detail' summary Combine items Print sort level notes

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
Option 2A New Pump Station, Canals & Hoey's Basin									
17th St Ave Canal									
01 Pump Station									
Miscellaneous	1.00 ls	25,000	25,000	25,000	25,000	-	100,000	214,676	
Miscellaneous	1.00 ls	-	-	200,000	-	-	200,000	420,853	Allowance
Geophysical Survey	5.00 day	-	8,250	-	-	-	8,250	17,938	Verification & location of existing site utilities.
3 - Man survey Crew	120.00 day	114,841	9,000	-	12,000	-	135,841	290,760	
Temporary Construction Roads - 8"gravel	20,000.00 sf	36,000	50,400	-	10,600	-	97,000	209,464	
Dump Truck Semi	1,500.00 hr	21,816	75,000	-	69,000	-	165,816	359,655	Off-site disposal. 2 hr R/T.Disposal fee \$100 per load.
Demolition Debris Removal- Transport To Landfill	500.00 ton	-	-	7,500	-	-	7,500	15,782	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	500.00 ton	-	-	27,500	-	-	27,500	57,867	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	500.00 ton	-	-	16,000	-	-	16,000	33,668	
Demo Generator Buildings	14,400.00 sf	62,667	-	-	23,040	-	85,707	183,842	
Demo Process Piping & Mechanical Systems	14,400.00 sf	13,731	-	-	9,831	-	23,561	50,679	
Demo Process Electrical Systems	14,400.00 sf	13,731	-	-	9,831	-	23,561	50,679	
Demo Horizontal Screw Pump	6.00 ea	15,256	-	-	10,923	-	26,179	56,310	
Demo Constant Duty Pump	6.00 ea	15,256	-	-	10,923	-	26,179	56,310	
Demo No.8 B.W.G Steel Tanks	16.00 ea	2,543	-	-	1,821	-	4,363	9,385	
Demo Transformers	12.00 ea	7,628	-	-	5,462	-	13,090	28,155	
Demo Emergency Generator Sets w/Fuel Oil Storage Tanks	16.00 ea	20,342	-	-	14,564	-	34,906	75,080	
Demo Mechanical Buildings	21,760.00 sf	57,058	-	-	40,852	-	97,910	210,600	
Demo Discharge & Suction Pipes 7" - 12.5' Dia.	2,725.00 lf	4,331	-	-	3,101	-	7,431	15,984	
Demo Mass Concrete	44,277.00 cy	481,716	-	-	1,271,529	-	1,753,245	3,792,749	****
Break Concrete On Site & Send To Recycler	32,000.00 cy	30,096	96,000	-	51,084	-	177,180	384,032	
Trucking Demo Materials	500.00 hr	7,272	-	-	20,125	-	27,397	59,277	
Dewatering - Well Point System Installation & 1st mo.	1,000.00 lf	66,175	150	-	24,925	-	91,250	195,755	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
Dewatering - Well Point System Monthly Rental	11,000.00 lf	319,720	1,100	-	-	-	320,820	684,758	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
By-pass piping	1.00 ls	59,074	25,000	-	75,000	-	159,074	343,505	Allowance
Dewatering - Local	1.00 ls	59,074	27,500	-	825,000	-	911,574	1,979,639	
Dewatering - Dredge Material	14,222.00 cy	140,024	35,555	-	88,888	-	264,467	569,419	
12" Pump & Hoses	180.00 day	27,356	45,000	-	45,000	-	117,356	254,068	
Load out	14,222.00 cy	15,306	-	-	24,709	-	40,014	86,389	
Bldg Exc Earth-Dozer	28,935.00 cy	62,080	-	-	58,296	-	120,377	259,247	Berm Removal
Bldg Exc Earth-Loader/Trucks	28,935.00 cy	57,171	144,675	-	57,110	-	258,956	560,752	Berm removal & soil disposal hauling
Bldg Exc Wetland-Backhoe/Truck	14,222.00 cy	29,425	-	-	60,926	-	90,351	195,270	Mat pad excavation for permanent pump station.
Site Fill Earth-Loader/Truck	28,750.00 cy	55,240	-	-	100,949	-	156,190	337,388	Berms
Fill Earth Stockpile - Dozer/Compactor	28,750.00 cy	25,023	560,625	-	56,805	-	642,453	1,395,861	Berms - import material
Bldg Fill Earth-Loader/Truck	3,555.00 cy	18,784	55,458	-	34,327	-	108,569	235,307	
Bldg Fill Rock-Dozer	53,750.00 cy	203,924	-	-	179,551	-	383,475	825,620	****
Fill Rock Loader/Rock Truck	53,750.00 cy	154,913	1,131,975	-	447,539	-	1,734,427	3,764,906	
Gravel Base - Roads	430.00 cy	567	10,062	-	1,287	-	11,916	25,887	
Rip Rap Machine Place	50,000.00 sf	73,395	500,000	-	88,900	-	662,295	1,437,068	
Rip Rap Hand Place Loose	15,000.00 sf	284,955	300,000	-	-	-	584,955	1,260,448	
Sandbags	2,500.00 ea	7,500	7,500	-	-	-	15,000	32,314	
Silt Fence	1,000.00 lf	568	5,775	-	500	-	6,843	14,855	Sediment controls. Includes chain link fence & poles.
Filter Fabric	1,000.00 sy	710	1,925	-	-	-	2,635	5,700	
Stone Check Dams	200.00 cy	142	7,425	-	-	-	7,567	16,447	
Geotextile (woven 200#) for Liner System	1,000.00 sy	167	3,150	-	160	-	3,477	7,553	
Sub - Sheetpiling	50,000.00 sf	-	-	1,500,000	-	-	1,500,000	3,156,396	1000 lf x 50' deep
Treated Wood Piles 14"	474,060.00 vf	1,485,927	12,681,105	-	2,518,628	-	16,685,660	36,219,592	****
Bituminous Base Course 2"	1,500.00 sy	-	-	10,800	-	-	10,800	22,726	
Bituminous Binder Course 2"	1,500.00 sy	-	-	10,800	-	-	10,800	22,726	
Utility Piping Subcontractor - Tie-ins Relocations Repairs	1.00 ls	-	-	100,000	-	-	100,000	210,426	Allowance
8' Chain Link Fence	1,500.00 lf	-	-	37,500	-	-	37,500	78,910	
Sub - Concrete	56,567.00 cy	-	-	19,798,450	-	-	19,798,450	41,661,164	****
Sub - Masonry Subcontr	42,650.00 sf	-	-	853,000	-	-	853,000	1,794,937	
Standard Brick Arch	42,650.00 sf	-	-	319,875	-	-	319,875	673,101	
Purchase Structural Steel	800.00 in	-	472,000	-	-	-	472,000	1,026,253	
Structural Steel Erection	800.00 in	469,238	-	-	320,160	-	789,398	1,697,591	
Steel Roof Deck 18 ga. 1-1/2"	45,450.00 sf	9,309	61,276	-	878	-	71,463	155,006	
Gal Steel Floor Grating 1.50"	38,300.00 sf	11,046	76,600	-	-	-	87,646	190,125	
Misc. Metal	17,500.00 lb	168,245	12,425	-	-	-	180,670	386,094	
Sub - Finish Carpentry - Offices	600.00 sf	-	-	75,000	-	-	75,000	157,820	Allowance - 2 offices 15x20' ea
FRP Weirs	500.00 lf	6,489	25,000	-	5,000	-	36,489	79,078	
Sub - Waterproofing	50,720.00 sf	-	-	50,720	-	-	50,720	106,728	
Roof Deck Insulation 1.50"	113,240.00 sf	41,577	72,700	-	-	-	114,277	246,806	
Sub - Fireproofing	113,240.00 sf	-	-	141,550	-	-	141,550	297,859	
Sub - Membrane Roofing	113,240.00 sf	-	-	566,200	-	-	566,200	1,191,434	
Roof Hatch 2'6" x 4'6"	5.00 ea	69	2,000	-	-	-	2,069	4,496	
Roof Hatch 5'0" x 5'0"	5.00 ea	1,970	6,125	-	-	-	8,095	17,521	
Roof Vents	13.00 ea	720	650	-	-	-	1,370	2,950	
Sub - HM Doors & Frames	2.00 ls	-	-	50,000	-	-	50,000	105,213	

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
01 Pump Station									
Overhead Doors Elec Operated	8.00 ea	-	-	18,400	-	-	18,400	38,718	
Waterproofing Paint System	93,300.00 sf	-	-	116,625	-	-	116,625	245,410	
Sub - Special Coatings	2.00 ls	-	-	400,000	-	-	400,000	841,706	
Alum Louvers Pneumatic	5,000.00 sf	32,446	40,000	-	-	-	72,446	156,219	
Equipment Unloading	10.00 ea	17,346	2,500	-	8,515	-	28,361	60,970	
Equipment Unloading	15.00 ea	28,115	3,750	-	15,938	-	47,802	102,811	
Equipment Rigging / Rough Set - Medium	10.00 ea	5,204	3,500	-	2,555	-	11,258	24,270	
Equipment Rigging / Rough Set - Medium	15.00 ea	8,434	5,250	-	4,781	-	18,466	39,812	
Equipment Rigging / Rough Set - Heavy	25.00 ea	18,743	12,500	-	18,150	-	49,393	106,644	
Equipment - Final Setting Grout Base	75.00 ea	29,811	18,750	-	-	-	48,561	104,393	
Pumps Motors Gears	1.00 ls	59,623	64,725,000	-	25,000	-	64,809,623	140,910,838	11 ea
VFDs for Pumps	9.00 ea	357,736	3,150,000	-	135,000	-	3,642,736	7,905,959	
Gates	2.00 ea	9,846	187,130	-	10,000	-	206,976	449,626	60 ft clear opening
36" Butterfly Valve Wafer Type	9.00 ea	5,317	225,000	-	-	-	230,317	500,556	
48" Butterfly Valve Wafer Type	9.00 ea	7,089	450,000	-	-	-	457,089	993,548	
Sub - Cathodic Protection	1.00 ls	-	-	150,000	-	-	150,000	315,640	
Sub - Cathodic Protection	1.00 ls	-	-	250,000	-	-	250,000	526,066	
Instrumentation & Control	1.00 ls	-	-	150,000	-	-	150,000	315,640	
Instrumentation & Control	1.00 ls	-	-	1,000,000	-	-	1,000,000	2,104,264	
Sub - Hoists & Cranes	1.00 ls	-	-	200,000	-	-	200,000	420,853	
Sub - Hoists & Cranes	1.00 ls	-	-	350,000	-	-	350,000	736,492	
Mechanical Subcontractor	1.00 ls	-	-	100,000	-	-	100,000	210,426	
Mechanical Subcontractor	1.00 ls	-	-	4,000,000	-	-	4,000,000	8,417,056	
HVAC subcontract	1.00 ls	-	-	100,000	-	-	100,000	210,426	
HVAC subcontract	1.00 ls	-	-	300,000	-	-	300,000	631,279	
Fuel Tanks	6.00 ea	-	-	450,000	-	-	450,000	946,919	20,000 gal. double containment
Electrical Subcontractor	1.00 ls	-	-	1,275,000	-	-	1,275,000	2,682,936	
Electrical Subcontractor	1.00 ls	-	-	12,000,000	-	-	12,000,000	25,251,167	
Generator Subcontractor	11.00 ea	-	-	11,000,000	-	-	11,000,000	23,146,903	3 mgw each
Site demolition chain link fence w/ barbed wire, 3 strands	500.00 lf	1,025	-	-	1,332	-	2,357	5,084	
Site demolition cut off timber piles to 2' below grade	3,724.00 ea	38,165	-	-	18,620	-	56,785	121,938	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, shore driven	200.00 lf	40,162	18,480	-	149,310	-	207,952	450,536	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, barge driven	200.00 lf	60,243	27,720	-	223,965	-	311,928	675,805	
01 Pump Station		5,504,468	85,405,986	55,649,920	7,217,389		153,777,763	330,237,765	
02 Canal									
Real Estate Easement Aquisitions	1.00 ls	-	-	-	-	34,350,000	34,350,000	71,594,465	Allowance
Site Restoration - Allowance	1.00 ls	-	-	500,000	-	-	500,000	1,052,132	
Miscellaneous	1.00 ls	-	-	140,000	-	-	140,000	294,597	
Bridge Modifications - 17th Street - RR	1.00 ls	-	-	1,000,000	-	-	1,000,000	2,104,264	
Bridge Modifications - 17th Street - I-10/6-110 Hwy	1.00 ls	-	-	1,410,000	-	-	1,410,000	2,967,012	
Bridge Modifications - 17th Street - Veterans Blvd	1.00 ls	-	-	800,000	-	-	800,000	1,683,411	
Bridge Modifications - 17th Street - Hammond Hwy	1.00 ls	-	-	927,000	-	-	927,000	1,950,653	
Dredge and Upland disposal	1,405,629.00 cy	-	-	33,468,026	-	-	33,468,026	69,133,247	Cost supported by 2010 cost analysis issued by USACE includes data from LA. Size and Type of dredging operation is contractors means and method
Construction Fence	25,600.00 lf	-	204,800	-	-	-	204,800	441,477	Installation and Removal
Trucking - Excavate Material Non Dredged 1 hr Round Trip	1.00 ls	-	-	1,300,000	-	-	1,300,000	2,685,346	
Crawler Crane 200 ton	8,000.00 hr	328,904	-	-	1,936,000	-	2,264,904	4,856,029	
20x30 barge (Used for By-Pass Pumping Station)	792.00 day	-	-	-	1,188,000	-	1,188,000	2,560,913	
20x30 barge (Used to transport dredged material to off load / load out stagingarea)	2,322.00 day	-	-	-	3,483,000	-	3,483,000	7,508,131	Barges used to move dredged materials to off load / load out area
Demolition Debris Removal- Transport To Landfill	24,893.00 ton	-	-	373,395	-	-	373,395	785,722	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	12,446.00 ton	-	-	684,530	-	-	684,530	1,440,432	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	12,446.00 ton	-	-	398,272	-	-	398,272	838,069	
Demolition Debris Removal- Transport To Landfill	400.00 ton	-	-	6,000	-	-	6,000	12,626	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	200.00 ton	-	-	11,000	-	-	11,000	23,147	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	200.00 ton	-	-	6,400	-	-	6,400	13,467	
Demolition Debris Removal	48,778.00 cy	2,985,760	-	-	2,869,707	-	5,855,467	12,383,480	
Demolition and Relocation of Existing Utilities Crossing	1.00 ls	3,000,000	500,000	-	1,750,000	-	5,250,000	11,077,165	
Demo Masonry Building	23,499.00 sf	102,264	-	-	37,598	-	139,862	300,007	
Demo Process Piping & Mechanical Systems	23,499.00 sf	22,406	-	-	16,043	-	38,449	82,702	
Demo Process Electrical Systems	23,499.00 sf	22,406	-	-	16,043	-	38,449	82,702	
Demo Bridge Crane	3.00 ea	3,814	-	-	2,731	-	6,545	14,078	
Demo Horizontal Screw Pump	9.00 ea	22,884	-	-	16,385	-	39,269	84,465	
Demo Constant Duty Pump	4.00 ea	10,171	-	-	7,282	-	17,453	37,540	
Demo No.8 B.W.G Steel Tanks	13.00 ea	2,066	-	-	1,479	-	3,545	7,625	
Demo Transformers	3.00 ea	1,907	-	-	1,365	-	3,272	7,039	
Demo Emergency Generator Sets w/Fuel Oil Storage Tanks	2.00 ea	2,543	-	-	1,821	-	4,363	9,385	
Demo Exhaust Silencers	2.00 ea	318	-	-	228	-	546	1,173	
Demo Steel Suction Screen w/Cleaning Equipment	10,474.00 sf	27,464	-	-	19,664	-	47,128	101,371	
Demo Discharge & Suction Pipes 7" - 12.5 Dia.	600.00 lf	954	-	-	683	-	1,637	3,519	
Demo Concrete Slab On Grade 12"-18"	2,774.00 cy	36,694	-	-	93,623	-	130,317	281,875	
Demo Concrete Susp Slab 12"-18"	1,029.00 cy	20,417	-	-	52,093	-	72,510	156,840	
Demo Concrete Walls 12"-18" w/ Footings	7,572.00 cy	205,951	-	-	543,624	-	749,575	1,621,536	
Demo Mass Concrete	618.00 cy	6,724	-	-	17,747	-	24,471	52,938	
Demolition Concrete Levee Walls 7' high, Expose Existing Sheet Pile Wall	25,600.00 lf	3,635,200	-	-	550,400	-	4,185,600	8,731,875	
Demo Roofing - Copper Standing Seam	32,693.00 sf	13,713	33	-	-	-	13,713	29,267	
Demo Gutters- Copper	570.00 lf	1,594	-	-	475	-	2,069	4,434	

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
02 Canal									
Demo Downspouts- Copper	660.00 vf	1,845	-	-	550	-	2,395	5,134	
Demo Steel Beams & Columns (377 tons)	525.00 ea	28,130	-	-	26,913	-	55,042	118,551	
Demo Steel Beams @ Bar Screen Framing (72 tons)	76.00 ea	4,072	-	-	3,896	-	7,968	17,162	
Demo Steel Trusses	30.00 ea	4,822	-	-	4,614	-	9,436	20,323	
Break Concrete On Site & Send To Recycler	20,145.00 cy	18,946	60,435	-	32,159	-	111,540	241,760	
Trucking Demo Materials	2,500.00 hr	36,360	-	-	100,625	-	136,985	292,383	
Asbestos Abatement - sub	1.00 ls	-	-	70,000	-	-	70,000	147,298	Allowance
Lead Abatement - sub	1.00 ls	-	-	70,000	-	-	70,000	147,298	Allowance
Site Yard Rental	3.00 ls	-	-	360,000	-	-	360,000	743,634	12 months - 2 yards
8' Aqua-Barrier-Useable	800.00 lf	2,274	208,000	-	946	-	211,220	455,135	Price is for 8' high aqua-barrier (monthly rental rate) and does not include installation. Barrier is capable of controlling up to 7' of standing water and sediment depth. Typical size 8' high x 100' long. Material price includes freight. Used to keep water put of canal construction zone.
6 foot Hesco Basket (RDFW) C3315 3x3x15	2,560.00 ea	-	1,926,758	-	-	-	1,926,758	4,153,418	Price is for 7' high portadam barrier and includes shipping. Barrier is capable of controlling up to 6' of standing water and sediment depth. Price doesn't include installation. Linear Foot price is based on cost for one months rental.
6 foot Hesco Basket (RDFW) C4315 4x3x3	2,560.00 ea	-	2,023,347	-	-	-	2,023,347	4,361,629	Price is for 7' high portadam barrier and includes shipping. Barrier is capable of controlling up to 6' of standing water and sediment depth. Price doesn't include installation. Linear Foot price is based on cost for one months rental.
By-pass piping	1.00 ls	29,537	15,000	-	35,000	-	79,537	171,753	Allowance
Dewatering - Local	1.00 ls	19,691	2,500	-	75,000	-	97,191	210,532	
Dewatering - Dredge Material	2,315.00 cy	22,793	5,788	-	14,469	-	43,049	92,688	
12" Pump & Hoses	60.00 day	9,119	15,000	-	15,000	-	39,119	84,689	
24" Pump & Hoses	516.00 day	19,605	258,000	-	-	-	277,605	596,851	
Rough Grade Balance of Site	384,000.00 sy	126,299	-	-	134,400	-	260,699	551,772	
Fine Grade Balance of Site	425,000.00 sy	129,180	-	-	-	-	129,180	268,132	
Load out	2,315.00 cy	2,491	-	-	4,022	-	6,513	14,062	
Load out Concrete	120,600.00 cy	129,789	-	-	209,526	-	339,314	721,060	
Site Load Out Excavated Soils	1,060,877.30 cy	1,916,442	-	-	3,252,953	3,447,851	8,617,246	18,112,148	
Canal and Embankment Excavation - Land	609,478.00 cy	1,387,107	-	-	2,872,055	-	4,259,162	9,070,297	
Canal and Embankment Excavation -Muck	313,024.00 cy	213,723	-	-	442,521	-	656,244	1,397,534	
Site Fill Clay-Dozer	294,400.00 cy	1,116,936	19,136,000	-	983,439	-	21,236,375	45,688,847	
Site Fill Blasted Rock-Dozer	64,755.00 cy	357,508	1,704,675	-	260,927	-	2,323,111	4,979,215	
Fill Sand-Loader/Truck - Hesco Baskets (RDFW) 150 lf per Day	46,933.32 cy	61,252	438,827	-	40,334	-	540,413	1,160,041	Crew comprised of Loader/Operator and two labors. approximately 150 liner feet per day. Use of a telabelt to place material in Hesco Baskets where Loader access is limited.
Orange Protection Fence Fence	25,600.00 lf	15,562	59,136	-	-	-	74,698	159,779	
Hydroseeding	1,280,000.00 sf	22,989	70,400	-	8,000	-	101,389	216,719	
Permanent Steel Sheeting 60' Deepby GVR System (Influent GW Barrier)	1,536,000.00 sf	-	48,967,680	9,216,000	-	-	58,183,680	124,594,241	Modified from Databse per Giken and Blue Iron LLC information of Installation per GVR Method
Permanent Steel Sheeting 60' Deep Sealant (Influent GW Barrier)	682,667.00 lf	-	-	2,048,001	-	-	2,048,001	4,230,454	Modified from Databse per Giken and Blue Iron LLC information Material and application to seal joints
Remove Existing Sheetpiling (Pull Out or Cut Off) Random Lengths 30' to 60'	1,536,000.00 sf	-	-	38,400,000	-	-	38,400,000	79,320,980	Unknown Sheetpile walls, length and types may vary, cost is a rough estimate to remove, cutoff or redrive to exceptable e.v.
Site demolition concrete pavement, 10" depth	20,907.00 sf	23,046	-	-	15,680	-	38,727	83,280	
Site demolition, hydrodemolition, concrete pavement, 18" - 24" depth	119,438.00 sf	168,524	-	-	114,660	-	283,185	608,977	
Site demolition concrete retaining walls & footings	719.00 cy	19,022	-	-	17,256	-	36,278	78,116	
Site demolition concrete box channel slabs & walls	1,703.00 cy	45,054	-	-	40,872	-	85,926	185,024	
Site demolition asphalt pavement & curb, 4" to 6" thick	3,572.00 sy	4,081	-	-	6,651	-	10,732	23,170	
Site demolition highway guard rails & barriers, timber, 4" x 8"	200.00 lf	402	-	-	133	-	535	1,147	
Site demolition guard rails & barriers, median barrier, box beam, 6" x 8"	400.00 lf	2,829	-	-	426	-	3,255	6,964	
Site demolition chain link fence w/ barbed wire, 3 strands	1,000.00 lf	2,050	-	-	2,664	-	4,714	10,167	
Site demolition cut off timber piles to 2' below grade	6,916.00 ea	70,877	-	-	34,580	-	105,457	226,457	
Site demolition remove railroad trestle 18" dia. steel piles	57.00 ea	1,168	-	-	1,140	-	2,308	4,972	
Site demolition remove railroad trestle steel beams (141 tons)	71.00 ea	3,638	-	-	3,550	-	7,188	15,483	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, shore driven	150.00 lf	30,122	13,860	-	111,983	-	155,964	337,902	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, barge driven	200.00 lf	60,243	27,720	-	223,965	-	311,928	675,805	
02 Canal		16,561,680	75,637,926	91,188,624	21,696,899	37,797,851	242,882,980	511,619,240	
03 Breakwater			34						
Breakwater Rock - Allowance	1.00 ls	-	-	0	-	-	0	0	NIC

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
03 Breakwater				0			0	0	
17th St Ave Canal		22,066,148	161,043,912	146,838,545	28,914,288	37,797,851	396,660,743	841,857,005	
GR General Requirements									
04 Miscellaneous									
Specialty Permits	1.00 ea		1	-	-	-	1	2	All permits are at no cost.
Prints & Records	99.00 set	-	12,375	-	-	-	12,375	26,907	
Administrative	750.00 mh	15,000	-	-	-	-	15,000	51,664	
Project Engineer	875.00 mh	39,244	-	-	-	-	39,244	135,166	
CADD	1,000.00 mh	36,000	-	-	-	-	36,000	123,994	
Project Engineer	1,875.00 mh	84,094	-	-	-	-	84,094	289,641	
Procurement	1,125.00 mh	39,375	-	-	-	-	39,375	135,618	
Project Manager	1,605.00 mh	84,343	-	-	-	-	84,343	290,499	****
CQC Manager	105.00 wk	270,572	-	-	26,552	-	297,124	624,380	
CQC Specialist	11,700.00 mh	421,200	40,950	-	74,393	-	536,543	1,132,890	
Field Sampler	1,495.00 day	301,990	37,375	-	67,275	-	406,640	859,983	a 4 yr. degreed, w/ 2 yr. experience
Material Testing - ls	1.00 ls	-	-	187,500	-	-	187,500	394,550	
Soil Testing - ls	1.00 ls	-	-	937,500	-	-	937,500	1,972,747	
Concrete Testing - ls	1.00 ls	-	-	937,500	-	-	937,500	1,972,747	
04 Miscellaneous		1,291,818	90,701	2,062,500	168,220		3,613,238	8,010,788	
GR General Requirements		1,291,818	90,701	2,062,500	168,220		3,613,238	8,010,788	
Hoey's Basin									
01 Pump Station									
3 - Man survey Crew	150.00 day	143,551	11,250	-	15,000	-	169,801	363,451	
Construction Fence	3,000.00 lf	-	24,000	-	-	-	24,000	52,182	Installation and Removal
Trucking - Excavate Material Non Dredged 1 hr Round Trip	1.00 ls	-	-	1,300,000	-	-	1,300,000	2,735,543	
Crawler Crane 200 ton	4,000.00 hr	164,452	-	-	968,000	-	1,132,452	2,455,671	
Demolition Subcontract	1.00 ls	-	-	75,000	-	-	75,000	157,820	
Demolition Debris Removal	5,000.00 cy	306,056	-	-	294,160	-	600,216	1,292,786	
Asphalt Pavement Demolition	1,333.00 sy	691	-	-	1,688	-	2,379	5,145	
Demolition Concrete Levee Walls 7' high, Expose Existing Sheet Pile Wall	25,600.00 lf	3,635,200	-	-	550,400	-	4,185,600	8,955,191	
Trucking Demo Materials	500.00 hr	7,272	-	-	20,125	-	27,397	59,277	
Site Yard Rental	1.00 ls	-	-	120,000	-	-	120,000	252,512	12 months - 2 yards
Sub - Dewatering	1.00 ls	-	-	25,000	-	-	25,000	52,607	
Sub - Dewatering	1.00 ls	-	-	100,000	-	-	100,000	210,426	
24" Pump & Hoses	258.00 day	9,802	129,000	-	-	-	138,802	301,401	
Rough Grade Balance of Site	66,000.00 sy	21,708	-	-	23,100	-	44,808	96,555	
Fine Grade Balance of Site	66,000.00 sy	20,061	-	-	-	-	20,061	42,815	
Site Exc Earth-Excavator	13,688.00 cy	12,863	-	0	22,966	-	35,829	77,388	
Load out	8,474.00 cy	6,857	-	-	11,069	-	17,926	38,702	
Load out Concrete	120,600.00 cy	129,789	-	-	209,526	-	339,314	732,567	
Site Load/Haul to Stockpile-Loader	5,214.00 cy	9,419	-	-	15,988	-	25,407	54,864	
Site Load Out Excavated Soils	2,437.00 cy	4,402	-	-	7,473	7,920	19,795	42,151	
Canal and Embankment Excavation - Land	2,119.00 cy	4,823	-	-	9,985	-	14,808	32,004	
Site Fill Earth-Loader/Truck	5,214.00 cy	10,018	-	-	18,308	-	28,326	61,187	
Site Fill Topsoil-Dozer Retained cut	3,600.00 sy	1,418	-	-	1,035	-	2,453	5,277	6' deep
Bldg Fill Stone-Backhoe/Truck	888.00 cy	1,497	16,739	-	2,079	-	20,315	44,111	
Limestone Gravel fill at Slabs	3,600.00 cy	39,185	49,140	-	29,012	-	117,337	253,554	
Gravel Base - Roads	430.00 cy	567	10,062	-	1,287	-	11,916	25,887	
Crushed Gravel -Roads	888.00 cy	1,561	27,066	-	3,545	-	32,172	69,888	
Hydroseeding	55,000.00 sf	988	3,025	-	344	-	4,357	9,433	
Steel Sheetting 30' Deep Exc	66,000.00 sf	-	1,980,000	396,000	-	1,320,000	3,696,000	7,889,559	
Permanent Steel Sheetting 60' GVR System (Influent GW Barrier)	132,000.00 sf	-	4,208,160	792,000	-	-	5,000,160	10,816,227	
Permanent Steel Sheetting 60' Sealant (Influent GW Barrier)	58,667.00 lf	-	-	176,001	-	-	176,001	370,353	
Remove Temporary Sheet Pile walls	66,000.00 sf	-	-	1,650,000	-	-	1,650,000	3,472,035	Unknown Sheetpile walls, length and types may vary, cost is a rough estimate to remove, cutoff or redrive to excepttable e.v.
Treated Wood Piles 12"	45,660.00 vf	128,808	1,038,194	-	218,328	-	1,385,330	3,006,921	****
Treated Wood Piles 14"	53,760.00 vf	168,509	1,438,080	-	285,621	-	1,892,210	4,107,424	****
Treated Wood Piles 14"	50,000.00 vf	141,051	1,337,500	-	159,560	-	1,638,111	3,556,044	****
Jack & Bore Sub	700.00 lf	-	-	3,500,000	-	-	3,500,000	7,364,924	****
Bituminous Base Course 2"	1,000.00 sy	-	-	7,200	-	-	7,200	15,151	
Bituminous Base Course 2"	1,333.00 sy	-	-	8,638	-	-	8,638	18,176	
Bituminous Base Course 2"	500.00 sy	-	-	3,600	-	-	3,600	7,575	
Bituminous Binder Course 2"	1,000.00 sy	-	-	7,200	-	-	7,200	15,151	
Bituminous Binder Course 2"	1,333.00 sy	-	-	8,665	-	-	8,665	18,232	
Bituminous Binder Course 2"	500.00 sy	-	-	3,600	-	-	3,600	7,575	
Saw Cut Asphalt 4" Thick	800.00 lf	286	-	-	141	-	427	918	
Trench Excav & Lay Pipe 18-20'	2,230.00 lf	261,270	5,575,000	-	113,284	-	5,949,554	12,925,540	156" dia. RCP - 2 pipelines
Lay Pipe Above Ground	7,270.00 lf	425,882	18,175,000	-	184,658	-	18,785,540	40,827,687	156" dia. RCP - 2 pipelines
Steel Sheetting Pits	44,600.00 sf	78,381	89,200	-	33,985	-	201,566	435,123	Includes sheetting rental
Trench Box 12' Deep	800.00 lf	-	-	-	4,000	-	4,000	8,697	
Trench Box 20' Deep	2,230.00 lf	-	-	-	22,300	-	22,300	48,486	
Utility Bed Sand	1,652.00 cy	5,934	41,749	-	8,831	-	56,514	122,640	
Reuse Trench Spoils @ Cover	28,014.00 cy	100,625	-	-	149,754	-	250,379	540,365	
Spoils to Waste	3,372.00 cy	2,878	-	-	5,959	-	8,837	19,098	
Load Spoils From Stockpile (Load Only)	3,372.00 cy	1,273	-	-	1,142	-	2,415	5,201	
3000 psi Thrust Block Concrete	250.00 cy	5,467	24,150	-	5,000	-	34,617	75,048	
RCP Class V Mortar Joint 96	3,600.00 lf	435,326	35	-	-	-	435,326	929,101	
8' Chain Link Fence	1,000.00 lf	-	-	25,000	-	-	25,000	52,607	

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
01 Pump Station									
Miscellaneous	1.00 ls	-	-	150,000	-	-	150,000	315,640	Allowance
Miscellaneous	1.00 ls	25,000	25,000	25,000	25,000	-	100,000	214,676	
Geophysical Survey	5.00 day	-	8,250	-	-	-	8,250	17,938	Verification & location of existing site utilities.
3 - Man survey Crew	100.00 day	95,701	7,500	-	10,000	-	113,201	242,300	
Temporary Construction Roads - 8"gravel	20,000.00 sf	36,000	50,400	-	10,600	-	97,000	209,654	
Dump Truck Semi	1,120.00 hr	16,289	56,000	-	51,520	-	123,809	268,543	Off-site disposal. 2 hr R/T.Disposal fee \$100 per load.
Demolition Debris Removal- Transport To Landfill	400.00 ton	-	-	6,000	-	-	6,000	12,626	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	400.00 ton	-	-	22,000	-	-	22,000	46,294	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	400.00 ton	-	-	12,800	-	-	12,800	26,935	
Demo Generator Buildings	14,400.00 sf	62,667	-	-	23,040	-	85,707	183,842	
Demo Process Piping & Mechanical Systems	14,400.00 sf	13,731	-	-	9,831	-	23,561	50,679	
Demo Process Electrical Systems	14,400.00 sf	13,731	-	-	9,831	-	23,561	50,679	
Demo Horizontal Screw Pump	4.00 ea	10,171	-	-	7,282	-	17,453	37,540	
Demo Constant Duty Pump	4.00 ea	10,171	-	-	7,282	-	17,453	37,540	
Demo No.8 B.W.G Steel Tanks	4.00 ea	636	-	-	455	-	1,091	2,346	
Demo Transformers	4.00 ea	2,543	-	-	1,821	-	4,363	9,385	
Demo Emergency Generator Sets w/Fuel Oil Storage Tanks	4.00 ea	5,085	-	-	3,641	-	8,726	18,770	
Demo Mechanical Buildings	10,000.00 sf	26,221	-	-	18,774	-	44,996	96,783	
Demo Discharge & Suction Pipes 7" - 12.5' Dia.	4,600.00 lf	7,310	-	-	5,234	-	12,544	26,982	
Demo Mass Concrete	42,055.00 cy	457,542	-	-	1,207,719	-	1,665,260	3,602,414	****
Break Concrete On Site & Send To Recycler	42,055.00 cy	39,552	126,165	-	67,136	-	232,853	504,703	
Trucking Demo Materials	400.00 hr	5,818	-	-	16,100	-	21,918	47,422	
Dewatering - Well Point System Installation & 1st mo.	1,000.00 lf	66,175	150	-	24,925	-	91,250	195,755	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
Dewatering - Well Point System Monthly Rental	11,000.00 lf	319,720	1,100	-	-	-	320,820	684,758	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
By-pass piping	1.00 ls	59,074	25,000	-	75,000	-	159,074	343,505	Allowance
Dewatering - Local	1.00 ls	59,074	27,500	-	825,000	-	911,574	1,979,639	
Dewatering - Dredge Material	10,667.00 cy	105,023	26,668	-	66,669	-	198,359	427,084	
12" Pump & Hoses	180.00 day	27,356	45,000	-	45,000	-	117,356	254,068	
Load out	10,667.00 cy	11,480	-	-	18,532	-	30,012	64,795	
Bldg Exc Earth-Dozer	28,935.00 cy	62,080	-	-	58,296	-	120,377	259,247	Berm Removal
Bldg Exc Earth-Loader/Trucks	28,935.00 cy	57,171	144,675	-	57,110	-	258,956	560,752	Berm removal & soil disposal hauling
Bldg Exc Wetland-Backhoe/Truck	10,667.00 cy	22,070	-	-	45,697	-	67,767	146,460	Mat pad excavation for permanent pump station.
Site Fill Earth-Loader/Truck	23,000.00 cy	44,192	-	-	80,759	-	124,952	269,910	Berms
Fill Earth Stockpile - Dozer/Compactor	23,000.00 cy	20,018	448,500	-	45,444	-	513,962	1,116,689	Berms - import material
Bldg Fill Earth-Loader/Truck	2,667.00 cy	14,092	41,605	-	25,753	-	81,450	176,530	
Bldg Fill Rock-Dozer	48,000.00 cy	182,109	-	-	160,343	-	342,452	737,297	****
Fill Rock Loader/Rock Truck	48,000.00 cy	138,341	1,010,880	-	399,663	-	1,548,884	3,362,148	
Gravel Base - Roads	430.00 cy	567	10,062	-	1,287	-	11,916	25,887	
Rip Rap Machine Place	45,000.00 sf	66,056	450,000	-	80,010	-	596,066	1,293,361	
Rip Rap Hand Place Loose	14,000.00 sf	265,958	280,000	-	-	-	545,958	1,176,418	
Sandbags	3,000.00 ea	9,000	9,000	-	-	-	18,000	38,777	
Silt Fence	1,000.00 lf	568	5,775	-	500	-	6,843	14,855	
Filter Fabric	1,000.00 sy	710	1,925	-	-	-	2,635	5,700	
Stone Check Dams	200.00 cy	142	7,425	-	-	-	7,567	16,447	
Geotextile (woven 200#) for Liner System	1,000.00 sy	167	3,150	-	160	-	3,477	7,553	
Sub - Sheetpiling	40,000.00 sf	-	-	1,200,000	-	-	1,200,000	2,525,117	800 lf x 50' deep
Treated Wood Piles 14"	341,760.00 vf	1,071,237	9,142,080	-	1,815,733	-	12,029,050	26,111,479	****
Bituminous Base Course 2"	1,500.00 sy	-	-	10,800	-	-	10,800	22,726	
Bituminous Binder Course 2"	1,500.00 sy	-	-	10,800	-	-	10,800	22,726	
Utility Piping Subcontractor - Tie-ins Relocations Repairs	1.00 ls	-	-	100,000	-	-	100,000	210,426	Allowance
8" Chain Link Fence	1,500.00 lf	-	-	37,500	-	-	37,500	78,910	
Sub - Concrete	42,204.00 cy	-	-	14,771,400	-	-	14,771,400	31,082,924	****
Sub - Masonry Subcontr	36,250.00 sf	-	-	725,000	-	-	725,000	1,525,591	
Standard Brick Arch	36,250.00 sf	-	-	271,875	-	-	271,875	572,097	
Purchase Structural Steel	700.00 tn	-	413,000	-	-	-	413,000	897,971	
Structural Steel Erection	700.00 tn	410,584	-	-	280,140	-	690,724	1,485,392	
Steel Roof Deck 18 ga. 1-1/2"	11,500.00 sf	2,355	15,504	-	222	-	18,082	39,220	
Gal Steel Floor Grating 1.50"	11,500.00 sf	3,317	23,000	-	-	-	26,317	57,087	
Misc. Metal	19,500.00 lb	187,473	13,845	-	-	-	201,318	430,220	
Sub - Finish Carpentry - Offices	600.00 sf	-	-	75,000	-	-	75,000	157,820	Allowance - 2 offices 15x20' ea
FRP Weirs	500.00 lf	6,489	25,000	-	5,000	-	36,489	79,078	
Sub - Waterproofing	44,400.00 sf	-	-	44,400	-	-	44,400	93,429	
Roof Deck Insulation 1.50"	80,705.00 sf	29,632	51,813	-	-	-	81,444	175,896	
Sub - Fireproofing	80,705.00 sf	-	-	100,881	-	-	100,881	212,281	
Sub - Membrane Roofing	80,705.00 sf	-	-	403,525	-	-	403,525	849,123	
Roof Hatch 2'6"x 4'6"	1.00 ea	14	400	-	-	-	414	899	
Roof Hatch 5'0" x 5'0"	1.00 ea	394	1,225	-	-	-	1,619	3,504	
Roof Vents	3.00 ea	166	150	-	-	-	316	681	
Sub - HM Doors & Frames	2.00 ls	-	-	50,000	-	-	50,000	105,213	
Overhead Doors Elec Operated	4.00 ea	-	-	9,200	-	-	9,200	19,359	
Waterproofing Paint System	11,500.00 sf	-	-	14,375	-	-	14,375	30,249	
Sub - Special Coatings	1.00 ls	-	37	180,000	-	-	180,000	378,768	
Sub - Special Coatings	1.00 ls	-	-	200,000	-	-	200,000	420,853	

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
01 Pump Station									
Alum Louvers Pneumatic	2,000.00 sf	12,978	16,000	-	-	-	28,978	62,488	
Equipment Unloading	8.00 ea	13,877	2,000	-	6,812	-	22,689	48,776	
Equipment Unloading	11.00 ea	20,618	2,750	-	11,688	-	35,055	75,394	
Equipment Rigging / Rough Set - Medium	8.00 ea	4,163	2,800	-	2,044	-	9,007	19,416	
Equipment Rigging / Rough Set - Medium	11.00 ea	6,185	3,850	-	3,506	-	13,542	29,195	
Equipment Rigging / Rough Set - Heavy	19.00 ea	14,245	9,500	-	13,794	-	37,539	81,050	
Equipment - Final Setting Grout Base	57.00 ea	22,657	14,250	-	-	-	36,907	79,338	
Pumps Motors Gears	1.00 ls	59,623	58,285,000	-	25,000	-	58,369,623	126,908,578	10 ea
VFDs for Pumps	8.00 ea	317,987	2,800,000	-	120,000	-	3,237,987	7,027,519	
Gates	2.00 ea	9,846	187,130	-	10,000	-	206,976	449,626	60 ft clear opening
36" Butterfly Valve Wafer Type	8.00 ea	4,726	200,000	-	-	-	204,726	444,939	
48" Butterfly Valve Wafer Type	8.00 ea	6,301	400,000	-	-	-	406,301	883,154	
Sub - Cathodic Protection	1.00 ls	-	-	135,000	-	-	135,000	284,076	
Sub - Cathodic Protection	1.00 ls	-	-	225,000	-	-	225,000	473,459	
Instrumentation & Control	1.00 ls	-	-	135,000	-	-	135,000	284,076	
Instrumentation & Control	1.00 ls	-	-	800,000	-	-	800,000	1,683,411	
Sub - Hoists & Cranes	1.00 ls	-	-	180,000	-	-	180,000	378,768	
Sub - Hoists & Cranes	1.00 ls	-	-	325,000	-	-	325,000	683,886	
Mechanical Subcontractor	1.00 ls	-	-	80,000	-	-	80,000	168,341	
Mechanical Subcontractor	1.00 ls	-	-	4,000,000	-	-	4,000,000	8,417,056	
HVAC subcontract	1.00 ls	-	-	80,000	-	-	80,000	168,341	
HVAC subcontract	1.00 ls	-	-	325,000	-	-	325,000	683,886	
Fuel Tanks	4.00 ea	-	-	300,000	-	-	300,000	631,279	20,000 gal. double containment
Electrical Subcontractor	1.00 ls	-	-	1,150,000	-	-	1,150,000	2,419,903	
Emergency Generator Subcontractor	1.00 ls	-	-	1,800,000	-	-	1,800,000	3,787,675	
Electrical Subcontractor	1.00 ls	-	-	12,500,000	-	-	12,500,000	26,303,299	
Generator Subcontractor	7.00 ea	-	-	7,000,000	-	-	7,000,000	14,729,847	3 mgw each
Site demolition chain link fence w/ barbed wire, 3 strands	500.00 lf	1,025	-	-	1,332	-	2,357	5,083	
Site demolition cut off timber piles to 2' below grade	1,830.00 ea	18,754	-	-	9,150	-	27,904	59,921	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, shore driven	100.00 lf	20,081	9,240	-	74,655	-	103,976	225,268	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, barge driven	200.00 lf	60,243	27,720	-	223,965	-	311,928	675,805	
01 Pump Station		4,664,276	74,457,987	47,455,556	6,088,454		132,666,273	284,943,027	
02 Canal									
Miscellaneous	1.00 ls	-	*	10,000	-	-	10,000	21,043	Allowance
Miscellaneous	1.00 ls	-	*	65,000	-	-	65,000	136,777	Allowance
Bridge Modifications - London Ave. - RR	1.00 ls	-	-	740,000	-	-	740,000	1,557,155	
Bridge Modifications - London Ave. - Gently Blvd	1.00 ls	-	-	977,500	-	-	977,500	2,056,918	
Bridge Modifications - London Ave. - Mirabeau	1.00 ls	-	-	592,500	-	-	592,500	1,246,776	
Bridge Modifications - London Ave. - Filmore Ave	1.00 ls	-	-	335,000	-	-	335,000	704,928	
Bridge Modifications - London Ave. - Robert E Lee Blvd	1.00 ls	-	-	481,000	-	-	481,000	1,012,151	
Bridge Modifications - London Ave. - Leon C Simon Blvd	1.00 ls	-	-	266,000	-	-	266,000	559,734	
Real Estate Easement Aquisitions	1.00 ls	-	-	-	-	18,050,000	18,050,000	37,620,963	Allowance
Site Restoration - Allowance	1.00 ls	-	-	500,000	-	-	500,000	1,052,132	
Dredge and Upland disposal	1,405,629.00 cy	-	-	33,468,026	-	-	33,468,026	69,133,247	Cost supported by 2010 cost analysis issued by USACE includes data from LA. Size and Type of dredging operation is contractors means and method
Construction Fence	30,600.00 lf	-	244,800	-	-	-	244,800	527,703	Installation and Removal
Trucking - Excavate Material Non Dredged 1 hr Round Trip	2.00 ls	-	-	2,600,000	-	-	2,600,000	5,370,691	
Crawler Crane 200 ton	11,000.00 hr	452,243	-	-	2,662,000	-	3,114,243	6,677,040	
20x30 barge (Used for By-Pass Pumping Station)	792.00 day	-	-	-	1,188,000	-	1,188,000	2,560,913	
20x30 barge (Used to transport dredged material to off load / load out stagingarea)	3,096.00 day	-	-	-	4,644,000	-	4,644,000	10,010,841	Barges used to move dredged materials to off load / load out area
Demolition Debris Removal- Transport To Landfill	1,830.00 ton	-	-	27,450	-	-	27,450	57,762	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	915.00 ton	-	-	50,325	-	-	50,325	105,897	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	915.00 ton	-	-	29,280	-	-	29,280	61,613	
Demolition Debris Removal- Transport To Landfill	100.00 ton	-	-	1,500	-	-	1,500	3,156	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	50.00 ton	-	-	2,750	-	-	2,750	5,787	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	50.00 ton	-	-	1,600	-	-	1,600	3,367	
Demolition Debris Removal- Transport To Landfill	568.00 ton	-	-	8,520	-	-	8,520	17,928	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	284.00 ton	-	-	15,620	-	-	15,620	32,869	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	284.00 ton	-	-	9,088	-	-	9,088	19,124	
Demolition Debris Removal- Transport To Landfill	100.00 ton	-	-	1,500	-	-	1,500	3,156	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	50.00 ton	-	-	2,750	-	-	2,750	5,787	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	50.00 ton	-	-	1,600	-	-	1,600	3,367	
Demolition Debris Removal	54,403.00 cy	3,330,073	-	-	3,200,637	-	6,530,710	13,811,523	
Demolition and Relocation of Existing Utilities Crossing	1.00 ls	3,000,000	500,000	-	1,750,000	-	5,250,000	11,077,165	
Demo Masonry Building	10,812.00 sf	29,408	-	-	10,812	-	40,220	86,272	
Demo Process Piping & Mechanical Systems	10,812.00 sf	6,873	-	-	1,730	-	8,603	18,430	
Demo Process Electrical Systems	10,812.00 sf	6,873	-	-	1,730	-	8,603	18,430	
Demo Bridge Crane	1.00 ea	1,271	-	-	910	-	2,182	4,693	
Demo Horizontal Screw Pump	5.00 ea	12,713	-	-	9,103	-	21,816	46,925	
Demo Vertical Submersible Pump	2.00 ea	15,892	-	-	11,378	-	27,270	58,657	
Demo No.8 B.W.G Steel Tanks	7.00 ea	1,112	-	-	796	-	1,909	4,106	
Demo Transformers	6.00 ea	3,814	-	-	2,731	-	6,545	14,078	
Demo Emergency Generator Sets w/Fuel Oil Storage Tanks	1.00 ea	1,589	-	-	1,138	-	2,727	5,866	
Demo Steel Suction Screen w/Cleaning Equipment	2,160.00 sf	5,664	-	-	4,055	-	9,719	20,905	
Demo Discharge & Suction Pipes 7' - 12.5' Dia.	440.00 lf	699	-	-	501	-	1,200	2,581	
Demo Masonry Building	1,584.00 sf	4,308	-	-	1,584	-	5,892	12,639	

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
02 Canal									
Demo Process Piping & Mechanical Systems	1,584.00 sf	1,007	-	-	253	-	1,260	2,700	
Demo Process Electrical Systems	1,584.00 sf	1,007	-	-	253	-	1,260	2,700	
Demo Bridge Crane	2.00 ea	2,543	-	-	1,821	-	4,363	9,385	
Demo Horizontal Screw Pump	2.00 ea	5,085	-	-	3,641	-	8,726	18,770	
Demo Constant Duty Pump	2.00 ea	5,085	-	-	3,641	-	8,726	18,770	
Demo No.8 B.W.G Steel Tanks	4.00 ea	636	-	-	455	-	1,091	2,346	
Demo Rotary Converter	1.00 ea	318	-	-	228	-	545	1,173	
Demo Transformers	3.00 ea	1,907	-	-	1,365	-	3,272	7,039	
Demo Emergency Generator Sets w/Fuel Oil Storage Tanks	1.00 ea	1,271	-	-	910	-	2,181	4,693	
Demo Exhaust Silencers	1.00 ea	159	-	-	114	-	273	587	
Demo Steel Suction Screen w/Cleaning Equipment	2,084.00 sf	5,465	-	-	3,913	-	9,377	20,170	
Demo Discharge & Suction Pipes 7" - 12.5" Dia.	298.00 lf	474	-	-	339	-	813	1,748	
Demo Concrete Slab On Grade 12"-18"	1,118.00 cy	14,789	-	-	37,733	-	52,521	113,604	
Demo Concrete Susp Slab 12"-18"	337.00 cy	6,687	-	-	17,061	-	23,747	51,365	
Demo Concrete Slab On Grade 12"-18"	150.00 cy	1,984	-	-	5,063	-	7,047	15,242	
Demo Concrete Susp Slab 12"-18"	68.00 cy	1,349	-	-	3,443	-	4,792	10,365	
Demo Concrete Flume 12" Thick	7,500.00 cy	900,698	-	-	843,750	-	1,744,448	3,688,363	
Demo Concrete Walls 12"-18"	1,570.00 cy	51,243	-	-	94,200	-	145,443	314,182	
Demo Mass Concrete	440.00 cy	4,787	-	-	12,636	-	17,423	37,690	
Demo Concrete Walls 12"-18"	97.00 cy	3,166	-	-	8,357	-	11,523	24,927	
Demo Mass Concrete	176.00 cy	1,915	-	-	5,054	-	6,969	15,076	
Demolition Concrete Levee Walls 7' high, Expose Existing Sheet Pile Wall	58,300.00 lf	8,278,600	-	-	1,253,450	-	9,532,050	19,885,481	
Demo Roofing - Slate Shingles	16,949.00 sf	3,199	-	-	-	-	3,199	6,828	
Demo Gutters- Copper	504.00 lf	1,409	-	-	420	-	1,829	3,921	
Demo Downspouts- Copper	279.00 vf	780	-	-	232	-	1,013	2,170	
Demo Steel Beams & Columns (16 tons)	17.00 ea	911	-	-	871	-	1,782	3,839	
Demo Steel Beams & Columns (17 tons)	18.00 ea	964	-	-	923	-	1,887	4,065	
Demo Steel Trusses	27.00 ea	4,340	-	-	4,152	-	8,492	18,291	
Break Concrete On Site & Send To Recycler	8,234.00 cy	7,744	24,702	-	13,145	-	45,591	98,816	
Trucking Demo Materials	2,500.00 hr	36,360	-	-	100,625	-	136,985	292,383	
Asbestos Abatement - sub	1.00 ls	-	-	5,000	-	-	5,000	10,521	Allowance
Asbestos Abatement - sub	1.00 ls	-	-	32,500	-	-	32,500	68,389	Allowance
Lead Abatement - sub	1.00 ls	-	-	5,000	-	-	5,000	10,521	Allowance
Lead Abatement - sub	1.00 ls	-	-	32,500	-	-	32,500	68,389	Allowance
Site Yard Rental	3.00 ls	-	-	360,000	-	-	360,000	743,634	12 months - 2 yards
8' Aqua-Barrier-Useable	1,600.00 lf	4,549	416,000	-	1,892	-	422,440	910,270	Price is for 8' high aqua-barrier (monthly rental rate) and does not include installation. Barrier is capable of controlling up to 7' of standing water and sediment depth. Typical size 8' high x 100' long. Material price includes freight. Used to keep water put of canal construction zone.
6 foot Hesco Basket (RDFW) C3315 3x3x15	3,060.00 ea	-	2,303,078	-	-	-	2,303,078	4,964,632	Price is for 7' high portadam barrier and includes shipping. Barrier is capable of controlling up to 6' of standing water and sediment depth. Price doesn't include installation. Linear Foot price is based on cost for one months rental.
6 foot Hesco Basket (RDFW) C4315 4x3x3	3,060.00 ea	-	2,418,532	-	-	-	2,418,532	5,213,510	Price is for 7' high portadam barrier and includes shipping. Barrier is capable of controlling up to 6' of standing water and sediment depth. Price doesn't include installation. Linear Foot price is based on cost for one months rental.
By-pass piping	1.00 ls	29,537	15,000	-	35,000	-	79,537	171,753	Allowance
Dewatering - Local	1.00 ls	19,691	2,500	-	75,000	-	97,191	210,532	
Dewatering - Dredge Material	2,315.00 cy	22,793	5,788	-	14,469	-	43,049	92,688	
By-pass piping	1.00 ls	29,537	15,000	-	35,000	-	79,537	171,753	Allowance
Dewatering - Local	1.00 ls	19,691	2,500	-	75,000	-	97,191	210,532	
Dewatering - Dredge Material	2,315.00 cy	22,793	5,788	-	14,469	-	43,049	92,688	
12" Pump & Hoses	120.00 day	18,237	30,000	-	30,000	-	78,237	169,379	
24" Pump & Hoses	516.00 day	19,605	258,000	-	-	-	277,605	596,851	
Rough Grade Balance of Site	433,500.00 sy	142,580	-	-	151,725	-	294,305	623,012	
Fine Grade Balance of Site	474,500.00 sy	144,225	-	-	-	-	144,225	299,361	
Load out	4,630.00 cy	4,983	-	-	8,044	-	13,027	28,124	
Load out Concrete	380,800.00 cy	409,813	-	-	661,587	-	1,071,400	2,276,779	
Site Load Out Excavated Soils	1,375,603.55 cy	2,484,985	-	-	4,217,994	4,470,712	11,173,690	23,485,407	
Canal and Embankment Excavation - Land	800,403.00 cy	1,821,632	-	-	3,771,755	-	5,593,387	11,911,657	
Canal and Embankment Excavation -Muck	395,024.00 cy	269,710	-	-	558,444	-	828,154	1,763,633	
Site Fill Clay-Dozer Sta. 0 + 00 to 20 + 25	34,500.00 cy	130,891	2,242,500	-	115,247	-	2,488,638	5,354,162	
Site Fill Clay-Dozer Sta. 20 + 25 to 153 + 00	209,130.00 cy	793,427	13,593,450	-	698,596	-	15,085,472	32,455,532	
Site Fill Blasted Rock-Dozer	97,905.00 cy	540,528	2,577,349	-	394,504	-	3,512,380	7,528,223	
Fill Sand-Loader/Truck - Hesco Baskets (RDFW) 150 lf per Day	56,100.00 cy	73,215	524,535	-	48,212	-	645,962	1,386,612	Crew comprised of Loader/Operator and two labors, approximately 150 liner feet per

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
02 Canal									
Fill Sand-Loader/Truck - Hesco Baskets (RDFW) 150 lft per Day	56,100.00 cy	73,215	524,535	-	48,212	-	645,962	1,386,612	day, Use of a telabell to place material in Hesco Baskets where Loader access is limited.
Orange Protection Fence Fence	30,600.00 lf	18,602	70,686	-	-	-	89,288	190,985	
Hydroseeding	1,530,000.00 sf	27,478	84,150	-	9,563	-	121,191	259,047	
Permanent Steel Sheeting 60' Deepby GVR System (Influent GW Barrier)	1,836,000.00 sf	-	58,531,680	11,016,000	-	-	69,547,680	148,929,053	
Permanent Steel Sheeting 60' Deep Sealant (Influent GW Barrier)	816,000.00 lf	-	-	2,448,000	-	-	2,448,000	5,056,713	Modified from Dtabse per Giken and Blue Iron LLC information Material and application to seal joints
Remove Existing Sheetpiling (Pull Out or Cut Off) Random Lengths 30' to 60'	1,779,000.00 sf	-	-	44,475,000	-	-	44,475,000	91,869,807	Unknown Sheetpile walls, length and types may vary, cost is a rough estimate to remove, cutoff or redrive to exceptable e.v.
Site demolition concrete pavement, 10" depth	4,071.00 sf	4,488	-	-	3,053	-	7,541	16,216	
Site demolition, hydrodemolition, concrete pavement, 18" - 24" depth	9,020.00 sf	12,727	-	-	8,659	-	21,386	45,990	
Site demolition concrete retaining walls & footings	1,120.00 cy	29,631	-	-	67,200	-	96,831	209,350	
Site demolition concrete box channel slabs & walls	1,130.00 cy	4,983	-	-	12,713	-	17,695	38,274	
Site demolition, hydrodemolition, concrete pavement, 18" - 24" depth	12,517.00 sf	13,798	-	-	9,388	-	23,186	49,860	
Site demolition concrete retaining walls & footings	471.00 cy	12,461	-	-	31,793	-	44,253	95,720	
Site demolition concrete box channel slabs & walls	384.00 cy	10,159	-	-	25,920	-	36,079	78,039	
Site demolition asphalt pavement & curb, 4" to 6" thick	200.00 sf	228	-	-	372	-	601	1,297	
Site demolition highway guard rails & barriers, timber, 4" x 8"	300.00 lf	603	-	-	200	-	802	1,721	
Site demolition guard rails & barriers, median barrier, box beam, 6" x 8"	300.00 lf	2,121	-	-	320	-	2,441	5,223	
Site demolition chain link fence w/ barbed wire, 3 strands	272.00 lf	558	-	-	725	-	1,282	2,765	
Site demolition cut off timber piles to 2' below grade	1,611.00 ea	16,510	-	-	8,055	-	24,565	52,750	
Site demolition chain link fence w/ barbed wire, 3 strands	200.00 lf	410	-	-	533	-	943	2,033	
Site demolition cut off timber piles to 2' below grade	1,838.00 ea	18,836	-	-	9,190	-	28,026	60,183	
Site demolition remove sheet piling	4,992.00 sf	2,558	-	-	2,496	-	5,054	10,886	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, shore driven	180.00 lf	36,146	16,632	-	134,379	-	187,157	405,483	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, barge driven	400.00 lf	120,487	55,440	-	447,930	-	623,857	1,351,609	
02 Canal		23,553,615	83,938,110	98,561,009	27,588,574	22,520,712	256,162,020	539,979,328	
London Ave Canal		28,217,891	158,396,096	146,016,566	33,677,029	22,520,712	388,828,293	824,922,355	
Orleans Ave Canal									
01 Pump Station									
Miscellaneous	1.00 ls	-	-	75,000	-	-	75,000	157,820	Allowance
Miscellaneous	1.00 ls	25,000	25,000	25,000	25,000	-	100,000	214,676	
Geophysical Survey	5.00 day	-	8,250	-	-	-	8,250	17,938	Verification & location of existing site utilities.
3 - Man survey Crew	120.00 day	114,841	9,000	-	12,000	-	135,841	290,760	
Temporary Construction Roads - 8"gravel	20,000.00 sf	36,000	50,400	-	10,600	-	97,000	209,464	
Dump Truck Semi	485.00 hr	7,054	24,250	-	22,310	-	53,614	116,288	Off-site disposal. 2 hr R/T.Disposal fee \$100 per load.
Demolition Debris Removal- Transport To Landfill	250.00 ton	-	-	3,750	-	-	3,750	7,891	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	250.00 ton	-	-	13,750	-	-	13,750	28,934	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	250.00 ton	-	-	8,000	-	-	8,000	16,834	
Demo Generator Buildings	14,400.00 sf	62,667	-	-	23,040	-	85,707	183,842	
Demo Process Piping & Mechanical Systems	14,400.00 sf	13,731	-	-	9,831	-	23,561	50,679	
Demo Process Electrical Systems	14,400.00 sf	13,731	-	-	9,831	-	23,561	50,679	
Demo Horizontal Screw Pump	4.00 ea	10,171	-	-	7,282	-	17,453	37,540	
Demo Constant Duty Pump	4.00 ea	10,171	-	-	7,282	-	17,453	37,540	
Demo No.8 B.W.G Steel Tanks	4.00 ea	636	-	-	455	-	1,091	2,346	
Demo Transformers	4.00 ea	2,543	-	-	1,821	-	4,363	9,385	
Demo Emergency Generator Sets w/Fuel Oil Storage Tanks	4.00 ea	5,085	-	-	3,641	-	8,726	18,770	
Demo Mechanical Buildings	2,500.00 sf	6,555	-	-	4,694	-	11,249	24,196	
Demo Discharge & Suction Pipes 7" - 12.5' Dia.	1,500.00 lf	2,384	-	-	1,707	-	4,091	8,798	
Demo Mass Concrete	35,798.00 cy	389,468	-	-	1,028,033	-	1,417,501	3,066,442	****
Break Concrete On Site & Send To Recycler	35,798.00 cy	33,668	107,394	-	57,147	-	198,209	429,612	
Trucking Demo Materials	250.00 hr	3,636	-	-	10,063	-	13,699	29,639	
Dewatering - Well Point System Instillation & 1st mo.	1,000.00 lf	66,175	150	-	24,925	-	91,250	195,755	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
Dewatering - Well Point System Monthly Rental	11,000.00 lf	319,720	1,100	-	-	-	320,820	684,758	Complete installation, operation, equipment rental, fuel and removal of 2" well point system, 5' O.C.
By-pass piping	1.00 ls	59,074	25,000	-	75,000	-	159,074	343,505	Allowance
Dewatering - Local	1.00 ls	59,074	27,500	-	825,000	-	911,574	1,979,639	
Dewatering - Dredge Material	4,625.00 cy	45,536	11,563	-	28,906	-	86,005	185,175	
12" Pump & Hoses	180.00 day	27,356	45,000	-	45,000	-	117,356	254,068	
Load out	4,625.00 cy	4,977	-	-	8,035	-	13,013	28,094	
Bldg Exc Earth-Dozer	28,935.00 cy	62,080	-	-	58,296	-	120,377	259,247	Berm Removal
Bldg Exc Earth-Loader/Trucks	28,935.00 cy	57,171	144,675	-	57,110	-	258,956	560,752	Berm removal & soil disposal hauling
Bldg Exc Wetland-Backhoe/Truck	4,625.00 cy	9,569	-	-	19,813	-	29,382	63,502	Mat pad excavation for permanent pump station.
Site Fill Earth-Loader/Truck	14,375.00 cy	27,620	-	-	50,475	-	78,095	168,694	Berms
Fill Earth Stockpile - Dozer/Compactor	14,375.00 cy	12,512	280,313	-	28,402	-	321,227	697,931	Berms - import material
Bldg Fill Earth-Loader/Truck	1,156.00 cy	6,108	18,034	-	11,162	-	35,304	76,516	
Bldg Fill Rock-Dozer	39,375.00 cy	149,386	-	-	131,532	-	280,918	604,814	****
Fill Rock Loader/Rock Truck	39,375.00 cy	113,483	829,238	-	327,848	-	1,270,569	2,758,012	
Gravel Base - Roads	430.00 cy	567	10,062	-	1,287	-	11,916	25,887	
Rip Rap Machine Place	40,000.00 sf	58,716	400,000	-	71,120	-	529,836	1,149,655	
Rip Rap Hand Place Loose	12,500.00 sf	237,463	250,000	-	-	-	487,463	1,050,374	

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
01 Pump Station									
Sandbags	2,500.00 ea	7,500	7,500	-	-	-	15,000	32,314	
Silt Fence	1,000.00 lf	568	5,775	-	500	-	6,843	14,855	
Filter Fabric	1,000.00 sy	710	1,925	-	-	-	2,635	5,700	
Stone Check Dams	200.00 cy	142	7,425	-	-	-	7,567	16,447	
Geotextile (woven 200#) for Liner System	1,000.00 sy	167	3,150	-	160	-	3,477	7,553	
Sub - Sheetpiling	25,000.00 sf	-	-	750,000	-	-	750,000	1,578,198	500 lf x 50' deep
Treated Wood Piles 14"	68,865.00 vf	215,855	1,842,139	-	365,872	-	2,423,866	5,261,491	****
Bituminous Base Course 2"	1,500.00 sy	-	-	10,800	-	-	10,800	22,726	
Bituminous Binder Course 2"	1,500.00 sy	-	-	10,800	-	-	10,800	22,726	
Utility Piping Subcontractor - Tie-ins Relocations Repairs	1.00 ls	-	-	100,000	-	-	100,000	210,426	Allowance
8' Chain Link Fence	1,500.00 lf	-	-	37,500	-	-	37,500	78,910	
Sub - Concrete	12,180.00 cy	-	-	4,263,000	-	-	4,263,000	8,970,477	****
Sub - Masonry Subcontr	16,050.00 sf	-	-	321,000	-	-	321,000	675,469	
Standard Brick Arch	16,050.00 sf	-	-	120,375	-	-	120,375	253,301	
Purchase Structural Steel	350.00 tn	-	206,500	-	-	-	206,500	448,986	
Structural Steel Erection	350.00 tn	205,292	-	-	140,070	-	345,362	742,696	
Steel Roof Deck 18 ga. 1-1/2"	5,000.00 sf	1,024	6,741	-	97	-	7,862	17,052	
Gal Steel Floor Grating 1.50"	5,000.00 sf	1,442	10,000	-	-	-	11,442	24,820	
Misc. Metal	10,000.00 lb	96,140	7,100	-	-	-	103,240	220,625	
Sub - Finish Carpentry - Offices	600.00 sf	-	-	75,000	-	-	75,000	157,820	Allowance - 2 offices 15x20' ea
FRP Weirs	500.00 lf	6,489	25,000	-	5,000	-	36,489	79,078	
Sub - Waterproofing	18,360.00 sf	-	-	18,360	-	-	18,360	38,634	
Roof Deck Insulation 1.50"	15,540.00 sf	5,706	9,977	-	-	-	15,682	33,869	
Sub - Fireproofing	15,540.00 sf	-	-	19,425	-	-	19,425	40,875	
Sub - Membrane Roofing	15,540.00 sf	-	-	77,700	-	-	77,700	163,501	
Roof Hatch 2'6" x 4'6"	1.00 ea	14	400	-	-	-	414	899	
Roof Hatch 5'0" x 5'0"	1.00 ea	394	1,225	-	-	-	1,619	3,504	
Roof Vents	2.00 ea	111	100	-	-	-	211	454	
Sub - HM Doors & Frames	2.00 ls	-	-	50,000	-	-	50,000	105,213	
Overhead Doors Elec Operated	2.00 ea	-	-	4,600	-	-	4,600	9,680	
Waterproofing Paint System	10,000.00 sf	-	-	12,500	-	-	12,500	26,303	
Sub - Special Coatings	1.00 ls	-	-	100,000	-	-	100,000	210,426	
Sub - Special Coatings	1.00 ls	-	-	200,000	-	-	200,000	420,853	
Alum Louvers Pneumatic	1,000.00 sf	6,489	8,000	-	-	-	14,489	31,244	
Equipment Unloading	9.00 ea	16,869	2,250	-	9,563	-	28,681	61,686	
Equipment Rigging / Rough Set - Medium	9.00 ea	5,061	3,150	-	2,869	-	11,079	23,887	
Equipment Rigging / Rough Set - Heavy	9.00 ea	6,748	4,500	-	6,534	-	17,782	38,392	
Equipment - Final Setting Grout Base	27.00 ea	10,732	6,750	-	-	-	17,482	37,581	
Pumps Motors Gears	1.00 ls	59,623	22,280,000	-	25,000	-	22,364,623	48,624,207	5 ea
VFDs for Pumps	2.00 ea	79,497	700,000	-	30,000	-	809,497	1,756,880	
Gates	2.00 ea	9,846	187,130	-	10,000	-	206,976	449,626	40 ft clear opening
36" Butterfly Valve Wafer Type	2.00 ea	1,181	50,000	-	-	-	51,181	111,235	
48" Butterfly Valve Wafer Type	2.00 ea	1,575	100,000	-	-	-	101,575	220,788	
Sub - Cathodic Protection	1.00 ls	-	-	75,000	-	-	75,000	157,820	
Sub - Cathodic Protection	1.00 ls	-	-	125,000	-	-	125,000	263,033	
Instrumentation & Control	1.00 ls	-	-	75,000	-	-	75,000	157,820	
Instrumentation & Control	1.00 ls	-	-	500,000	-	-	500,000	1,052,132	
Sub - Hoists & Cranes	1.00 ls	-	-	150,000	-	-	150,000	315,640	
Sub - Hoists & Cranes	1.00 ls	-	-	250,000	-	-	250,000	526,066	
Mechanical Subcontractor	1.00 ls	-	-	50,000	-	-	50,000	105,213	
Mechanical Subcontractor	1.00 ls	-	-	1,000,000	-	-	1,000,000	2,104,264	
HVAC subcontract	1.00 ls	-	-	50,000	-	-	50,000	105,213	
HVAC subcontract	1.00 ls	-	-	150,000	-	-	150,000	315,640	
Fuel Tanks	2.00 ea	-	-	150,000	-	-	150,000	315,640	20,000 gal. double containment
Electrical Subcontractor	1.00 ls	-	-	637,500	-	-	637,500	1,341,468	
Electrical Subcontractor	1.00 ls	-	-	3,500,000	-	-	3,500,000	7,364,924	
Generator Subcontractor	3.00 ea	-	-	3,000,000	-	-	3,000,000	6,312,922	3 mgw each
Site demolition chain link fence w/ barbed wire, 3 strands	500.00 lf	1,025	-	-	1,332	-	2,357	5,084	
Site demolition cut off timber piles to 2' below grade	1,452.00 ea	14,881	-	-	7,260	-	22,141	47,544	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, shore driven	100.00 lf	20,081	9,240	-	74,655	-	103,976	225,268	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, barge driven	200.00 lf	60,243	27,720	-	223,965	-	311,928	675,805	
01 Pump Station		2,889,327	27,780,624	16,009,060	3,901,524		50,580,534	108,739,222	
02 Canal									
Miscellaneous	1.00 ls	-	*	62,000	-	-	62,000	130,464	
Bridge Modifications - Orleans Ave. - I-10	1.00 ls	-	-	1,410,000	-	-	1,410,000	2,967,012	
Bridge Modifications - Orleans Ave. - Harrison Ave	1.00 ls	-	-	336,000	-	-	336,000	707,033	
Bridge Modifications - Orleans Ave. - Filmore Ave	1.00 ls	-	-	125,000	-	-	125,000	263,033	
Bridge Modifications - Orleans Ave. - Robert E Lee Blvd	1.00 ls	-	-	596,000	-	-	596,000	1,254,141	
Real Estate Easement Aquisitions	1.00 ls	-	-	-	-	0	0	0	Allowance
Site Restoration - Allowance	1.00 ls	-	-	500,000	-	-	500,000	1,052,132	
Miscellaneous	0.00 ls	-	25	-	-	-	25	54	
Dredge and Upland disposal	890,093.33 cy	-	-	21,193,122	-	-	21,193,122	43,777,584	Cost supported by 2010 cost analysis issued by USACE includes data from LA. Size and Type of dredging operation is contractors means and method
Construction Fence	22,160.00 lf	-	177,280	-	-	-	177,280	382,154	Installation and Removal
Trucking - Excavate Material Non Dredged 1 hr Round Trip	1.00 ls	-	-	1,300,000	-	-	1,300,000	2,685,346	
Crawler Crane 200 ton	8,000.00 hr	328,904	41	-	1,936,000	-	2,264,904	4,856,029	
20x30 barge (Used for By-Pass Pumping Station)	792.00 day	-	-	-	1,188,000	-	1,188,000	2,560,913	

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
02 Canal									
20x30 barge (Used to transport dredged material to off load / load out stagingarea)	2,322.00 day				3,483,000		3,483,000	7,508,131	Barges used to move dredged materials to off load / load out area
Demolition Debris Removal- Transport To Landfill	2,388.00 ton			35,820			35,820	75,375	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	1,194.00 ton			65,670			65,670	138,187	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	1,194.00 ton			38,208			38,208	80,400	
Demolition Debris Removal- Transport To Landfill	3,558.00 ton			53,370			53,370	112,305	
Demolition Debris Removal- Greater Metro C/D Landfill Charge (2 Tons/Cy)	1,779.00 ton			97,845			97,845	205,892	
Demolition Debris Removal- Highway 90 C/D Landfill Charge (2 Tons/Cy)	1,779.00 ton			56,928			56,928	119,792	
Demolition Debris Removal	48,778.00 cy	2,985,760			2,869,707		5,855,467	12,383,480	
Demolition and Relocation of Existing Utilities Crossing	1.00 ls	3,000,000	500,000		1,750,000		5,250,000	11,077,165	
Demo Masonry Building	10,481.00 sf	28,507			10,481		38,988	83,631	
Demo Process Piping & Mechanical Systems	10,481.00 sf	6,662			4,770		11,433	24,591	
Demo Process Electrical Systems	10,481.00 sf	6,662			4,770		11,433	24,591	
Demo Bridge Crane	1.00 ea	1,271			910		2,182	4,693	
Demo Horizontal Screw Pump	5.00 ea	12,713			9,103		21,816	46,925	
Demo Vertical Submersible Pump	2.00 ea	5,085			3,641		8,726	18,770	
Demo No.8 B.W.G Steel Tanks	7.00 ea	1,112			796		1,909	4,106	
Demo Transformers	6.00 ea	3,814			2,731		6,545	14,078	
Demo Emergency Generator Sets w/Fuel Oil Storage Tanks	1.00 ea	1,589			1,138		2,727	5,866	
Demo Steel Suction Screen w/Cleaning Equipment	4,347.00 sf	11,398			8,161		19,560	42,072	
Demo Discharge & Suction Pipes 7" - 12.5' Dia.	440.00 lf	699			501		1,200	2,581	
Demo Concrete Slab On Grade 12"-18"	1,118.00 cy	14,789			37,733		52,521	113,604	
Demo Concrete Susp Slab 12"-18"	337.00 cy	6,687			17,061		23,747	51,366	
Demo Concrete Walls 12"-18"	1,570.00 cy	51,243			135,260		186,503	403,457	
Demo Mass Concrete	616.00 cy	6,702			17,690		24,392	52,766	
Demolition Concrete Levee Walls 7' high, Expose Existing Sheet Pile Wall	27,905.19 lf	3,962,536			599,961		4,562,498	9,518,148	
Demo Roofing - Slate Shingles	14,459.00 sf	2,729					2,729	5,825	
Demo Gutters- Copper	411.00 lf	1,149			342		1,492	3,197	
Demo Downspouts- Copper	213.00 vf	596			177		773	1,657	
Demo Steel Beams & Columns (33 tons)	35.00 ea	1,875			1,794		3,669	7,903	
Demo Steel Trusses	20.00 ea	3,215			3,076		6,291	13,549	
Break Concrete On Site & Send To Recycler	6,640.00 cy	6,245	19,920		10,600		36,765	79,687	
Trucking Demo Materials	1,900.00 hr	27,634			76,475		104,109	222,211	
Asbestos Abatement - sub	1.00 ls			31,000			31,000	65,232	Allowance
Lead Abatement - sub	1.00 ls			31,000			31,000	65,232	Allowance
Site Yard Rental	3.00 ls			360,000			360,000	743,634	12 months - 2 yards
8' Aqua-Barrier-Useable	800.00 lf	2,274	208,000		946		211,220	455,135	Price is for 8' high aqua-barrier (monthly rental rate) and does not include installation. Barrier is capable of controlling up to 7' of standing water and sediment depth. Typical size 8' high x 100' long. Material price includes freight. Used to keep water put of canal construction zone.
6 foot Hesco Basket (RDFW) C3315 3x3x15	2,216.00 ea		1,667,850				1,667,850	3,595,302	Price is for 7' high portadam barrier and includes shipping. Barrier is capable of controlling up to 6' of standing water and sediment depth. Price doesn't include installation. Linear Foot price is based on cost for one months rental.
6 foot Hesco Basket (RDFW) C4315 4x3x3	2,216.00 ea		1,751,460				1,751,460	3,775,536	Price is for 7' high portadam barrier and includes shipping. Barrier is capable of controlling up to 6' of standing water and sediment depth. Price doesn't include installation. Linear Foot price is based on cost for one months rental.
By-pass piping	1.00 ls	29,537	15,000		35,000		79,537	171,753	Allowance
Dewatering - Local	1.00 ls	19,691	2,500		75,000		97,191	210,532	
Dewatering - Dredge Material	2,315.00 cy	22,793	5,788		14,469		43,049	92,688	
12" Pump & Hoses	60.00 day	9,119	15,000				39,119	84,689	
24" Pump & Hoses	516.00 day	19,605	258,000				277,605	596,851	
Rough Grade Balance of Site	199,440.00 sy	65,597			69,804		135,401	286,629	
Fine Grade Balance of Site	199,440.00 sy	60,620					60,620	125,826	
Load out	2,315.00 cy	2,491			4,022		6,513	14,062	
Load out Concrete	207,345.00 cy	223,143			360,233		583,376	1,239,703	
Site Load Out Excavated Soils	1,678,069.60 cy	3,031,380			5,145,441	5,453,726	13,630,547	28,649,350	
Canal and Embankment Excavation - Land	151,016.00 cy	343,696			711,636		1,055,332	2,247,431	
Canal and Embankment Excavation -Muck	45,304.80 cy	30,933			64,047		94,980	202,269	
Site Fill Clay-Dozer	152,904.00 cy	580,109	9,938,760		510,774		11,029,642	23,729,645	
Site Fill Blasted Rock-Dozer	137,884.44 cy	761,252	3,629,808		555,599		4,946,659	10,602,367	
Fill Sand-Loader/Truck - Hesco Baskets (RDFW) 150 lft per Day	40,626.68 cy	53,021	379,859		34,915		467,795	1,004,161	Crew comprised of Loader/Operator and two labors, approximately 150 liner feet per day, Use of a telabell to place material in Hesco Baskets where Loader access is limited.
Orange Protection Fence Fence	22,160.00 lf	13,471	51,190				64,661	138,308	

Spreadsheet Level	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Real Estate	Total Cost	Total Price	Notes
02 Canal									
Hydroseeding		19,899	60,940	-	6,925	-	87,764	187,598	
Permanent Steel Sheeting 60' Deepby GVR System (Influent GW Barrier)	1,108,000.00 sf	-	42,387,648	7,977,600	-	-	50,365,248	107,851,890	
Permanent Steel Sheeting 60' Deep Sealant (Influent GW Barrier)	590,933.00 lf	-	-	1,772,799	-	-	1,772,799	3,661,983	Modified from Database per Giken and Blue Iron LLC information Material and application to seal joints
Remove Existing Sheetpiling (Pull Out or Cut Off) Random Lengths 30' to 60'	1,536,000.00 sf	-	-	38,400,000	-	-	38,400,000	79,320,980	Unknown Sheetpile walls, length and types may vary, cost is a rough estimate to remove, cutoff or redrive to acceptable e.v.
Site demolition, hydrodemolition, concrete pavement, 18" - 24" depth	17,132.00 sf	37,770	-	-	25,698	-	63,468	136,486	
Site demolition concrete retaining walls & footings	1,779.00 cy	47,065	-	-	120,083	-	167,147	361,540	
Site demolition concrete box channel slabs & walls	25.00 cy	661	-	-	1,688	-	2,349	5,081	
Site demolition asphalt pavement & curb, 4" to 6" thick	100.00 sy	114	-	-	186	-	300	649	
Site demolition highway guard rails & barriers, timber, 4" x 8"	200.00 lf	402	-	-	133	-	535	1,147	
Site demolition guard rails & barriers, median barrier, box beam, 6" x 8"	200.00 lf	1,414	-	-	213	-	1,627	3,482	
Site demolition chain link fence w/ barbed wire, 3 strands	800.00 lf	1,640	-	-	2,131	-	3,771	8,134	
Site demolition cut off timber piles to 2' below grade	1,611.00 ea	16,510	-	-	8,055	-	24,565	52,750	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, shore driven	100.00 lf	20,081	9,240	-	74,655	-	103,976	225,268	
Temporary Steel sheet piling seawalls, steel sheeting, 12' high, barge driven	200.00 lf	60,243	27,720	-	223,965	-	311,928	675,805	
02 Canal		15,954,109	61,105,988	74,442,362	20,234,495	5,453,726	177,190,680	373,671,017	
Orleans Ave Canal		18,843,436	88,886,611	90,451,422	24,136,019	5,453,726	227,771,215	482,410,240	
Option 2A New Pump Station, Canals & Hoey's Basin		77,914,471	471,375,380	420,886,236	90,739,799	69,100,209	1,130,016,095	2,400,116,747	
Replacement Pump Stations, Deepened Canals, New PS at Hoey's Basin	1.00 LS	77,914,471	471,375,380	420,886,236	90,739,799	69,100,209	1,130,016,095	2,400,116,747	

Partial Totals

Description	Amount	Totals	Hours	Rate	Cost Basis	Cost per Unit	Percent of Total
Labor	77,914,471		2,137,252 hrs			77,914,470.920 /LS	3.25%
Material	471,375,380					471,375,380.410 /LS	19.64%
Subcontract	420,886,236					420,886,235.860 /LS	17.54%
Equipment	90,739,799		1,659,114 hrs			90,739,799.030 /LS	3.78%
Real Estate	69,100,209					69,100,209.230 /LS	2.88%
Subtotal	1,130,016,095	1,130,016,095				1,130,016,095.000 /LS	47.08
Mobilization	22,600.322			2.00 %	C	22,600.321.910 /LS	0.94%
Professional Labor Overhead	402.375			195.00 %	C	402.374.590 /LS	0.02%
Sales Tax	50,590.366			9.00 %	C	50,590.366.150 /LS	2.11%
Safety Equipment & Supplies	779.145			1.00 %	C	779.144.710 /LS	0.03%
Consumables	454.974			2.00 %	C	454.974.390 /LS	0.02%
Small Tools & Equipment	454.974			2.00 %	C	454.974.390 /LS	0.02%
Rend on Subcontractors	3,414.473			2.00 %	C	3,414.473.210 /LS	0.14%
Subtotal	78,696,629	1,208,712,724				1,208,712,724.000 /LS	3.28
General Conditions	72,522.763			6.00 %	T	72,522.763.490 /LS	3.02%
GC Total	72,522,763	1,281,235,487				1,281,235,487.000 /LS	3.02
Contingency - Construction	384,370.646			30.00 %	T	384,370.646.490 /LS	16.01%
Total Contingency	384,370,646	1,665,606,133				1,665,606,133.000 /LS	16.01
Escalation	116,592.429			7.00 %	T	116,592.429.430 /LS	4.86%
Total Escalation	116,592,429	1,782,198,562				1,782,198,562.000 /LS	4.86
Contractor Overhead & Profit	178,219.856			10.00 %	T	178,219.856.420 /LS	7.43%
Total OH&P	178,219,856	1,960,418,418				1,960,418,418.000 /LS	7.43
Builder's Risk Insurance	9,802.092			0.50 %	T	9,802.092.100 /LS	0.41%
Design Build Insurance	39,208.368			2.00 %	T	39,208.368.410 /LS	1.63%
Performance & Payment Bond	29,406.276			1.50 %	T	29,406.276.310 /LS	1.23%
Total bonds & Insurance	78,416,736	2,038,835,154				2,038,835,154.000 /LS	3.27
Engineering Design	122,330.109			6.00 %	T	122,330.109.450 /LS	5.10%
Enor Construction Support	61,165.055			3.00 %	T	61,165.054.720 /LS	2.55%
Engineering Support	183,495,164	2,222,330,318				2,222,330,318.000 /LS	7.65
Client Rep Management	111,116.516			5.00 %	T	111,116.516.080 /LS	4.63%
Constr Design Chances/FCCs	66,669.910			3.00 %	T	66,669.909.650 /LS	2.78%
Client Subtotal	177,786,426	2,400,116,744				2,400,116,744.000 /LS	7.41
Partial Total		2,400,116,744				2,400,116,744.000 /LS	

**Option 2 and 2a
Canal Liner Alternative Comparison**

Item	Description	Total			
		Amount			
		New Orleans PS Canal Options - Earthen	New Orleans PS Canal Options - Cellular Concrete Mat	New Orleans PS Canal Options - Concrete Lined	New Orleans PS Canal Options - Concrete Lined w-timber piles

Canals 17th - Options for 17th Street Canal

03.01	Earthen Canals Option 2				
03.300	Real Estate	34,350,000			
03.302	Canals	21,236,375			
03.304	Removal of Concrete Floodwalls & Setup of Temporary Flood Controls	72,214,313			
03.305	Excavation of Canal and Regrade Earthen Levees to Ground Elevation	117,464,776			
03.308	Site Restoration	101,389			
	03.01 Earthen Canals Option 2	245,366,852			
03.02	Concrete Lined Canals Option 2				
03.302	Canals			213,626,635	
03.304	Removal of Concrete Floodwalls & Setup of Temporary Flood Controls			76,967,124	
03.305	Excavation of Canal and Regrade Earthen Levees to Ground Elevation			105,322,903	
03.308	Site Restoration			101,389	
	03.02 Concrete Lined Canals Option 2			396,018,051	
03.03	Concrete Lined -Timber Pile Option 2				

Item	Description	Total			
		Amount			
		New Orleans PS Canal Options - Earthen	New Orleans PS Canal Options - Cellular Concrete Mat	New Orleans PS Canal Options - Concrete Lined	New Orleans PS Canal Options - Concrete Lined w-timber piles
03.302	Canals				213,676,635
03.304	Removal of Concrete Floodwalls & Setup of Temporary Flood Controls				16,735,468
03.305	Excavation of Canal and Regrade Earthen Levees to Ground Elevation				219,626,731
03.308	Site Restoration				101,389
	03.03 Concrete Lined -Timber Pile Option 2				450,140,223
03.04	Cellular Concrete Mat Lined Canal System Option 2				
03.302	Canals		31,696,983		
03.304	Removal of Concrete Floodwalls & Setup of Temporary Flood Controls		76,967,099		
03.305	Excavation of Canal and Regrade Earthen Levees to Ground Elevation		97,710,440		
03.308	Site Restoration		101,389		
	03.04 Cellular Concrete Mat Lined Canal System Option 2		206,475,911		
	Canals 17th - Options for 17th Street Canal	245,366,852	206,475,911	396,018,051	450,140,223

Canals 17th 2A - Option 2A for 17th Street Canal

Item	Description	Total			
		Amount			
		New Orleans PS Canal Options - Earthen	New Orleans PS Canal Options - Cellular Concrete Mat	New Orleans PS Canal Options - Concrete Lined	New Orleans PS Canal Options - Concrete Lined w-timber piles
03.300	Real Estate	34,350,000			
03.302	Canals	21,236,375			
03.304	Removal of Concrete Floodwalls & Setup of Temporary Flood Controls	72,214,313			
03.305	Excavation of Canal and Regrade Earthen Levees to Ground Elevation	105,753,173			
03.308	Site Restoration	101,389			
	03.01A Earthen Canal Option 2A	233,655,249			
	03.02A Concrete Lined Canals Option 2A				
03.302	Canals			201,926,626	
03.304	Removal of Concrete Floodwalls & Setup of Temporary Flood Controls			76,967,124	
03.305	Excavation of Canal and Regrade Earthen Levees to Ground Elevation			103,883,907	
03.308	Site Restoration			101,389	
	03.02A Concrete Lined Canals Option 2A			382,879,046	
	03.03A Concrete Lined -Timber Pile Option 2A				
03.302	Canals				213,626,635
03.304	Removal of Concrete Floodwalls & Setup of Temporary Flood Controls				16,735,468
03.305	Excavation of Canal and Regrade Earthen Levees to Ground Elevation				204,593,674
03.308	Site Restoration				101,389

Item	Description	Total			
		Amount			
		New Orleans PS Canal Options - Earthen	New Orleans PS Canal Options - Cellular Concrete Mat	New Orleans PS Canal Options - Concrete Lined	New Orleans PS Canal Options - Concrete Lined w-timber piles
	03.03A Concrete Lined -Timber Pile Option 2A				435,057,166
03.04A	Cellular Concrete Mat Lined Canal System Option 2A				
03.302	Canals		52,432,983		
03.304	Removal of Concrete Floodwalls & Setup of Temporary Flood Controls		74,919,148		
03.305	Excavation of Canal and Regrade Earthen Levees to Ground Elevation		105,615,918		
03.308	Site Restoration		101,389		
	03.04A Cellular Concrete Mat Lined Canal System Option 2A		233,069,439		
	Canals 17th 2A - Option 2A for 17th Street Canal	233,655,249	233,069,439	382,879,046	435,057,166

Canals London - Options for London Canal

03.01	Earthen Canals Option 2	
03.300	Real Estate	18,050,000
03.302	Canals	17,574,110
03.304	Removal of Concrete Floodwalls & Setup of Temporary Flood Controls	90,618,131

Item	Description	Total			
		Amount			
		New Orleans PS Canal Options - Earthen	New Orleans PS Canal Options - Cellular Concrete Mat	New Orleans PS Canal Options - Concrete Lined	New Orleans PS Canal Options - Concrete Lined w-timber piles
03.305	Excavation of Canal and Regrade Earthen Levees to Ground Elevation	123,440,332			
03.308	Site Restoration	121,191			
	03.01 Earthen Canals Option 2	249,803,765			
03.02	Concrete Lined Canals Option 2				
03.302	Canals			33,524,977	
03.304	Removal of Concrete Floodwalls & Setup of Temporary Flood Controls			89,844,057	
03.305	Excavation of Canal and Regrade Earthen Levees to Ground Elevation			119,870,981	
03.308	Site Restoration			121,191	
	03.02 Concrete Lined Canals Option 2			243,361,206	
03.03	Concrete Lined -Timber Pile Option 2				
03.302	Canals				33,524,977
03.304	Removal of Concrete Floodwalls & Setup of Temporary Flood Controls				87,396,057
03.305	Excavation of Canal and Regrade Earthen Levees to Ground Elevation				204,243,537
03.308	Site Restoration				121,191
	03.03 Concrete Lined -Timber Pile Option 2				325,285,762
03.04	Cellular Concrete Mat Lined Canal System Option 2				
03.302	Canals		51,299,666		

Item	Description	Total			
		Amount			
		New Orleans PS Canal Options - Earthen	New Orleans PS Canal Options - Cellular Concrete Mat	New Orleans PS Canal Options - Concrete Lined	New Orleans PS Canal Options - Concrete Lined w-timber piles
03.304	Removal of Concrete Floodwalls & Setup of Temporary Flood Controls		90,618,131		
03.305	Excavation of Canal and Regrade Earthen Levees to Ground Elevation		114,403,807		
03.308	Site Restoration		121,191		
	03.04 Cellular Concrete Mat Lined Canal System Option 2		256,442,795		
Canals London - Options for London Canal		249,803,765	256,442,795	243,361,206	325,285,762

Canals Orleans - Options for Orleans Canal

03.01 Earthen Canals Option 2		
03.300	Real Estate	0
03.302	Canals	11,029,642
03.304	Removal of Concrete Floodwalls & Setup of Temporary Flood Controls	67,637,203
03.305	Excavation of Canal and Regrade Earthen Levees to Ground Elevation	93,586,753
03.308	Site Restoration	87,764

Item	Description	Total			
		Amount			
		New Orleans PS Canal Options - Earthen	New Orleans PS Canal Options - Cellular Concrete Mat	New Orleans PS Canal Options - Concrete Lined	New Orleans PS Canal Options - Concrete Lined w-timber piles
	03.01 Earthen Canals Option 2	172,341,363			
	03.02 Concrete Lined Canals Option 2				
03.302	Canals			10,741,208	
03.304	Removal of Concrete Floodwalls & Setup of Temporary Flood Controls			68,118,199	
03.305	Excavation of Canal and Regrade Earthen Levees to Ground Elevation			68,083,646	
03.308	Site Restoration			87,764	
	03.02 Concrete Lined Canals Option 2			147,030,817	
	03.03 Concrete Lined -Timber Pile Option 2				
03.302	Canals				6,828,641
03.304	Removal of Concrete Floodwalls & Setup of Temporary Flood Controls				65,864,404
03.305	Excavation of Canal and Regrade Earthen Levees to Ground Elevation				141,525,095
03.308	Site Restoration				87,764
	03.03 Concrete Lined -Timber Pile Option 2				214,305,904
	03.04 Cellular Concrete Mat Lined Canal System Option 2				
03.302	Canals		52,432,983		
03.304	Removal of Concrete Floodwalls & Setup of Temporary Flood Controls		67,637,203		
03.305	Excavation of Canal and Regrade Earthen Levees to Ground Elevation		71,150,555		

Item	Description	Total			
		Amount			
		New Orleans PS Canal Options - Earthen	New Orleans PS Canal Options - Cellular Concrete Mat	New Orleans PS Canal Options - Concrete Lined	New Orleans PS Canal Options - Concrete Lined w-timber piles
	<i>Canals Orleans - Options for Orleans Canal</i>	<i>172,341,363</i>	<i>191,308,506</i>	<i>147,030,817</i>	<i>214,305,904</i>
	<i>Total</i>	<i>901,167,229</i>	<i>887,296,651</i>	<i>1,169,289,121</i>	<i>1,424,789,055</i>

Item	Description	Total			
		Amount			
		New Orleans PS Canal Options - Earthen	New Orleans PS Canal Options - Cellular Concrete Mat	New Orleans PS Canal Options - Concrete Lined	New Orleans PS Canal Options - Concrete Lined w-timber piles
Estimate Totals					
	Labor	71,386,384	74,566,466	201,274,178	245,158,180
	Material	297,225,278	418,088,821	551,175,982	729,880,102
	Subcontract	356,738,010	310,932,707	330,156,965	318,353,132
	Equipment	89,067,557	83,708,657	86,681,996	131,397,641
	Other	86,750,000	0	0	0
		901,167,229	887,296,651	1,169,289,121	1,424,789,055
	Mobilization	18,023,345	17,745,933	23,385,782	28,495,781
	Sales Tax - Material Only	26,750,275	37,627,994	49,605,838	65,689,209
	Contingency - Construction Escalation				
	Safety Equipment & Supplies Consumables	356,932	372,832	1,006,371	1,225,791
	Small Tools & Equipment				
	Bond on Subcontractors				
		946,297,781	943,043,410	1,243,287,112	1,520,199,836
	Professional Labor Overhead				
		946,297,781	943,043,410	1,243,287,112	1,520,199,836
	General Conditions	47,314,889	47,152,171	62,164,356	76,009,992
	Contractor Overhead & Profit	94,629,778	94,304,341	124,328,711	152,019,984
		1,088,242,448	1,084,499,922	1,429,780,179	1,748,229,812
	Location Market Factor				
		1,088,242,448	1,084,499,922	1,429,780,179	1,748,229,812
	Builder's Risk Insurance	5,441,212*	5,422,500*	7,148,901*	8,741,149*
	2% Performance & Payment Bond	546,000	546,000	546,000	546,000
		1,094,229,660	1,090,468,422	1,437,475,080	1,757,516,961

Item	Description	Total			
		Amount			
		New Orleans PS Canal Options - Earthen	New Orleans PS Canal Options - Cellular Concrete Mat	New Orleans PS Canal Options - Concrete Lined	New Orleans PS Canal Options - Concrete Lined w-timber piles
	Engineering Design	65,653,780	65,428,105	86,248,505	105,451,018
	Construction Management	54,711,483	54,523,421	71,873,754	87,875,848
	Engr Construction Support	32,826,890	32,714,053	43,124,252	52,725,509
	Constr Design Changes/FCOs	32,826,890	32,714,053	43,124,252	52,725,509
	Total	<u>1,280,248,703</u>	<u>1,275,848,054</u>	<u>1,681,845,843</u>	<u>2,056,294,845</u>

Appendix B
Supporting Documentation

Pump Station Mechanical/Electrical

OPTION 1A & 1B	Use the larger of these two widths		Width of Gates	Width of Exterior Walls	Req'd Width
	Width req'd by Pumps-	Width req'd by FSI			
17TH STREET	436	372	112.75	6	554.75
ORLEANS	124	103	41	6	171
LONDON	316	270	133.25	6	455.25
OPTION 2					
17TH STREET	436	301	na	4	440
ORLEANS	124	85	na	4	128
LONDON	316	219	na	4	320
OPTION 2A					
17TH STREET	380	263	na	4	384
ORLEANS	124	85	na	4	128
LONDON	316	219	na	4	320

Pump Station Widths are based upon wall interior and exterior wall thickness of 2 ft.
Pump/Motor width requirements based on ITT Flyght pump requirements.

OPTION 1A & 1B	1000 CFS Pumps/Motors Engine Driven			1000 CFS Pumps/Motors Electric			500 CFS Pumps/Motors			250 CFS Pumps/Motors			150 CFS Pumps/Motors			FSI WIDTH	Divider Walls @ 1' WIDTH	TOTAL WIDTH
	Number	Req'd Width	Total Width	Number	Req'd Width	Total Width	Number	Req'd Width	Total Width	Number	Req'd Width	Total Width	Number	Req'd Width	Total Width			
17TH STREET 12500 cfs	4	26	104	7	26	182	2	20	40	2	15	30	0	10	0	356	16	372
ORLEANS 2700 cfs	2	26	52	0	26	0	1	20	20	1	15	15	1	10	10	12500	6	103
LONDON 9000 cfs	4	26	104	4	26	104	1	20	20	2	15	30	0	10	0	2900	12	270

FSI

OPTION 2	1000 CFS Pumps/Motors Engine Driven			1000 CFS Pumps/Motors Electric			500 CFS Pumps/Motors			250 CFS Pumps/Motors			150 CFS Pumps/Motors			TOTAL WIDTH	Divider Walls @ 1' WIDTH	TOTAL WIDTH
	Number	Req'd Width	Total Width	Number	Req'd Width	Total Width	Number	Req'd Width	Total Width	Number	Req'd Width	Total Width	Number	Req'd Width	Total Width			
17TH STREET 12500 cfs	4	21	84	7	21	147	2	15	30	2	12	24	0	10	0	285	16	301
ORLEANS 2700 cfs	2	21	42	0	21	0	1	15	15	1	12	12	1	10	10	12500	6	85
LONDON 7880	4	21	84	4	21	84	1	15	15	2	12	24	0	10	0	2900	12	219

OPTION 2A	1000 CFS Pumps/Motors Engine Driven			1000 CFS Pumps/Motors Electric			500 CFS Pumps/Motors			250 CFS Pumps/Motors			150 CFS Pumps/Motors			TOTAL WIDTH	Divider Walls @ 1' WIDTH	TOTAL WIDTH
	Number	Req'd Width	Total Width	Number	Req'd Width	Total Width	Number	Req'd Width	Total Width	Number	Req'd Width	Total Width	Number	Req'd Width	Total Width			
17TH STREET 10000	3	21	63	7	21	147	1	15	15	2	12	24	0	10	0	249	14	263
ORLEANS 2700 cfs	2	21	42	0	21	0	1	15	15	1	12	12	1	10	10	11000	6	85
LONDON 9000 cfs	4	21	84	4	21	84	1	15	15	2	12	24	0	10	0	2900	12	219

2500 cfs pumped from Hoey Basin

OPTION 1A & 1B	1000 CFS Pumps/Motors Engine Driven			1000 CFS Pumps/Motors Electric			500 CFS Pumps/Motors			250 CFS Pumps/Motors			150 CFS Pumps/Motors		
	Number	Req'd Width *	Total Width	Number	Req'd Width *	Total Width	Number	Req'd Width *	Total Width	Number	Req'd Width *	Total Width	Number	Req'd Width	Total Width
17TH STREET 12500 cfs	4	30	120	7	30	210	2	22	44	2	17	34	0	17	0
ORLEANS 2700 cfs	2	30	60	0	30	0	1	22	22	1	17	17	1	17	17
LONDON 9000 cfs	4	30	120	4	30	120	1	22	22	2	17	34	0	17	0

FSI

OPTION 2	1000 CFS Pumps/Motors Engine Driven			1000 CFS Pumps/Motors Electric			500 CFS Pumps/Motors			250 CFS Pumps/Motors			150 CFS Pumps/Motors		
	Number	Req'd Width *	Total Width	Number	Req'd Width *	Total Width	Number	Req'd Width *	Total Width	Number	Req'd Width	Total Width	Number	Req'd Width	Total Width
17TH STREET 12500 cfs	4	30	120	7	30	210	2	22	44	2	17	34	0	17	0
ORLEANS 2700 cfs	2	30	60	0	30	0	1	22	22	1	17	17	1	17	17
LONDON 9000	4	30	120	4	30	120	1	22	22	2	17	34	0	17	0

OPTION 2A	1000 CFS Pumps/Motors Engine Driven			1000 CFS Pumps/Motors Electric			500 CFS Pumps/Motors			250 CFS Pumps/Motors			150 CFS Pumps/Motors		
	Number	Req'd Width *	Total Width	Number	Req'd Width *	Total Width	Number	Req'd Width *	Total Width	Number	Req'd Width *	Total Width	Number	Req'd Width	Total Width
17TH STREET 10000	3	30	90	7	30	210	1	22	22	2	17	34	0	17	0
ORLEANS 2700 cfs	2	30	60	0	30	0	1	22	22	1	17	17	1	17	17
LONDON 9000 cfs	4	30	120	4	30	120	1	22	22	2	17	34	0	17	0

2500 cfs pumped from Hoey Basin

Req'd widths obtained from pg 59 of the USACE90-Day Implementation Report

NEW ORLEANS SEWAGE AND WATER BOARD, PUMP STATION OPCC

Check gate size vs flows in USACE report and S&WB report.

	17th Street		Orleans Ave			London Ave	
	USACE	AECOM	USACE	AECOM	AECOM	USACE	AECOM
Low Lake Elevation	1	1	1	1	1	1	1
Gate Sill Elevation	-10	-10	-8	-8	-8	-8	-8
Water Passage Height	11	11	9	9	9	9	9
Gate Opening Width	10.25	10.25	10.25	10.25	10.25	10.25	10.25
Number of Gates	11	11	5	5	4	13	13
Water Passage Width (ft)	112.75	112.75	51.25	51.25	41	133.25	133.25
Water Passage Area (sf)	1240.25	1240.25	461.25	461.25	369	1199.25	1199.25
Flow Rate (cfs)	12500	12500	3390	2700	2700	8980	9000
Water Velocity (fps)	10.08	10.08	7.35	5.85	7.32	7.49	7.50

Table duplicated from 3-13-09 USACE report



Golden Harvest, Inc.

Golden Gates™

Phone: 360-757-4334
Fax: 360-757-1135
Email: sales@goldenharvestinc.com

Post Office Box 287
Burlington, WA 98233
Web: www.goldenharvestinc.com

Quoted by: **DAVID WISE**

BUDGET QUOTATION #10-0421 PAGE 1 OF 2

FOR ANSWERS TO QUESTIONS REGARDING THIS QUOTATION CONTACT:

TOM CLUIN SOUTHERN STATES REGIONAL SALES MANAGER @ 901-489-6769 OR DAVID WISE @ 1-800-338-6238

PLEASE RESPOND TO:

Johnson Equipment Company
4264 Perkins Road
Baton Rouge, LA 70806

ATTN:
Robert Herrington

PHONE:
225-278-4441

FAX:
225-346-0193

EMAIL:
robert@jeco.us

DATE: April 6, 2010
QUOTE EXPIRES: 30 days
JOB: 17th st, Orleans & London canals
New Orleans, LA

BID DATE:
ENGINEERS: AECOM
Steve Melvin

PHONE: 318-675-2873

FAX: 318-6176516

FOB: FACTORY (Full Freight Allowed)

SHIPPING NOTE: Split shipments will be at buyer's expense

TERMS: Net 30

SUBMITTALS: 2-4 weeks following receipt of order.

DELIVERY: 12-18 weeks following submittal approval.

ADDENDA REC'D:

BUDGET QUOTATION

SPECIFICATION:
SECTION:

#	LOCATION	GATE	SIZE	TYPE	QTY	TOTAL
1	17 th ST. CANAL GATES ARE BASED ON A 20'-0 INVERT TO OPERATING DECK & 11'-0" OF SEATING HEAD	SUG-1	123 X 132	MODEL GH-46 TYPE 304 STAINLESS STEEL SLIDE GATE. NON-SELF CONTAINED WALL MOUNTED FRAME. TYPE 304 STAINLESS STEEL STEM WITH COLD ROLLED THREADS, UHMW STEM GUIDE BUSHINGS. PEDESTAL MOUNTED ELECTRIC MOTOR OPERATOR, 480V/3PH/60HZ, OPEN CLOSE SERVICE, STEM OILER, CONTROL PANEL WITH MOUNTING FEET, NEMA 4X ENCLOSURE, SEE DESCRIPTION BELOW. GALVINIZED STEM COVER WITH MYLAR STRIP INDICATOR. STOP NUTS. ANCHOR BOLTS.	1	\$93,100.00 each
2	ORLEANS & LONDON CANALS GATES ARE BASED ON A 20'-0 INVERT TO OPERATING DECK & 11'-0" OF SEATING HEAD	SUG-2	123 X 108	MODEL GH-46 TYPE 304 STAINLESS STEEL SLIDE GATE. NON-SELF CONTAINED WALL MOUNTED FRAME. TYPE 304 STAINLESS STEEL STEM WITH COLD ROLLED THREADS, UHMW STEM GUIDE BUSHINGS. PEDESTAL MOUNTED ELECTRIC MOTOR OPERATOR, 480V/3PH/60HZ, OPEN CLOSE SERVICE, STEM OILER, CONTROL PANEL WITH MOUNTING FEET, NEMA 4X ENCLOSURE, SEE DESCRIPTION BELOW. GALVINIZED STEM COVER WITH MYLAR STRIP INDICATOR. STOP NUTS. ANCHOR BOLTS.	1	\$82,875.00 each

FIELD SERVICE:

(1) TRIP, (3) 8 HR DAYS INCLUDED IN THIS QUOTATION. Additional days are available at \$750 per day plus actual travel and maintenance expenses. REQUEST SHOULD BE MADE 21 DAYS BEFORE SERVICE REPRESENTATIVE IS REQUIRED.

Control Boxes include: (IF REQUIRED) I CAN REMOVE THIS IF IT IS NOT REQUIRED.

- (1) Nema 4X enclosure, with back panel, mounting feet and padlock latch.
- (1) Nema full rated voltage reversing contactor, 120 volt coil and equipped with overload relays.
- (1) Control power transformer, 480 to 120 volt with primary and secondary fuse protection.
- (1) Nema 4X rated selector switch , 3 position, mounted on enclosure door.
- (2) Nema 4X rated momentary pushbuttons, 1 NO mounted on enclosure door.
- (2) Nema 4X rated momentary pushbuttons, 1 NC mounted on enclosure door.
- (4) Nema 4X rated pilot light, 120 volt LED type, mounted on enclosure door.
- (8) Legend plates for door mounted devices.
- (1) Terminal block assembly, 30 points plus incoming and outgoing power terminals.
- (2) Ground lugs.

- Actuators are quoted with our standard submittal package which consists of the applicable wiring diagram(s), dimensional drawing(s) and a certified data sheet.

- 1. Stainless steel anchor bolts are included for concrete mounted frames.
- 2. Mill Finish on stainless steel surfaces.

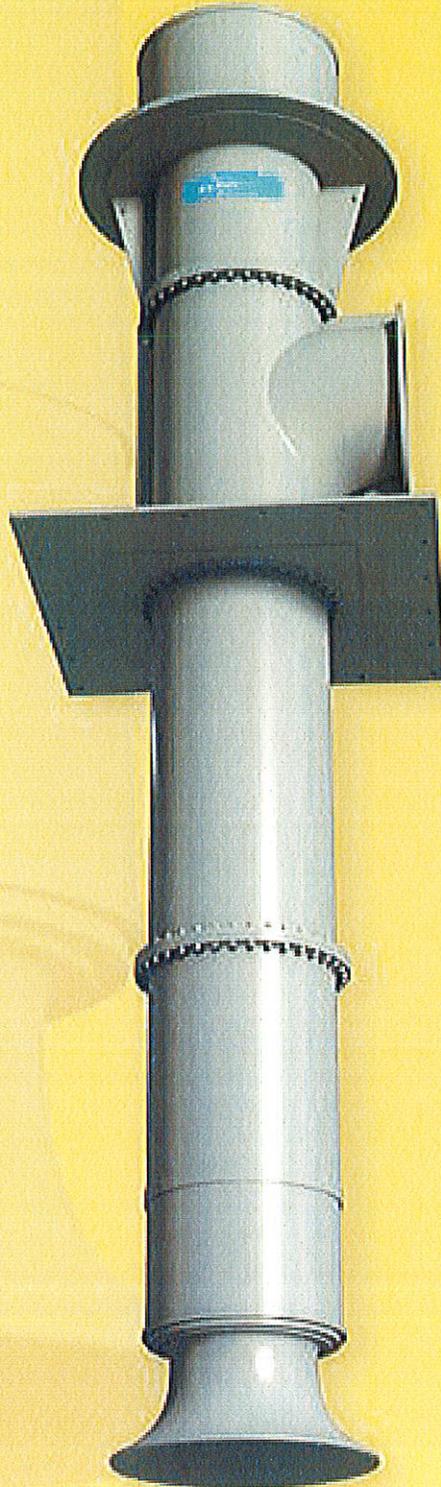
5

- 3. Epoxy Adhesive by contractor.
- 4. Sales tax not Included.



Large vertical column pumps

The most energy-efficient pumps on the market



Higher efficiency, bigger savings

Large pumps consume significant quantities of energy. So even a small increase in efficiency translates into a considerable decrease in costs.

Flygt's large wet-pit column pumps are the most efficient pumps available. Backed up by over 125 years of experience as Allis-Chalmers, Flygt pumps are quite simply better designed and better made.

On top of this, we tailor our pumps to the exact duty point of your application. And that means even larger energy savings.

More reliable, less downtime

The unique hydraulic thrust-relief design for high heads results in low thrust values from maximum flow to shut-off head. This prolongs the service life of the thrust bearing. To reach high pressure heads the pumps can be arranged in a one-, two- or three-stage configuration.

You decide

An extensive range of hydraulic units are available with various performance and design characteristics to handle different types of media. This makes it possible to customize pumps to meet the precise needs of your application.

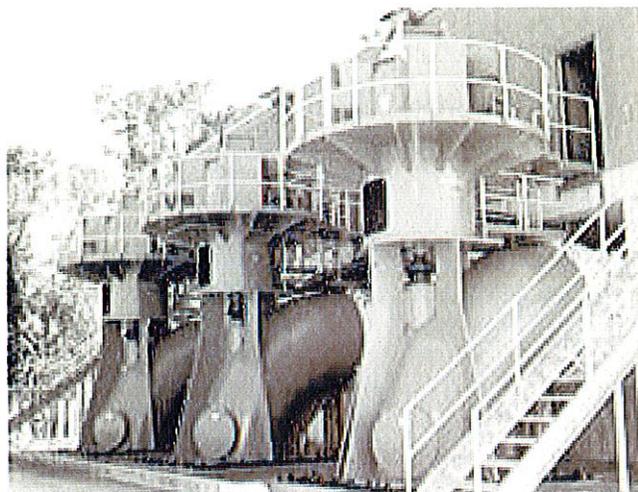
Large pumps for a wide range of applications

- Circulating water
- Service water
- Make-up water
- Water supply
- Process cooling
- Flood control
- Wastewater

Cost-effective installation

The column and discharge elbow can be cast or fabricated. The elbow can be installed either above or below the floor discharge. This allows for more flexible installation options and may even offer lower installation costs. A vertical configuration takes a minimum of valuable floor space.

The column pipe is made in sections so that intermediate bearings can be used if required.



Three compelling advantages:

- *Top-rated efficiency*
- *Unsurpassed reliability*
- *Simple maintenance*

From 700 to 25,000 l/s 10,000 – 400,000 USgpm

Flygt has the widest range of large wet-pit column pumps on the market. Our largest models deliver an incredible 25,000 l/s (400,000 USgpm) and heads up to 60 m (200 ft) in a single stage. We also have the most complete portfolio of wastewater pumps available. So, no matter what your need, we can recommend the best solution for your application.

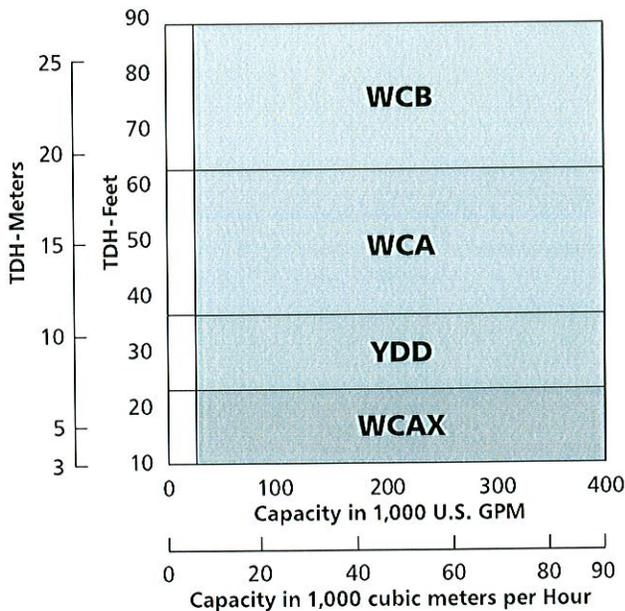
Pull-out for faster servicing

With pull-out functionality, you can remove the all-internal parts without disturbing the suction bell, column, discharge elbow, or discharge piping. This optional feature substantially reduces maintenance and downtime costs by eliminating the need to drain or enter the sump during maintenance.

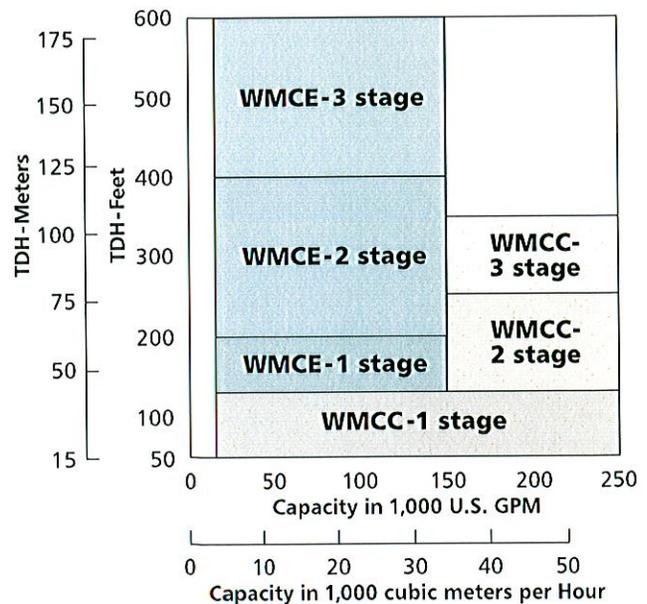


The back pull-out design gives you fast access to the wet end without having to disconnect the piping.

Low to medium head pumps Range chart



High head pumps Range chart



Quality in every detail

1. Driver pedestal

Substantial openings provide easy access to the adjustable coupling and stuffing box.

2. Stuffing box

The box is packed with graphite impregnated Teflon to reduce resistance and prolong the life of the shaft sleeve.

3. Shaft tube

Shaft tubes protect shafts from the pumped fluid and provide a passage for bearing lubrication. Open lineshaft pumps (without shaft tubes) can be provided for self-lubricated pumping applications.

4. Intermediate coupling

This solid sleeve provides a rigid transmission of power and torque through the shafts. The coupling is positively driven via coupling keys and transmits thrust loads via the split thrust ring design.

5. Bearings

A wide range of bearings are available including water lubricated rubber or elastomeric bearings or grease lubricated bronze bearings. Bearings are provided in the lower bowl assembly, in the stuffing box, and at intermediate locations as the application may require. Bearing spacing is conservatively designed using a lateral critical speed analysis. Intermediate bearing supports are used to support bearings in the pipe columns at the designed locations.

6. Shaft sleeves

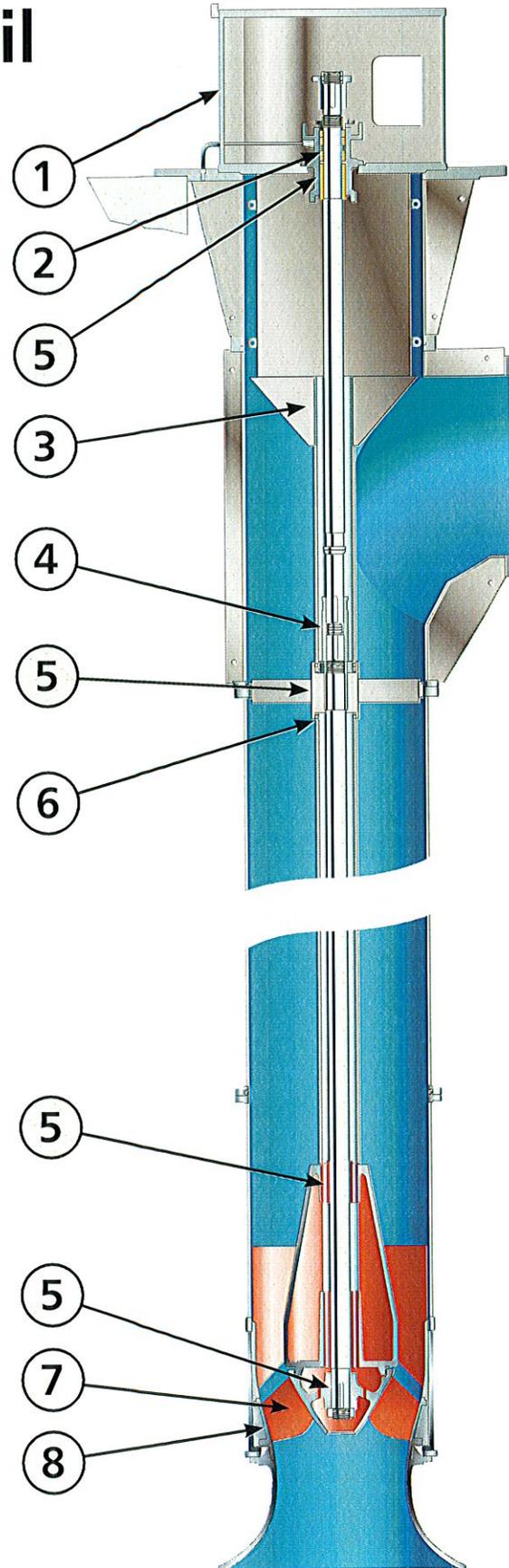
Shaft sleeves are provided under the packing and at all bearing locations. The shaft sleeves provide extended wear life and are designed for easy and low cost replacement/renewal of the wearing surfaces.

7. Impeller

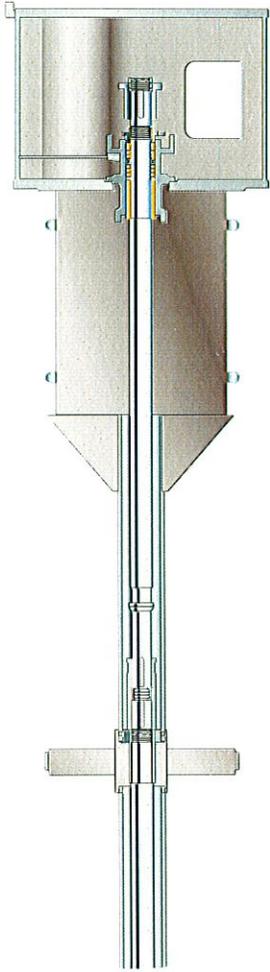
The special design of the impeller ensures optimal pumping efficiency.

3. Impeller cone

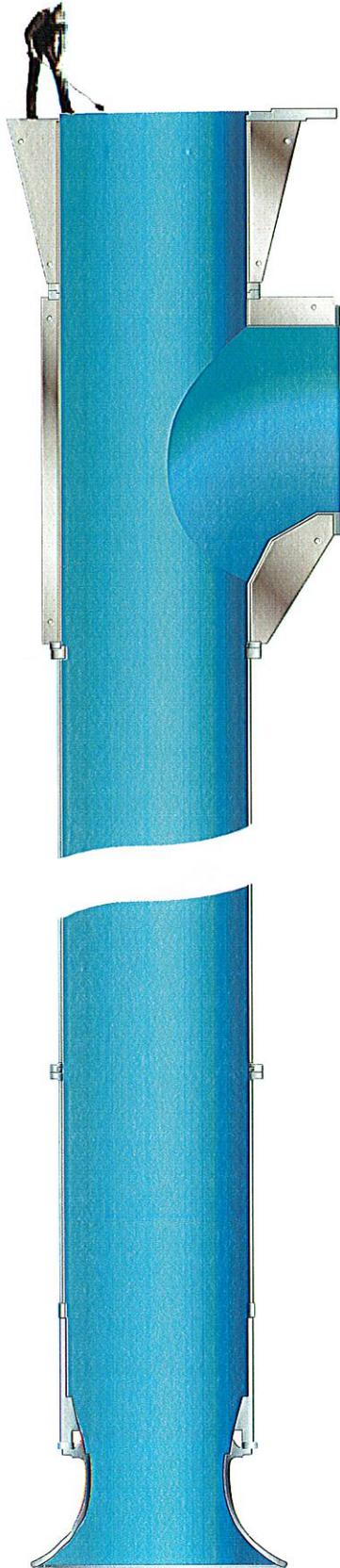
The impeller cone is a separately cast component thus permitting economical renewal of impeller design clearances.



Typical section view showing pull-out type design



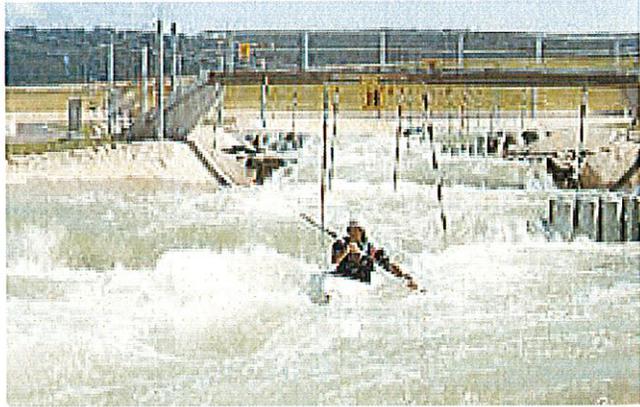
Removable inner element



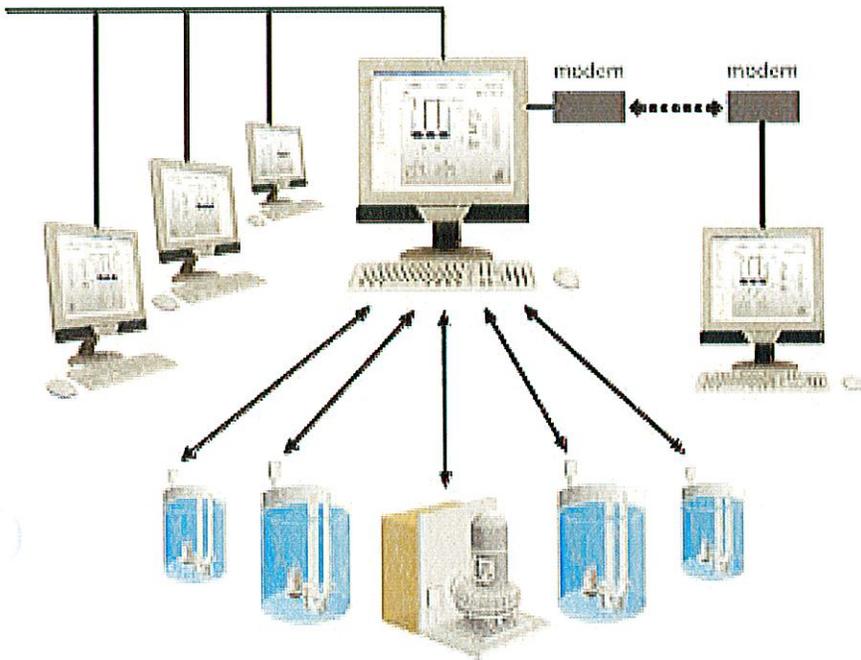
Column pipe, discharge elbow and suction bell remain undisturbed

Tailoring total solutions

No other supplier can so perfectly meet your pumping needs as Flygt. We offer the widest range of pumps on the market: everything from a fractional kW output submersible to the world's largest vertical column pump. We have unmatched resources, both in terms of manpower and facilities. For instance, we operate the largest water tank in North America for testing our pumps. Flygt is also a one-stop supplier, with a full range of auxiliary equipment including variable speed drives, monitoring and control equipment, expansion joints and control valves. And then we have the experience and know-how to translate your needs into reality.



Reduce service visits and emergency call-outs



Monitoring and control

With a well designed monitoring and control system, service costs can be radically reduced. For example, unnecessary service checks can be eliminated with the help of automatically generated service alerts. And armed with detailed information, you'll be able to slash the number of emergency call-outs.

At Flygt we supply both the hardware and software for complete systems: everything from pump controllers, sensors and start equipment, to the software for running the system. With Flygt's SCADA supervision software, AquaView, you get a complete picture of your fluid handling processes.

World-wide service, world-class value

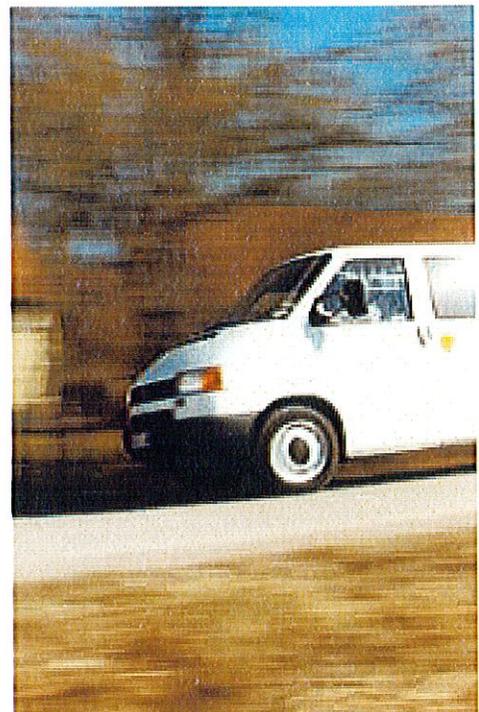
Because no two pumping stations or systems are alike, we let you choose the type of support package that best matches your needs.

At one end, we help in selecting the right pump for a new application. At the other end, we can provide full service assistance that includes everything from system planning and design, through construction and commissioning, to operation and maintenance.

With a world-wide network of authorised service centres, you always get the support you need: whether it's a question of planned maintenance, or express delivery of a part.

Extensive spare parts guarantee

We guarantee the availability of spare parts 20 years after we stop production of a pump model. This is just one of the ways we demonstrate long-term commitment to our customers.



As a leading supplier of fluid handling solutions, Flygt can supply everything you need to design, build and operate pump systems in a safe and cost-effective way.

Our products are used in water supply, wastewater treatment, sewage systems, mines,

construction, process industries and numerous other applications.

Flygt is represented in over 130 countries and has more than 40 sales companies around the world.

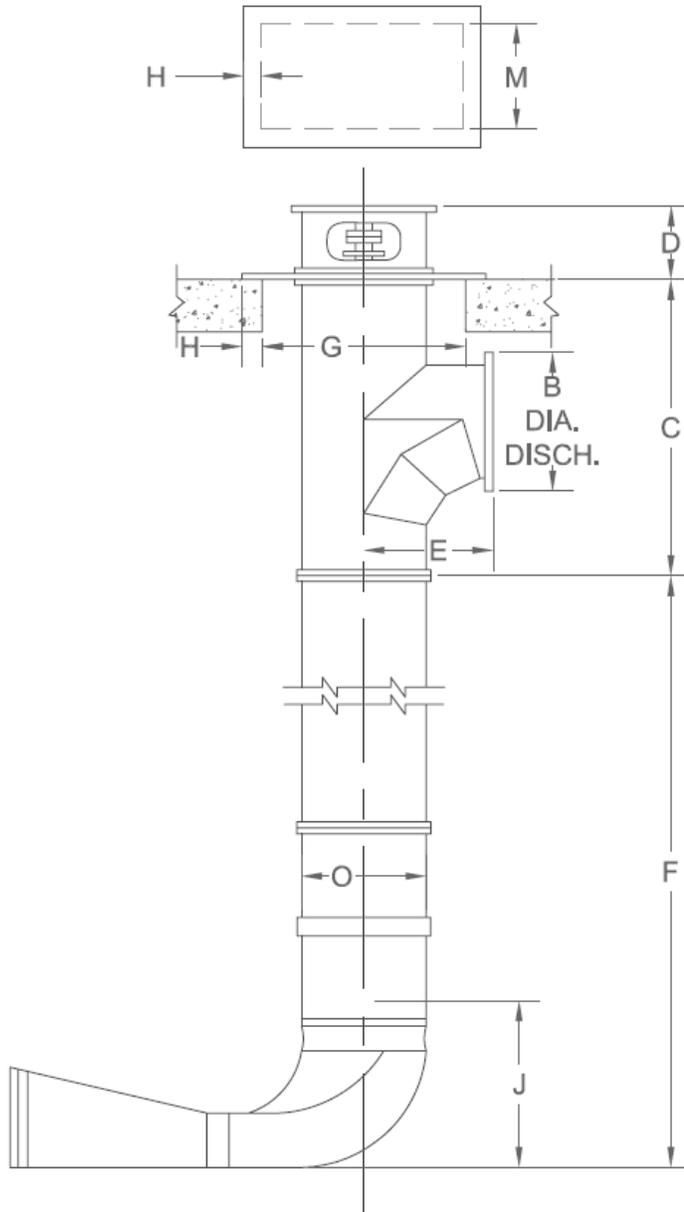


www.flygt.com



1000 CFS

174 x 126 YDD Pump



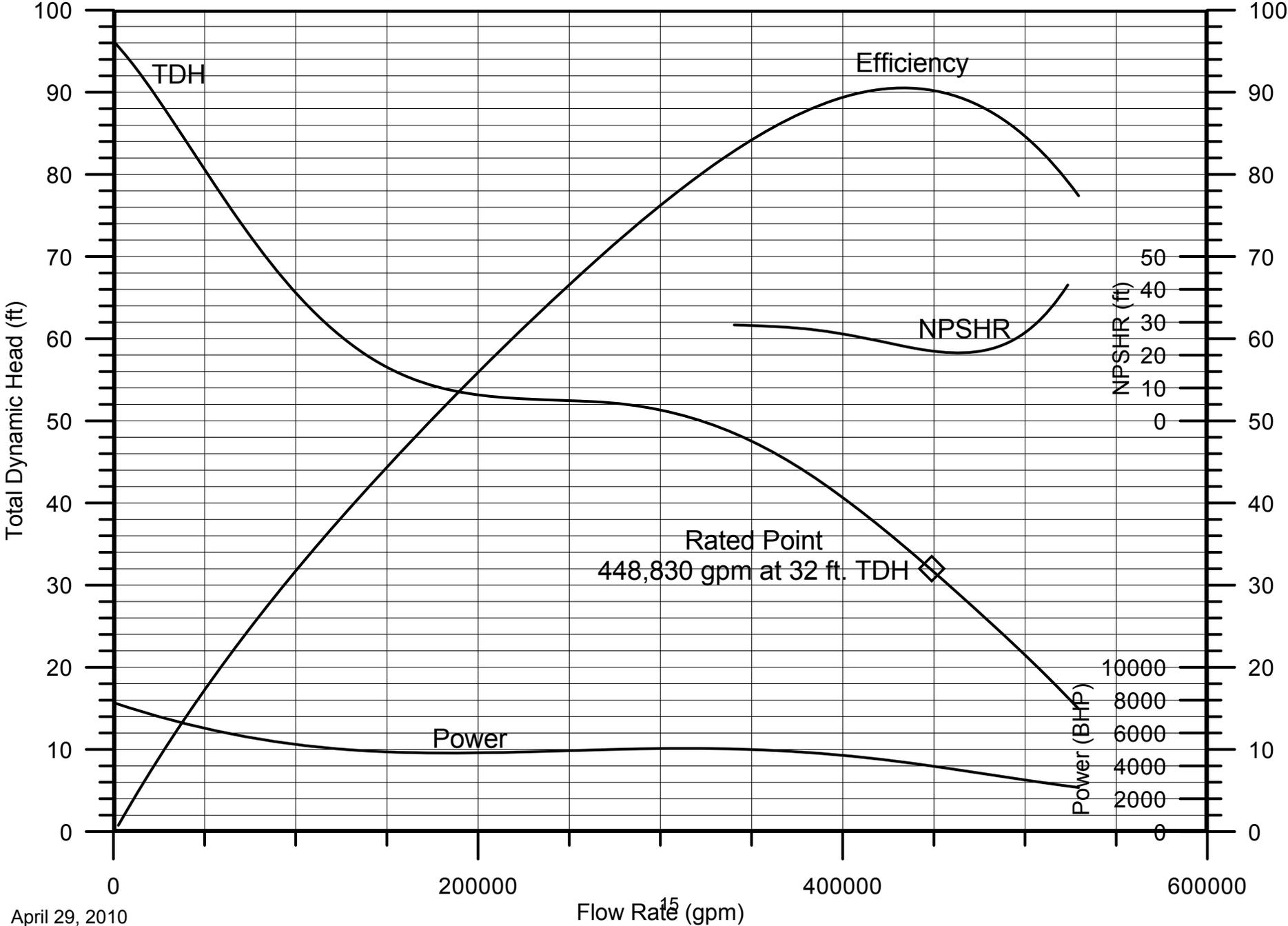
Dimensions in Inches

- B = 126
- C = 212
- D = 82
- E = 108
- F = 460
- G = 222
- H = 10.0
- J = 170
(Impeller Eye)
- M = 204
- O = 126

Dimensions are approximate and subject to change.

"d" for Type 10 FSI = 106.0

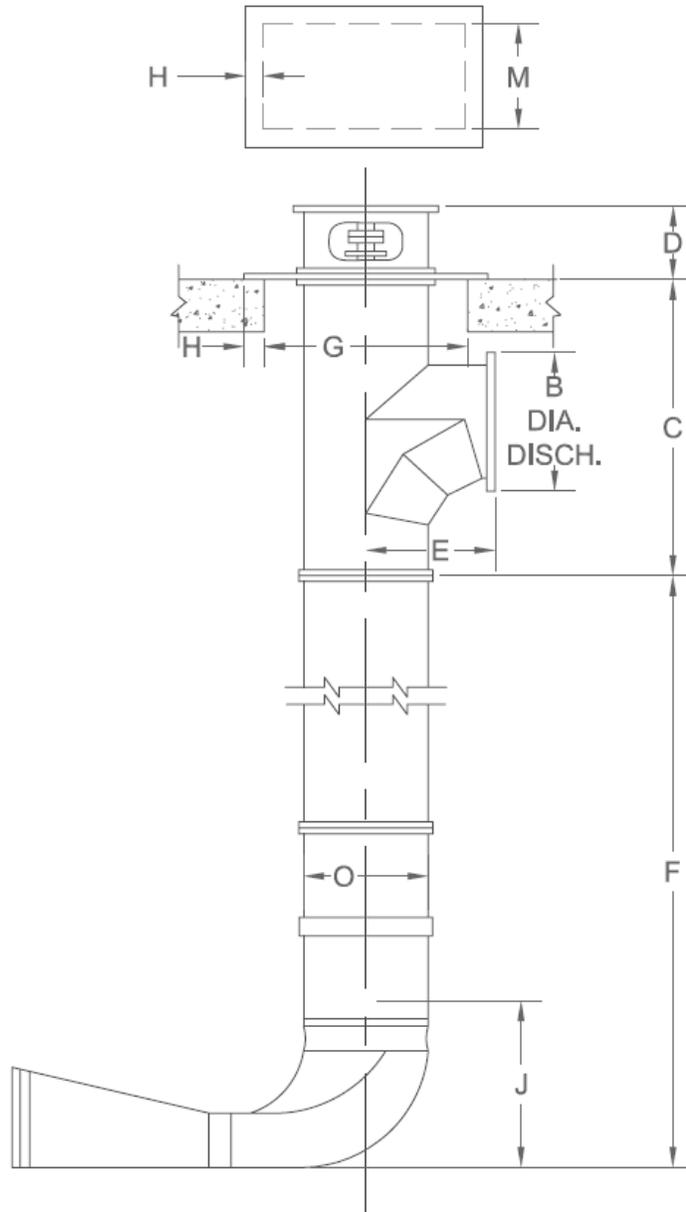
Pumps at the Lakefront - 1000 CFS
 ITT Flygt Curve Number 74061
 174 x 126 YDD at 200 RPM





500 CFS

132 x 84 YDD Pump



Dimensions in Inches

- B = 84
- C = 191
- D = 59
- E = 73
- F = 481
- G = 136
- H = 7.0
- J = 130
(Impeller Eye)
- M = 136
- O = 84

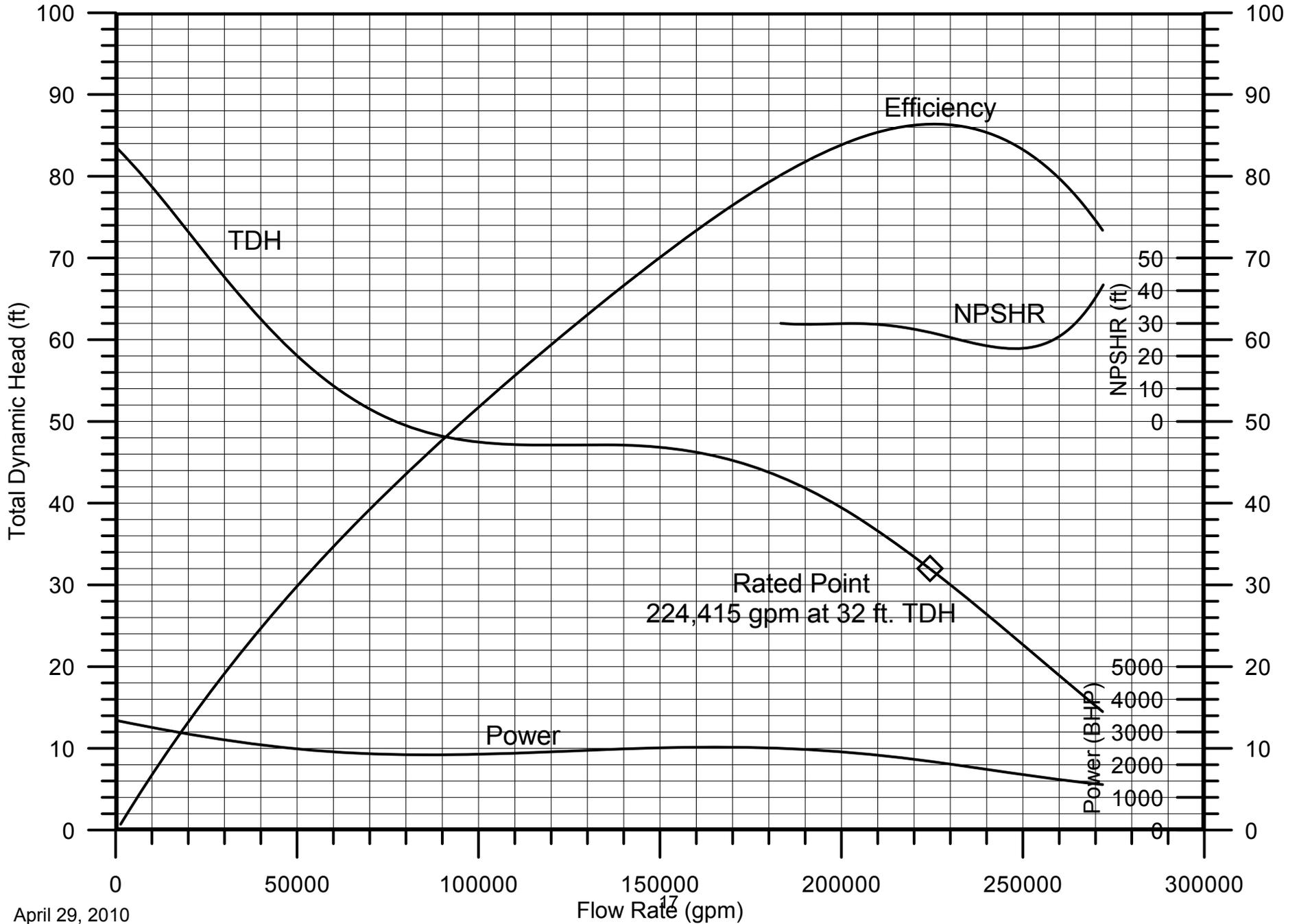
Dimensions are approximate and subject to change.

"d" for Type 10 FSI = 73.8

Pumps at the Lakefront - 500 CFS
ITT Flygt Curve Number 74060
132 x 84 YDD at 271 RPM



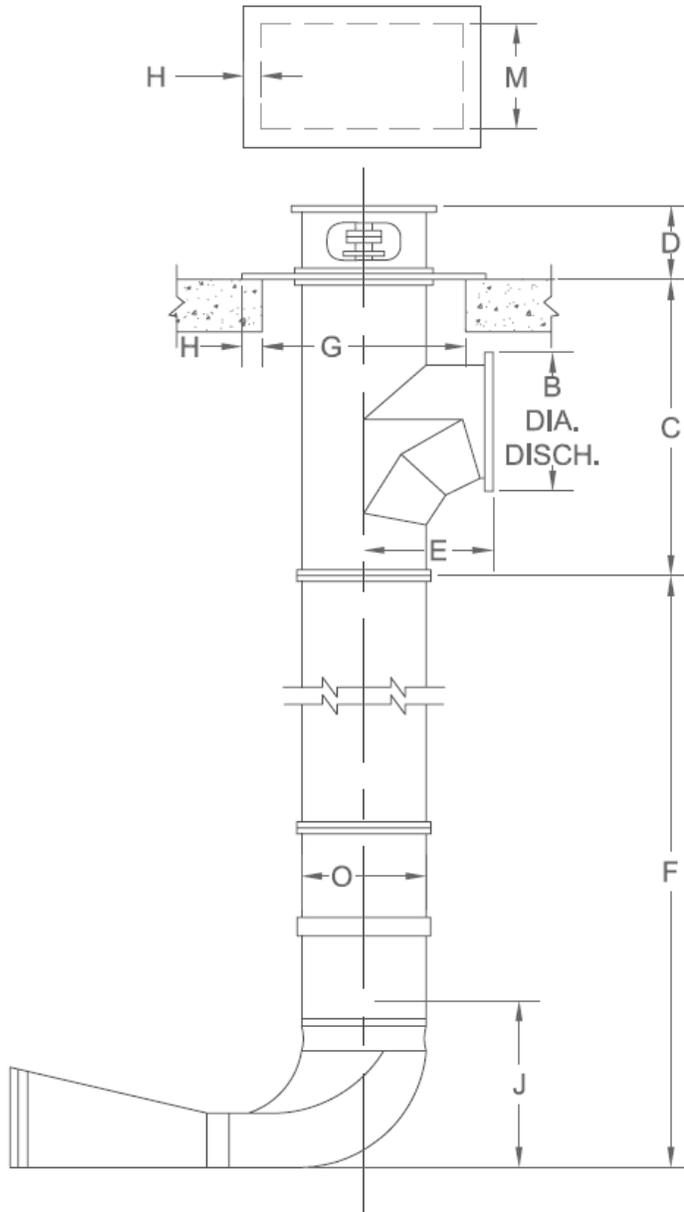
ITT





250 CFS

90 x 60 YDD Pump



Dimensions in Inches

B	=	60
C	=	103
D	=	47
E	=	51
F	=	569
G	=	106
H	=	6.0
J	=	85
(Impeller Eye)		
M	=	106
O	=	60

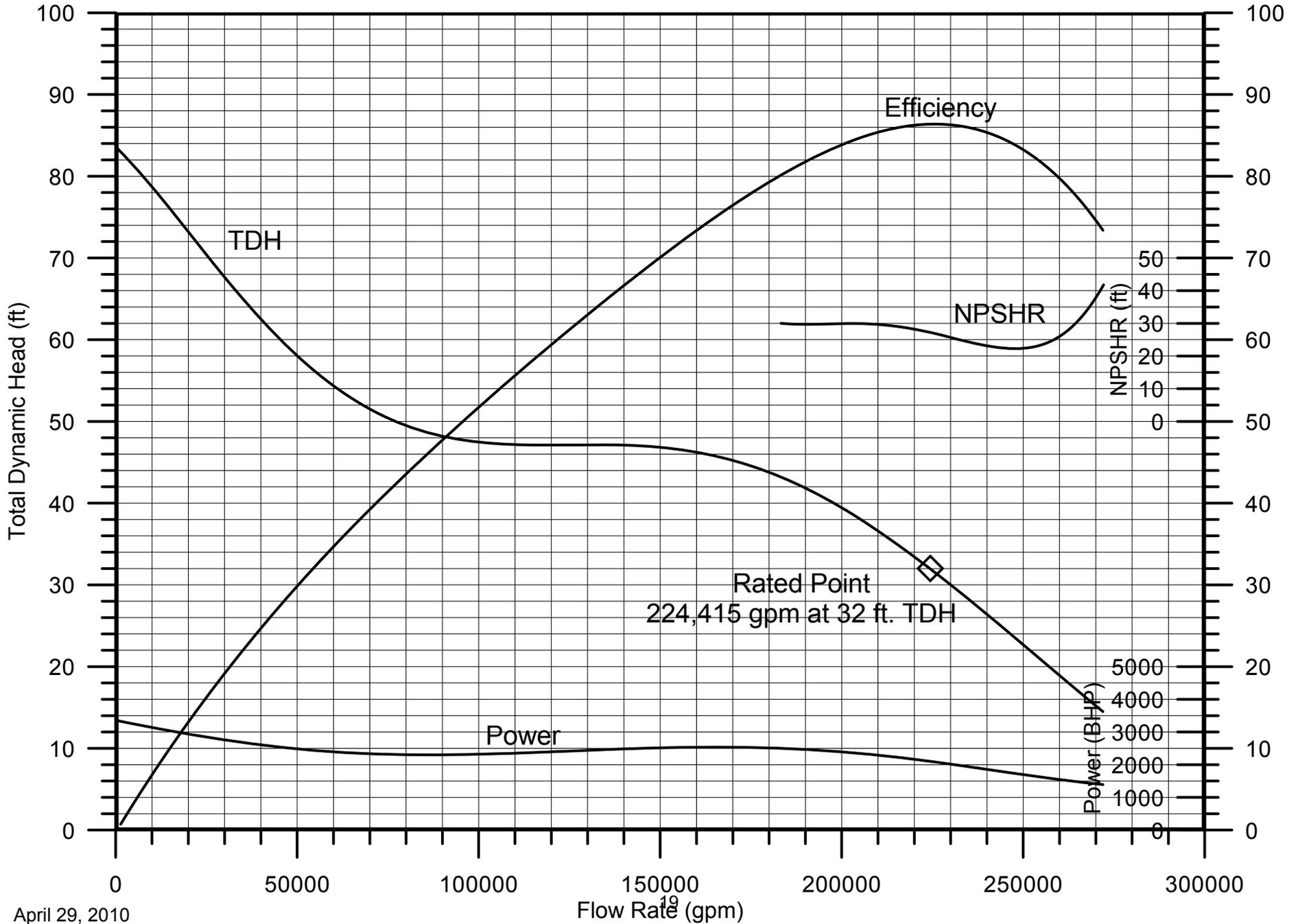
Dimensions are approximate and subject to change.

"d" for Type 10 FSI = 51.2

Pumps at the Lakefront - 250 CFS
ITT Flygt Curve Number 74060
132 x 84 YDD at 271 RPM



ITT





ITT

Greg Japs
Applications Engineer

ITT Flygt Corporation

N27 W23293 Roundy Drive
Pewaukee, WI 53072
tel 262-548-8178
fax 262-548-8170
e-mail: gregory.japs@itt.com

To: Sal Monsour
At: Trigon Associates
Date: April 29, 2010
Subject: Budget Quotation for Pumps at the Lakefront
ITT Flygt Reference No. CP10046

Copy: Leon Dressel –
GSE
Mark Shaw -
ITT

Sal,

17th St. Station – Current Condition, Pump Equipment

Quantity nine (9) ITT Flygt vertical column pumps, model 174 x 126 YDD rated at 448,830 gpm at 4.5 ft. of TDH. Pumps will be below floor discharge, non-removable element, enclosed-lineshaft design. Each pump is complete with baseplate, foundation plates, hold-down bolts, and hardware, rigid adjustable coupling & guard, and a hydrostatic test. Pricing includes pump model test for current and future condition. One set of special tools is included. Pricing is FOB jobsite.

Quantity 2 (2) ITT Flygt vertical column pumps, model 132 x 84 YDD rated at 224,430 gpm at 4.5 ft. of TDH. Pumps will be below floor discharge, non-removable element, enclosed-lineshaft design. Each pump is complete with baseplate, foundation plates, hold-down bolts, and hardware, rigid adjustable coupling & guard, and a hydrostatic test. Pricing includes pump model test for current and future condition. One set of special tools is included. Pricing is FOB jobsite.

Quantity two (2) ITT Flygt vertical column pumps, model 90 x 60 YDD rated at 112,215 gpm at 4.5 ft. of TDH. Pumps will be below floor discharge, non-removable element, enclosed-lineshaft design. Each pump is complete with baseplate, foundation plates, hold-down bolts, and hardware, rigid adjustable coupling & guard, and a hydrostatic test. Pricing includes pump model test for current and future condition. One set of special tools is included. Pricing is FOB jobsite.

Price for one (1) 1000 CFS pump with suction bell: \$3,950,000

Price for one (1) 500 CFS pump with suction bell: \$2,225,000

Price for one (1) 250 CFS pump with suction bell: \$1,150,000

17th St. Station – Current Condition, Drive Equipment

Quantity 3, 1800 diesel engines and accessories: \$1,775,000

Quantity 6, 1800 hp, 1200 rpm horizontal electric motors: \$1,450,000

Quantity 9, 1800 hp right angle gears: \$2,700,000

Quantity 2, 800 hp 1200 rpm horizontal electric motors: \$240,000

Quantity 2, 800 hp right angle gears: \$430,000

Quantity 2, 400 hp 1200 rpm horizontal electric motors: \$90,000

Quantity 2, 400 hp right angle gears: \$120,000



ITT

17th St. Station – Future Condition, Pump Equipment Required for Conversion

Quantity two (2) new 174 x 126 YDD pumps with FSI rated for 448,830 gpm at 32 ft of TDH. Pumps will be below floor discharge, non-removable element, enclosed-lineshaft design. Each pump is complete with baseplate, foundation plates, hold-down bolts, and hardware, rigid adjustable coupling & guard, and a hydrostatic test. Pricing is FOB jobsite.

Quantity nine (9) 174 x 126 YDD conversion kits to convert the existing pumps to 448,830 gpm at 32 ft of TDH. Conversion kits include FSI, new upper shaft, new upper shaft tube, new column section, and miscellaneous bolting, keys, etc.

Quantity two (2) 132 x 84 YDD conversion kits to convert the existing pumps to 224,430 gpm at 32 ft of TDH. Conversion kits include FSI, new upper shaft, new upper shaft tube, new column section, and miscellaneous bolting, keys, etc.

Quantity two (2) 90 x 60 WCAX conversion kits to convert the existing pumps to 112,215 gpm at 32 ft of TDH. Conversion kits include FSI, new upper shaft, new upper shaft tube, new column section, and miscellaneous bolting, keys, etc.

Qty. 1 1000 CFS pump with FSI: \$4,715,000

Qty. 1 1000 CFS conversion kit: \$765,000

Qty. 1 500 CFS conversion kit: \$475,000

Qty. 1 250 CFS conversion kit: \$325,000

17th St. Station – Future Condition, Drive Equipment

Quantity 4, 5000 diesel engines and accessories: \$8,500,000

Quantity 7, 5000 hp, 1200 rpm horizontal electric motors: \$5,425,000

Quantity 11, 4000 hp right angle gears: \$10,450,000

Quantity 2, 2400 hp 1200 rpm horizontal electric motors: \$580,000

Quantity 2, 2000 hp right angle gears: \$700,000

Quantity 2, 1300 hp, 392 rpm, direct drive vertical motors: \$590,000



ITT

London Ave – Current Condition, Pump Equipment

Quantity seven (7) ITT Flygt vertical column pumps, model 174 x 126 YDD rated at 448,830 gpm at 4.5 ft. of TDH. Pumps will be below floor discharge, non-removable element, enclosed-lineshaft design. Each pump is complete with baseplate, foundation plates, hold-down bolts, and hardware, rigid adjustable coupling & guard, and a hydrostatic test. Pricing includes pump model test for current and future condition. One set of special tools is included. Pricing is FOB jobsite.

Quantity one (1) ITT Flygt vertical column pumps, model 132 x 84 YDD rated at 224,430 gpm at 4.5 ft. of TDH. Pumps will be below floor discharge, non-removable element, enclosed-lineshaft design. Each pump is complete with baseplate, foundation plates, hold-down bolts, and hardware, rigid adjustable coupling & guard, and a hydrostatic test. Pricing includes pump model test for current and future condition. One set of special tools is included. Pricing is FOB jobsite.

Quantity two (2) ITT Flygt vertical column pumps, model 90 x 60 YDD rated at 112,215 gpm at 4.5 ft. of TDH. Pumps will be below floor discharge, non-removable element, enclosed-lineshaft design. Each pump is complete with baseplate, foundation plates, hold-down bolts, and hardware, rigid adjustable coupling & guard, and a hydrostatic test. Pricing includes pump model test for current and future condition. One set of special tools is included. Pricing is FOB jobsite.

Price for one (1) 1000 CFS pump with suction bell: \$3,950,000

Price for one (1) 500 CFS pump with suction bell: \$2,225,000

Price for one (1) 250 CFS pump with suction bell: \$1,150,000

London Ave – Current Condition, Drive Equipment

Quantity 3, 1800 diesel engines and accessories: \$1,775,000

Quantity 4, 1800 hp, 1200 rpm horizontal electric motors: \$967,000

Quantity 7, 1800 hp right angle gears: \$2,100,000

Quantity 1, 800 hp 1200 rpm horizontal electric motors: \$120,000

Quantity 1, 800 hp right angle gears: \$215,000

Quantity 2, 400 hp 1200 rpm horizontal electric motors: \$90,000

Quantity 2, 400 hp right angle gears: \$120,000



ITT

London Ave – Future Condition, Pump Equipment Required for Conversion

Quantity one (1) new 176 x 126 YDD pumps with FSI rated for 448,830 gpm at 32 ft of TDH. Pumps will be below floor discharge, non-removable element, enclosed-lineshaft design. Each pump is complete with baseplate, foundation plates, hold-down bolts, and hardware, rigid adjustable coupling & guard, and a hydrostatic test. Pricing is FOB jobsite.

Quantity seven (7) 176 x 126 YDD conversion kits to convert the existing pumps to 448,830 gpm at 32 ft of TDH. Conversion kits include FSI, new upper shaft, new upper shaft tube, new column section, and miscellaneous bolting, keys, etc.

Quantity one (1) 132 x 84 YDD conversion kits to convert the existing pumps to 224,430 gpm at 32 ft of TDH. Conversion kits include FSI, new upper shaft, new upper shaft tube, new column section, and miscellaneous bolting, keys, etc.

Quantity two (2) 90 x 60 YDD conversion kits to convert the existing pumps to 112,215 gpm at 32 ft of TDH. Conversion kits include FSI, new upper shaft, new upper shaft tube, new column section, and miscellaneous bolting, keys, etc.

- Qty. 1 1000 CFS pump with FSI: \$4,715,000
- Qty. 1 1000 CFS conversion kit: \$765,000
- Qty. 1 500 CFS conversion kit: \$475,000
- Qty. 1 250 CFS conversion kit: \$325,000

London Ave – Future Condition, Drive Equipment

- Quantity 4, 5000 diesel engines and accessories: \$8,500,000
- Quantity 4, 5000 hp, 1200 rpm horizontal electric motors: \$3,100,000
- Quantity 8, 4000 hp right angle gears: \$7,600,000
- Quantity 1, 2400 hp 1200 rpm horizontal electric motors: \$290,000
- Quantity 1, 2400 hp right angle gears: \$350,000
- Quantity 2, 1300 hp, 392 rpm, direct drive vertical motors: \$590,000



ITT

Orleans Ave – Current Condition, Pump Equipment

Quantity two (2) ITT Flygt vertical column pumps, model 176 x 126 YDD rated at 448,830 gpm at 4.5 ft. of TDH. Pumps will be below floor discharge, non-removable element, enclosed-lineshaft design. Each pump is complete with baseplate, foundation plates, hold-down bolts, and hardware, rigid adjustable coupling & guard, and a hydrostatic test. Pricing includes pump model test for current and future condition. One set of special tools is included. Pricing is FOB jobsite.

Quantity one (1) ITT Flygt vertical column pumps, model 132 x 84 YDD rated at 224,430 gpm at 4.5 ft. of TDH. Pumps will be below floor discharge, non-removable element, enclosed-lineshaft design. Each pump is complete with baseplate, foundation plates, hold-down bolts, and hardware, rigid adjustable coupling & guard, and a hydrostatic test. Pricing includes pump model test for current and future condition. One set of special tools is included. Pricing is FOB jobsite.

Quantity one (1) ITT Flygt vertical column pumps, model 90 x 60 YDD rated at 112,215 gpm at 4.5 ft. of TDH. Pumps will be below floor discharge, non-removable element, enclosed-lineshaft design. Each pump is complete with baseplate, foundation plates, hold-down bolts, and hardware, rigid adjustable coupling & guard, and a hydrostatic test. Pricing includes pump model test for current and future condition. One set of special tools is included. Pricing is FOB jobsite.

Price for one (1) 1000 CFS pump with suction bell: \$3,950,000

Price for one (1) 500 CFS pump with suction bell: \$2,225,000

Price for one (1) 250 CFS pump with suction bell: \$1,150,000

Orleans Ave – Current Condition, Drive Equipment

Quantity 2, 1800 diesel engines and accessories: \$1,183,000

Quantity 2, 1800 hp right angle gears: \$600,000

Quantity 1, 800 hp 1200 rpm horizontal electric motors: \$120,000

Quantity 1, 800 hp right angle gears: \$215,000

Quantity 1, 400 hp 1200 rpm horizontal electric motors: \$45,000

Quantity 1, 400 hp right angle gears: \$60,000



ITT

Orleans Ave – Future Condition, Pump Equipment Required for Conversion

Quantity one (1) new 132 x 84 YDD pumps with FSI rated for 224,415 gpm at 32 ft of TDH. Pumps will be below floor discharge, non-removable element, enclosed-lineshaft design. Each pump is complete with baseplate, foundation plates, hold-down bolts, and hardware, rigid adjustable coupling & guard, and a hydrostatic test. Pricing is FOB jobsite.

Quantity two (2) 174 x 126 WCAX conversion kits to convert the existing pumps to 448,830 gpm at 32 ft of TDH. Conversion kits include FSI, new upper shaft, new upper shaft tube, new column section, and miscellaneous bolting, keys, etc.

Quantity one (1) 132 x 84 YDD conversion kits to convert the existing pumps to 224,430 gpm at 32 ft of TDH. Conversion kits include FSI, new upper shaft, new upper shaft tube, new column section, and miscellaneous bolting, keys, etc.

Quantity one (1) 90 x 60 YDD conversion kits to convert the existing pumps to 112,215 gpm at 32 ft of TDH. Conversion kits include FSI, new upper shaft, new upper shaft tube, new column section, and miscellaneous bolting, keys, etc.

- Qty. 1 500 CFS pump with FSI: \$3,175,000
- Qty. 1 1000 CFS conversion kit: \$765,000
- Qty. 1 500 CFS conversion kit: \$475,000
- Qty. 1 250 CFS conversion kit: \$325,000

Orleans Ave – Future Condition, Drive Equipment

- Quantity 2, 5000 diesel engines and accessories: \$4,250,000
- Quantity 2, 5000 hp right angle gears: \$1,780,000
- Quantity 2, 2400 hp 1200 rpm horizontal electric motors: \$580,000
- Quantity 2, 2400 hp right angle gears: \$700,000
- Quantity 1, 1300 hp, 392 rpm, direct drive vertical motors: \$295,000

*Budgetary price is subject to change depending upon actual system requirements.

If you have any questions, please feel free to contact me.

Regards,
Greg Japs

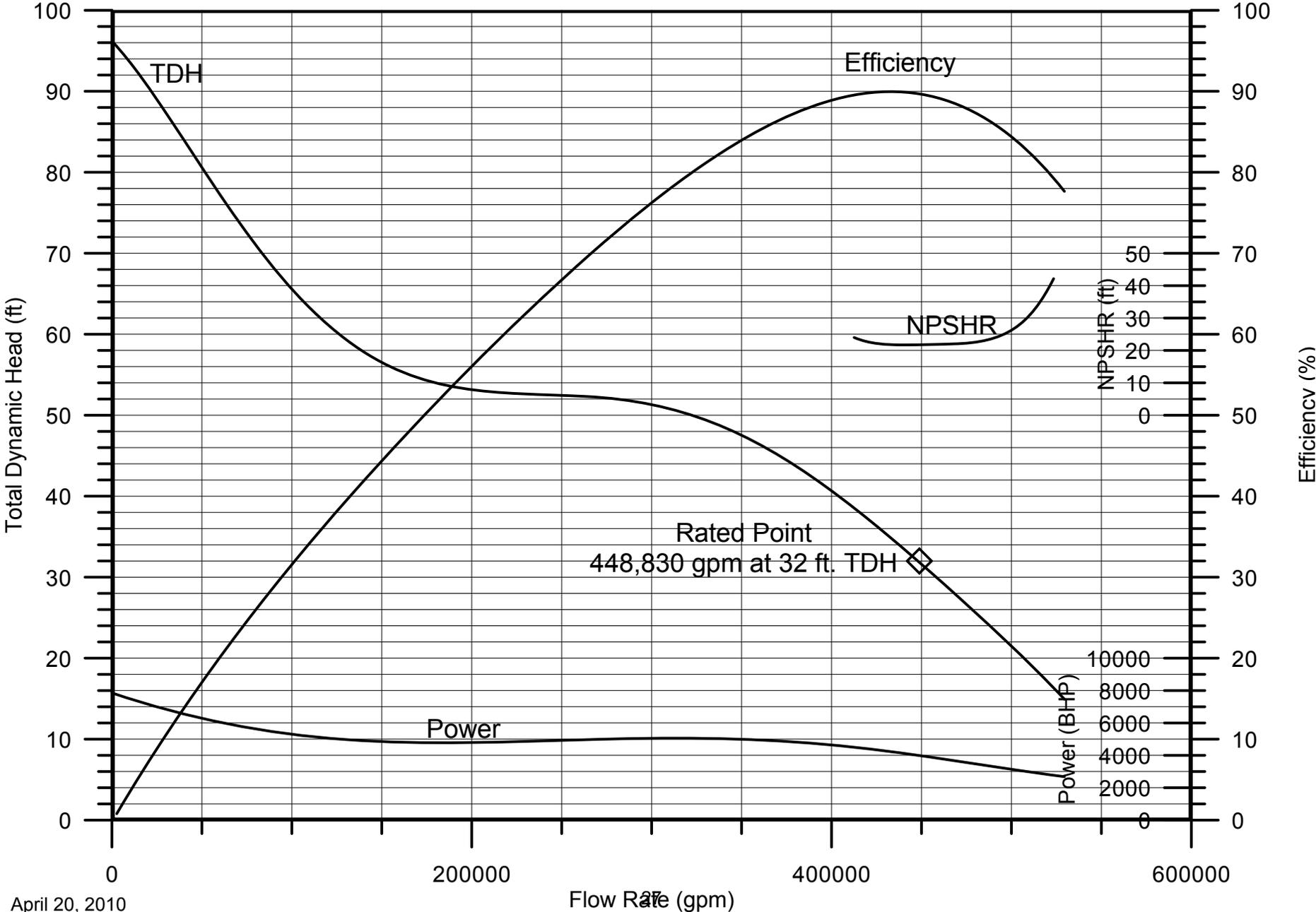


Vertical Mixed Flow Column Pump

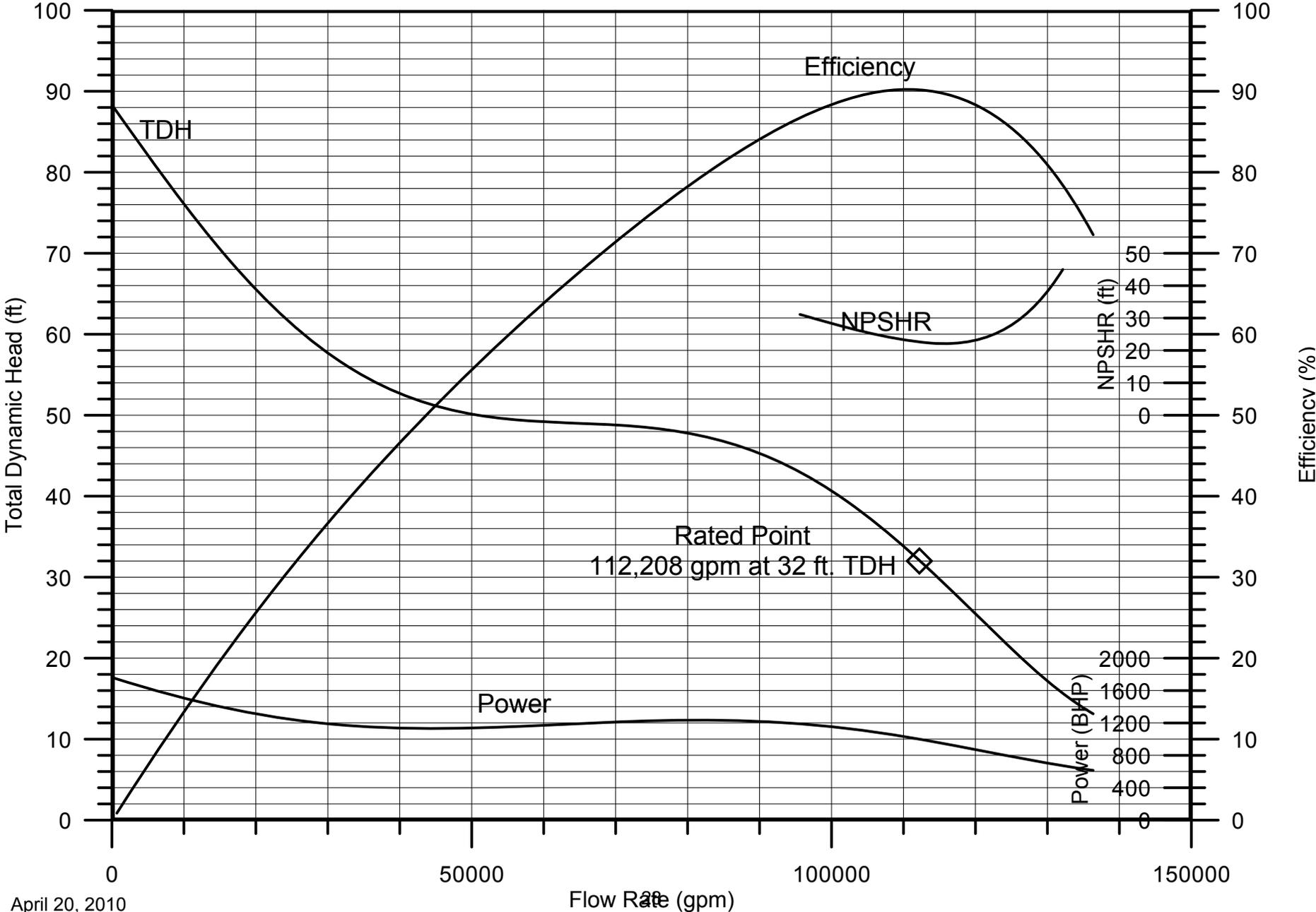
Parts and Material List

PART NAME	MATERIAL	ASTM #/UNS#
Suction Bell	Carbon Steel	A36
Impeller	316L Stainless Steel	A743, CF3M
Impeller Cone	316L Stainless Steel	A743, CF3M
Diffuser	Ductile Iron	A536, Gr. 65-45-12
Pump Shaft (s)	410 Stainless Steel	A276, Type 410 SS
Shaft Tube (s)	Carbon Steel	A36
Column Pipe (s)	Carbon Steel	A36
Discharge Elbow, Baseplate, & Motor Pedestal	Carbon Steel	A36
Foundation Plates	Carbon Steel	A36
Adjustable Coupling	Forged Steel	A668, CL D
Intermediate Shaft Coupling	410 Stainless Steel	A743, CA15
Bearing	Elastomeric	Thordon SXL
Shaft Sleeve	420 Stainless Steel	A743, CA40
Gland	Bronze	B584, C93200
Wear Rings	420 Stainless Steel	A743, CA40
Stuffing Box & Bearing Hsg.	Cast Iron	A48, CL 30
Packing	Teflon	N/A

Hoey and Dwyer Diversion
ITT Flygt Curve Number 74045
174 x 126 YDD at 200 RPM



Hoey and Dwyer Diversion
 ITT Flygt Curve Number 74044
 90 x 66 YDD at 392 RPM



Pump Intake Design

9.8 Pump intake design

Metric units of measurement are used; and corresponding US units appear in brackets. Charts, graphs and sample calculations are also shown in both metric and US units.

Since values given in metric units are not exact equivalents to values given in US units, it is important that the selected units of measure be stated in reference to this standard. If no such statement is provided, metric units shall govern. See Section 9.8.8 for Glossary and Nomenclature.

In the application of this standard, the pump rated flow shall be used as the design flow for the basis of the intake design.

9.8.1 Design objectives

Specific hydraulic phenomena have been identified that can adversely affect the performance of pumps. Phenomena that must not be present to an excessive degree are:

- Submerged vortices
- Free-surface vortices
- Excessive pre-swirl of flow entering the pump
- Non-uniform spatial distribution of velocity at the impeller eye
- Excessive variations in velocity and swirl with time
- Entrained air or gas bubbles

The negative impact of each of these phenomena on pump performance depends on pump specific speed and size, as well as other design features of the pump that are specific to a given pump manufacturer. In general, large pumps and axial flow pumps (high specific speed) are more sensitive to adverse flow phenomena than small pumps or radial flow pumps (low specific speed). A more quantitative assessment of which pump types may be expected to withstand a given level of adverse phenomena with no ill effects has not been performed. Typical symptoms of adverse hydraulic conditions are reduced flow rate, head, effects on power, and increased vibration and noise.

The intake structure should be designed to allow the pumps to achieve their optimum hydraulic performance for all operating conditions. A good design ensures that the adverse flow phenomena described above are within the limits outlined in Section 9.8.5.6.

If an intake is designed to a geometry other than that presented in this standard, and this design is shown by prototype or model tests, performed in accordance with Section 9.8.5, to meet the acceptance criteria in Section 9.8.5.6, then this alternative design shall be deemed to comply with this standard.

9.8.2 Intake structures for clear liquids

9.8.2.1 Rectangular intakes

This section is applicable to wet pit pumps. This section also applies to the intakes for dry pit pumps with less than five diameters of suction piping immediately upstream from the pump (see Section 9.8.4).

9.8.2.1.1 Approach flow patterns

The characteristics of the flow approaching an intake structure is one of the most critical considerations for the designer. When determining direction and distribution of flow at the entrance to a pump intake structure, the following must be considered:

- The orientation of the structure relative to the body of supply liquid
- Whether the structure is recessed from, flush with, or protrudes beyond the boundaries of the body of supply liquid
- Strength of currents in the body of supply liquid perpendicular to the direction of approach to the pumps
- The number of pumps required and their anticipated operating combinations

The ideal conditions, and the assumptions upon which the geometry and dimensions recommended for rectangular intake structures are based, are that the structure draws flow so that there are no cross-flows in the vicinity of the intake structure that create asymmetric flow patterns approaching any of the pumps, and

the structure is oriented so that the supply boundary is symmetrical with respect to the centerline of the structure. As a general guide, cross-flow velocities are significant if they exceed 50% of the pump bay entrance velocity. Section 9.8.5 provides recommendations for analyzing departures from this ideal condition based upon a physical hydraulic model study.

9.8.2.1.2 Open vs. partitioned structures

If multiple pumps are installed in a single intake structure, dividing walls placed between the pumps result in more favorable flow conditions than found in open sumps. Adverse flow patterns can frequently occur if dividing walls are not used. For pumps with design flows greater than 315 l/s (5,000 gpm) dividing walls between pumps are required.

9.8.2.1.3 Trash racks and screens

Partially clogged trash racks or screens can create severely skewed flow patterns. If the application is such that screens or trash racks are susceptible to clogging, they must be inspected and cleaned as frequently as necessary to prevent adverse effects on flow patterns.

Any screen-support structure that disrupts flow, such as dual-flow traveling screens, otherwise known as double-entry single-exit screens, can create a high-velocity jet and severe instability near the pumps. A physical hydraulic model study must be performed in every such case. The screen exit should be placed a minimum distance of six bell diameters, 6D, (see Section 9.8.6) from the pumps. However, this distance should be used only as a general guideline for initial layouts of structures, with final design developed with the aid of a physical model study.

The recommendations in this standard should be followed if suction bell strainers are used.

9.8.2.1.4 Recommendations for dimensioning rectangular intake structures

The basic design requirements for satisfactory hydraulic performance of rectangular intake structures include:

- Adequate depth of flow to limit velocities in the pump bays and reduce the potential for formulation of surface vortices
- Adequate pump bay width, in conjunction with the depth, to limit the maximum pump approach

velocities to 0.5 m/s (1.5 ft/s), but narrow and long enough to channel flow uniformly toward the pumps

The minimum submergence, S, required to prevent strong air core vortices is based in part on a dimensionless flow parameter, the Froude number, defined as:

$$F_D = V/(gD)^{0.5} \tag{9.8.2.1-1}$$

Where:

F_D = Froude number (dimensionless)

V = Velocity at suction inlet = Flow/Area, based on D

D = Outside diameter of bell or pipe inlet

g = gravitational acceleration

Consistent units must be used for V , D and g so that F_D is dimensionless. The minimum submergence, S , shall be calculated from (Hecker, G.E., 1987),

$$S = D(1+2.3F_D) \tag{9.8.2.1-2}$$

where the units of S are those used for D . Section 9.8.7 provides further information on the background and development of this relationship.

It is appropriate to specify sump dimensions in multiples of pump bell diameters "D" (see Section 9.8.6). Basing dimensions on "D" ensures geometric similarity of hydraulic boundaries and dynamic similarity of flow patterns. There is some variation in bell velocity among pump types and manufacturers. However, variations in bell inlet velocity are of secondary importance to maintaining acceleration of the flow and converging streamlines into the pump bell.

The basic recommended layout for rectangular sumps, dimensioned in units of pump bell diameter "D," is shown in Figure 9.8.1. The dimension variables and their recommended values are defined in Table 9.8.1.

Through-flow traveling screens generally do not clog to the point where flow disturbances occur. Therefore, they may be located such that Y is 4.0D or more in dimension. For non-selfcleaning trash racks or stationary screens, the dimension Y shall be increased to a minimum of 5.0D. Care must be taken to ensure that clogging does not occur to the extent that large non-uniformities in the pump approach flow will be generated.

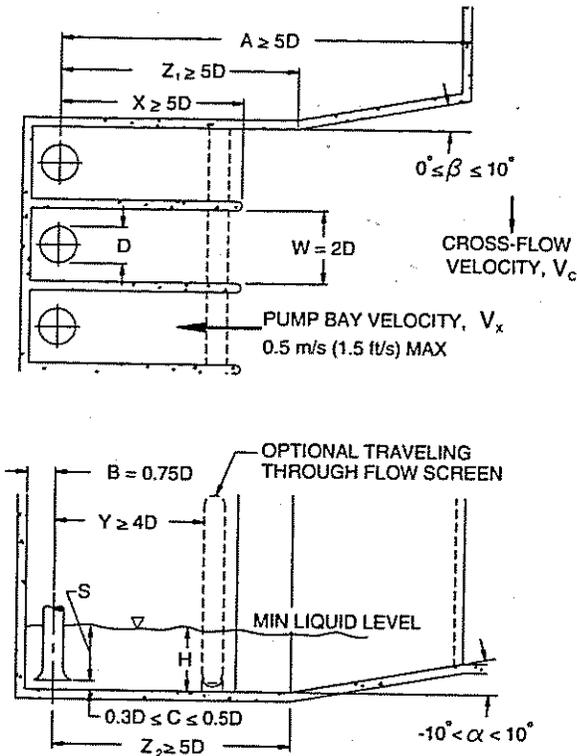


Figure 9.8.1 — Recommended intake structure layout

The effectiveness of the recommended pump bay dimensions depends upon the characteristics of the flow approaching the structure, and upon the geometry of hydraulic boundaries in the immediate vicinity of the structure. Section 9.8.2.1.1 provides a discussion of the requirements for satisfactory approach flow conditions.

Negative values of β (the angle of wall divergence) require flow distribution or straightening devices, and should be developed with the aid of a physical hydraulic model study.

Occasionally, it is necessary to increase the bay width to greater than $2D$ to prevent velocities at the entrance to the pump bays from exceeding 0.5 m/s (1.5 ft/s). Greater bay widths may also result due to the arrangement of mechanical equipment. In these cases, the bay width in the immediate vicinity of the pumps must be decreased to $2D$. The dimension of the filler wall required to achieve the reduction in bay width is as shown in Figure 9.8.2.

For pumps with design flows of 315 l/s ($5,000 \text{ gpm}$) or less, no partition walls between pumps are required, and the minimum pump spacing shall be $2D$.

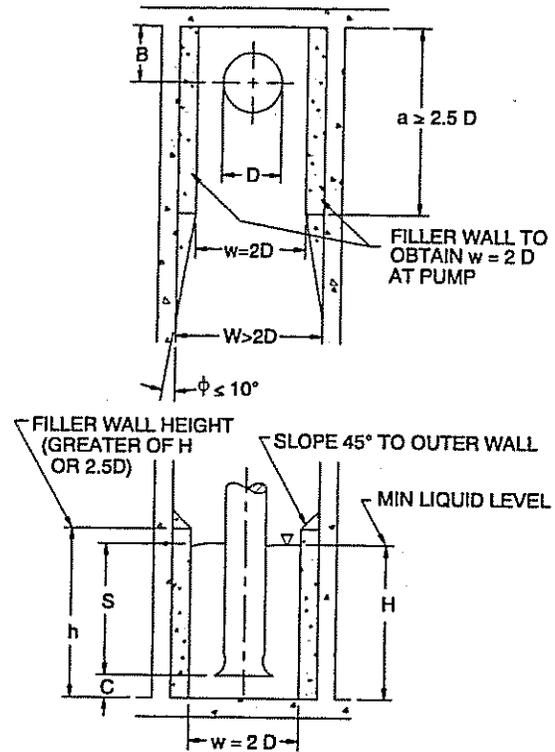


Figure 9.8.2 — Filler wall details for proper bay width

Table 9.8.2 provides a sequence of steps to follow in determining the general layout and internal geometry of a rectangular intake structure.

9.8.2.2 Formed suction intakes

9.8.2.2.1 General

This standard applies to formed suction intakes. The standard utilizes the "TYPE 10" design developed by the US Army Corps of Engineers (ETL No. 110-2-327). The formed suction intake (FSI) may eliminate the need for the design of sumps with approach channels and appurtenances to provide satisfactory flow to a pump. The FSI design is relatively insensitive to the direction of approach flow and skewed velocity distribution at its entrance. In applying the FSI design, consideration should be given to the head loss in the FSI which will affect to some extent the system curve calculations, and the net positive suction head (NPSH) available to the pump impeller, typically located near the FSI exit.

9.8.2.2.2 Dimensions

The FSI design dimensions are indicated in Figure 9.8.3. The wall shown in Figure 9.8.3 above the FSI

opening reduces the tendency for surface vortices when the FSIs are installed in individual bays. The wall is not necessary for unrestricted approach flow conditions.

$$SID = 1.0 + 2.3 F_D$$

Where:

S is the distance from the minimum recommended liquid level to the centerline of the FSI opening in the elevation view

9.8.2.2.3 Application standards

Minimum submergence (see Section 9.8.7) is calculated as follows:

Table 9.8.1 — Recommended dimensions for Figures 9.8.1 and 9.8.2

Dimension Variable	Description	Recommended Value
A	Distance from the pump inlet bell centerline to the intake structure entrance	A = 5D minimum, assuming no significant cross-flow ^a at the entrance to the intake structure
a	Length of constricted bay section near the pump inlet	a = 2.5D minimum
B	Distance from the back wall to the pump inlet bell centerline	B = 0.75D
C	Distance between the inlet bell and floor	C = 0.3D to 0.5D
D	Inlet bell design outside diameter	See Section 9.8.6
H	Minimum liquid depth	H = S + C
h	Minimum height of constricted bay section near the pump inlet bell	h = (greater of H or 2.5D)
S	Minimum pump inlet bell submergence	S = D(1.0 + 2.3 F _D) (see Section 9.8.7 for detailed discussion on determining minimum submergence)
W	Pump inlet bay entrance width	W = 2D minimum
w	Constricted bay width near the pump inlet bell	w = 2D
X	Pump inlet bay length	X = 5D minimum, assuming no significant cross-flow at the entrance to the intake structure
Y	Distance from pump inlet bell centerline to the through-flow traveling screen	Y = 4D minimum. Dual-flow screens require a model study
Z ₁	Distance from pump inlet bell centerline to diverging walls	Z ₁ = 5D minimum, assuming no significant cross-flow ^a at the entrance to the intake structure
Z ₂	Distance from inlet bell centerline to sloping floor	Z ₂ = 5D minimum
α	Angle of floor slope	α = -10 to +10 degrees
β	Angle of wall convergence	β = 0 to +10 degrees (Negative values of β, if used, require flow distribution devices developed through a physical model study)
φ	Angle of convergence from constricted area to bay walls	φ = 10 degrees maximum

^a Cross-flow is considered significant when V_C > 0.5 V_X average

D is the diameter of a circle having an area equivalent to the rectangular FSI opening,
 $D = [(4/\pi)WH_f]^{0.5}$

V used in F_D , is the average velocity through the FSI opening

The circular geometry results in a smaller circumference, and hence minimizes excavation and construction materials for a given sump volume. The circular geometry lends itself to the use of the caisson construction technique. The availability of prefabricated circular construction elements has made this design the most popular for smaller pump stations. Fully equipped prefabricated pump stations often have a circular design for the above reasons.

9.8.2.3 Circular pump stations (clear liquids)

9.8.2.3.1 General

A circular design is suitable for many types and sizes of pump stations. It can be used with most types of pumps and for most types of liquids. A circular design may offer a more compact layout that often results in reduced construction costs.

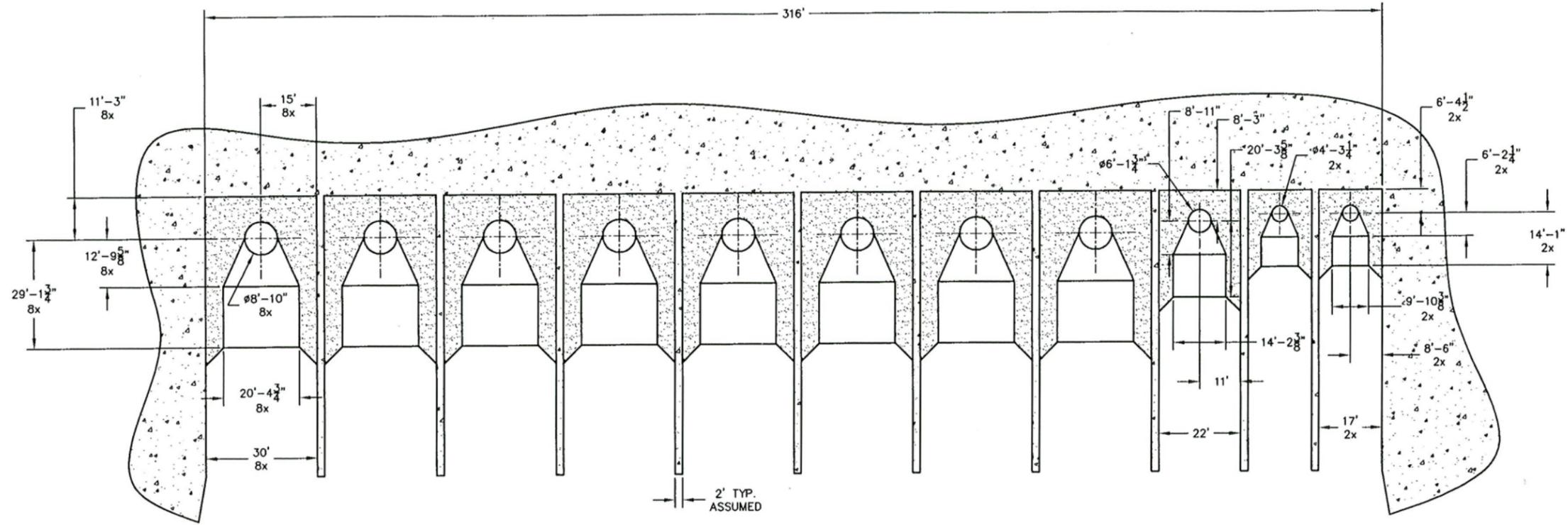
The recommended designs of circular stations are categorized in two groups: duplex and triplex. Stations with four or more pumps are not addressed in the standard because of complex flow patterns; such designs require a model study. Circular pump sumps for flows exceeding 315 l/s (5000 gpm) per pump require a model test.

Table 9.8.2 — Design sequence, rectangular intake structures

Design Step	Description
1	Consider the flow patterns and boundary geometry of the body of liquid from which the pump station is to receive flow. Compare with the approach flow condition described in Section 9.8.2.1.1 and determine from Section 9.8.5.1 if a hydraulic model study is required.
2	Determine the number and size of pumps required to satisfy the range of operating conditions likely to be encountered.
3	Identify pump inlet bell diameter. If final bell diameter is not available, use the relationship in Figure 9.8.25 to obtain the inlet bell design diameter
4	Determine the bell-floor clearance, see Figure 9.8.1. A good preliminary design number is 0.5D.
5	Determine the required bell submergence, using the relationship in Section 9.8.7.
6	Determine the minimum allowable liquid depth in the intake structure from the sum of the floor clearance and the required bell submergence.
7	Check bottom elevation near the entrance to the structure and determine if it is necessary to slope the floor upstream of the bay entrance.
8	Check the pump bay velocity for the maximum single-pump flow and minimum liquid depth with the bay width set to 2D. If bay velocity exceeds 0.5 m/s (1.5 ft/s), then increase the bay width to reduce to a maximum flow velocity of 0.5 m/s (1.5 ft/s).
9	If it is necessary to increase the pump bay width to greater than 2D, then decrease bay width in the vicinity of the pumps according to Figure 9.8.2.
10	Compare cross-flow velocity (at maximum system flow) to average pump bay velocity. If cross-flow value exceeds 50% of the bay velocity, a hydraulic model study is necessary.
11	Determine the length of the structure and dividing walls, giving consideration to minimum allowable distances to a sloping floor, screening equipment, and length of dividing walls. If dual flow traveling screens or drum screens are to be used, a hydraulic model study is required (see Section 9.8.5.1, Need for Model Study).
12	If the final selected pump bell diameter and inlet velocity is within the range given in Section 9.8.6, the sump dimensions (developed based on the inlet bell design diameter) need not be changed and will comply with these standards.

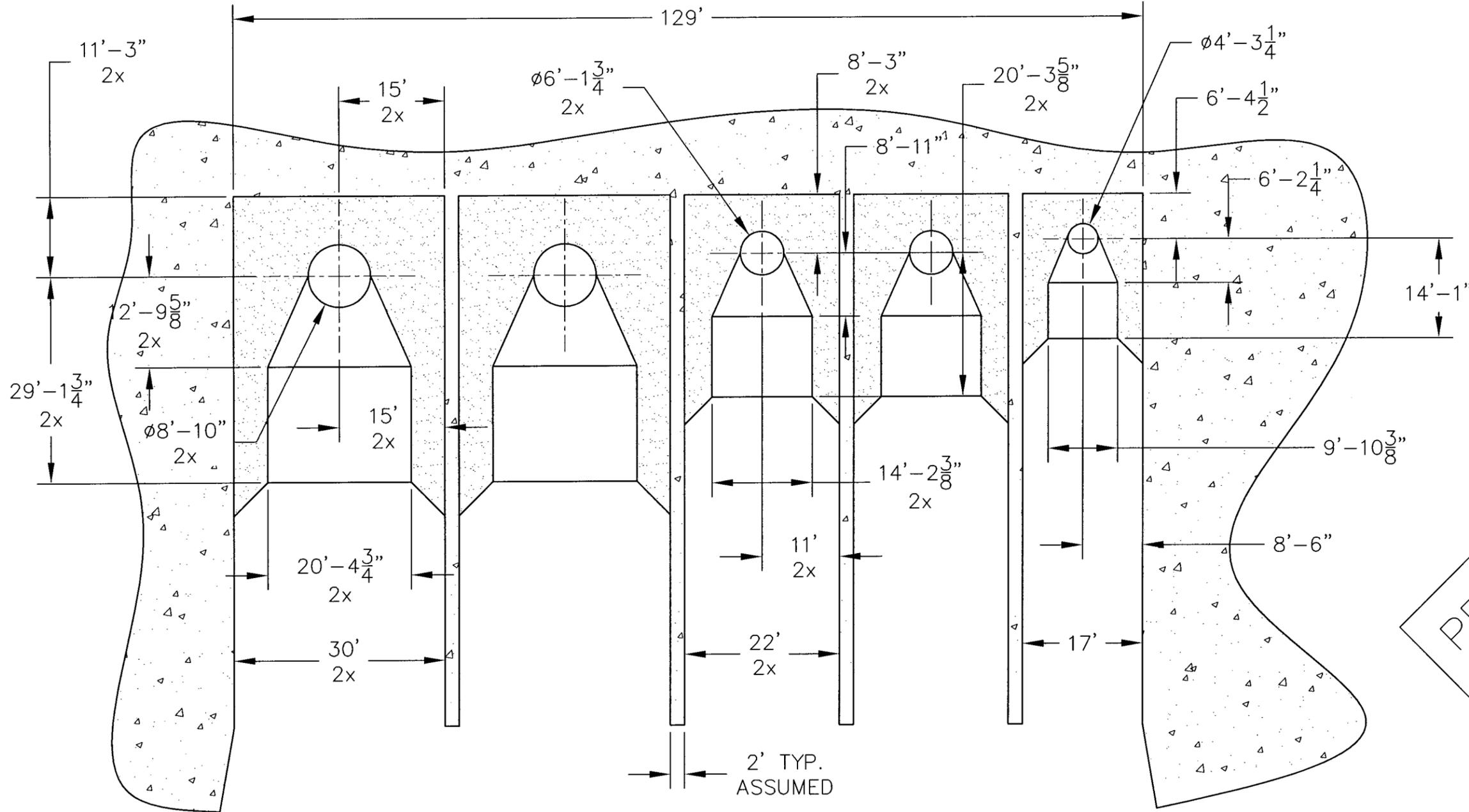
NOTES:

- 1. ALL DIMENSIONS ARE PRELIMINARY AND NEED TO BE VERIFIED WITH A SUMP MODEL STUDY.
- 2. DIMENSIONS ARE BASED ON H.I. STANDARDS.



PRELIMINARY
NOT FOR CONSTRUCTION

PEWAUKEE, WI USA				NAME LONDON AVE. STATION FUTURE FSI	
CONFIDENTIAL-PROPERTY OF ITT FLYGT CORP. UNLESS OTHERWISE SPECIFIED				MATL QTY=8 1,000 CFS PUMPS QTY=1 500 CFS PUMPS QTY=2 250 CFS PUMPS	
1-PLC. DEC.±.06 2-PLC. DEC.±.03 3-PLC. DEC.±.010	FOR TOLERANCES NOT SPECIFIED SEE 500-SERIES SHOP STANDARDS		R: WT: F:		BUL
DR: MZ 4-2-10 CH: AP:	SIMILAR TO		THIRD ANGLE PROJECTION		PART NO.
	SCALE NTS	SHEET ---			



PRELIMINARY
NOT FOR CONSTRUCTION

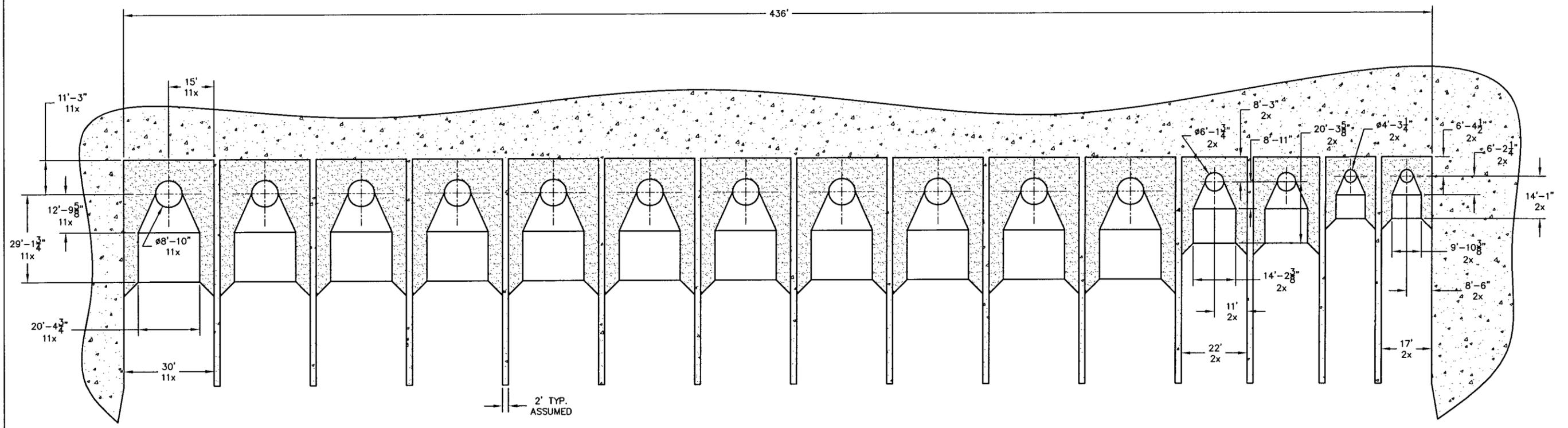
NOTES:

1. ALL DIMENSIONS ARE PRELIMINARY AND NEED TO BE VERIFIED WITH A SUMP MODEL STUDY.
2. DIMENSIONS ARE BASED ON H.I. STANDARDS.

 PEWAUKEE, WI USA				NAME ORLEANS AVE. STATION FUTURE FSI	
CONFIDENTIAL-PROPERTY OF ITT FLYGT CORP. UNLESS OTHERWISE SPECIFIED				MATL QTY=2 1,000 CFS PUMPS QTY=2 500 CFS PUMPS QTY=1 250 CFS PUMPS	
1-PLC. DEC.±.06 2-PLC. DEC.±.03 3-PLC. DEC.±.010		FOR TOLERANCES NOT SPECIFIED SEE 500-SERIES SHOP STANDARDS		R: WT: F: BUL	
DR: MZ 4-2-10 CH: AP:		SIMILAR TO		THIRD ANGLE PROJECTION	
		SCALE NTS		SHEET ---	
		PART NO.			

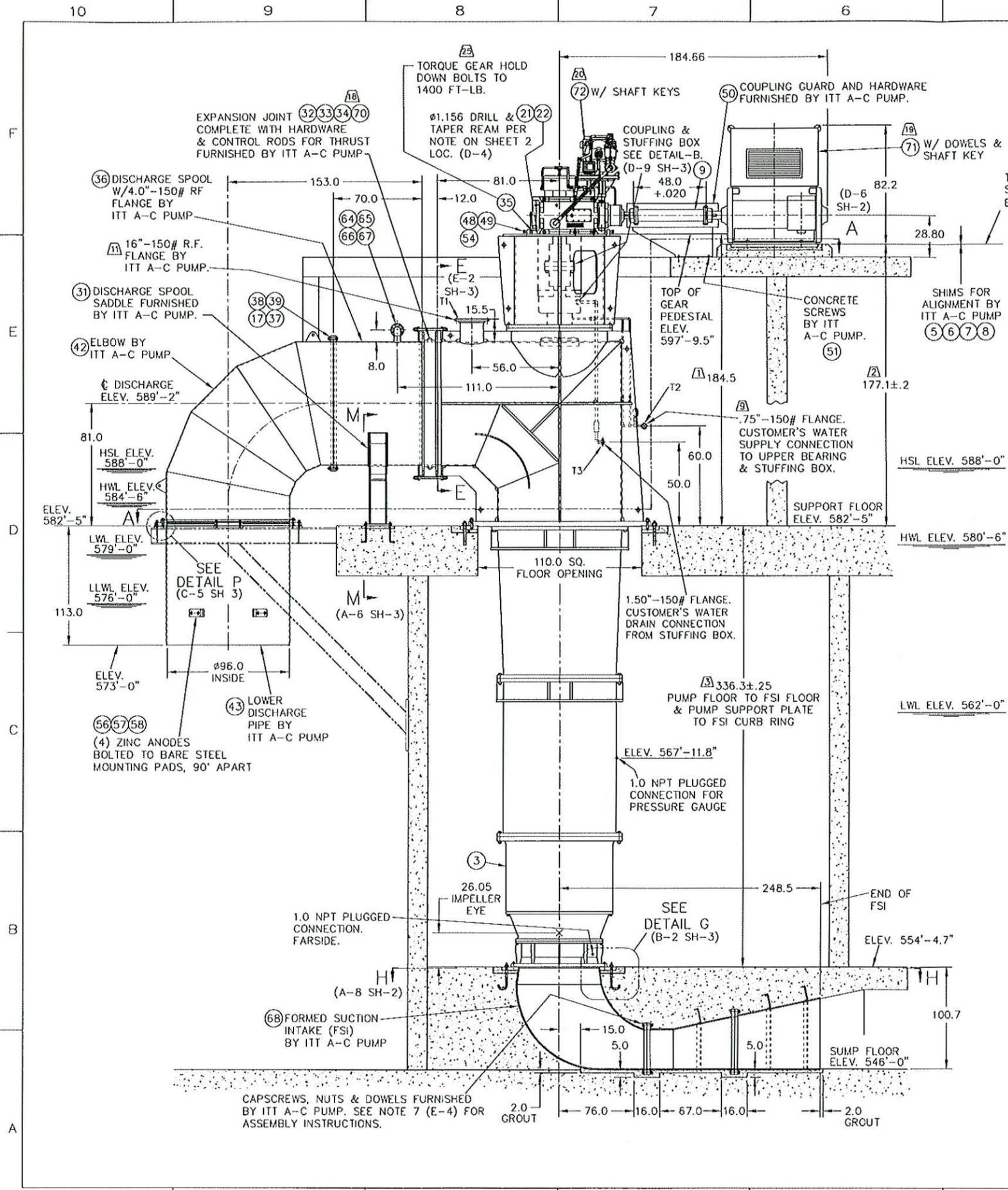
NOTES:

- 1. ALL DIMENSIONS ARE PRELIMINARY AND NEED TO BE VERIFIED WITH A SUMP MODEL STUDY.
- 2. DIMENSIONS ARE BASED ON H.I. STANDARDS.



PRELIMINARY
NOT FOR CONSTRUCTION

 PEWAUKEE, WI USA		 ITT		NAME 17TH ST. STATION FUTURE FSI	
CONFIDENTIAL-PROPERTY OF ITT FLYGT CORP. UNLESS OTHERWISE SPECIFIED				MATL QTY=11 1,000 CFS PUMPS QTY=2 500 CFS PUMPS QTY=2 250 CFS PUMPS	
1-PLC. DEC.±.06 2-PLC. DEC.±.03 3-PLC. DEC.±.010		FOR TOLERANCES NOT SPECIFIED SEE 500-SERIES SHOP STANDARDS		R: WT: F: BUL	
DR: MZ 4-2-10 CH: AP:		SIMILAR TO SCALE NTS SHEET ---		THIRD ANGLE PROJECTION PART NO.	



- NOTES:
- ITT A-C PUMP WILL FURNISH PUMP SUPPORT PLATES (WITH LEVELING SCREWS) TOGETHER WITH STUDS & NUTS NECESSARY TO SECURE PUMP TO PUMP SUPPORT PLATES. FOUNDATION BOLTS, NUTS & WASHERS TO SECURE PUMP SUPPORT PLATE TO CONCRETE FOUNDATION ARE TO BE FURNISHED BY CONTRACTOR.
 - PUMP DISCHARGE HYDRAULIC THRUST WILL BE TAKEN BY THE PUMP SUPPORT PLATES. DISCHARGE PIPE WILL BE SUPPORTED NEAR THE PUMP TO AVOID PLACING PIPE STRAINS ON THE PUMP. GROUT AROUND PUMP SUPPORT PLATE MUST BE OF THE NON-SHRINK TYPE & OF SUFFICIENT STRENGTH. PUMP RATED DISCHARGE HYDRAULIC THRUST IS 23,790 LBS. CAUTION: DO NOT USE BOLTS AT PUMP DISCHARGE FLANGE TO PULL PIPING INTO ALIGNMENT.
 - THE PUMP FOUNDATION SHALL BE SUFFICIENTLY RIGID TO ABSORB ANY PERMISSIBLE VIBRATIONS & SHALL BE ADEQUATELY SUPPORTED SUCH THAT WHEN SUBJECT TO LOAD OF THE PUMP & DRIVER, THE LEVEL, AS MEASURED ON THE DRIVER MOUNTING FLANGE, IS MAINTAINED TO WITHIN .002 INCH PER FOOT IN ALL DIRECTIONS. THIS IS IMPORTANT TO PERMIT ALIGNMENT OF THE PUMP & DRIVER COUPLING & TO PROVIDE A VERTICAL ALIGNMENT OF THE PUMP SHAFT IN ITS BEARINGS.
 - ROTATION OF THE PUMP IS CLOCKWISE WHEN VIEWING UNIT FROM TOP.
 - LIFTING DEVICE WILL BE FURNISHED BY ITT A-C PUMP FOR LIFTING THE ENTIRE PUMP AND ALL INDIVIDUAL COMPONENTS.
 - FOR HANDLING & SHIPPING DWG. SEE 08-308-996-475.
 - FIELD ASSEMBLY OF FORMED SUCTION INTAKE (F.S.I.): WHEN ASSEMBLING THE MATING SECTIONS OF THE F.S.I., APPLY A NARROW APPROX. #1 CONTINUOUS BEAD OF LOCTITE #504 TO THE ENTIRE FLANGE FACE (TO ONE MATING FLANGE) BETWEEN THE CAPSCREW HOLES & INSIDE OPENING. APPLY TWO (2) GENEROUS LONGITUDINAL BEADS OF LOCTITE #277, 180' FROM EACH OTHER, OVER THE ENGAGEMENT THREAD LENGTH OF CAPSCREWS. USE NO LUBRICANT OF ANY KIND. INSTALL CAPSCREWS & NUTS. INSTALL DOWELS. TORQUE EACH CAPSCREW TO 500 FT. LBS.
 - STUFFING BOX. CUSTOMER WATER SUPPLY: .500 PIPING TO STUFFING BOX SEAL WATER SUPPLY. CUSTOMER TO FURNISH 2 GPM CLEAN FILTERED WATER (250 MICRONS) AT APPROX. 30-150 PSI MAX, 90' MAX. WATER TO BE SUPPLIED DURING PUMP OPERATION.
 - UPPER BEARING. CUSTOMER WATER SUPPLY: .750 PIPING TO UPPER BEARING WATER SUPPLY. CUSTOMER TO FURNISH 13 GPM CLEAN FILTERED WATER (250 MICRONS) AT APPROX. 30-150 PSI MAX, 90' MAX. WATER TO BE SUPPLIED DURING PUMP OPERATION.
 - THE RECOMMENDED LOW WATER LEVEL ALARM IS 562 FT. (LWL) AND THE RECOMMENDED SHUTDOWN LEVEL IS 555 FT.
 - PUMP VIBRATION LEVELS AS MEASURED AT GEAR MOUNTING FLANGE: 0.12 IN/S NORMAL, 0.20 IN/S ALARM & 0.28 IN/S TRIP.
 - STIFFNESS IN THE "Y" DIRECTION = 2,000,000 LB/IN, "X" DIRECTION = 357,000 LB/IN, "Z" DIRECTION = 385,000 LB/IN. ALLOWABLE DEFLECTIONS ARE "X" = 0.125"; "Y" = 0.040"; "Z" = 0.045"

LOADING @ PUMP FOUNDATION SUPPORT FLOOR:
 NON-OPERATING: 197,510 LB (WET)
 OPERATING: 200,160 LB ↓, 23,790 LB ←, 160,570 LB-FT (MOMENTARY)

LOADING @ SUPPORT SADDLE FOUNDATION FLOOR:
 NON-OPERATING: 27,580 LB (WET)
 OPERATING: 27,580 LB ↓, (14,620 LB ←, 39,600 LB-FT (MOMENTARY))

LOADING @ DISCHARGE PIPE FOUNDATION FLOOR:
 NON-OPERATING: 78,550 LB (WET)
 OPERATING: 81,200 LB ↓, 23,790 LB ←, 160,570 LB-FT (MOMENTARY)

- NOTES FOR SETTING OF RIGID COUPLING
- SEE INSTRUCTION BOOK FOR STEP BY STEP INSTRUCTIONS FOR COUPLING ALIGNMENT.
 - LOWER PUMP HALF COUPLING UNTIL LOCKING PIN IS CLEAR OF ADJUSTMENT RING SUCH THAT A GAP OF .254 IS ATTAINED BETWEEN PUMP & MOTOR HALF COUPLING FLANGES WHEN PUMP HALF COUPLING IS RAISED. THE ADJUSTMENT RING MUST BE SEATED IN PUMP HALF COUPLING COUNTER-BORE & IMPELLER MUST REMAIN AT REST WHEN THE GAP IS MEASURED. NOTE: ROTATION OF ONE SLOT (45°) WILL CHANGE GAP BY .010.
 - DISTANCE FROM BOTTOM OF ADJUSTMENT RING TO RELIEF ON SHAFT IS .1 MINIMUM TO 1.1 MAXIMUM. IF MINIMUM DIMENSION BECOMES LESS THAN .1, SHIM UNDER GEAR MOTOR ACCORDINGLY.
 - INSTALL BOLTS, WASHERS, NUTS & TIGHTEN. THIS WILL RAISE THE ROTATING ELEMENT .254 ALLOWED, & WILL GIVE PROPER RUNNING CLEARANCE FOR THE IMPELLER. TORQUE COUPLING BOLTS TO 910 FT. LBS. HARDENED WASHERS MUST BE USED UNDER BOLT HEAD & NUT. (FURNISHED BY ITT)

RATING
 CAPACITY-----205,000 GPM
 POOL TO POOL HEAD---17 FT.
 TOTAL HEAD-----19.5 FT.
 SPEED-----225 RPM

RUNOUTS T.I.R.
 COUPLING FACES----- .001
 COUPLING OUTSIDE DIA--- .003
 MOTOR SHAFT----- .002
 PUMP SHAFT----- .002

MAX. ALLOWABLE EXTERNAL NOZZLE LOADING
 $F_x = F_y = F_z = \pm 9,600$ LBS
 $M_x = M_y = M_z = \pm 19,200$ FT-LBS

ESTIMATED WEIGHTS LBS
 PUMP COMPLETE (DRY)-----84,700 (A)

WATER IN PUMP ABOVE SUCTION
 LOW WATER LEVEL TO PUMP
 DISCHARGE FLANGE-----100,000

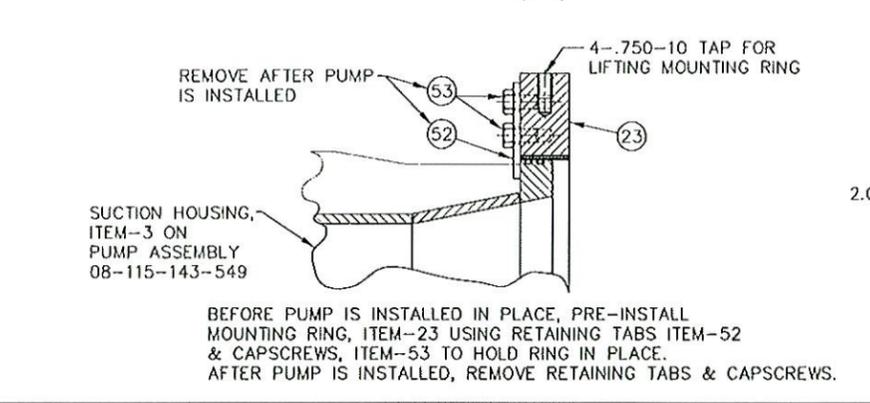
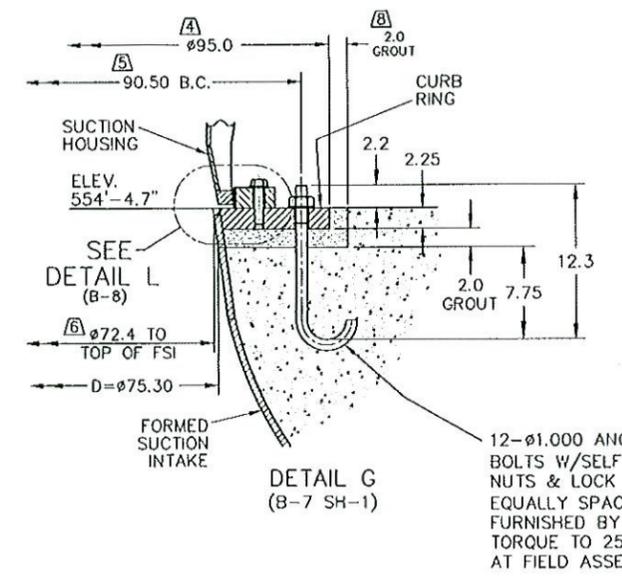
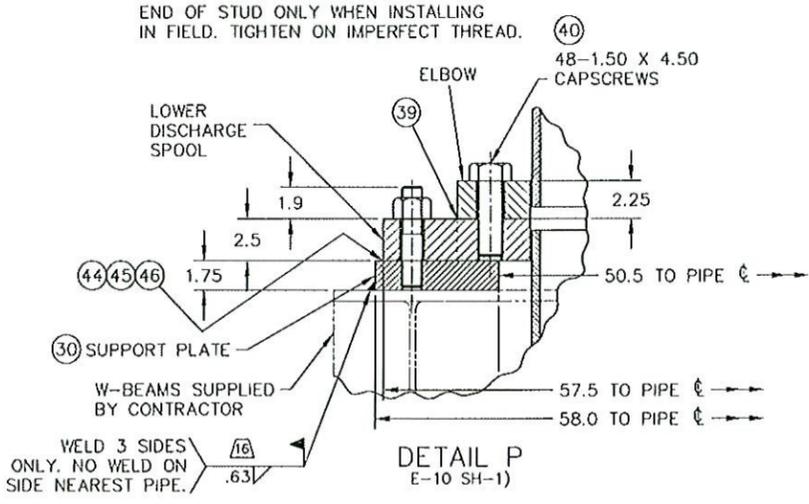
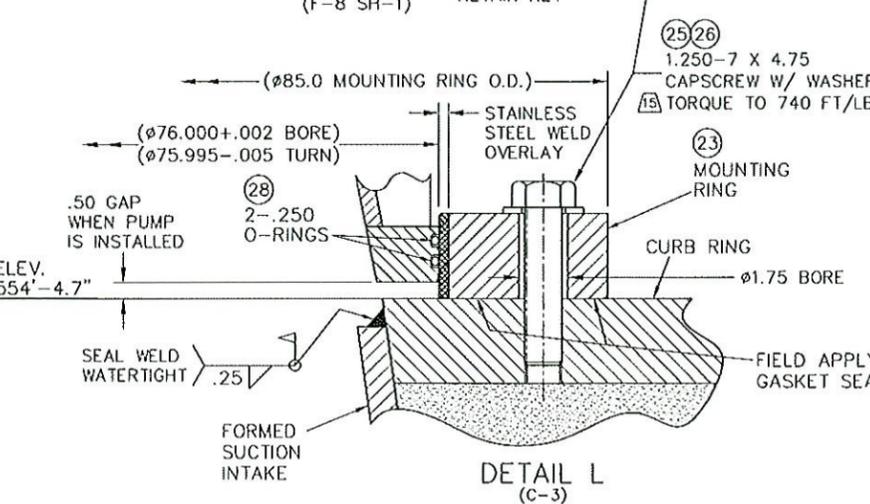
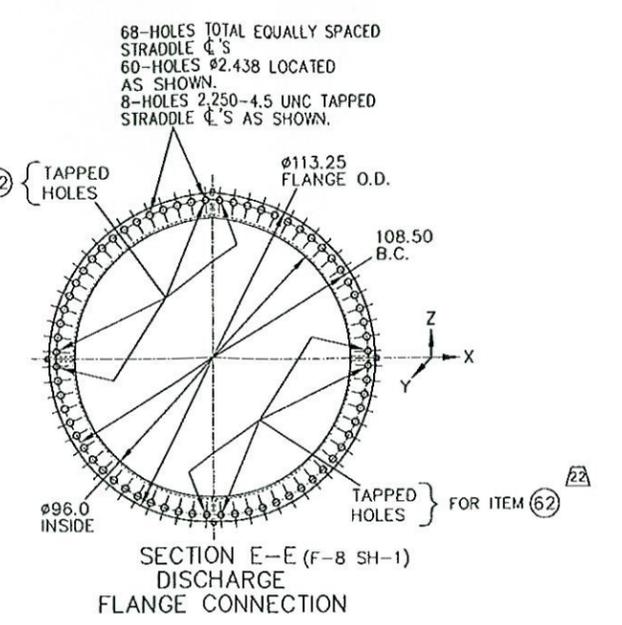
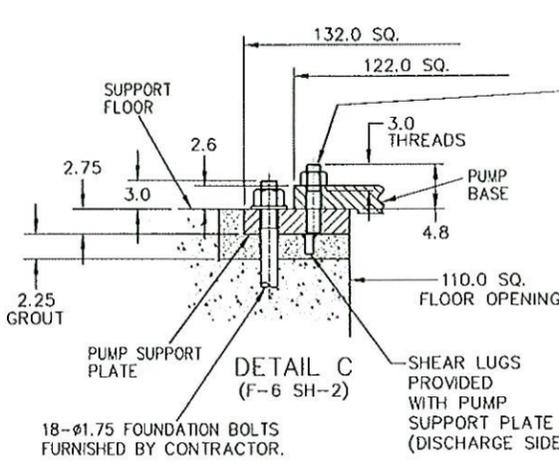
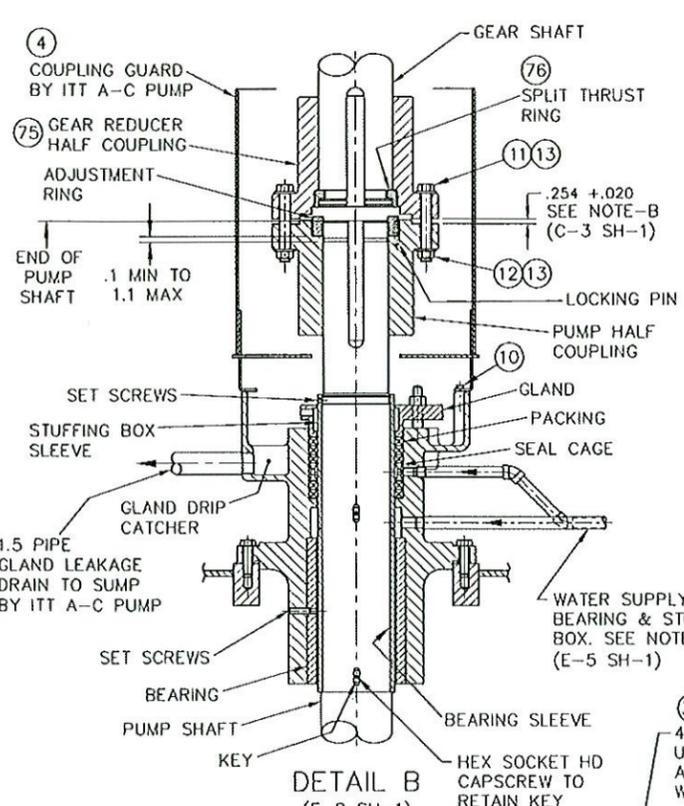
WATER IN DISCHARGE PIPING
 ABOVE DISCHARGE LOW WATER
 LEVEL TO PUMP DISCHARGE
 FLANGE-----84,400

PUMP SUPPORT PLATES -----4,100
 GEAR -----8,540
 MOTOR -----12,500
 FORMED SUCTION INTAKE -----23,500
 EXPANSION JOINT -----1,000
 DISCHARGE SPOOL -----5,110
 DISCHARGE SPOOL SADDLE-----2,210
 ELBOW -----7,120
 LOWER DISCHARGE PIPE -----6,290
 HIGH SPEED COUPLING -----620 (A)

FINAL ORDER COMPLETE { WITH TOOLS 08-116-153-683
 WITHOUT TOOLS 08-116-153-684

CONFIDENTIAL - PROPERTY OF DEPT: 4438 MI	A-C Custom Pump ITT Industries	NAME OUTLINE & FINAL ASSEMBLY
UNLESS OTHERWISE SPECIFIED		MATL 96 WCAX PUMP
FOR TOLERANCES NOT SPECIFIED SEE 500-SERIES SHOP STANDARDS		R: W/T: F: BUL
DR:DCW 4-27-05 CH:DCW 5-2-05 AP:GJJ 5-2-05	SIMILAR TO MK-459 SCALE NTS SHEET 1 OF 3	THIRD ANGLE PROJECTION PART NO. 08-405-264-461

01	5-2-05 DCW
REVISED PER CUSTOMERS REQUEST.	
02	9-14-05 DCW
A(E-7) DIM WAS 189.0	
A(E-6) DIM WAS 181.8	
A(C-7) DIM WAS 455.8	
A(D-3) DIM WAS 102.5	
A(D-3) DIM WAS 98.0	
A(C-3) DIM WAS 74.3	
REVISED PER CUSTOMERS REQUEST.	
03	4-24-06 MZ
ADDED NOTE 11 (F-9) ADDED " & CONTROL RODS" TO NOTE (D-3) ADDED LOADING.	
04	6-7-06 MZ
A(E-6) WAS 1.0 NPT.	
A(B-3) WAS 96,000#.	
A(I) ADDED VALVE & ACTUATOR NOTE. NOTE 2 WAS 61,100 LBS. REVISED LOADING BASED ON NEW PUMP WEIGHT.	
05	11-8-06 MZ
ADDED ITEM NUMBERS. A2 WEIGHT WAS 340 PUMP SUPPORT FLOOR LOWERED 115.0" ELEV. WAS 592'-0" SUPPORT FLOOR ELEV. WAS 592'-0". (D-4) REVISED LOADING. ADDED 16" FLANGE CONN. TO DISCHARGE ELBOW. RELOCATED 4" FLANGE CONN. A(I)(F-10) WAS 4'-150#	
06	3-30-07 MZ
SEE SHEETS 2 & 3.	
07	4-25-07 MZ
REVISED PER CUSTOMERS REQUEST.	
08	6-13-07 MZ
SEE SHEET 3.	
09	10-24-07 MZ
A(B)(F-9) DELETED ITEM-3A	
10	12-18-07 MZ
A(B)(F-9) ADDED ITEM 70.	
A(F-6) WAS ITEM 70.	
A(D)(F-7) WAS ITEM 71.	
11	3-24-08 MZ
SEE SHEET 2 & 3	
12	6-3-08 DCW
SEE SHEET 3.	
13	9-29-08 MZ
VIBRATION LEVELS WERE 0.08 IN/S NORMAL & 0.12 IN/S ALARM & 0.16 IN/S TRIP	
A4 ADDED STIFFNESS FOR "X" & "Z" DIRECTIONS	
A5 ADDED TORQUE NOTE	
14	1-6-09 MZ



CONFIDENTIAL - PROPERTY OF DEPT: 4438 MI	A-C Custom Pump ITT Industries	NAME OUTLINE & FINAL ASSEMBLY
UNLESS OTHERWISE SPECIFIED		MATL 96 WCAX PUMP
FOR TOLERANCES NOT SPECIFIED SEE 500-SERIES SHOP STANDARDS		R: WT: E: BUL
DR:DCW 4-27-05 CH:DCW 5-2-05 AP:GJJ 5-2-05	SIMILAR TO MK-459 SCALE NTS SHEET 3 OF 3	THIRD ANGLE PROJECTION PART NO. 08-405-264-461

01	5-2-05 DCW
02	9-14-05 DCW
REVISED PER CUSTOMERS REQUEST.	
03	4-24-06 MZ
①⑧(D-2) DIM WAS 6.0	
04	6-7-06 MZ
05	11-8-06 MZ
ADDED ITEM NUMBERS.	
①④ QTY. WAS 8	
①⑤ ADDED TORQUE VALUE	
06	3-30-07 MZ
MOVED SHEAR LUGS TO DISCHARGE SIDE.	
07	4-25-07 MZ
①⑥ ADDED FIELD WELD REVISED PER CUSTOMERS REQUEST.	
08	6-13-07 MZ
①⑦(F-6) DELETED ITEM-38	
09	10-24-07 MZ
10	12-18-07 MZ
11	3-24-08 MZ
①⑧(B-6) ADDED WELD NOTE.	
12	6-3-08 DCW
①⑨(E-2)(F-4) ADDED ITEM 62	
13	9-29-08 MZ
ADDED TOLERANCE OF +.20	
14	1-6-09 MZ

DIESEL GENERATOR SET

CATERPILLAR®



Image shown may not reflect actual package

Standby
3100 ekW 3875 kVA
60 Hz 1800 rpm
4160 Volts

Caterpillar® is leading the power generation market place with power solutions engineered to deliver unmatched performance, reliability, durability and cost-effectiveness.

FEATURES

EMISSIONS / FUEL STRATEGY

- EPA Tier 2

DESIGN CRITERIA

- The generator set accepts 100% rated load in one step per NFPA 110 and meets ISO 8528-5 transient response.

FULL RANGE OF ATTACHMENTS

- Wide range of bolt-on attachments, factory designed and tested
- Flexible packaging options for easy and cost effective installation

SINGLE SOURCE SUPPLIER

- Fully prototype tested with field validation

WORLDWIDE PRODUCT SUPPORT

- Caterpillar® dealers provide extensive post-sale support including maintenance and repair agreements
- Caterpillar dealers have over 1,600 dealer branch stores operating in 200 countries
- CAT SOSSM program cost effectively detects internal engine component condition, even the presence of unwanted fluids and combustion by-products

CAT C175-16 DIESEL ENGINE

- Reliable and durable
- Four-stroke diesel engine combines superior performance with excellent fuel economy
- Advanced electronic engine control
- Low installation and operating cost

CAT SR5 GENERATOR

- Designed to match performance and output characteristics of Caterpillar diesel engines
- Industry leading mechanical and electrical design
- Industry leading motor starting capabilities
- High efficiency

CAT EMCP3 CONTROL PANELS

- Simple user friendly interface and navigation
- Scalable system to meet a wide range of customer needs
- Integrated Control System and Communications Gateway

Factory Installed Standard & Optional Equipment

System	Standard	Optional
Air Inlet	<ul style="list-style-type: none"> Air cleaner; 4 x single element canister with service indicator(s) Plug group for air inlet shut-off 	<ul style="list-style-type: none"> Air cleaner; 4 x dual element with service indicator(s) Air inlet adapters
Control Panel	<ul style="list-style-type: none"> EMCP 3.1 (set mounted) 	<ul style="list-style-type: none"> EMCP 3.2 or 3.3 Local & remote annunciator modules Discrete I/O module Generator temperature monitoring & protection Remote monitoring Load share module
Cooling	<ul style="list-style-type: none"> SCAC cooling Jacket water and AC inlet / outlet flanges 	<ul style="list-style-type: none"> Remote horizontal SCAC radiator Remote fuel cooler Low coolant level sensor (for remote radiators)
Exhaust	<ul style="list-style-type: none"> Dry exhaust manifold Bolted flange (ANSI 6" & DIN 150) with bellow for each turbo (qty 4) 	<ul style="list-style-type: none"> Engine Exhaust Temperature Module Mufflers (15dBA, 25dBA, or 40dBA) 20" vertical exhaust collector Weld flange ANSI 20"
Fuel	<ul style="list-style-type: none"> Primary fuel filter with water separator Secondary/ tertiary fuel filters (engine mounted) 	
Generator	<ul style="list-style-type: none"> SR5 generator <ul style="list-style-type: none"> 3 phase brushless, salient pole IEC platinum stator RTDs Cat Digital Voltage Regulator (CDVR) 	<ul style="list-style-type: none"> Space heater kit Oversized generators Power connection arrangement
Governor	<ul style="list-style-type: none"> ADEM™ A4 	<ul style="list-style-type: none"> Redundant shutdown
Lubrication	<ul style="list-style-type: none"> Lubricating oil Oil filter, filler and dipstick Oil drain line with valves Fumes disposal Gear type lube oil pump Integral lube oil cooler 	<ul style="list-style-type: none"> Electric prelube pump
Mounting	<ul style="list-style-type: none"> Rails-engine / generator Rubber anti-vibration mounts (shipped loose) 	<ul style="list-style-type: none"> Spring type linear vibration isolators IBC vibration isolators
Starting / Charging	<ul style="list-style-type: none"> Dual 24 volt electric starting motors Batteries with rack and cables Battery disconnect switch 	<ul style="list-style-type: none"> Oversized battery set 75 amp charging alternator Battery chargers (20 amp) Jacket water heater Ether starting aid
Crankcase Systems	<ul style="list-style-type: none"> Open crankcase ventilation 	<ul style="list-style-type: none"> Crankcase explosion relief valve
Circuit Breakers		(No set mounted circuit breakers available on medium or high voltage packages)
General	<ul style="list-style-type: none"> RH service (Except LH Service Oil Filter) SAE standard rotation Paint - Caterpillar yellow with high gloss black rails Flywheel and flywheel housing - SAE N0. 00 	<ul style="list-style-type: none"> Barring group- manual or air powered Factory test reports

CAT C175 ENGINE

Engine	C175	
Number of cylinders	16	
Cycle	Four stroke	
Cooling	Water	
Bore	175 mm	6.89 inches
Stroke	220 mm	8.66 inches
Displacement	84.67 L	5166.63 in ³
Compression ratio	15.3:1	
Aspiration	TA	
Cooling type	SCAC	
Fuel system	Common Rail	
Governor type	ADEM™ A4	

CAT SR5 GENERATOR

Frame	1848
Insulation class (UL1446 recognized)	H
Temperature rise @ 40C ambient	150 °C
Winding type	Form
Winding connection	Star (wye)
Winding pitch	0.6667
Excitation	PM
Motor starting capability @30% voltage dip and 0.4 pf (skVA)	7949 skVA
Number of poles	4
Number of bearings	2
Number of leads	6
Number of phases	3
IP rating	IP23
Overspeed capability - % of rated	125%
Wave form deviation	Less than 3%
Telephone Influence Factor (TIF)	Less than 50
Harmonic distortion	Less than 5%
Heat rejection to atmosphere	119.1 kW

CAT CDVR VOLTAGE REGULATOR

Caterpillar Digital Voltage Regulator (CDVR)	
Microprocessor based	
VAR/PF control	
RFI suppression	
Minimum / maximum excitation limiter	
Exciter diode monitor	
Direct 3 phase sensing with selectable volts/Hz	
Communicates with EMCP3	
Programmable operating characteristics	
Compatible with SE, PM and IE excitation	
Voltage regulation steady state	less than +/- 0.25%

CATERPILLAR EMCP 3 CONTROLS

Features	EMCP3.1 (Standard)	EMCP 3.2 (Optional)	EMCP 3.3 (Optional)
• 12-24 Volt (nominal) DC control	X	X	X
• Run/Auto/stop control	X	X	X
• Display size (mm)	24x95	24x95	28x100
• Display size (pixels)	33 x132	33 x132	64x240
• Display available in any of 26 languages with text translation capability	X	X	X
• Temperature operating range -40 C to 70 C (-40 F to 158 F), (display to -20 C/-4 F)	X	X	X
• Designed for mounting on generator set package (vibration tested to 4.3G sinusoidal and 15G shock)	X	X	X
• 3-phase, true RMS metering	X	X	X
• Generator metering accuracy (+/- X%)	2	1	1
• Metering - L-L volts, L-N Volts, phase Amps, Hz	X	X	X
• Digital indications for RPM, operating hours, oil pressure, coolant temperature and system DC voltage	X	X	X
• Two LED indicators for common warning/shutdown alarms (i.e. low oil pressure, high coolant temperature, low coolant level, over-speed, emergency stop, failure to start due to over crank, etc.)	X	X	X
• Reset all events function	X	X	X
• Voltage adjust when CDVR is on J1939 data-link	X	X	X
• Integrates with ADEM engine governor for engine monitoring, alarms, and control	X	X	X
• Integrates with Caterpillar Digital Voltage Regulator (CDVR) for alarms and control	X	X	X
• Compatible with Caterpillar ET service tool for enhanced serviceability including data capturing from event log, data logging, set point programming and troubleshooting	X	X	X
• Field re-flashable software ensures the customers get the latest updated software	X	X	X
• Programmable switch inputs	4	6	6
• Programmable relay outputs (2A continuous DC)	4	6	6
• Integration with programmable annunciator module - local/remote (NFPA 99-110) (optional)		Maximum 4	Maximum 4
• Integration with programmable discrete I/O (DIO) module (optional)		Maximum 4	Maximum 4
• Programmable discrete outputs		1	2
• Additional configurable Input (0-2 kOhm resistive sender)		1	1
• Programmable protective relaying functions - under/over voltage, under/over frequency and phase over-current		X	X
• Programmable kW level relay		X	X
• Power metering - kW, kVA, kVAR, kWhr, %kW, PF		X	X
• Built in Modbus isolated data link (RS -485 half-duplex) that supports serial communication at data rate up to 57.6 kbaud and functions as a communications gateway to the customer's SCADA system or device, providing all generator set data for remote monitoring, automatically generated monthly reports, trending/graphing, storing events history, etc.		X	X
• Free Modbus RTU / remote monitoring PC software		X	X
• Engine crank attempt counter		X	X
• Engine successful start counter		X	X
• Service maintenance interval (engine hrs & real-time)		X	X
• Engine oil temperature in °C or °F (optional)		X	X
• Real time clock		X	X
• Programmable cycle timer		X	X
• Programmable protective relaying function - reverse power			X
• Enhanced engine monitoring - intake/exhaust manifold, SCAC inlet, oil and fuel temperatures; fuel, crankcase and intake manifold pressures; oil, fuel and air filter restrictions; instant and total fuel consumption - where supported by Engine Control Module (ECM)			X
• Integration with RTD module for generator temperature monitoring (optional)			Maximum 1
• Integration with thermocouple module(s) for generator temperature monitoring (optional)			Maximum 2

TECHNICAL DATA

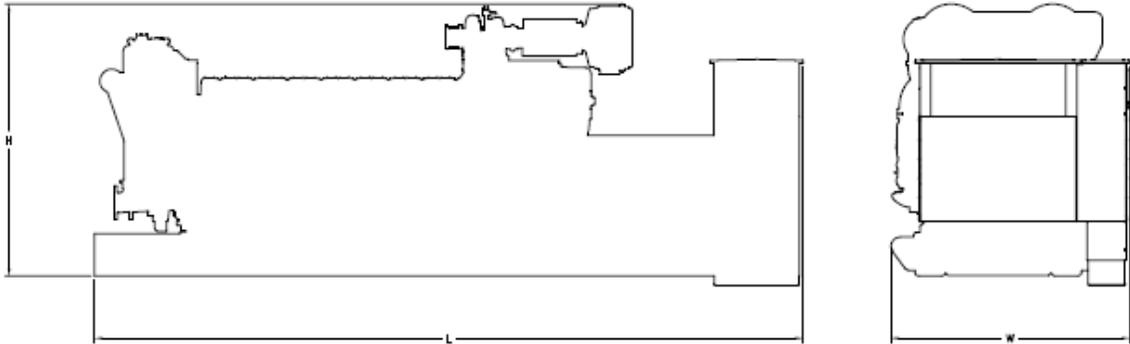
EPA Tier 2		
Generator Set Package Performance	Units	
Generator set power rating @ 0.8 pf	3875 kVA	
Generator set power rating with fan *	3100 ekW	
Generator set rated voltage	4160 Volts	
Generator set rated current @0.8 pf (Amps)	537.8 Amps	
Air Inlet		
Combustion air inlet flow rate	262.6 m3/min	9,274.7 cfm
Cooling System		
Coolant to aftercooler temp max	46°C at 30°C ambient	115°F at 86°F ambient
Emissions (Nominal¹)		
NOx+ HC		5.19 g/bhp-hr
CO		0.65 g/bhp-hr
HC		0.10 g/bhp-hr
PM		0.03 g/bhp-hr
Exhaust System		
Exhaust stack gas temperature	472.6°C	882.6°F
Exhaust gas flow rate (Wet)	688.1 m3/min	24,300.6 cfm
Exhaust system backpressure (max. allowable)	6.7 kPA	26.9 in water
Exhaust flange size (internal diameter)	150 mm	6 inches
Fuel Consumption		
100% Load with fan	797.6 L/hr	210.7 Gal/hr
75% Load with fan	605.3 L/hr	159.9 Gal/hr
50% Load with fan	473.6 L/hr	125.1 Gal/hr
Heat Rejection		
Heat rejection to coolant (total)	1,360.4 kW	77,432.0 Btu/min
Heat rejection to exhaust (total)	3,070.2 kW	174,755.0 Btu/min
Heat rejection to aftercooler (Stage 2)	482.9 kW	27,488.0 Btu/min
Heat rejection to atmosphere from engine	274.1 kW	15,603.0 Btu/min
Heat rejection to atmosphere from generator	119.1 kW	6779.1 Btu/min
Lube System		
Sump refill with filter	540 L	142.6 Gal

* The generator set package is not offered with an engine driven radiator. The addition of an engine driven fan will reduce the output below the nameplate rating.

1. Emissions data measurement procedures are consistent with those described in EPA CFR 40 Part 89, Subpart D & E and ISO8178-1 for measuring HC, CO, PM, NOx. Data shown is based on steady state operating conditions of 77°F, 28.42 in HG and number 2 diesel fuel with 35° API and LHV of 18,390 btu/lb. The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on 100% load and thus cannot be used to compare to EPA regulations which use values based on a weighted cycle.

Package Dimensions and Weights

Length	6,464.7 mm	254.51 in
Width	2,089.4 mm	82.26 in
Height	2,211.1 mm	87.05 in
Approx. Package Weight- Dry	18,510 kg	40,800 lbs



RATING DEFINITIONS AND CONDITIONS

Ratings are based on SAE J1995 standard conditions. These ratings also apply at ISO3046 standard conditions.

Standby - Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year. Standby power in accordance with ISO8528. Fuel stop power in accordance with ISO3046. Standby ambients shown indicate ambient temperature at 100% load which results in a coolant top tank temperature just below the shutdown temperature.

Additional Ratings may be available for specific customer requirements. Consult your Caterpillar representative for details.

Meets or Exceeds International Specifications: AS1359, CSA, IEC60034, ISO3046, ISO8528, NEMA MG 1-33, UL508A, 98/37/EC

Fuel Rates are based on fuel oil of 35° API (16° C or 60° F) gravity having an LHV of 42 780 kJ/kg (18,390 Btu/lb) when used at 29° C (85° F) and weighing 838.9 g/liter (7.001 lbs/U.S. gal.).

Emissions Data measurement procedures are consistent with those described in EPA CFR 40 Part 89, subpart D and E, and ISO8178-1 for measuring HC, CO, PM and NOx. Data shown is based on steady state operating conditions of 77°F, 28.42 in HG and number 2 diesel fuel with 35° API and LHV of 18,390 btu/lb. The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on 100% load and thus cannot be used to compare EPA regulations which use values based on a weighted cycle.

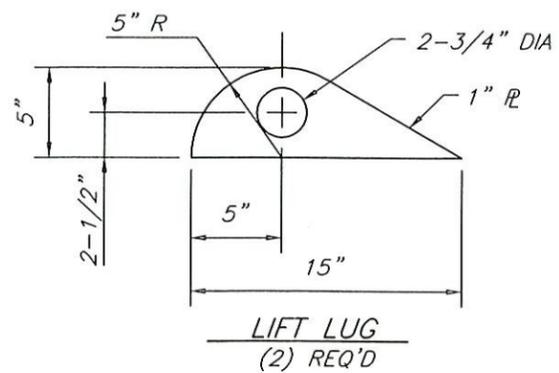
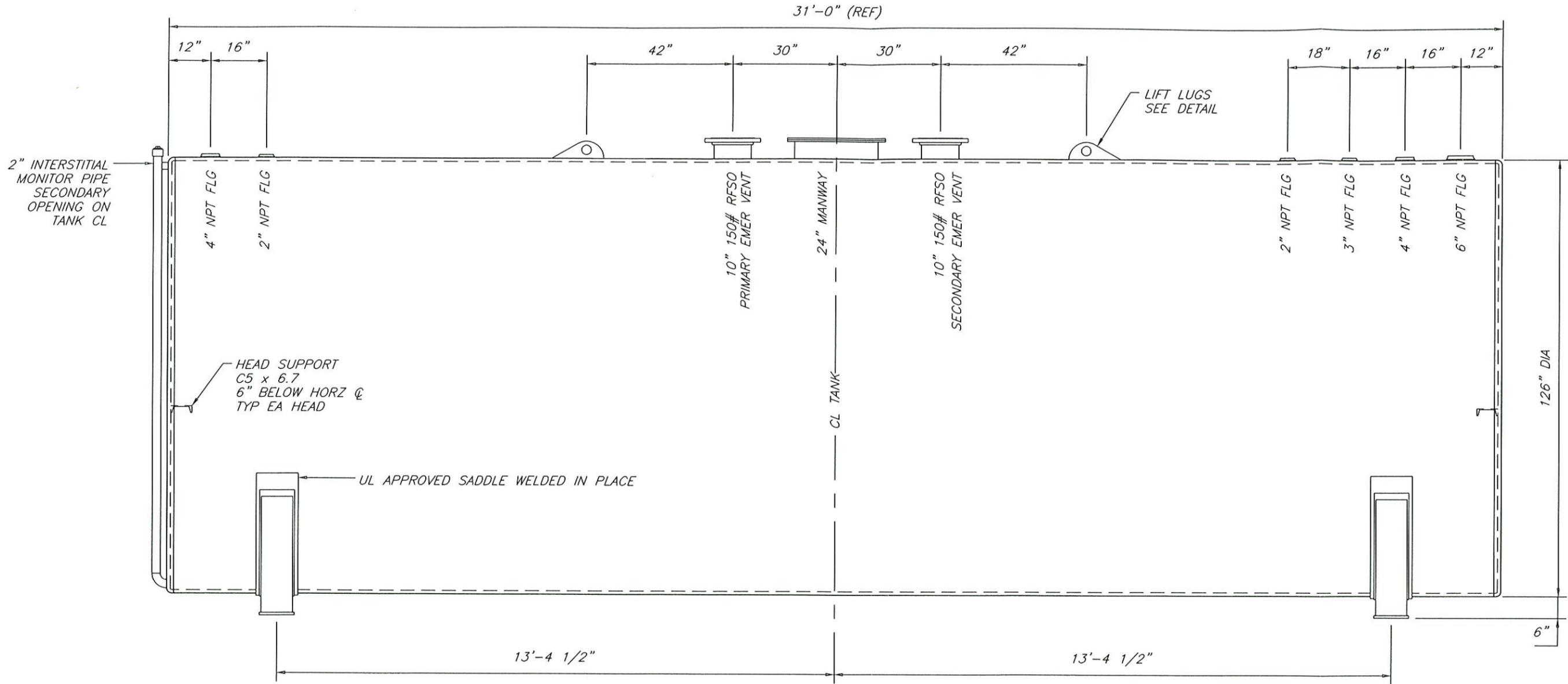
Performance Number: DM8455
 Feature Code: 175DE12
 Generator Arrangement: 252-3976
 U.S Sourced
 December 2008

www.CAT-ElectricPower.com

© 2008 Caterpillar
 All right reserved

Materials and specifications are subject to change without notice.

The International System of Units (SI) is used in this publication. CAT, CATERPILLAR, their respective logos, "Caterpillar Yellow," and the POWER EDGE™ trade dress, as well as corporate and product identity used herein, are trademarks of Caterpillar and may not be used without permission.



- NOTES**
- TANK TO BE BUILT IN ACCORDANCE WITH UL 142 AND F921 AND LABELED AS SUCH.
 - ALL MATERIAL IS CARBON STEEL: 1/4" PRIMARY TANK SHELL AND HEADS, 7 GAUGE SECONDARY SHELL AND HEADS.
 - TANK EXTERIOR TO RECEIVE SSPC-SP6/NACE #3 SANDBLAST, (1) COAT OF CHEMPRIME 3001 CORROSION RESISTANT EPOXY PRIMER AT 4-8 MILS DFT, (1) COAT OF CHEMTHANE 3300 HIGH PERFORMANCE ACRYLIC POLYURETHANE (WHITE) AT 2-3 MILS DFT.
 - ALL OPENINGS ARE PRIMARY UNLESS NOTED OTHERWISE.
 - ESTIMATED WEIGHT OF TANK IS 24,950 LBS.

IMPORTANT NOTE

IF POSSIBLE, REVIEW THIS DRAWING WITH YOUR CONTRACTOR. OF SPECIFIC IMPORTANCE, DOES THE TANK HAVE THE NECESSARY FITTINGS FOR THE EQUIPMENT YOU PLAN TO INSTALL

CUSTOMER APPROVAL REQUIRED

- MAKE NOTED CHANGES AND RE-SUBMIT
 - APPROVED WITH CHANGES NOTED
 - APPROVED AS DRAWN
- SIGNATURE _____ DATE _____



FOR
TRIGON ASSOCIATES, LLC
NEW ORLEANS, LA

DRAWN BY
D. HIGDON

CHECKED BY

CUSTOMER ORDER NO.
QUANTITY
ONE

DATE
4-21-2010

DRAWING DESCRIPTION
GENERAL ARRANGEMENT
20,000 GAL HORIZONTAL DOUBLE WALL

DRAWING FILE
23686-1

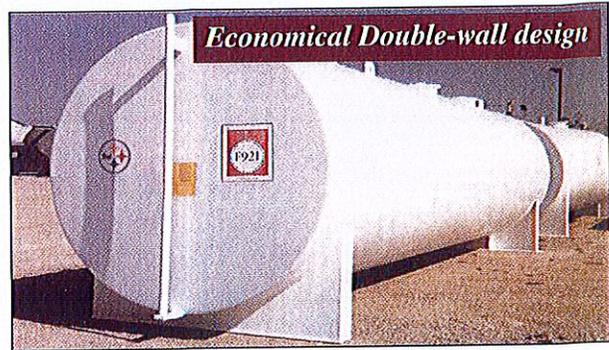
SHEET
1 OF 1

REVISION
0

The F921® aboveground storage tank is manufactured with a double-wall steel design.

Standard features include built-in, testable, impermeable

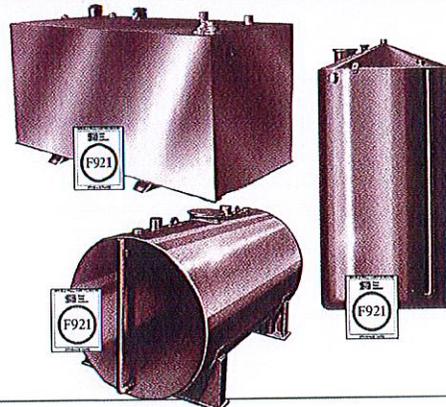
secondary containment and interstitial monitoring capability. The F921® delivers uncompromising performance, reliability, service and economy.



Economical Double-wall design

- F921® secondary containment can be tightness tested on site with standard testing procedures
- Horizontal, vertical and rectangular designs available
- Double-wall design offers integral, impermeable secondary containment to meet EPA SPCC requirements
- Interstitial leak detection capability
- Primary storage tank and secondary containment compatible with a wide range of fuels and chemicals
- Meets UL 142, ULC-S630, ULC-S601, and ULC/ORD-C142.18
- Built to nationally-recognized STI standards with strict third-party quality control inspection program
- New! UL listed supports available to raise vertical tank bottoms off the ground.

Rectangular, Vertical, or Horizontal - with a variety of options!

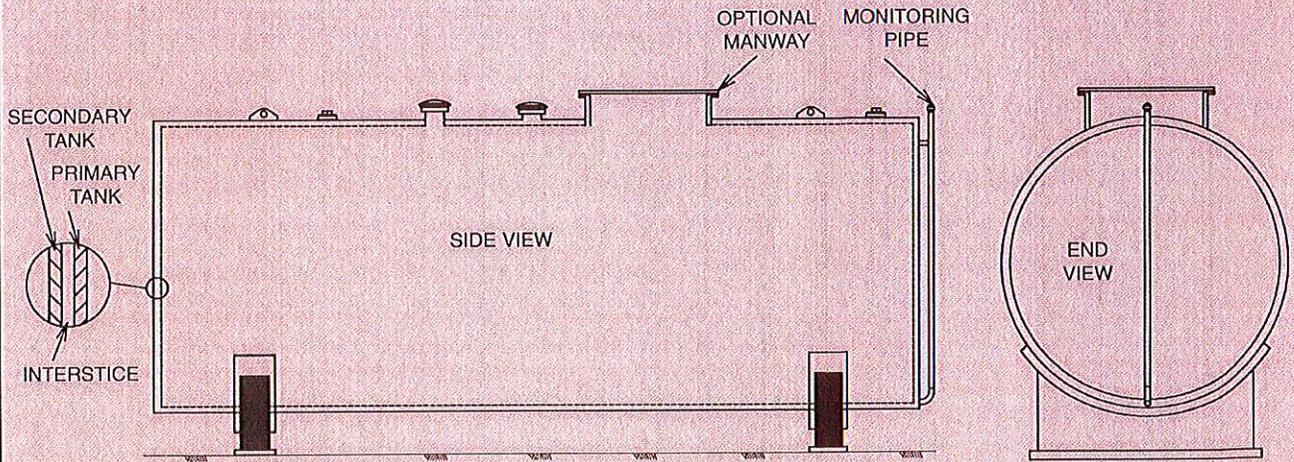


- Customized compartments can be provided for cost-effective multi-product storage
- Capacities up to 50,000 gallons
- Variety of saddle and skid designs available
- Available from a large network of manufacturers

The F921® is available from an extensive group of STI fabricators who participate in the Steel Tank Institute's Quality Assurance Program. Under the program, independent quality control inspectors make unannounced visits to STI members, ensuring fabrication to the highest possible standards.



F921® Cylindrical Double-Wall Aboveground Tanks



- Carries Steel Tank Institute F921® and UL 142 label
- 300° or 360° outer wall for secondary containment available
- Variety of UL approved skid and saddle supports available
- Capacity ranges: up to 50,000 gallons
- Easily relocated

F921® Guideline Specification

A) General

1. Provide F921® double-wall steel aboveground storage tanks.

B) Labeling

1. Tanks shall bear the Steel Tank Institute F921® Double-Wall Aboveground Storage Tank identification label.
2. Aboveground tanks shall bear Underwriters Laboratories UL 142 label for primary tank and secondary containment.

C) Product Description

1. Tanks shall be manufactured in accordance with Steel Tank Institute F921 standard for double-wall aboveground storage tanks.
2. Aboveground tank primary and secondary containment (inner and outer walls) shall be manufactured in accordance with and listed for

Underwriters Laboratories UL 142 Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids.

3. Tank shall be double-wall with a steel inner wall for primary containment and provide integral secondary containment by an impervious steel outer wall.
4. Integral secondary containment shall be testable and shall provide access for interstitial leak detection monitoring.
5. UL 142 listed supports shall be used for all horizontal, rectangular and vertical double-wall tanks.

D) Manufacturer

1. Manufacturer shall be a licensed member company of Steel Tank Institute and subject to Steel Tank Institute's Quality Assurance program.



570 Oakwood Road
Lake Zurich, IL 60047
847/438-8265
Fax 847/438-8766
website: www.steeltank.com

STI Technology Guide Specification Software

- Complete AST/UST Project Specs in CSI Format
- Easy to use, interactive Windows-based CD-ROM



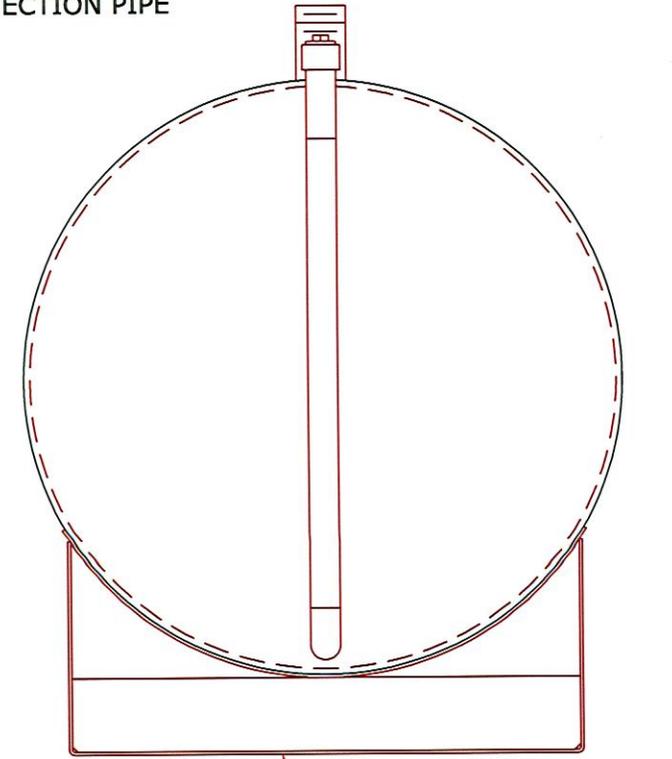
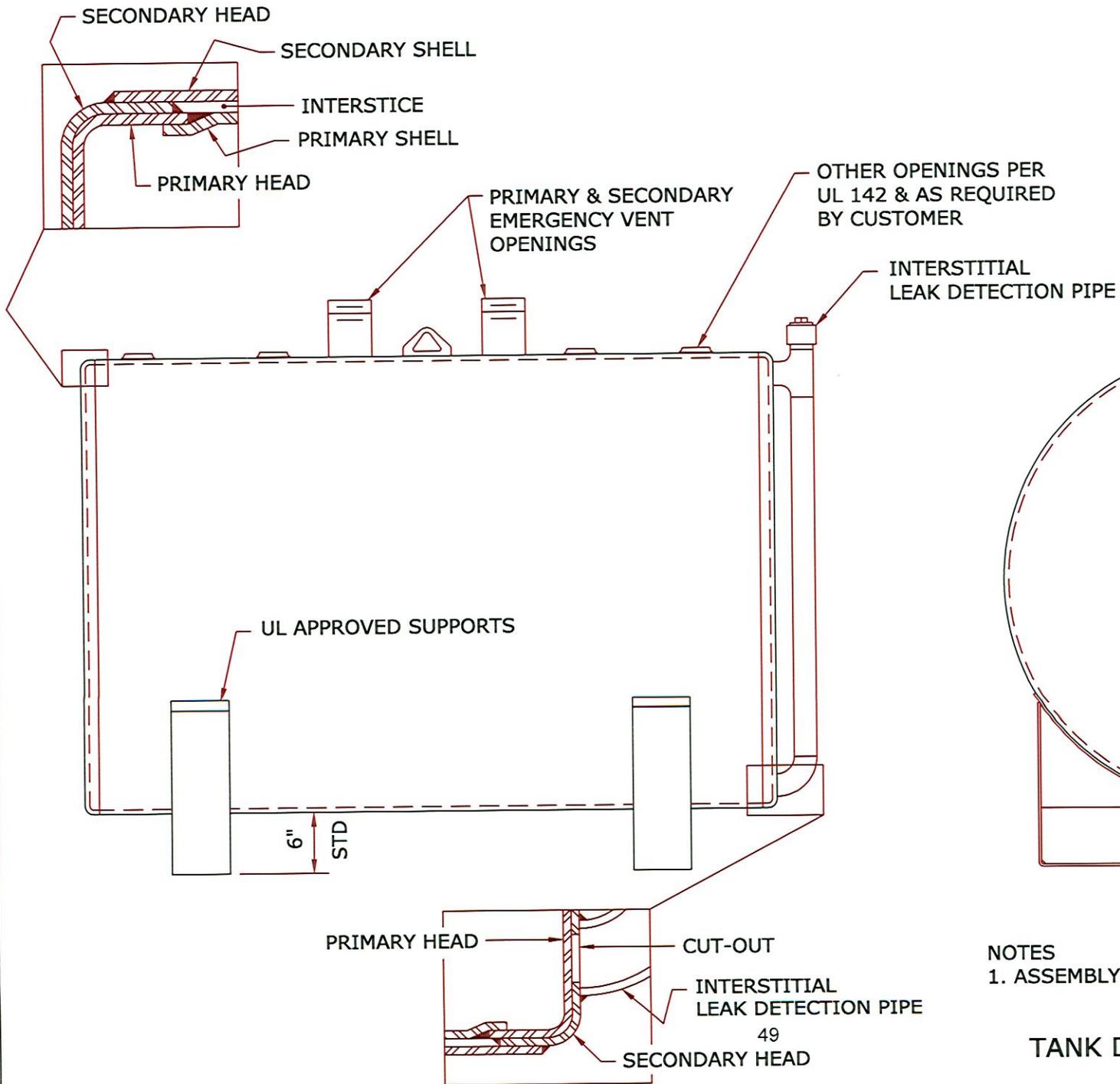
Use the STI Technology Guide online for your next F921 specification!
All you need in tanks.



Aboveground • Underground • Indoor • Outdoor • Single Wall • Double Wall • Compartmentalized



11/02-5M-Item #110-50-0001



NOTES
1. ASSEMBLY CARRIES STI F921 AND UL 142 LABEL

TANK DIAGRAM: F921 HORIZONTAL
DWG FILE: 02-04-01 DATE: 2-24-02



SOUTHERN Tank & Manufacturing Co., Inc.

Quotation

23686

Give us a look on the web at southerntank.net

1501 Haynes Avenue P.O. Box 2066 Owensboro, KY 42302-2066 Local: 270-684-2321 Toll Free: 800-876-2321 Fax: 270-683-6099

ATTN: GREG KOLENOVSKY
TRIGON ASSOCIATES, LLC

QUOTATION NO.: 23686

REVISION:

PHONE: (504) 585-5767

DATE: 04/20/2010

FAX:

Page 1 of 1

NEW ORLEANS, LA

REFERENCE: BUDGET QUOTE DRAINAGE PUMP STATIONS

We appreciate this opportunity to submit for your approval and acceptance, this quotation on the following products:

ITEM	QTY	ITEM DESCRIPTION	UNIT PRICE	TOTAL
1	1	20,000 GALLON HORIZONTAL ABOVEGROUND STORAGE TANK, DOUBLEWALL CONSTRUCTION, BUILT TO U.L.-142 STANDARDS AND SPECIFICATIONS AND LABELED AS SUCH. 126" DIAMETER X 31'-0" LONG X 1/4" CARBON STEEL PRIMARY TANK AND 7 GAUGE SECONDARY WRAP. 1-8" 150# RFSO FLANGE AND 1-2" INTERNAL MONITOR PIPE OPENING IN THE INTERSTITIAL AREA AND 1-24" MANWAY, 1-8" 150# RFSO FLANGE OPENING, 1-6", 2-4", 1-3" AND 2-2" F.N.P.T. ABOVE LIQUID OPENINGS IN THE PRIMARY TANK. 2-6" TALL SUPPORT SADDLES, WELDED TO THE TANK. EXTERIOR TO BE SANDBLASTED TO AN S.S.P.C. SP6/NACE #3 FINISH, RECEIVE ONE PRIMER COAT OF CHEMPRIME 3001 CORROSION RESISTANT EPOXY PRIMER @ 4-8 MILS D.F.T. AND SHALL RECEIVE A TOPCOAT OF CHEMLINE CHEMTHANE #3300 HIGH PERFORMANCE ACRYLIC POLYURETHANE @ 2-3 MILS D.F.T. (WHITE).	24,640.00	\$24,640.00
2	2	MOR2440F 8" 8 OZ EMERGENCY VENT, FLANGED WITH GASKET AND NUTS/BOLTS	233.97	\$467.94
3	1	FREIGHT TO NEW ORLEANS, LA	4,500.00	\$4,500.00

AVAILABILITY: ALLOW 6 TO 12 WEEKS AFTER RECEIPT OF APPROVED DRAWINGS

F.O.B. POINT: OWENSBORO, KY

May we look forward to serving you?

TERMS: TO BE DETERMINED

SOUTHERN Tank & Manufacturing Co., Inc.

ADD SALES TAX IF APPLICABLE

OFFLOADING IS RESPONSIBILITY OF CUSTOMER

CHERIE ACKER, SALES REPRESENTATIVE

***** **DISCLAIMER** *****

Because the tank, equipment, and piping on your order will be subjected to vibrations and motion during delivery, Southern Tank & Mfg Co, Inc will not be responsible for seepage or leaks at any threaded connections. Piping is tested in our shop at these connections after assembly and prior to shipment to assure there are no leaks or seepage. Southern Tank takes all necessary and reasonable steps to minimize vibrations in transit with the use of bracing. However, we cannot guarantee that seepage will not occur. Re-tightening on site BY OTHERS may be required.

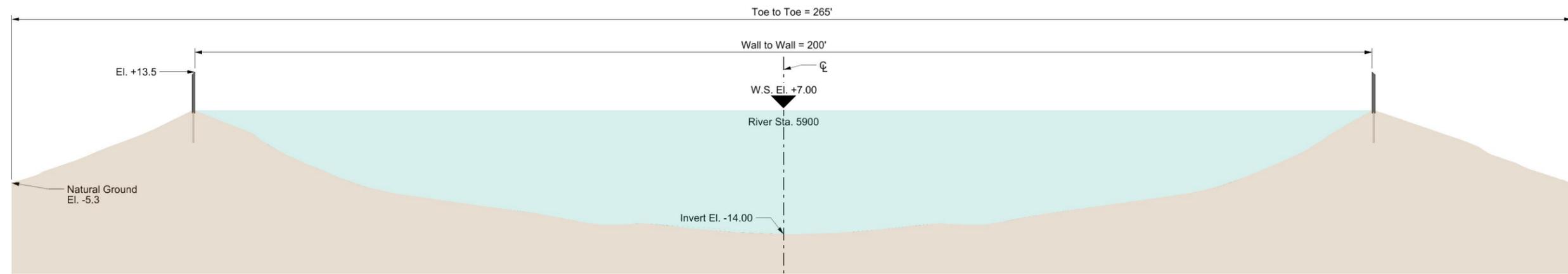
51

Installation and wiring of equipment is the responsibility of the end user unless otherwise stated in quotation.

SOUTHERN TANK will charge 1-1/2% per month interest on all invoices not paid within 30 days of invoice date.

** QUOTATION WILL BE HONORED FOR 15 DAYS FROM QUOTATION DATE **

Canal Cross Sections



Existing 17th St. Canal - Typical

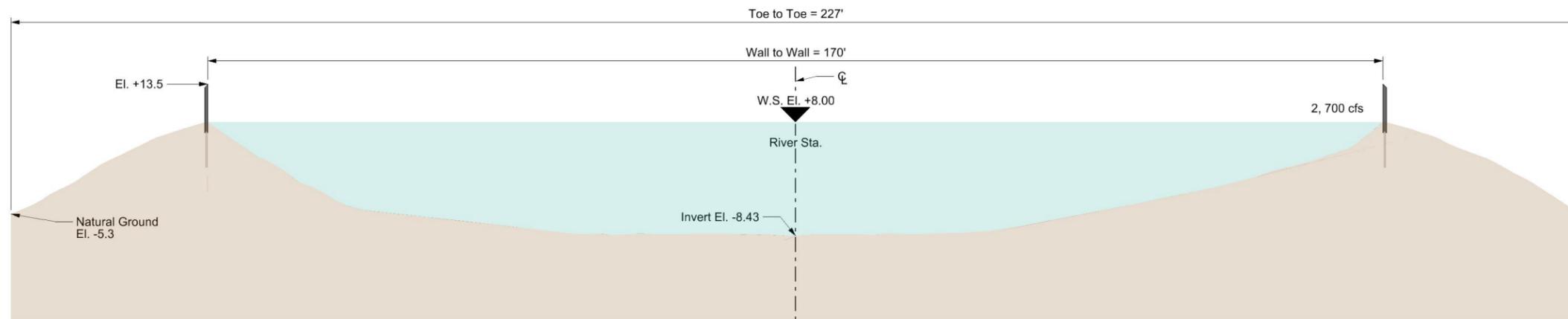
REVISIONS		
Date	By	Description



	Names	Dates
Drawn by	S.H.	04-10
Checked by	D.R.	04-10
Designed by	J.S.	04-10
Checked by	D.R.	04-10
Approved by		

SEWERAGE & WATER BOARD OF NEW ORLEANS		
CANAL	PARISH	AECOM PROJECT #
17th Street	ORLEANS/ JEFFERSON	60149879

SHEET TITLE:		EXISTING 17th STREET CANAL - TYPICAL
PROJECT NAME:		PERMANENT PROTECTION SYSTEM OPINION OF PROBABLE COST FOR OPTIONS 1, 2, AND 2a
SHEET NO.		1



Existing Orleans Avenue Canal - Typical

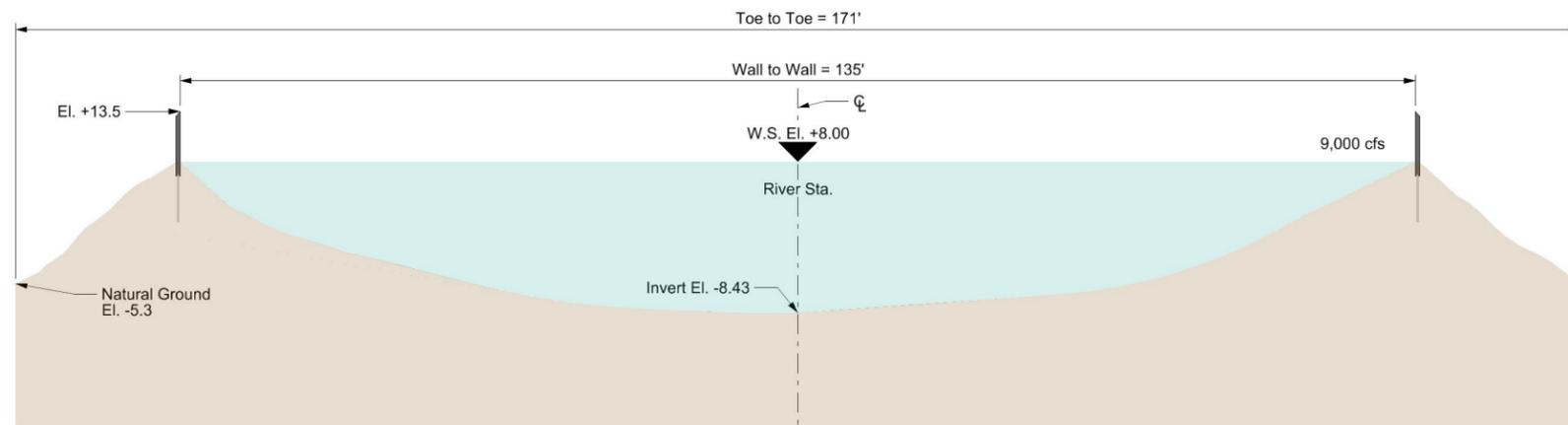
REVISIONS		
Date	By	Description



Names	Dates
Drawn by S.H.	04-10
Checked by D.R.	04-10
Designed by J.S.	04-10
Checked by D.R.	04-10
Approved by	

SEWERAGE & WATER BOARD OF NEW ORLEANS		
CANAL	PARISH	AECOM PROJECT #
ORLEANS	ORLEANS	60149879

SHEET TITLE:		EXISTING ORLEANS AVENUE CANAL - TYPICAL
PROJECT NAME:		PERMANENT PROTECTION SYSTEM OPINION OF PROBABLE COST FOR OPTIONS 1, 2, AND 2a
SHEET NO.		2



Existing London Avenue Canal - Typical

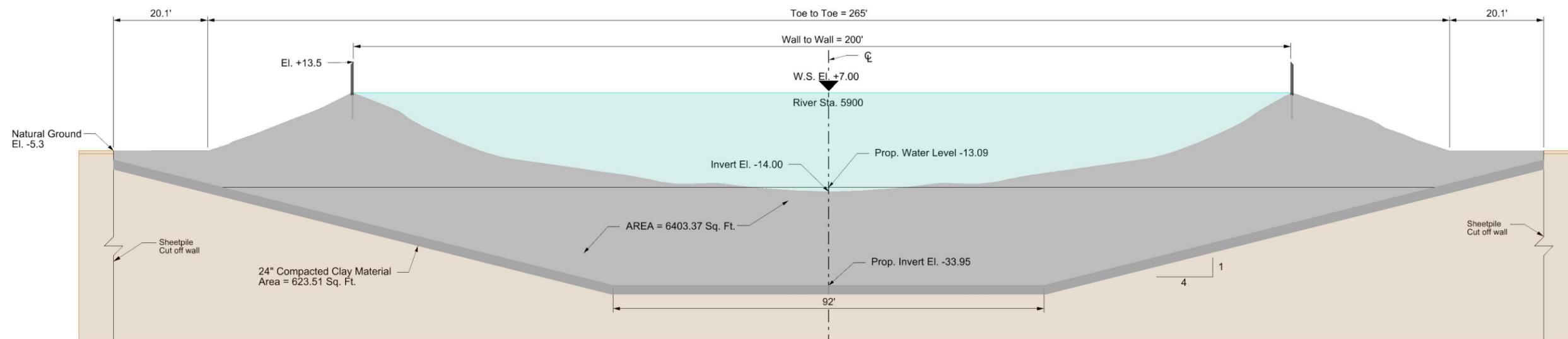
REVISIONS		
Date	By	Description



	Names	Dates
Drawn by	S.H.	04-10
Checked by	D.R.	04-10
Designed by	J.S.	04-10
Checked by	D.R.	04-10
Approved by		

SEWERAGE & WATER BOARD OF NEW ORLEANS		
CANAL	PARISH	AECOM PROJECT #
LONDON	ORLEANS	60149879

SHEET TITLE:		EXISTING LONDON AVENUE CANAL - TYPICAL
PROJECT NAME:		PERMANENT PROTECTION SYSTEM OPINION OF PROBABLE COST FOR OPTIONS 1, 2, AND 2a
SHEET NO.		3



17th St. Canal
Option 2 Overlay - Clay Liner

Area of Excavated Material = 6403.37 Sq. Ft.
 Area of Compacted Clay = 623.51 Sq. Ft.
 Approx. Length of Canal = 12,800 Ft.
 Total Volume Excavated Material = 81,963,136 CF
 Total Volume Compacted Caly = 7,980,928 CF

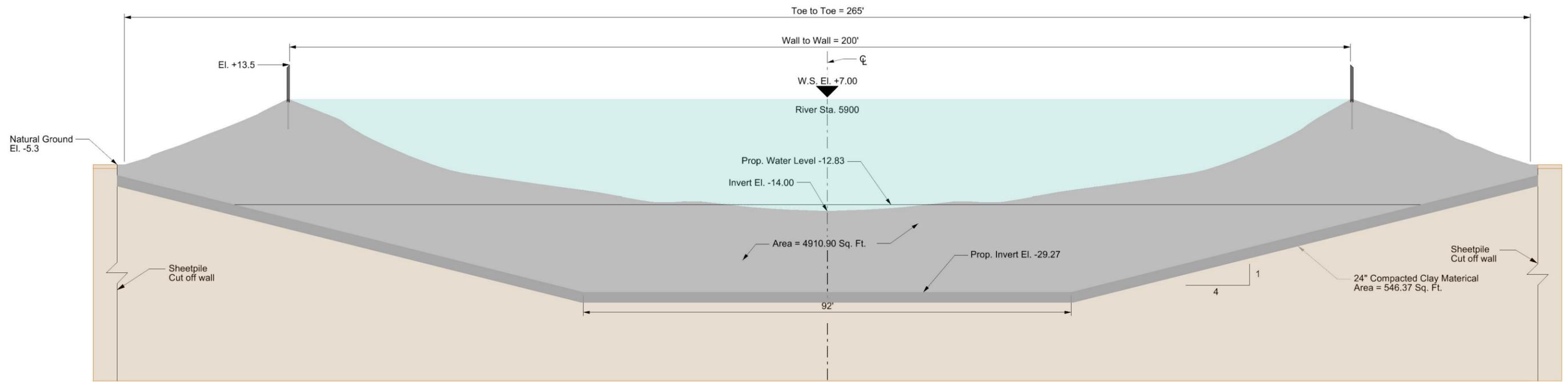
REVISIONS		
Date	By	Description



Names	Dates
Drawn by S.H.	04-10
Checked by D.R.	04-10
Designed by J.S.	04-10
Checked by D.R.	04-10
Approved by	

SEWERAGE & WATER BOARD OF NEW ORLEANS		
CANAL	PARISH	AECOM PROJECT #
17th Street	ORLEANS/ JEFFERSON	60149879

SHEET TITLE:	
17th St. Canal Option 2 Overlay - Clay Liner	
PROJECT NAME:	SHEET NO.
PERMANENT PROTECTION SYSTEM OPINION OF PROBABLE COST FOR OPTIONS 1, 2, AND 2a	4



17th St. Canal
Option 2A Overlay - Clay Liner

Area of Excavated Material = 4910.90 Sq. Ft.
 Area of Compacted Clay = 546.37 Sq. Ft.
 Approx. Length of Canal = 12,800 Ft.
 Total Volume Excavated Material = 62,859,520 CF
 Total Volume Compacted Caly = 6,993,536 CF

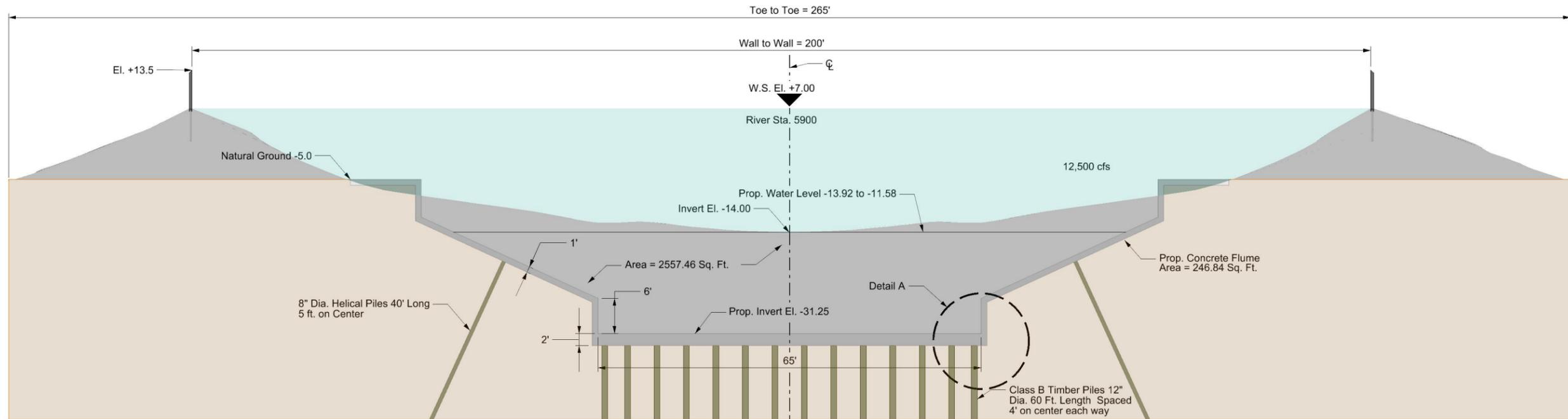
REVISIONS		
Date	By	Description



Names	Dates
Drawn by S.H.	04-10
Checked by D.R.	04-10
Designed by J.S.	04-10
Checked by D.R.	04-10
Approved by	

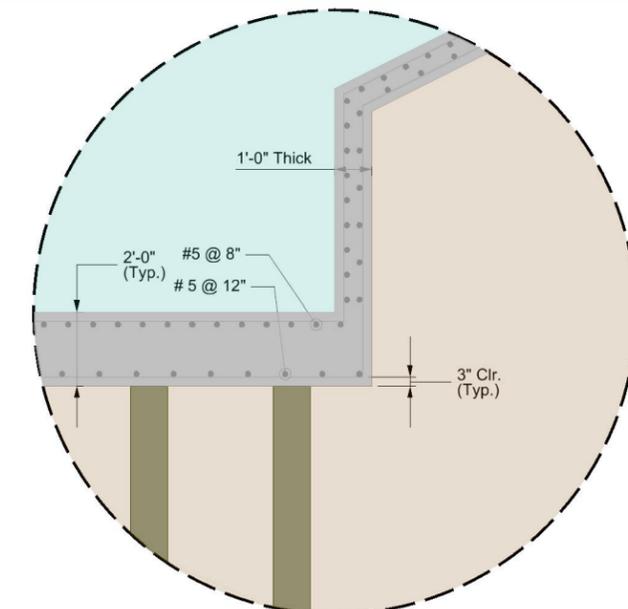
SEWERAGE & WATER BOARD OF NEW ORLEANS		
CANAL	PARISH	AECOM PROJECT #
17th Street	ORLEANS/ JEFFERSON	60149879

SHEET TITLE: 17th St. Canal Option 2A Overlay - Clay Liner	
PROJECT NAME: PERMANENT PROTECTION SYSTEM OPINION OF PROBABLE COST FOR OPTIONS 1, 2, AND 2a	SHEET NO. 5



17th St. Canal
Option 2 Overlay - Concrete Flume

Area of Excavated Material = 2557.46 Sq. Ft.
 Area of Concrete Flume = 246.84 Sq. Ft.
 Approx. Length of Canal = 12,800 Ft.
 Total Volume Excavated Material = 32,735,488 CF
 Total Volume Reinforced Concrete = 3,159,552 CF



DETAIL A

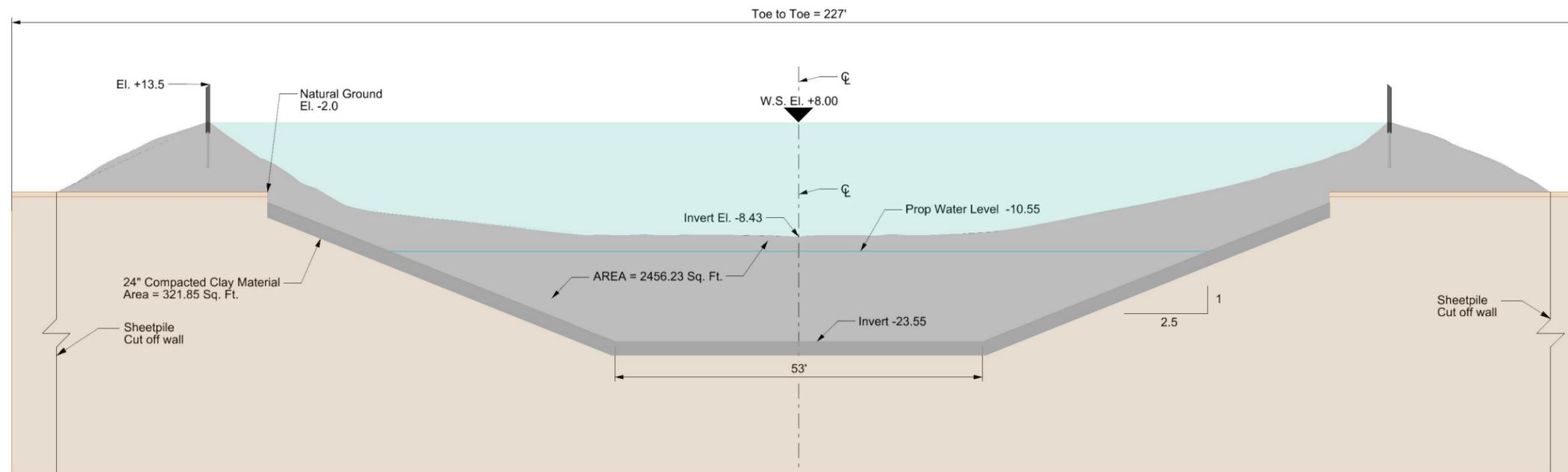
REVISIONS		
Date	By	Description



	Names	Dates
Drawn by	S.H.	04-10
Checked by	D.R.	04-10
Designed by	J.S.	04-10
Checked by	D.R.	04-10
Approved by		

SEWERAGE & WATER BOARD OF NEW ORLEANS		
CANAL	PARISH	AECOM PROJECT #
17th Street	ORLEANS/ JEFFERSON	60149879

SHEET TITLE:		SHEET NO.
17th St. Canal Option 2 Overlay - Concrete Flume		6
PROJECT NAME:		
PERMANENT PROTECTION SYSTEM OPINION OF PROBABLE COST FOR OPTIONS 1, 2, AND 2a		



Orleans Avenue Canal
Option 2 Overlay - Clay Liner

Area of Exavated Material = 2456.23 Sq. Ft.
 Area of Compacted Clay = 321.85 Sq. Ft.
 Approx. Length of Canal = 11,080 Ft.
 Total Volume Exavated Material = 27,215,028.4 CF
 Total Volume Compacted Clay = 3,566,098 CF

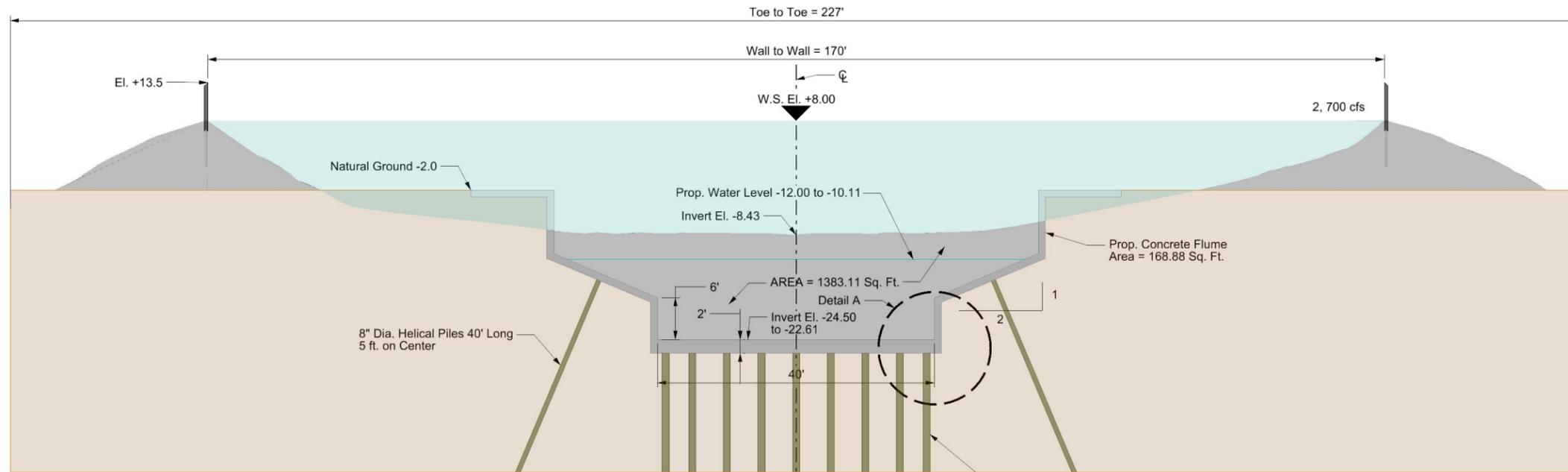
REVISIONS		
Date	By	Description



Names	Dates
Drawn by S.H.	04-10
Checked by D.R.	04-10
Designed by J.S.	04-10
Checked by D.R.	04-10
Approved by	

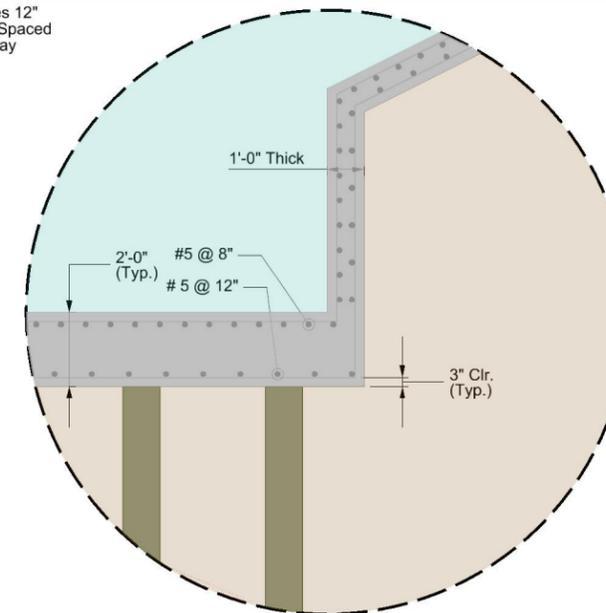
SEWERAGE & WATER BOARD OF NEW ORLEANS		
CANAL	PARISH	AECOM PROJECT #
ORLEANS	ORLEANS	60149879

SHEET TITLE:	
ORLEANS AVENUE CANAL OPTION 2 OVERLAY - CLAY LINER	
PROJECT NAME:	SHEET NO.
PERMANENT PROTECTION SYSTEM OPINION OF PROBABLE COST FOR OPTIONS 1, 2, AND 2a	7



Orleans Avenue Canal
Option 2 Overlay - Concrete Flume

Area of Excavated Material = 1383.11 Sq. Ft.
 Area of Concrete Flume = 168.88 Sq. Ft.
 Approx. Length of Canal = 11,080 Ft.
 Total Volume Excavated Material = 15,324,859 CF
 Total Volume Reinforced Concrete = 1,871,190 CF



DETAIL A

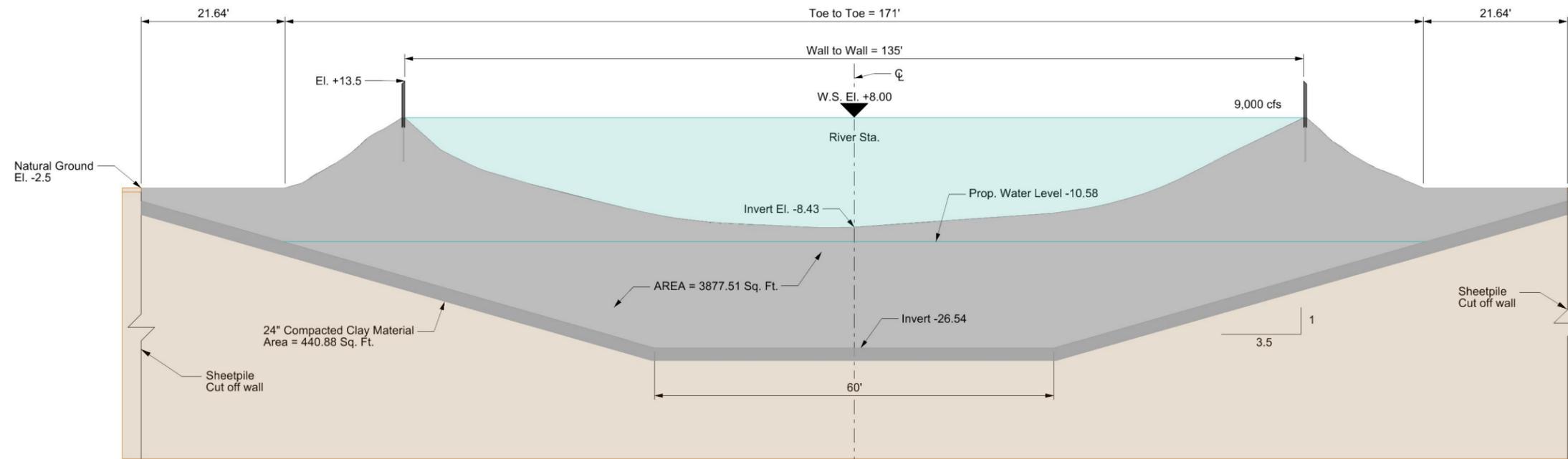
REVISIONS		
Date	By	Description



	Names	Dates
Drawn by	S.H.	04-10
Checked by	D.R.	04-10
Designed by	J.S.	04-10
Checked by	D.R.	04-10
Approved by		

SEWERAGE & WATER BOARD OF NEW ORLEANS		
CANAL	PARISH	AECOM PROJECT #
ORLEANS	ORLEANS	60149879

SHEET TITLE: ORLEANS AVENUE CANAL OPTION 2 OVERLAY - CONCRETE FLUME	
PROJECT NAME: PERMANENT PROTECTION SYSTEM OPINION OF PROBABLE COST FOR OPTIONS 1, 2, AND 2a	SHEET NO. 8



London Avenue Canal Sta. 00+00 to 132+75
Option 2 Overlay - Clay Liner

Area of Exavated Material = 3877.51 Sq. Ft.
 Area of Compacted Clay = 440.88 Sq. Ft.
 Approx. Length of Canal = 13,275 Ft.
 Total Volume Exavated Material = 51,473,945.25 CF
 Total Volume Compacted Clay = 5,852,682 CF

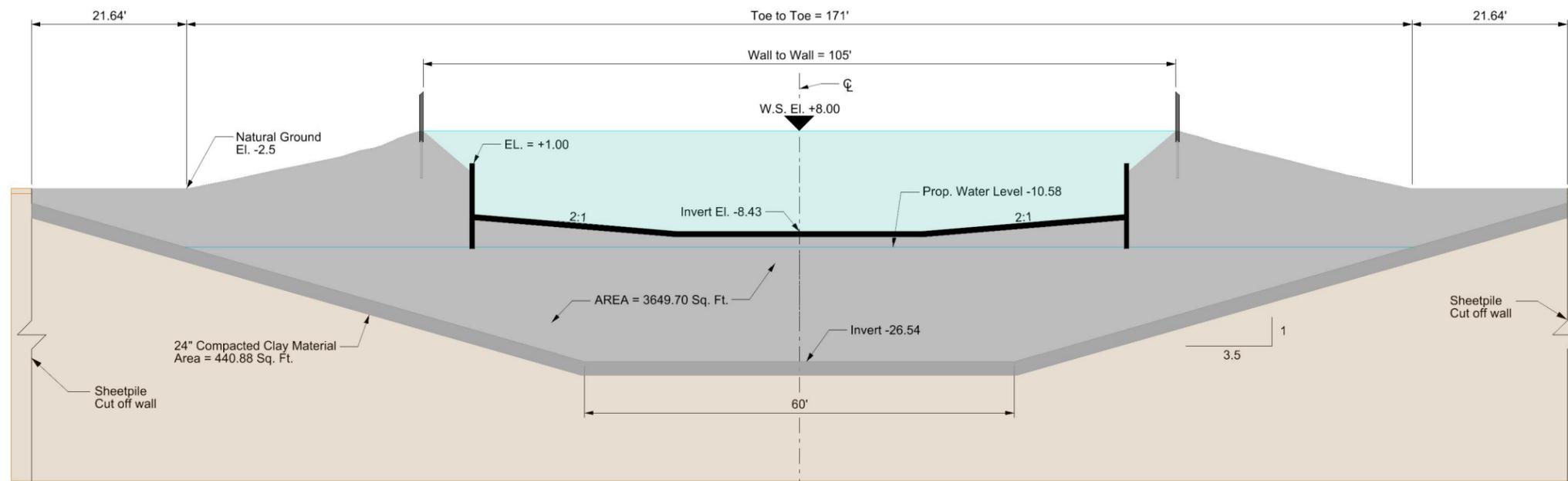
REVISIONS		
Date	By	Description



Names	Dates
Drawn by S.H.	04-10
Checked by D.R.	04-10
Designed by J.S.	04-10
Checked by D.R.	04-10
Approved by	

SEWERAGE & WATER BOARD OF NEW ORLEANS		
CANAL	PARISH	AECOM PROJECT #
LONDON	ORLEANS	60149879

SHEET TITLE: LONDON AVENUE CANAL STA. 00+00 TO 132+75 OPTION 2 OVERLAY - CLAY LINER	
PROJECT NAME: PERMANENT PROTECTION SYSTEM OPINION OF PROBABLE COST FOR OPTIONS 1, 2, AND 2a	SHEET NO. 9



London Avenue Canal Sta. 132+75 to 153+00
Option 2 Overlay - Clay Liner

Area of Excavated Material = 3649.70 Sq. Ft.
 Area of Concrete Flume = 440.88 Sq. Ft.
 Approx. Length of Canal = 2,025 Ft.
 Total Volume Excavated Material = 7,390,642.5 CF
 Total Volume Reinforced Concrete = 892,782 CF

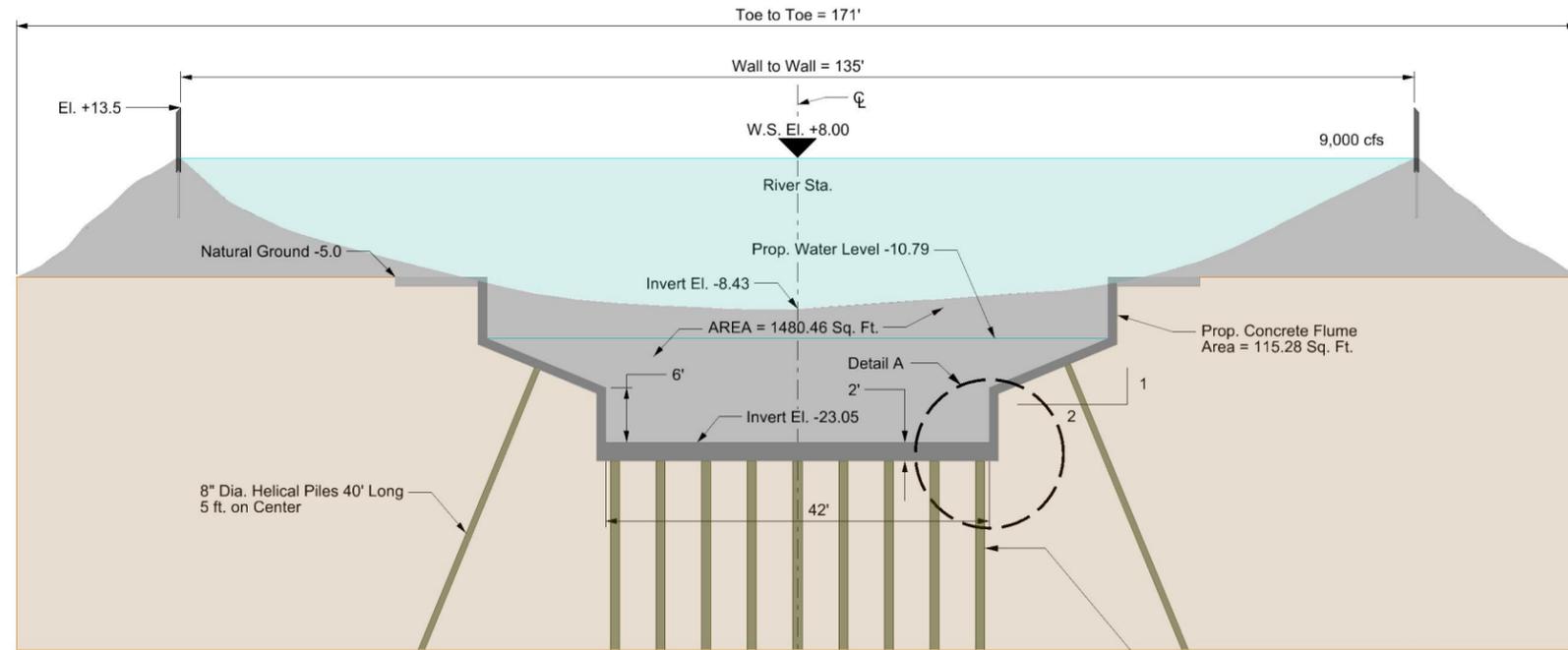
REVISIONS		
Date	By	Description



	Names	Dates
Drawn by	S.H.	04-10
Checked by	D.R.	04-10
Designed by	J.S.	04-10
Checked by	D.R.	04-10
Approved by		

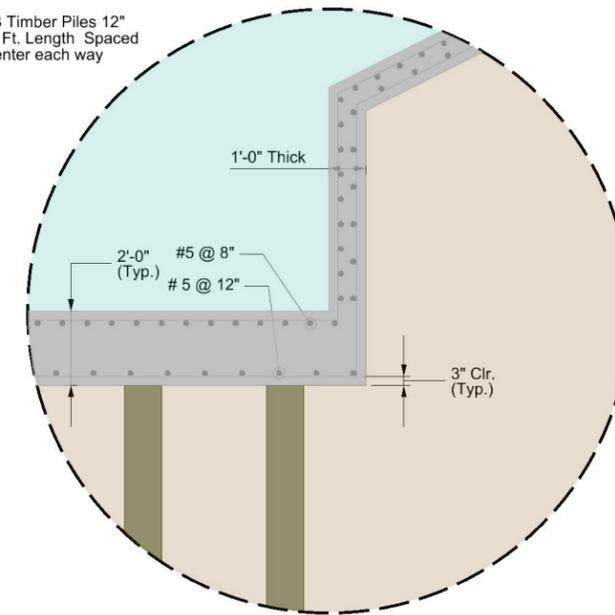
SEWERAGE & WATER BOARD OF NEW ORLEANS		
CANAL	PARISH	AECOM PROJECT #
LONDON	ORLEANS	60149879

SHEET TITLE:		SHEET NO.
LONDON AVENUE CANAL STA. 132+75 TO 153+00 OPTION 2 OVERLAY - CLAY LINER		10
PROJECT NAME:		
PERMANENT PROTECTION SYSTEM OPINION OF PROBABLE COST FOR OPTIONS 1, 2, AND 2a		



**London Avenue Canal Sta. 0+00 to 132+75
Option 2 Overlay - Concrete Flume**

Area of Excavated Material = 1480.46 Sq. Ft.
 Area of Concrete Flume = 115.28 Sq. Ft.
 Approx. Length of Canal = 13,275 Ft.
 Total Volume Excavated Material = 19,653,107 CF
 Total Volume Reinforced Concrete = 1,530,342 CF



DETAIL A

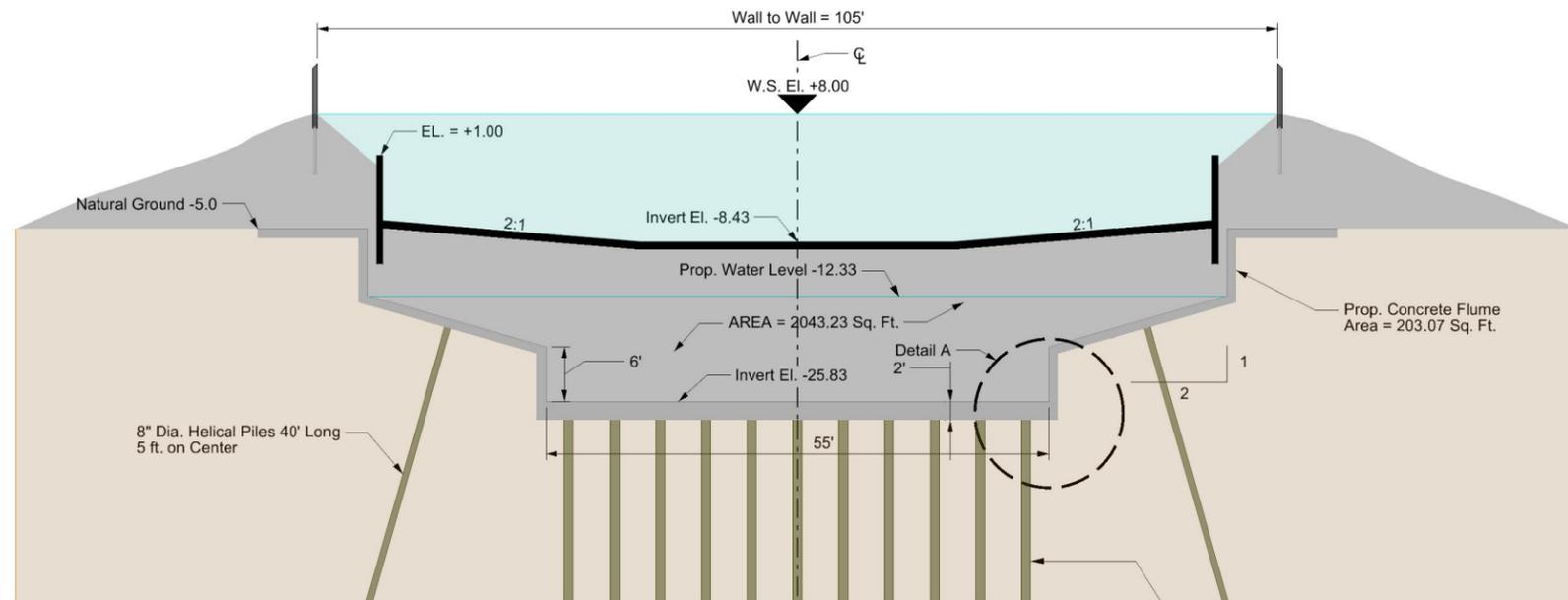
REVISIONS		
Date	By	Description



	Names	Dates
Drawn by	S.H.	04-10
Checked by	D.R.	04-10
Designed by	J.S.	04-10
Checked by	D.R.	04-10
Approved by		

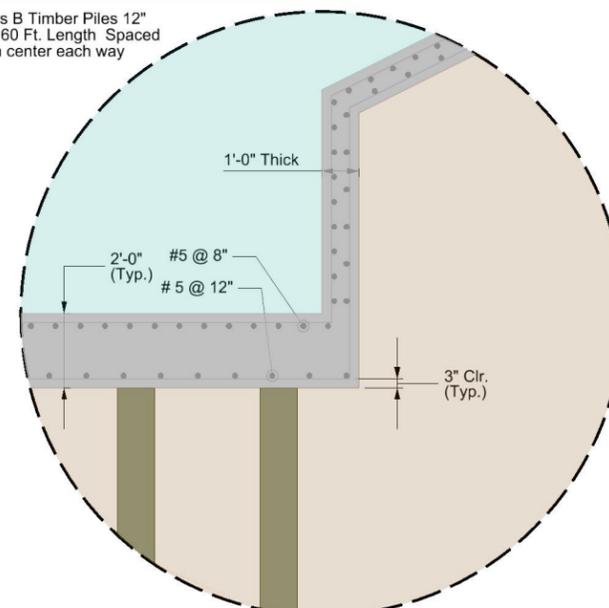
SEWERAGE & WATER BOARD OF NEW ORLEANS		
CANAL	PARISH	AECOM PROJECT #
LONDON	ORLEANS	60149879

SHEET TITLE: LONDON AVENUE CANAL STA. 0+00 TO 132+75 OPTION 2 OVERLAY - CONCRETE FLUME		SHEET NO. 11
PROJECT NAME: PERMANENT PROTECTION SYSTEM OPINION OF PROBABLE COST FOR OPTIONS 1, 2, AND 2a		



London Avenue Canal Sta. 132+75 to 153+00
Option 2 Overlay - Concrete Flume

Area of Excavated Material = 2043.23 Sq. Ft.
 Area of Concrete Flume = 203.07 Sq. Ft.
 Approx. Length of Canal = 2,025 Ft.
 Total Volume Excavated Material = 4,137,541 CF
 Total Volume Reinforced Concrete = 411,217 CF



DETAIL A

REVISIONS		
Date	By	Description



	Names	Dates
Drawn by	S.H.	04-10
Checked by	D.R.	04-10
Designed by	J.S.	04-10
Checked by	D.R.	04-10
Approved by		

SEWERAGE & WATER BOARD OF NEW ORLEANS		
CANAL	PARISH	AECOM PROJECT #
LONDON	ORLEANS	60149879

SHEET TITLE: LONDON AVENUE CANAL STA. 132+75 TO 153+00 OPTION 2 OVERLAY - CONCRETE FLUME		SHEET NO. 12
PROJECT NAME: PERMANENT PROTECTION SYSTEM OPINION OF PROBABLE COST FOR OPTIONS 1, 2, AND 2a		

Real Estate

**Opinion of Probable Cost
AECOM
Real Estate/ROW Calculations**

17th Street Canal

Side of Canal	Neighborhood	Street Address at Northern Boundary	Street Address at Southern Boundary	Comments	Estimated Length, Ft.	Estimated Area (25' Width), Sq. Ft.	Average Lot Size	Average Lot Area	Improved Property Price, \$		Estimate for Full Property Value/Permanent ROW					
									Low	High	Improved Price per Sq Ft (Lot), \$		Total, \$			
											Low	High	Low	High		
East	West End	7100 Bellaire Drive (at Hammond Hwy)	6000 Bellaire Drive (at Veterans Blvd.)	Private property. With the exception of two (2) properties, the 25' permanent ROW appears to be within reasonable distance (>30') from houses.	7,100	177,500	50'X200'	10,000	\$ 229,000	\$ 299,900	\$ 22.90	\$ 29.99	\$ 4,064,750	\$ 5,323,225		
				Assume two (2) properties will be acquired in fee title.	N/A	N/A	N/A	N/A	\$ 229,000	\$ 299,900	\$ -	\$ -	\$ 458,000	\$ 599,800		
	Lakewood	5950 Bellaire Drive (at Veterans Blvd.)	5750 Bellaire Blvd. (at I-10)	Private property.	1,200	30,000	75'X210'	15,750	\$ 299,900	\$ 316,400	\$ 19.04	\$ 20.09	\$ 571,238	\$ 602,667		
				Private property. With the exception of one (1) property, the 25' permanent ROW appears to be within reasonable distance (>20') from houses.	N/A	N/A	N/A	N/A	\$ 299,900	\$ 316,400	\$ -	\$ -	\$ 299,900	\$ 316,400		
				Private property. With the exception of three (3) properties, the 25' permanent ROW appears to be within reasonable distance (>20') from houses.	2,700	67,500	75'X210'	15,750	\$ 299,900	\$ 316,400	\$ 19.04	\$ 20.09	\$ 1,285,286	\$ 1,356,000		
				Assume three (3) properties will be acquired in fee title.	N/A	N/A	N/A	N/A	\$ 299,900	\$ 316,400	\$ -	\$ -	\$ 899,700	\$ 949,200		
Railroad ROW	DPS #6	Assume \$0 cost. Permit fee will be applicable.	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -				
DPS #6	DPS #6	Assume \$0 cost for S&WB property at DPS #6.	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -				
West	Jefferson Parish	Hammond Hwy	Rosebud St.	Property on west side is Orpheum St. ROW. Assume \$0 for cost for ROW. However, a number of properties may be damaged by loss of access and/or intrusion of the ROW to an unreasonable distance. Assume fifty (50) properties will be acquired in fee title.	-	-	-	-	\$ 193,000	\$ 339,300	\$ -	\$ -	\$ 9,650,000	\$ 16,965,000		
			Rosebud St.	I-10	Property on west side is Orpheum St. ROW. Assume \$0 for cost. However, a number of properties may be damaged by loss of access and/or intrusion of the ROW to an unreasonable distance. Assume twenty-five (25) properties will be acquired in fee title.	-	-	-	-	\$ 193,000	\$ 339,300	\$ -	\$ -	\$ 4,825,000	\$ 8,482,500	
				Adjustment of 25' ROW needed to accommodate commercial buildings immediately north and south of Veterans Blvd.	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		
		I-10	Railroad ROW	Property on west side is Orpheum St. ROW. Assume \$0 for cost. However, a number of properties may be damaged by loss of access and/or intrusion of the ROW to an unreasonable distance into property. Assume seventeen (17) properties will be acquired in fee	-	-	-	-	\$ 193,000	\$ 339,300	\$ -	\$ -	\$ 3,281,000	\$ 5,768,100		
		DPS #6	DPS #6	Assume \$0 cost for S&WB property at DPS #6.	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		
											Total, 17th Street Canal				\$ 25,334,874	\$ 40,362,892

Orleans Avenue Canal

Side of Canal	Neighborhood	Street Address at Northern Boundary	Street Address at Southern Boundary	Comments	Estimated Length, Ft.	Estimated Area (25' Width), Sq. Ft.	Average Lot Size	Average Lot Area	Improved Property Price, \$		Estimate for Full Property Value/Permanent ROW					
									Low	High	Improved Price per Sq Ft (Lot), \$		Total, \$			
											Low	High	Low	High		
East	Lakeshore/Lake Vista	Swan St.	Thrush St.	Property on east side owned by Levee Board (or ROW to); area has been utilized by COE since Katrina. Assume \$0 for cost.	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		
	City Park	Marconi Drive	Marconi Drive	Property on east side owned by City Park. Assume \$0 for cost.	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		
West	Lakeshore/Lake Vista	Crystal Street	General Haig	Majority of of property on west side owned (or ROW to) by Levee Board; assume \$0 cost for this portion. At southern end, NOFD Fire Station (Robert E. Lee at Orleans Ave Canal); assume \$0 cost for NOFD/City property.	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		
	Lakeview	7100 Orleans Ave.	5800 Orleans Ave. (at I-610)	Property on west side is Orleans Avenue ROW. Assume \$0 for cost.	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		
	I-610 to DPS #7			Assume \$0 cost for S&WB property at DPS #7.	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		
											Total, Orleans Avenue Canal				\$ -	\$ -

Notes:

- 1--Property sales data (Trulia) by neighborhood for period from 10/1/09 to 4/1/10.
- 2--Times-Picayune, February 10, 2010

Assumptions:

- 1--Based on cross-section for Option 2 clay liner for the 17th Street Canal, the toe of the levee was assumed to be 32 feet from the floodwall. Permanent 25-foot ROW measured from toe of levee.
- 2--Based on cross-section for Option 2 clay liner for the Orleans Avenue Canal, no additional permanent ROW is required.
- 3--Properties assumed to be improved and undamaged.

**Opinion of Probable Cost
AECOM
Real Estate/ROW Calculations**

London Avenue Canal

Side of Canal	Neighborhood	Street Address at Northern Boundary	Street Address at Southern Boundary	Comments	Estimated Length, Ft.	Estimated Area (25' Width), Sq. Ft.	Average Lot Size	Average Lot Area	Improved Property Price, \$		Improved Price per Sq Ft (Lot), \$		Total, \$	
									Low	High	Low	High	Low	High
East	Lake Terrace and Lake Oaks	Privateer Place/Founders Avenue, University of New Orleans	Founder's Drive at Leon C. Simon Blvd.	Property on west side owned by UNO. COE has been utilizing since Katrina. Assume \$0 for cost.	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	St. Anthony	6300 London Drive		On northern end (between Leon C. Simon Drive and Robert E. Lee Blvd.), property on east side is London Drive ROW. Permanent 25' ROW will encroach on London Drive. Assume \$0 for cost.	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
		6100 Warrington Drive	5300 Warrington Drive (at Filmore)	Private property. With the exception of ten (10) properties, the 25' permanent ROW appears to be within reasonable distance (>20') from houses. Assume \$0 cost for portion of ROW along S&WB property at DPS #4 (at Prentiss Ave.).	3,150	78,750	40'X130'	5,200	\$ 126,000	\$ 184,200	\$ 24.23	\$ 35.42	\$ 1,908,173	\$ 2,789,567
				Assume ten (10) properties will be acquired in fee title.	-	-	-	-	\$ 126,000	\$ 184,200	\$ -	\$ -	\$ 1,260,000	\$ 1,842,000
	Dillard	5280 Warrington (at Filmore)	Warrington (at curve between Lombard St. and Stephen Girard)	Private property. With the exception of ten (10) properties, the 25' permanent ROW appears to be within reasonable distance (>20') from houses.	3,500	87,500	40'X130'	5,200	\$ 113,000	\$ 184,200	\$ 21.73	\$ 35.42	\$ 1,901,442	\$ 3,099,519
		Warrington (at curve between Lombard St. and Stephen Girard)		Assume ten (10) properties will be acquired in fee title.	-	-	-	-	\$ 113,000	\$ 184,200	\$ -	\$ -	\$ 1,130,000	\$ 1,842,000
		Live Oak Place (at Gently Blvd.)	Benefit St.	Property on east side owned by Dillard University. Assume \$0 for cost.	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
				Assume one (1) property will be acquired in fee title; remaining property appears to be Interstate ROW.	-	-	-	-	\$ 113,000	\$ 184,200	\$ -	\$ -	\$ 113,000	\$ 184,200
		London Ave (at Benefit St.)	Railroad ROW	Property on east side is London Avenue ROW. Assume \$0 for cost for London Avenue ROW. However, nine (9) properties may be damaged by loss of access and/or intrusion of the ROW to an unreasonable distance. Assume nine (9) properties will be acquired in fee title.	-	-	-	-	\$ 113,000	\$ 184,200	\$ -	\$ -	\$ 1,017,000	\$ 1,657,800
		Railroad ROW DPS #3	DPS #3	Assume \$0 cost. Permit fee will be applicable. Assume \$0 cost for S&WB property at DPS #3.	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Total, London Avenue Canal--East Side												\$ 7,329,615	\$ 11,415,087
	West	Lake Terrace and Lake Oaks	6510 Pratt Drive	6200 Pratt Drive (at Robert E. Lee Blvd.)	Property on west side owned (or ROW to) by Levee Board; assume \$0 cost for this portion.	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -
Filmore		6170 Pratt Drive (at Robert E. Lee Blvd.)	5700 Pratt Drive; area adjacent to DPS #4 (near Prentiss Ave.)	Private property. With the exception of eight (8) properties, the 25' permanent ROW appears to be within reasonable distance (>20') from houses.	1,800	45,000	50'X130'	6,500	\$ 164,000	\$ 184,200	\$ 25.23	\$ 28.34	\$ 1,135,385	\$ 1,275,231
				Assume eight (8) properties will be acquired in fee title.	-	-	-	-	\$ 164,000	\$ 184,200	\$ -	\$ -	\$ 1,312,000	\$ 1,473,600
		5700 Pratt Drive; area adjacent to DPS #4 (near Prentiss Ave.)	4900 Pratt Drive (at Mirabeau Ave.)	Private property. With the exception of eight (8) properties, the 25' permanent ROW appears to be within reasonable distance (>20') from houses.	3,000	75,000	60'X150'	9,000	\$ 164,000	\$ 184,200	\$ 18.22	\$ 20.47	\$ 1,366,667	\$ 1,535,000
				Assume eight (8) properties will be acquired in fee title.	-	-	-	-	\$ 164,000	\$ 184,200	\$ -	\$ -	\$ 1,312,000	\$ 1,473,600
		4890 Pratt Drive (at Mirabeau Ave.)	1770 Carnot St. (near Pratt Dr.)	Private property. With the exception of two (2) properties, the 25' permanent ROW appears to be within reasonable distance (>20') from houses.	960	24,000	75'X150'	11,250	\$ 164,000	\$ 184,200	\$ 14.58	\$ 16.37	\$ 349,867	\$ 392,960
			Assume two (2) properties will be acquired in fee title.	-	-	-	-	\$ 164,000	\$ 184,200	\$ -	\$ -	\$ 328,000	\$ 368,400	
Dillard		1770 Carnot St. (near Pratt Dr.)	1750 Virgil Blvd.	Property on west side owned by Dillard University. Assume \$0 for cost. At Virgil Blvd., assume one (1) property will be acquired in fee title.	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
				Assume one (1) property will be acquired in fee title.	-	-	-	-	\$ 113,000	\$ 184,200	\$ -	\$ -	\$ 113,000	\$ 184,200
		1750 Virgil Blvd.	1780 Lafreniere St. (at London Ave.)	Private property. With the exception of four (4) properties, the 25' permanent ROW appears to be within reasonable distance (>20') from houses.	950	23,750	50'X125'	6,250	\$ 113,000	\$ 184,200	\$ 18.08	\$ 29.47	\$ 429,400	\$ 699,960
				Assume four (4) properties will be acquired in fee title.	-	-	-	-	\$ 113,000	\$ 184,200	\$ -	\$ -	\$ 452,000	\$ 736,800
		1780 Lafreniere St. (at London Ave.)	3000 Address on London Ave. (at Gently Blvd.)	Property on west side is London Ave. ROW. Assume \$0 cost for London Ave. ROW. However, three (3) properties may be damaged by loss of access and/or intrusion of the ROW to an unreasonable distance. Assume three (3) properties will be acquired in fee title.	-	-	-	-	\$ 113,000	\$ 184,200	\$ -	\$ -	\$ 339,000	\$ 552,600
	2360 Gently Blvd.	Railroad ROW	Private property. Assume four (4) properties will be acquired in fee title.	-	-	-	-	\$ 113,000	\$ 184,200	\$ -	\$ -	\$ 339,000	\$ 552,600	
Railroad ROW DPS #3	DPS #3	Assume \$0 cost. Permit fee will be applicable. Assume \$0 cost for S&WB property at DPS #3.	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		
Total, London Avenue Canal--West Side												\$ 7,476,318	\$ 9,244,951	

Notes:

1--Property sales data (Trulia) by neighborhood for period from 10/1/09 to 4/1/10.

2--Times-Picayune, February 10, 2010

Assumptions:

1--Based on cross-section for Option 2 clay liner for the London Avenue Canal (Sta 0+00 to 20+25), the toe of the

2--Based on cross-section for Option 3 clay liner for the London Avenue Canal (Sta 20+25 to 153+00), the toe of the levee was assumed to be 18 feet from the floodwall. Permanent 25-foot ROW measured from toe of levee.

3--Properties assumed to be improved and undamaged.

**Opinion of Probable Cost
AECOM
Real Estate/ROW Calculations**

Bypasses and Hoey's Canal Diversion

Side of Canal	Neighborhood	Street Address at Northern Boundary	Street Address at Southern Boundary	Comments	Estimated Length, Ft.	Estimated Area (25' Width), Sq. Ft.	Average Lot Size	Average Lot Area	Improved Property Price, \$		Estimate for Full Property Value/Permanent ROW				
									Low	High	Improved Price per Sq Ft (Lot), \$		Total, \$		
											Low	High	Low	High	
17th Street Canal/DPS #6 Bypass															
East	Lakewood	Bellaire Dr./Maryland		Assume five (5) properties will be acquired in fee title.	N/A	N/A	-	-	\$ 299,900	\$ 316,400	\$ -	\$ -	\$ 1,499,500	\$ 1,582,000	
London Avenue/DPS #4 Canal Bypass															
East	St. Anthony	Warrington Dr. (near Prentiss)		Assume two (2) properties will be acquired in fee title.	N/A	N/A	-	-	\$ 126,000	\$ 184,200	\$ -	\$ -	\$ 252,000	\$ 368,400	
Hoey's Canal Diversion															
				Assume costs as indicated in previous reports per direction of AECOM.	N/A	N/A	-	-	\$ -	\$ -	\$ -	\$ -	\$ 2,000,000	\$ 2,000,000	
Florida Avenue Diversion on London Avenue Canal															
				Assume all work will be performed within S&WB property or Florida Avenue canal ROW. Assume \$0 cost.	N/A	N/A	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Orleans Avenue Canal/DPS #7 Bypass															
				All work will be performed within S&WB property. Assume \$0 cost.	N/A	N/A	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
London Avenue Canal/DPS #3 Bypass (Option A)															
				All work will be performed within S&WB property. Assume \$0 cost.	N/A	N/A	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	

Total, All ROW \$ 43,892,307 \$ 64,973,329

Notes:
1--Property sales data (Trulia) by neighborhood for period from 10/1/09 to 4/1/10.
2--Times-Picayune, February 10, 2010

Assumptions:
1--Properties assumed to be improved and undamaged.

**Opinion of Probable Cost
AECOM
Real Estate/ROW Calculations**

Average Cost Per Property (Improved), in \$1,000's									
Jefferson Parish/70005 /North	Jefferson Parish/70005/ South	West End*	Lakewood	Lakeshore/ Lake Vista	Lake Terrace and Lake Oaks	St. Anthony	Dillard	Filmore	
\$234	\$379	\$70	\$135	\$240	\$250	\$130	\$137	\$91	
\$225	\$230	\$106	\$165	\$170	\$278	\$120	\$110	\$145	
\$235	\$154	\$145	\$176	\$255	\$332	\$135	\$75	\$93	
\$80	\$205	\$187	\$207	\$429	\$250	\$94	\$79	\$175	
\$180	\$70	\$209	\$250	\$317	\$244	\$150	\$153	\$135	
\$100	\$275	\$209	\$256	\$440	\$280	-	\$123	\$241	
\$230	\$245	\$213	\$260	\$182	\$320	-	-	\$140	
\$157	\$446	\$228	\$341	\$175	-	-	-	\$149	
\$230	\$140	\$244	\$350	\$407	-	-	-	\$173	
\$210	\$650	\$260	\$365	\$392	-	-	-	\$200	
\$208	\$151	\$433	\$460	\$560	-	-	-	\$260	
\$229	\$375	\$445	\$490	\$457	-	-	-	-	
\$247	\$350	-	\$660	\$325	-	-	-	-	
\$205	\$156	-	-	\$170	-	-	-	-	
\$180	\$275	-	-	\$399	-	-	-	-	
\$205	\$150	-	-	\$308	-	-	-	-	
\$150	\$180	-	-	-	-	-	-	-	
\$195	\$155	-	-	-	-	-	-	-	
\$325	\$305	-	-	-	-	-	-	-	
\$134	\$235	-	-	-	-	-	-	-	
\$175	\$160	-	-	-	-	-	-	-	
\$163	\$375	-	-	-	-	-	-	-	
\$239	\$340	-	-	-	-	-	-	-	
\$175	\$711	-	-	-	-	-	-	-	
\$117	\$285	-	-	-	-	-	-	-	
\$125	\$145	-	-	-	-	-	-	-	
\$220	-	-	-	-	-	-	-	-	
\$206	-	-	-	-	-	-	-	-	
\$225	-	-	-	-	-	-	-	-	
Total	\$5,602	\$7,141	\$2,748	\$4,114	\$5,226	\$1,954	\$628	\$676	\$1,802
Average	\$193	\$275	\$229	\$316	\$327	\$279	\$126	\$113	\$164

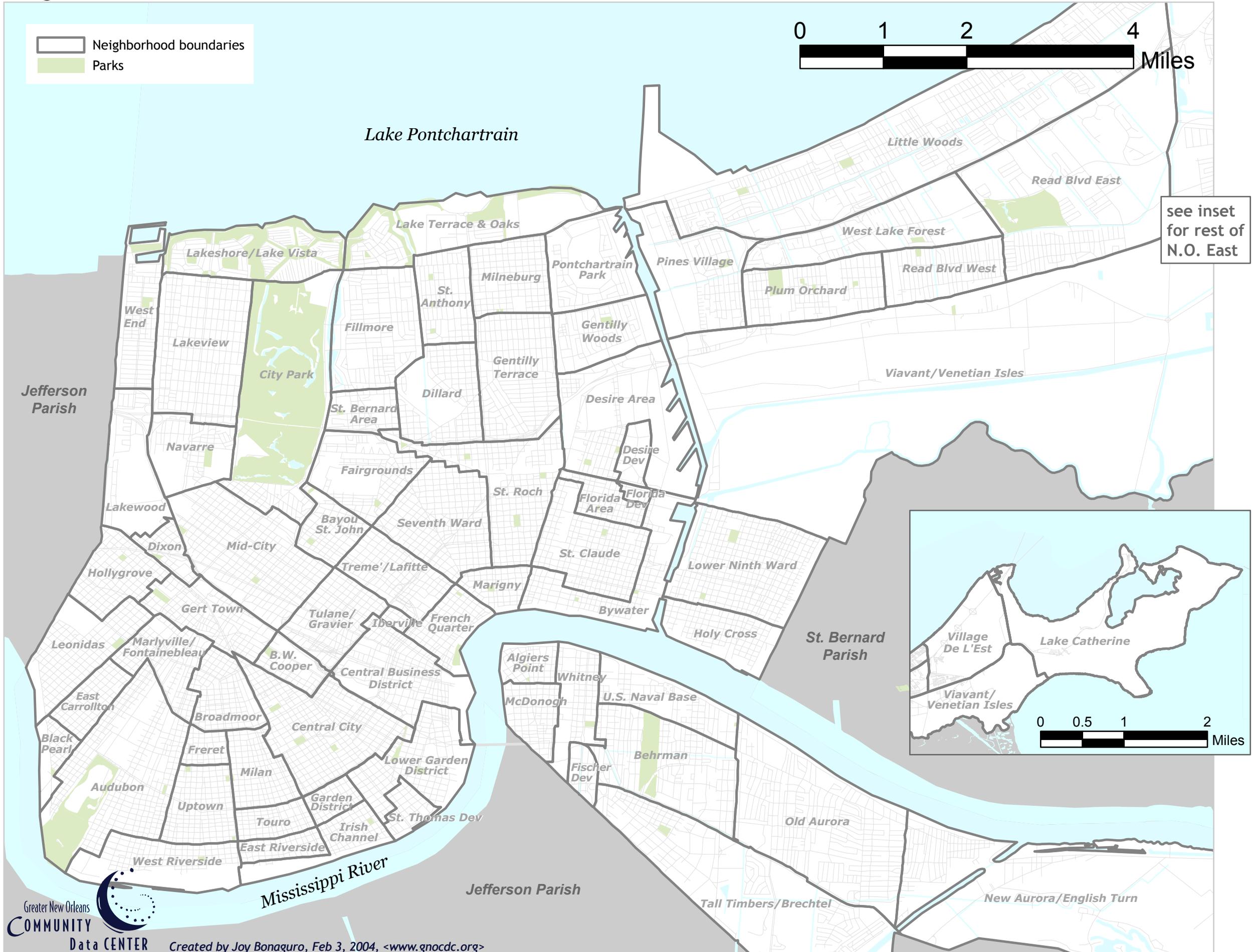
*South of Hammond Highway

Notes:

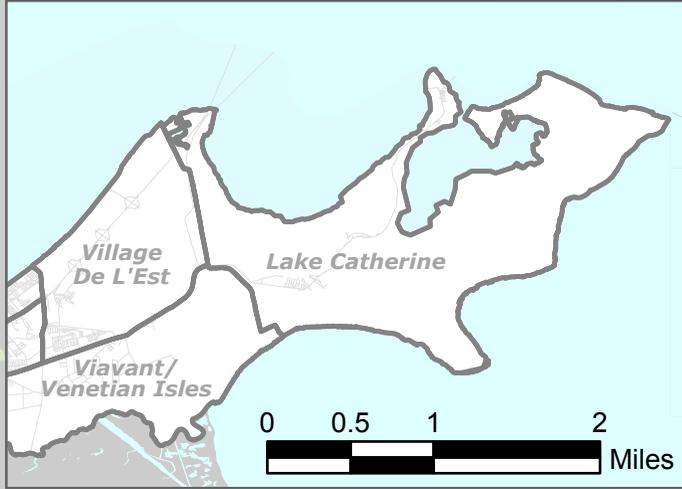
1. Data derived from residential home sale prices in New Orleans neighborhoods from Trulia.com.
2. Based on 6-month period from 10/1/09 to 4/1/10.
3. Sale prices significantly lower than remaining sales prices (e.g., \$25K-\$50K) were assumed to be for unimproved properties and are not included.
4. Jefferson Parish 70005/North area bounded by Bonnel Canal, Lake Pontchartrain, 17th Street Canal, and Veterans Blvd.
5. Jefferson Parish 70005/South area bounded by Hesper/Beverly Garden, Veterans Blvd., 17th Street Canal and Metairie Road.

Neighborhoods in Orleans Parish

-  Neighborhood boundaries
-  Parks



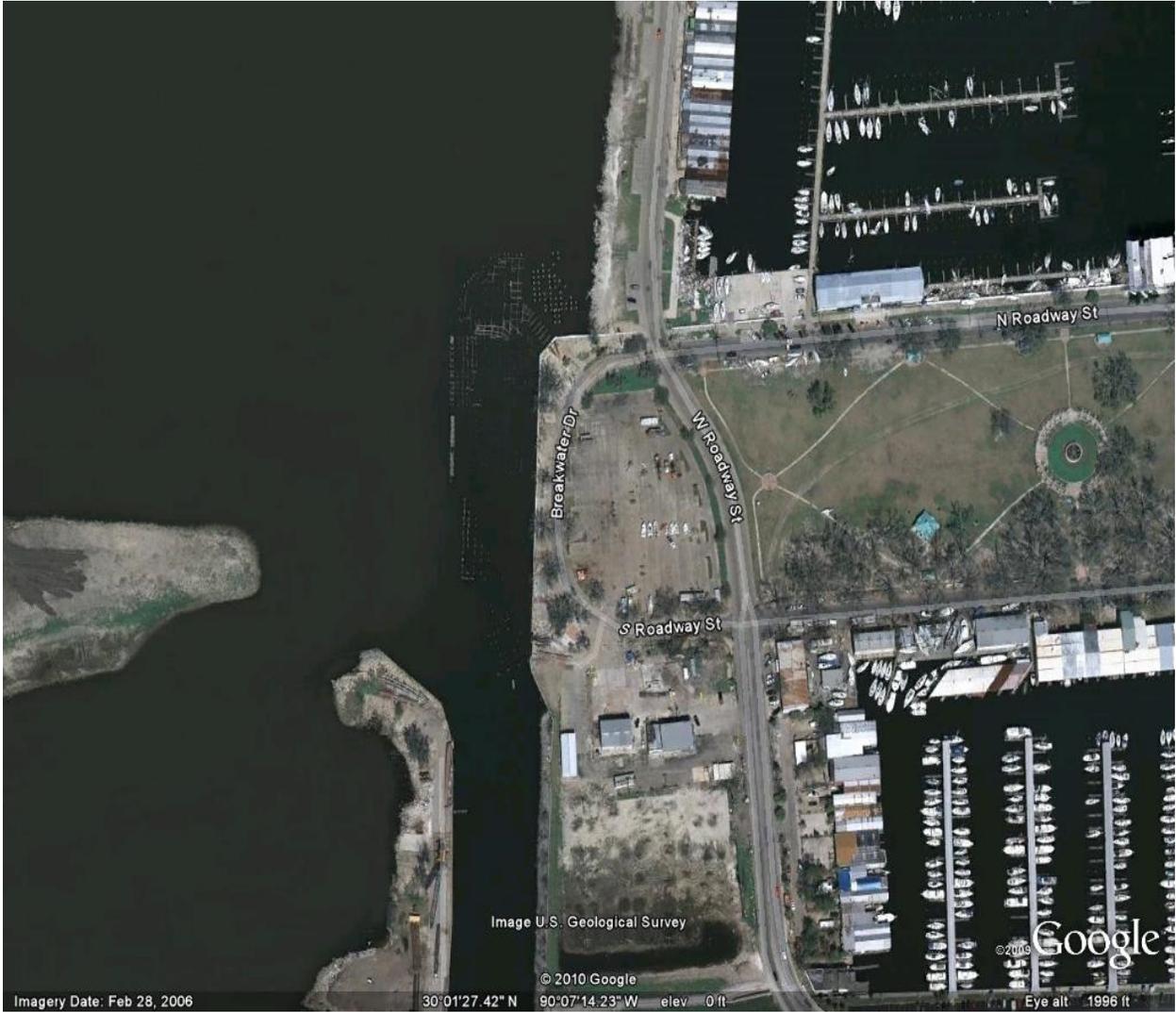
see inset for rest of N.O. East



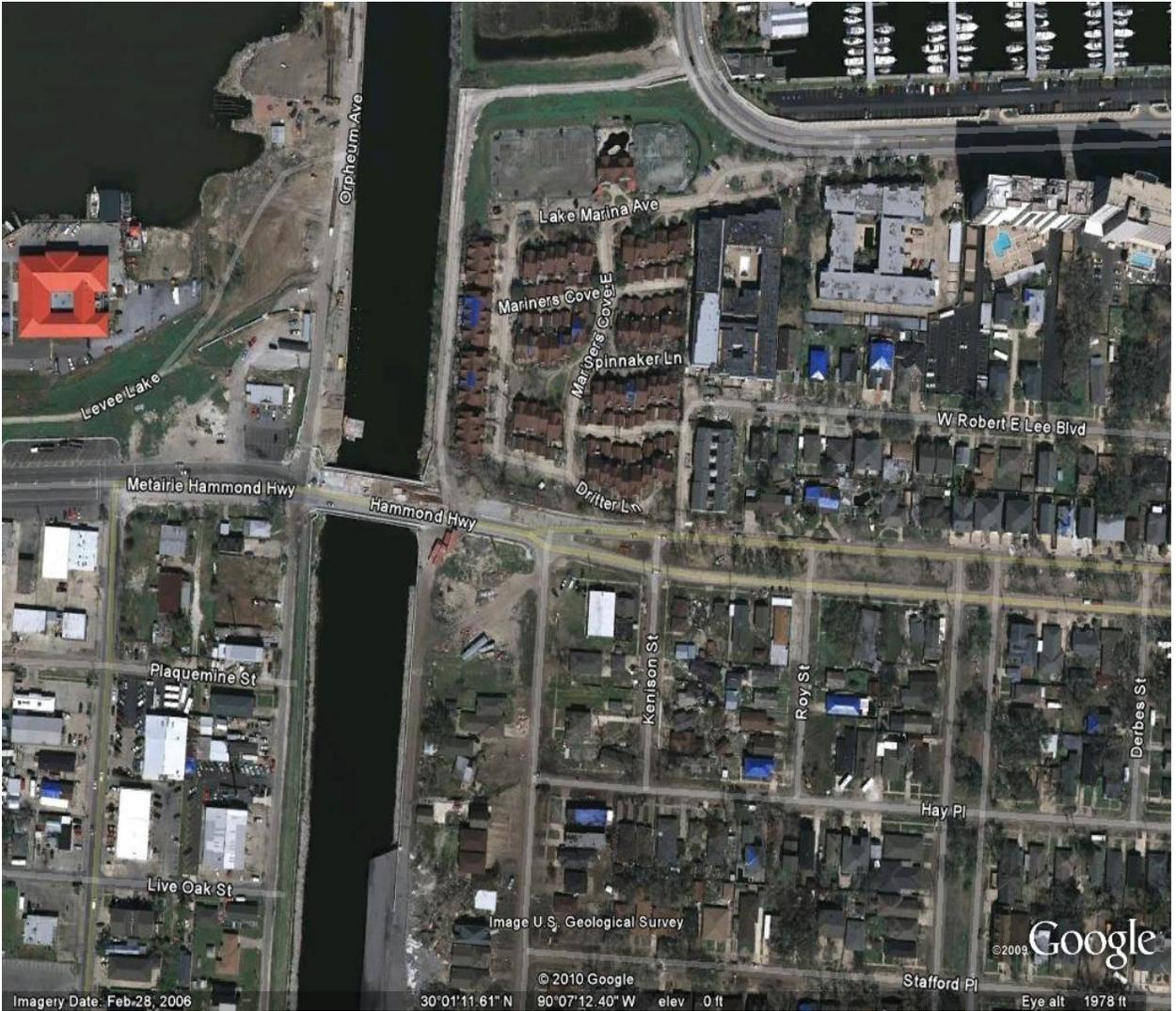
Created by Joy Bonaguro, Feb 3, 2004, <www.gnocdc.org>

Data sources: Water & parish boundaries (Census Tiger files), parks (ESRI StreetMap 2003), neighborhood boundaries (City Planning Commission of New Orleans)

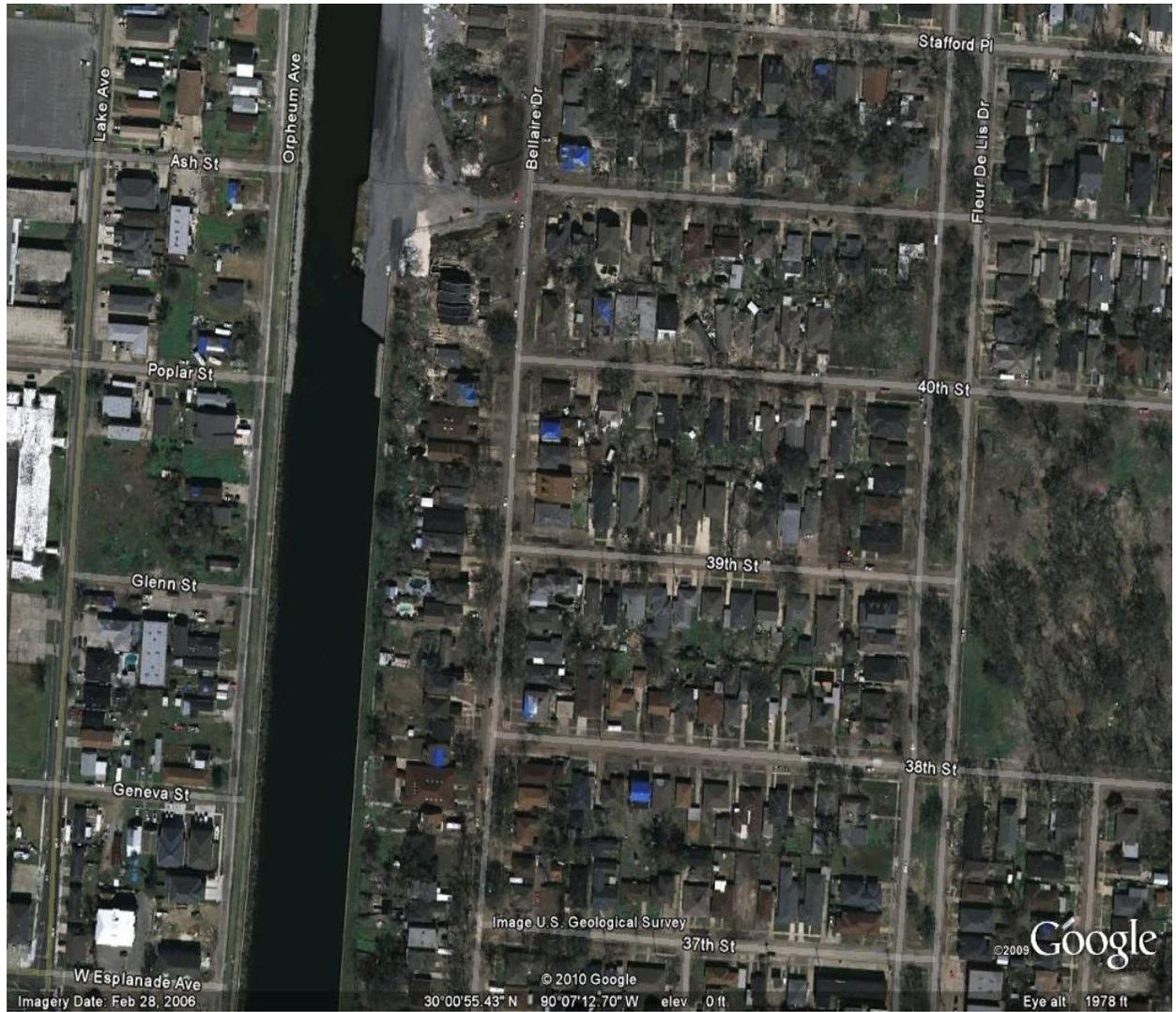
17 Street Canal



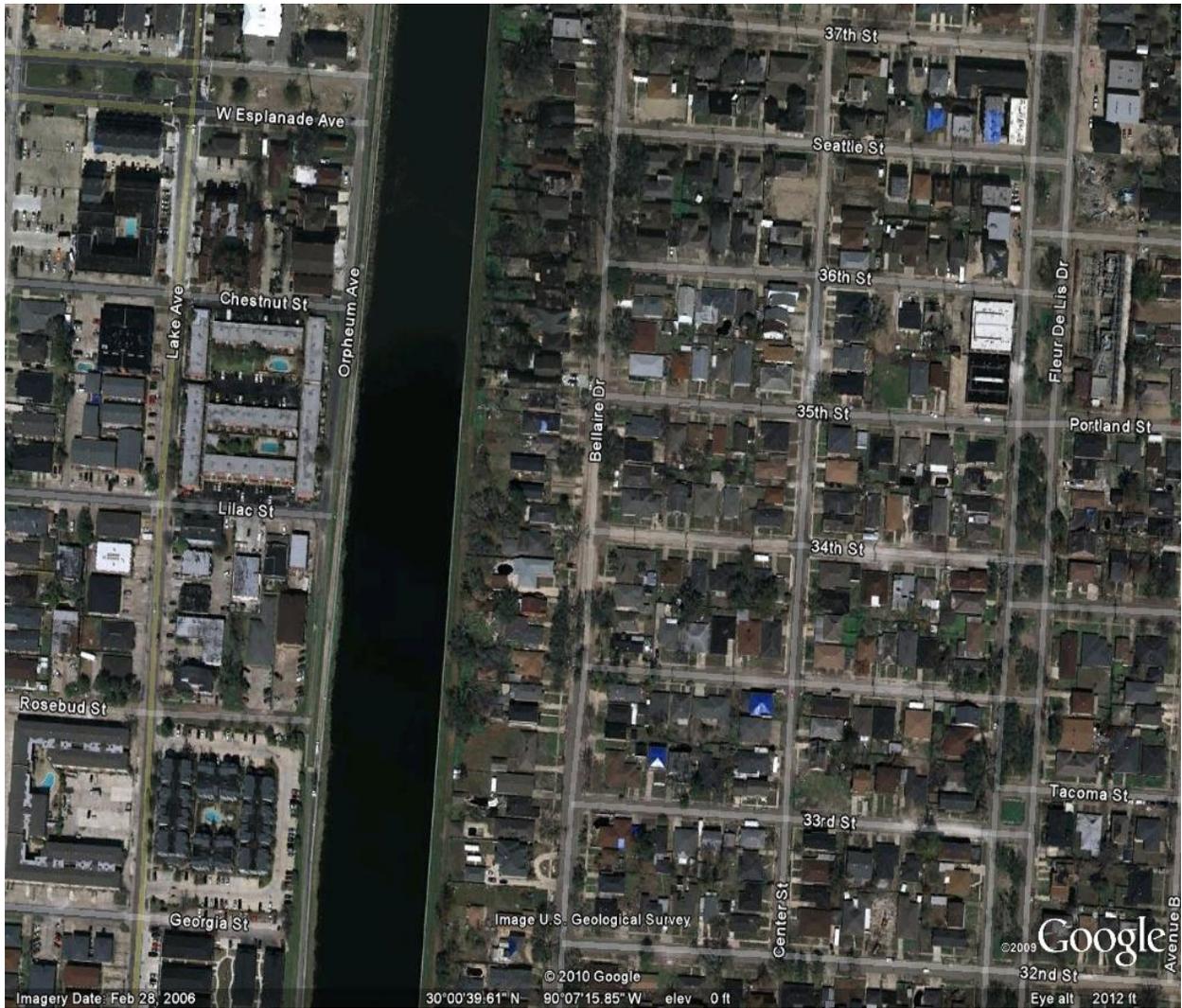
17th Street Canal, Northern End



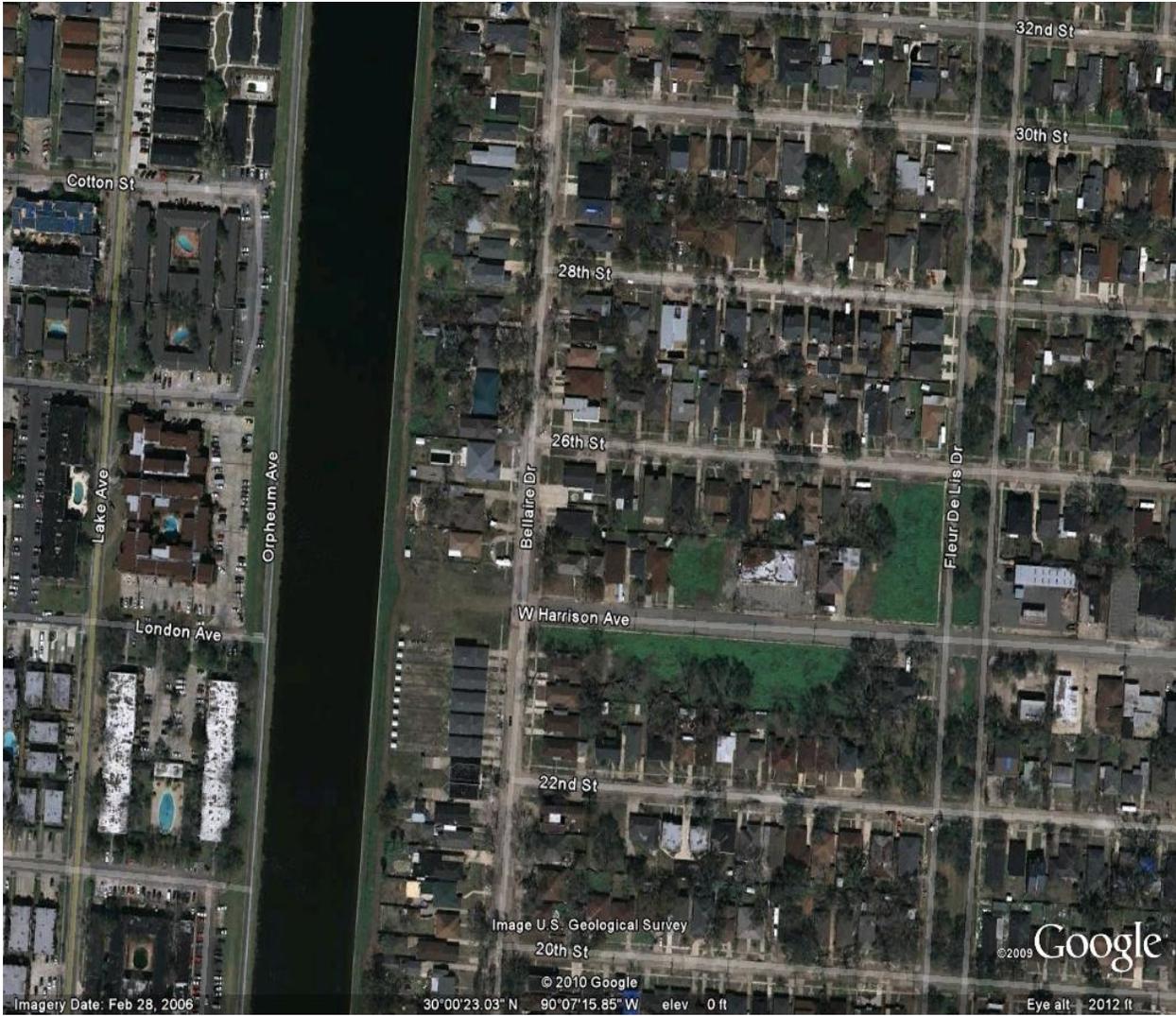
17th Street Canal (to Stafford Place)



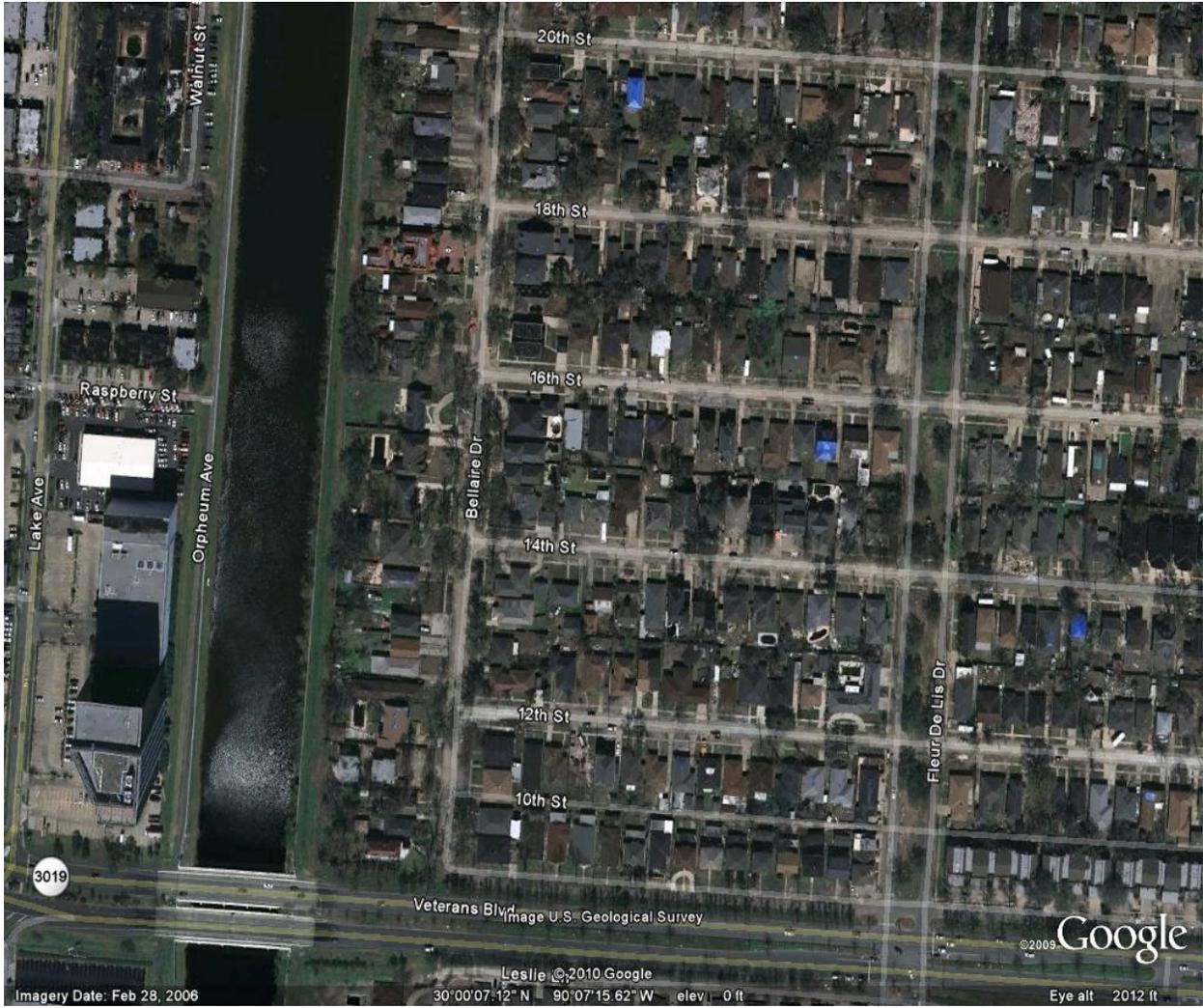
17th Street Canal (Stafford Place to 37th Street)



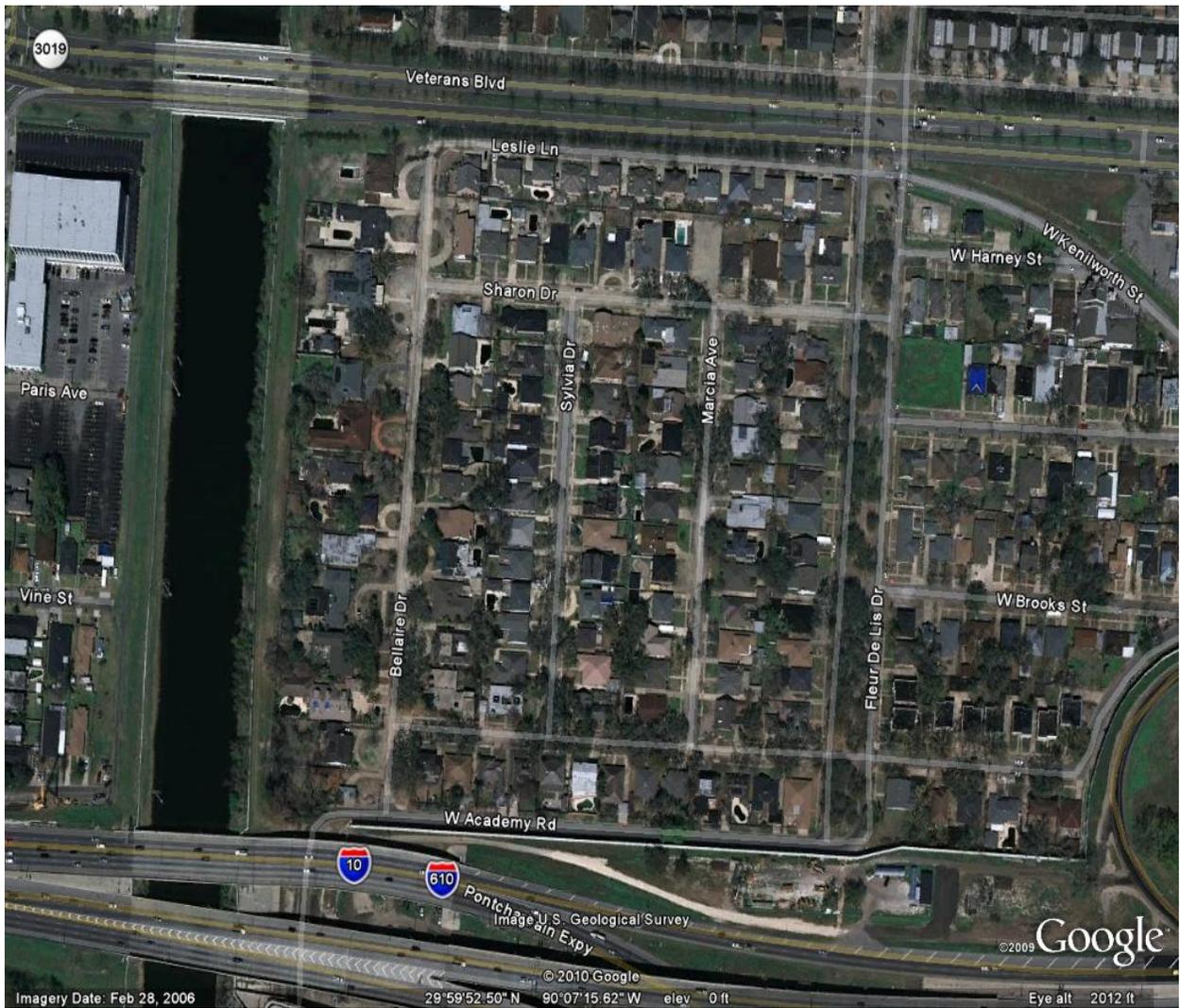
17th Street Canal (37th Street to 32nd Street)



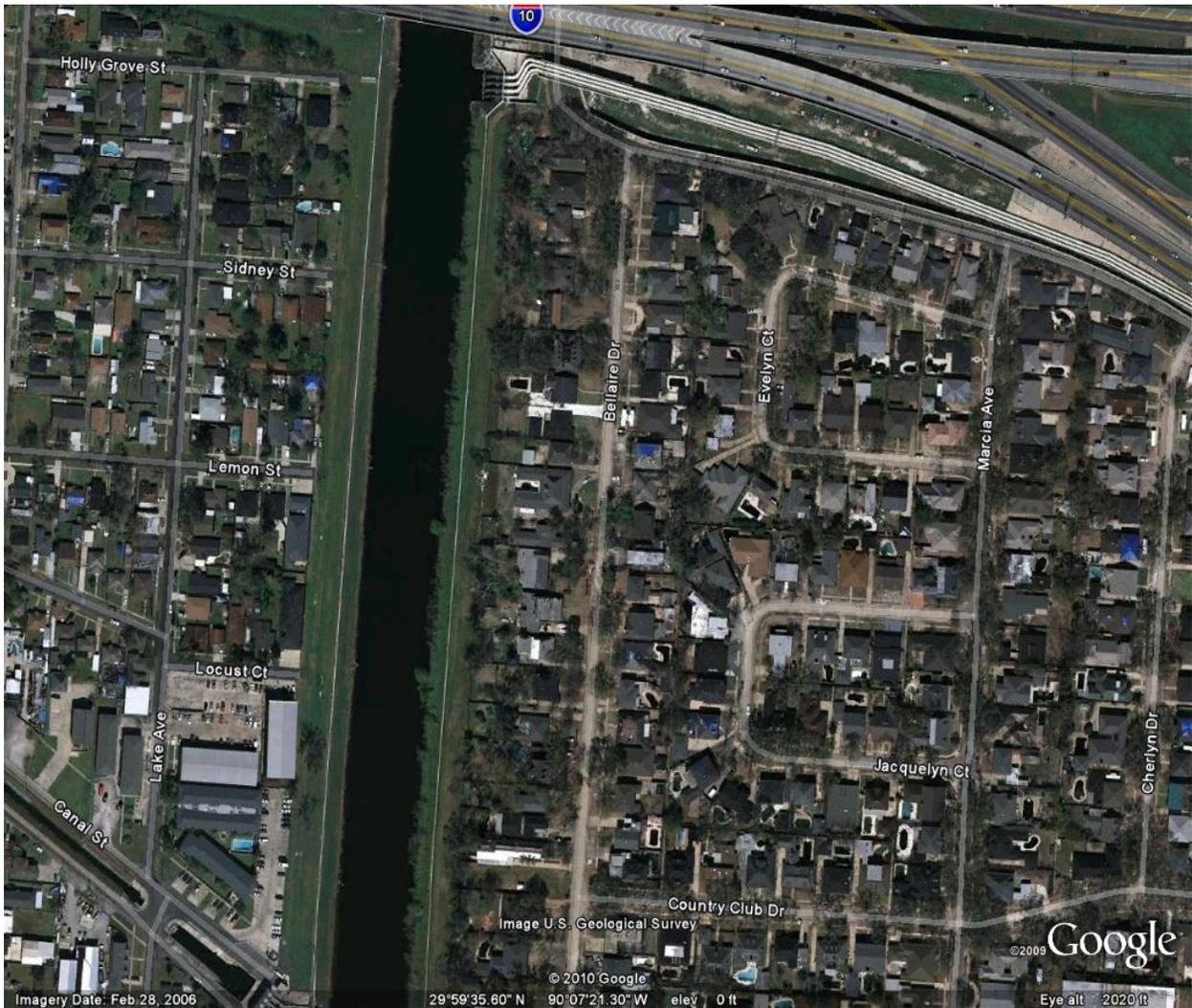
17th Street Canal (32nd Street to 20th Street)



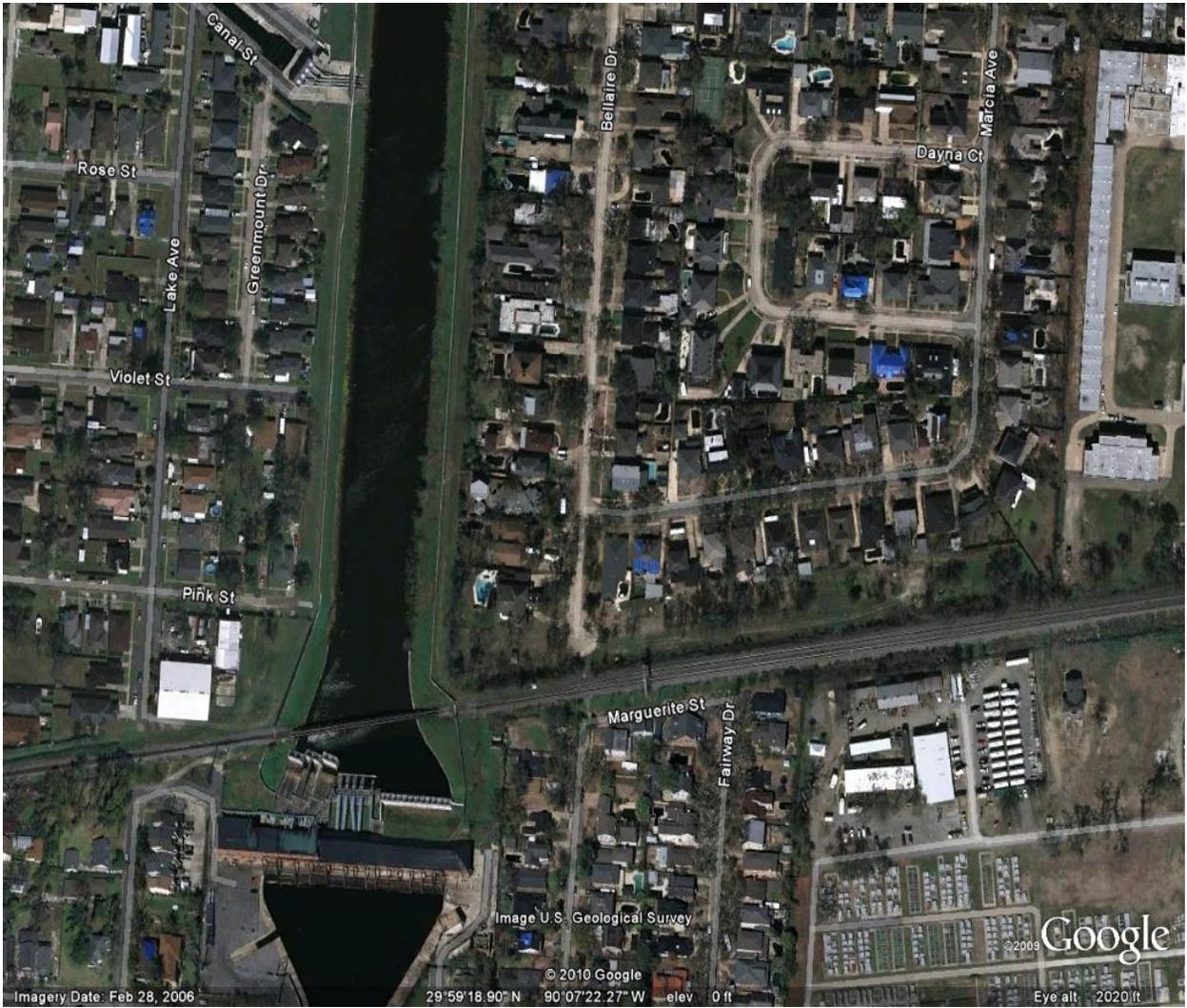
17th Street Canal (20th Street to Veterans Boulevard)



17th Street Canal (Veterans Boulevard to I10)

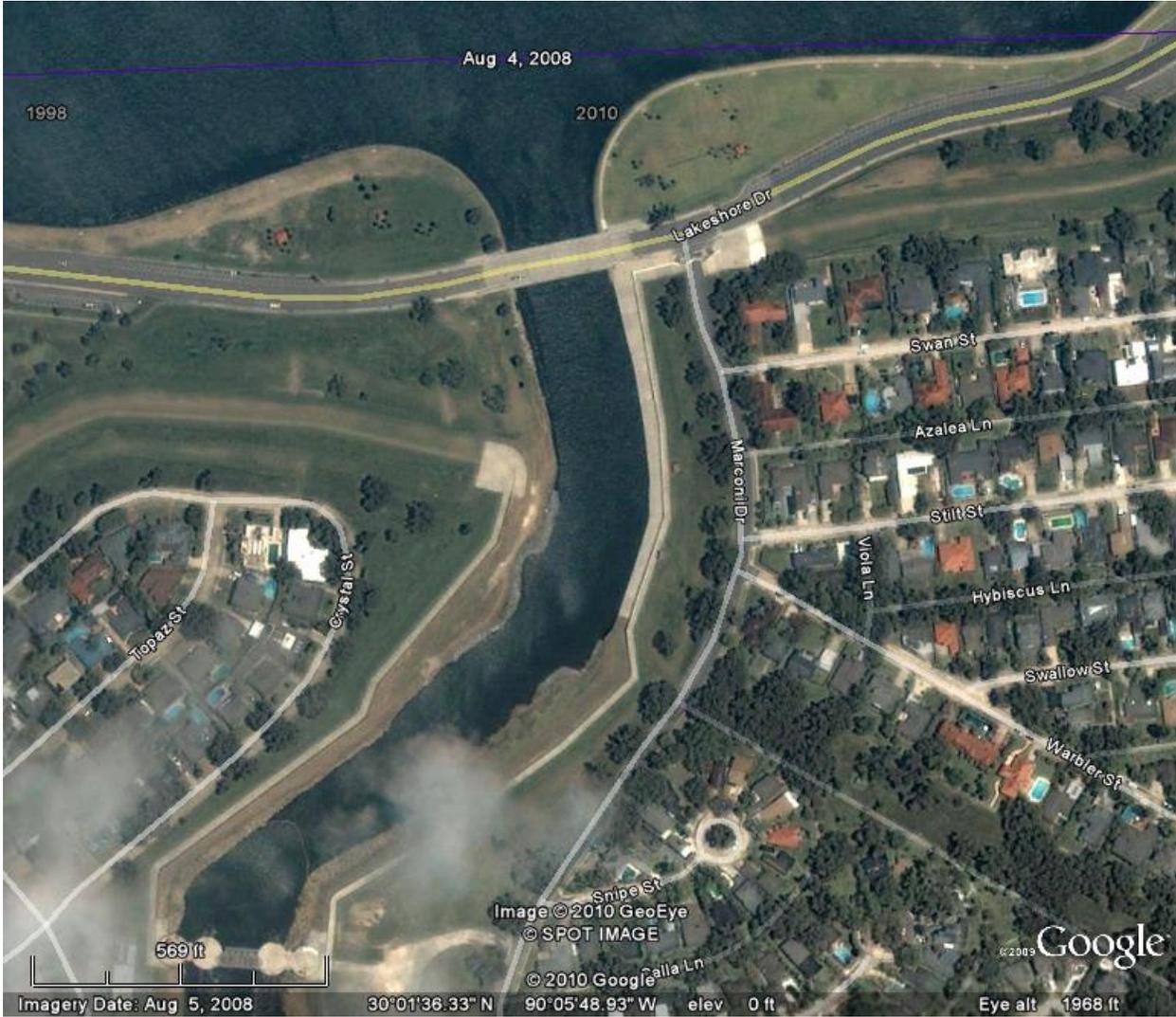


17th Street Canal (I10 to Canal Street)

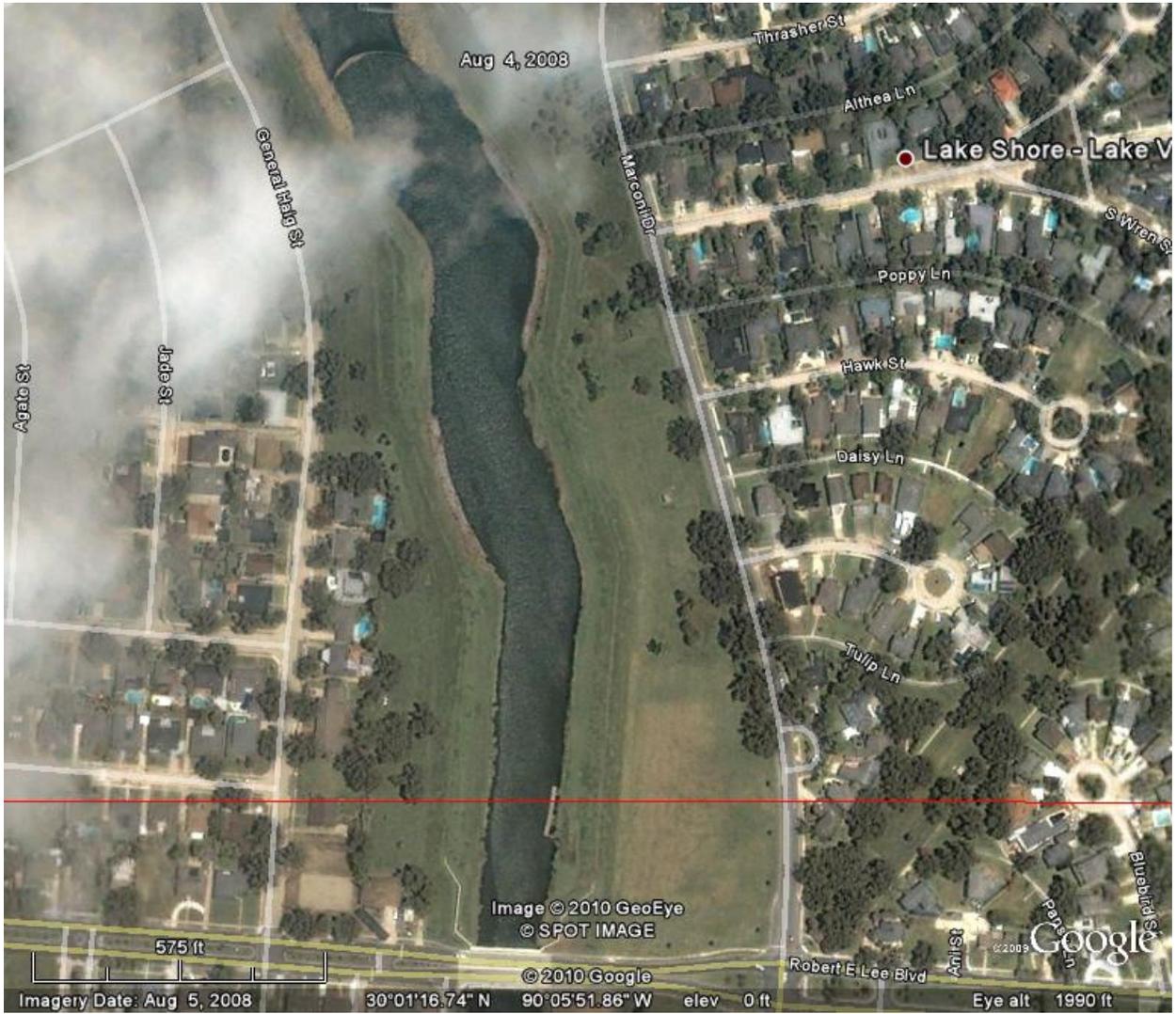


17th Street Canal, Southern End (Canal Street to DPS 6)

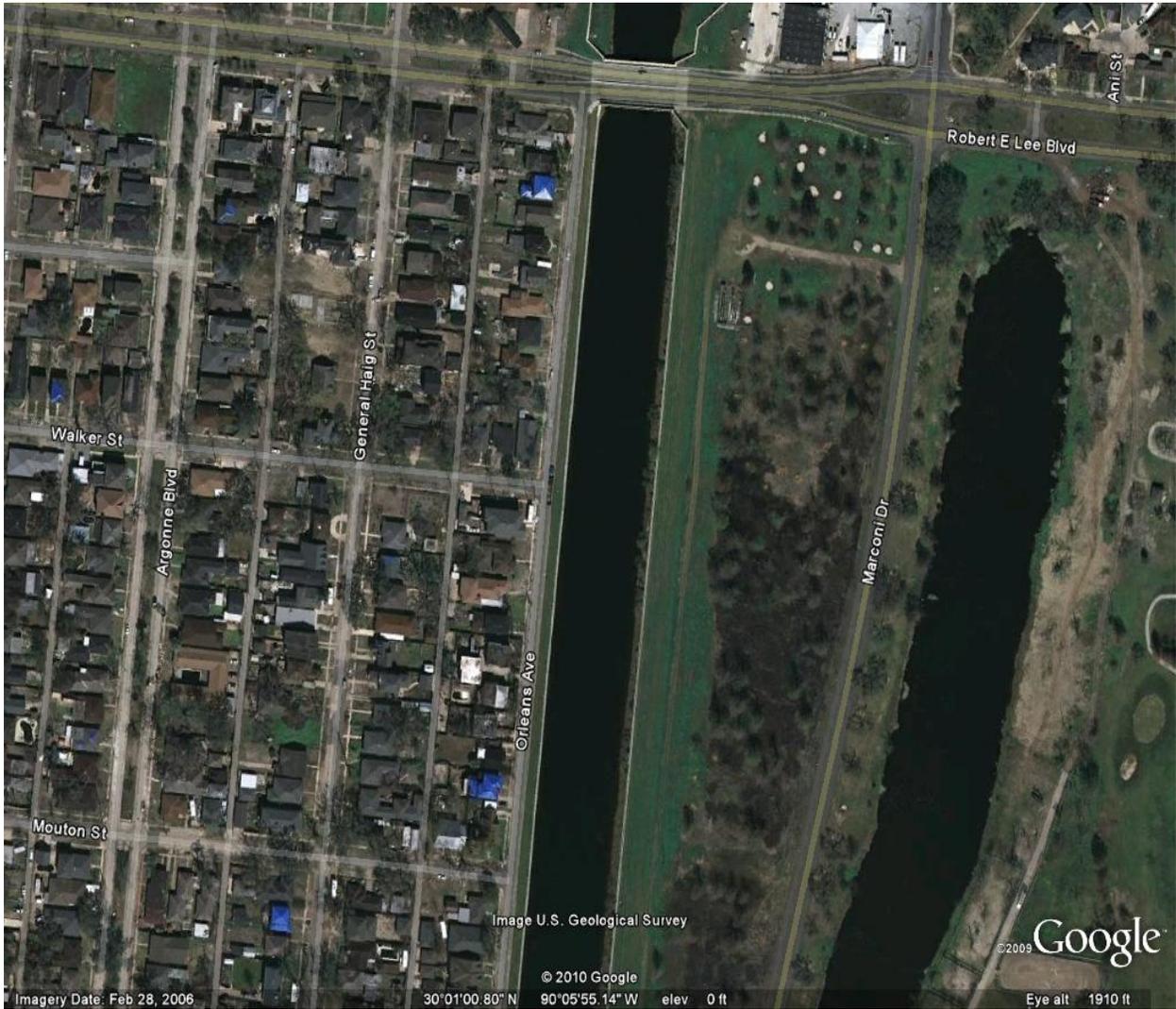
Orleans Avenue Canal



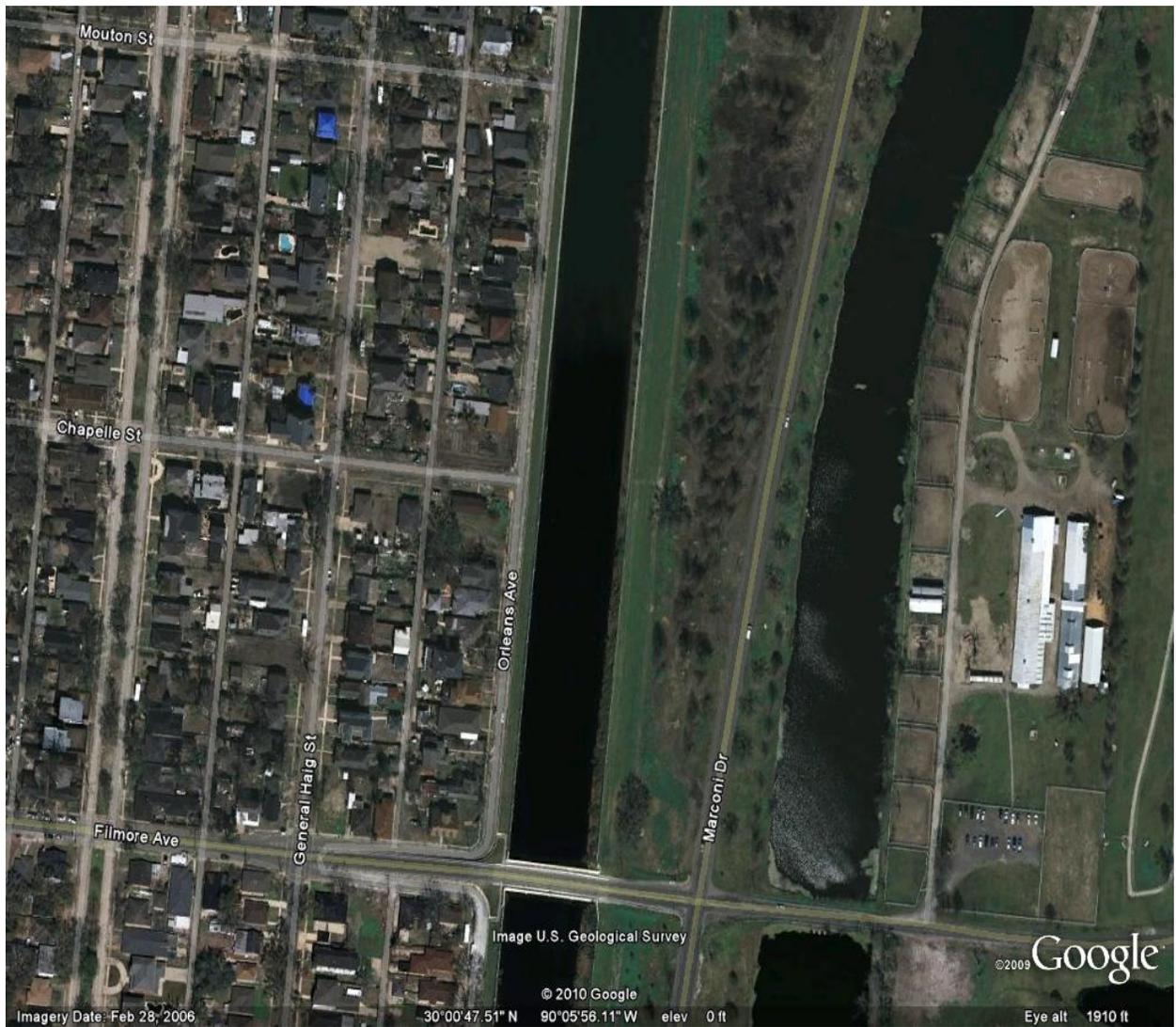
Orleans Avenue Canal, Northern End (Outfall to Interim Closure Structure)



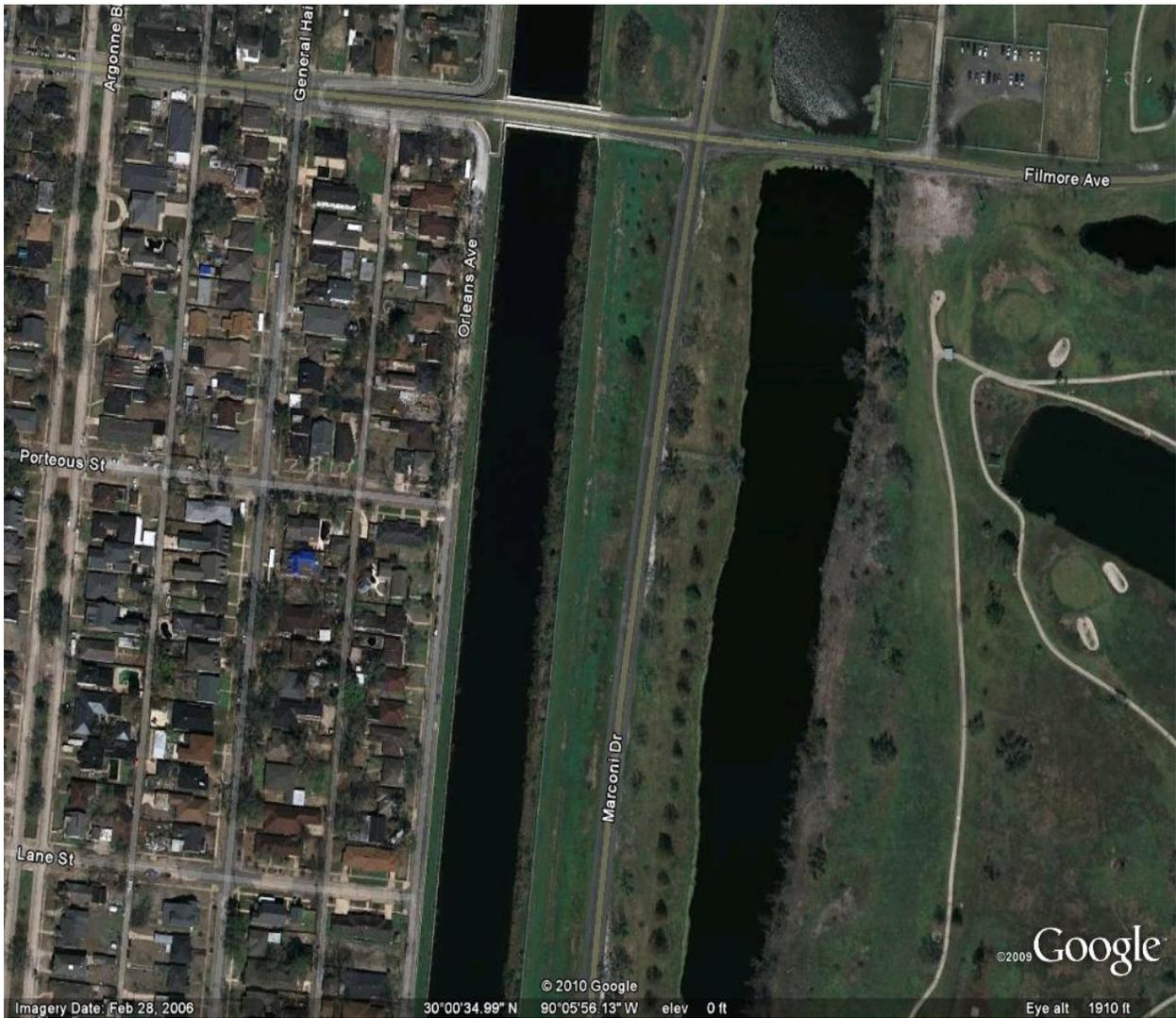
Orleans Avenue Canal (Interim Closure Structure to Robert E. Lee Blvd.)



Orleans Avenue Canal (Robert E. Lee Blvd. to Mouton Street)



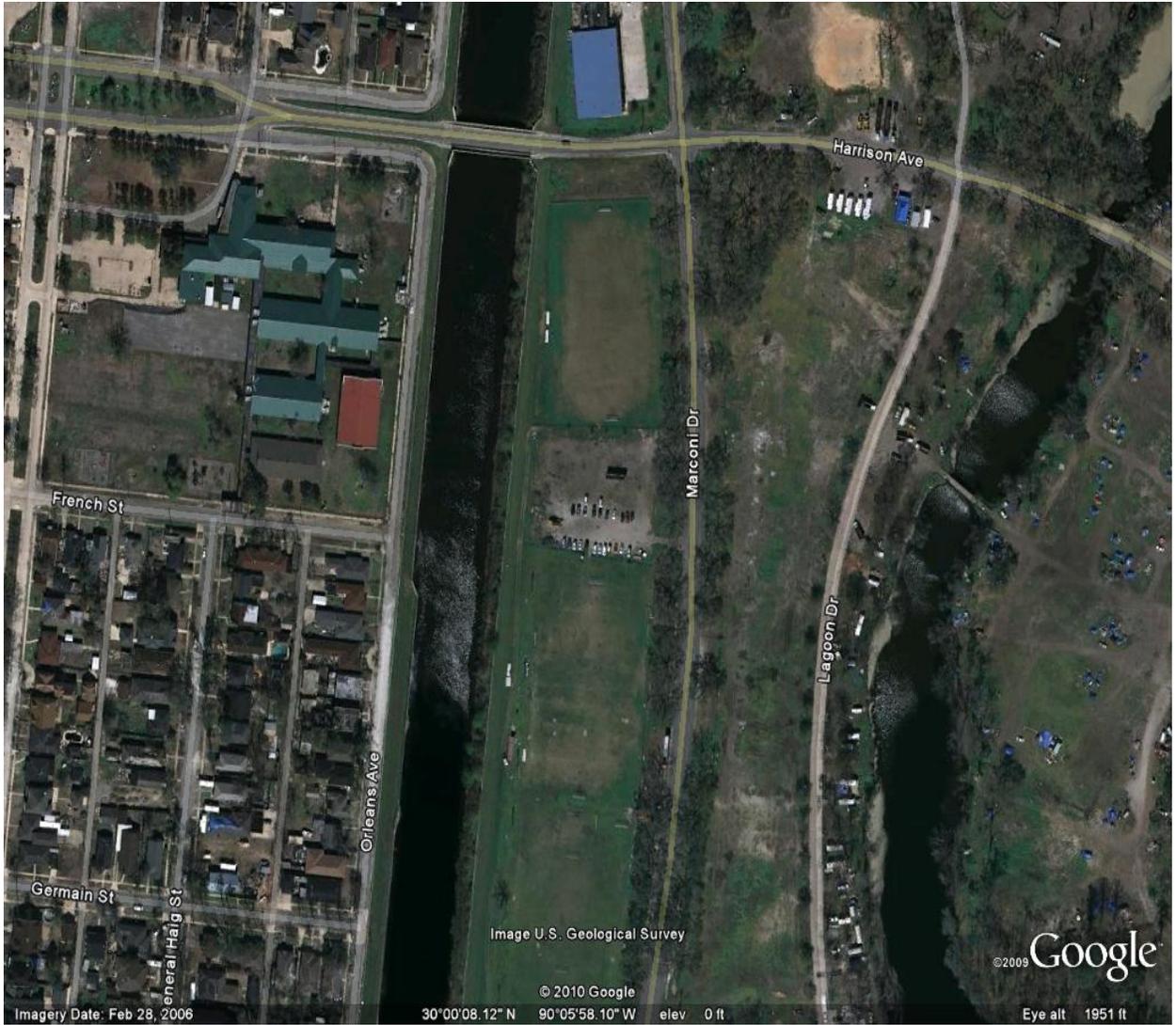
Orleans Avenue Canal (Mouton Street to Filmore Avenue)



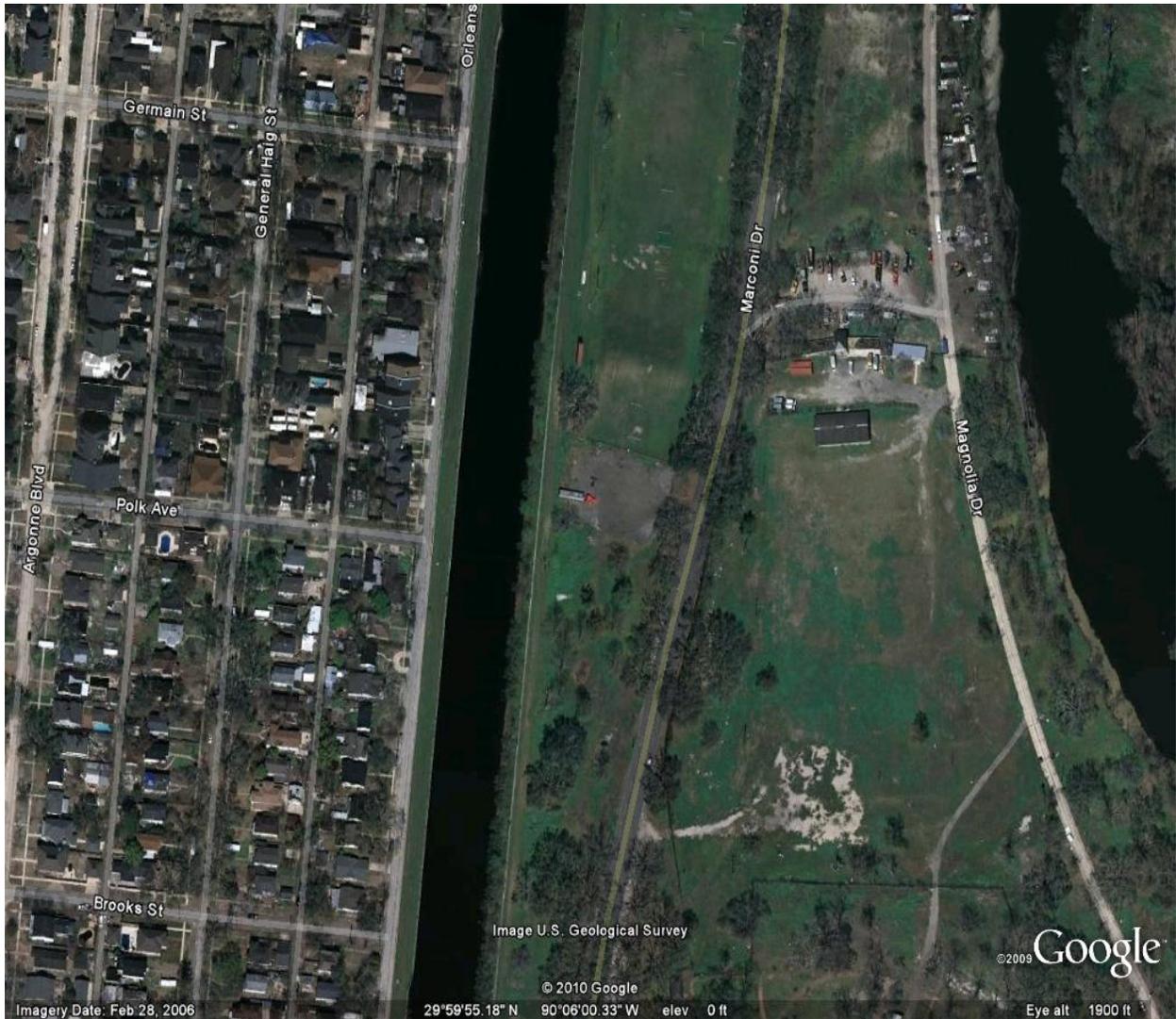
Orleans Avenue Canal (Filmore Avenue to Lane Street)



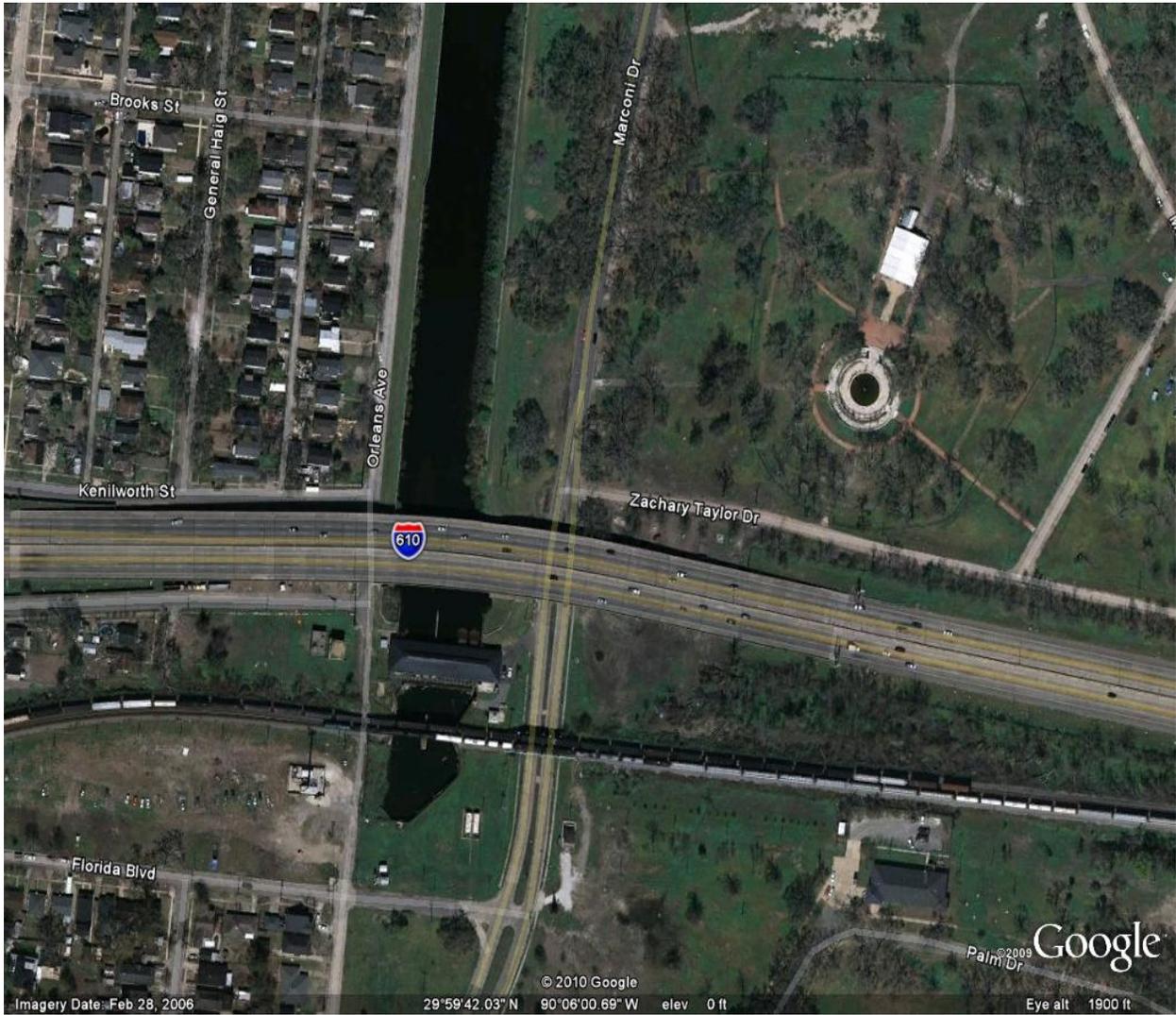
Orleans Avenue Canal (Lane Street to Harrison Avenue)



Orleans Avenue Canal, Northern End (Harrison Avenue to Germain Street)



Orleans Avenue Canal (Germain Street to Brooks Street)

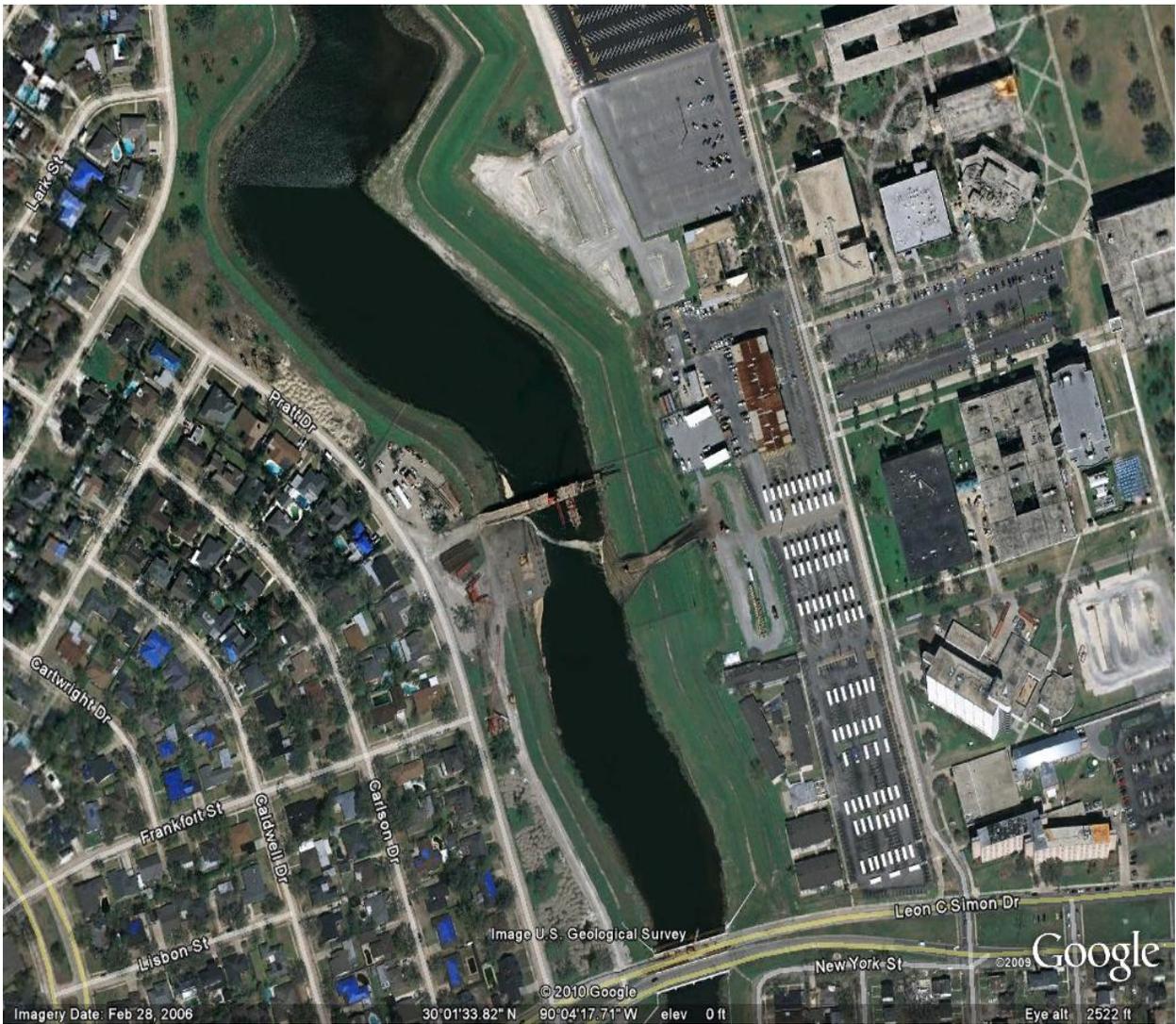


Orleans Avenue Canal, Southern End (Brooks Street to DPS 7)

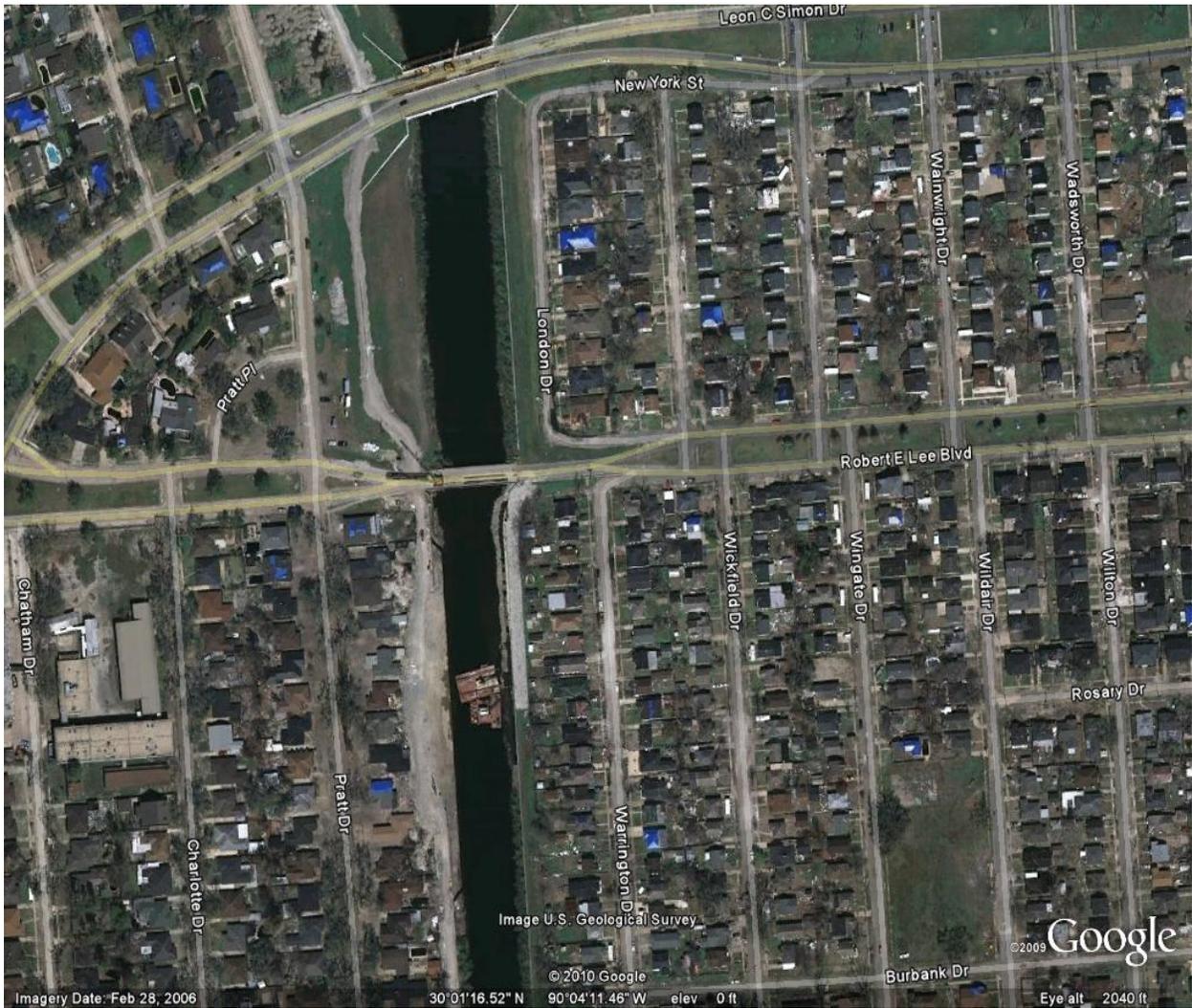
London Avenue Canal



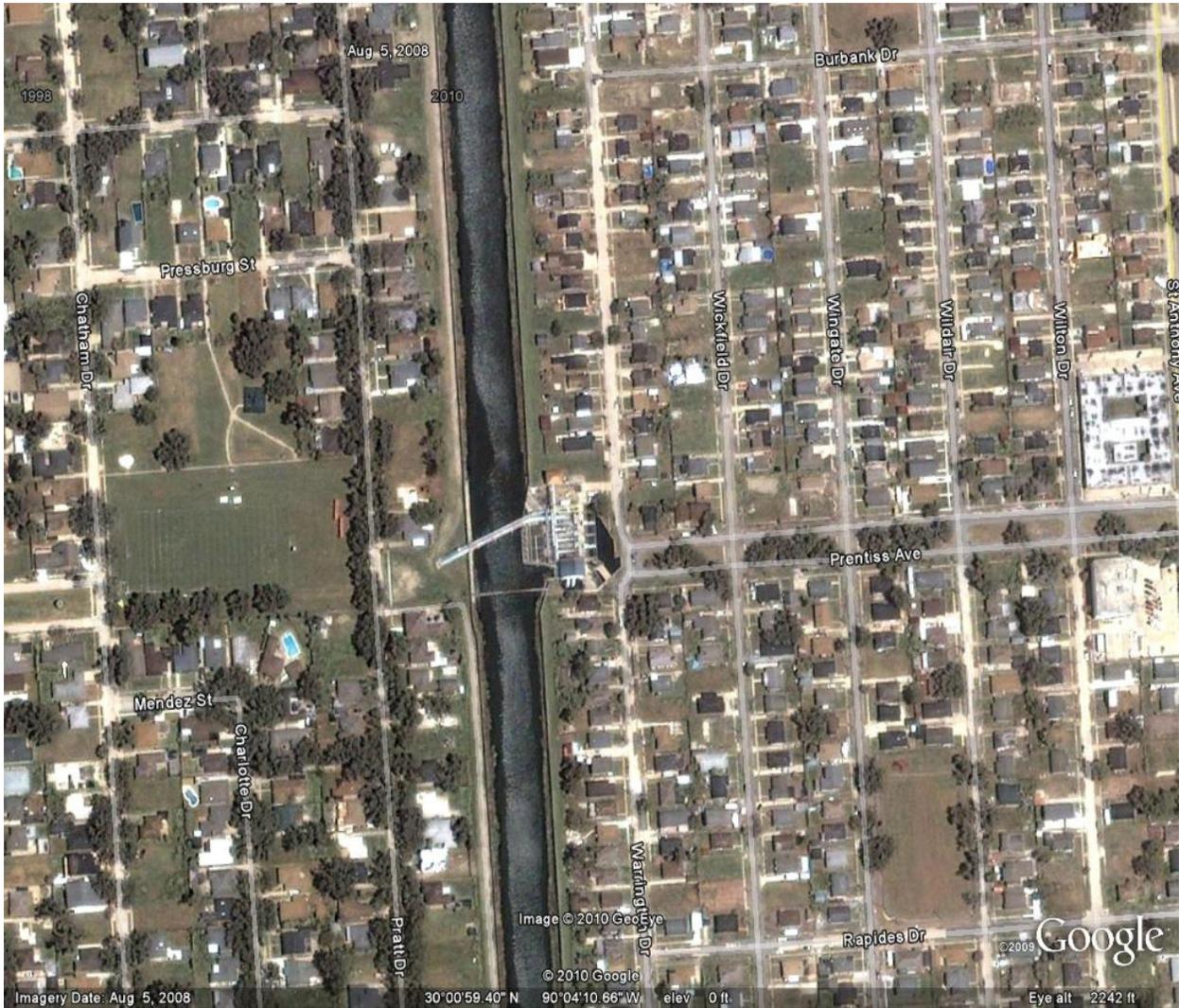
London Avenue Canal, Northern End



London Avenue Canal, Northern End (to Leon C. Simon Drive)



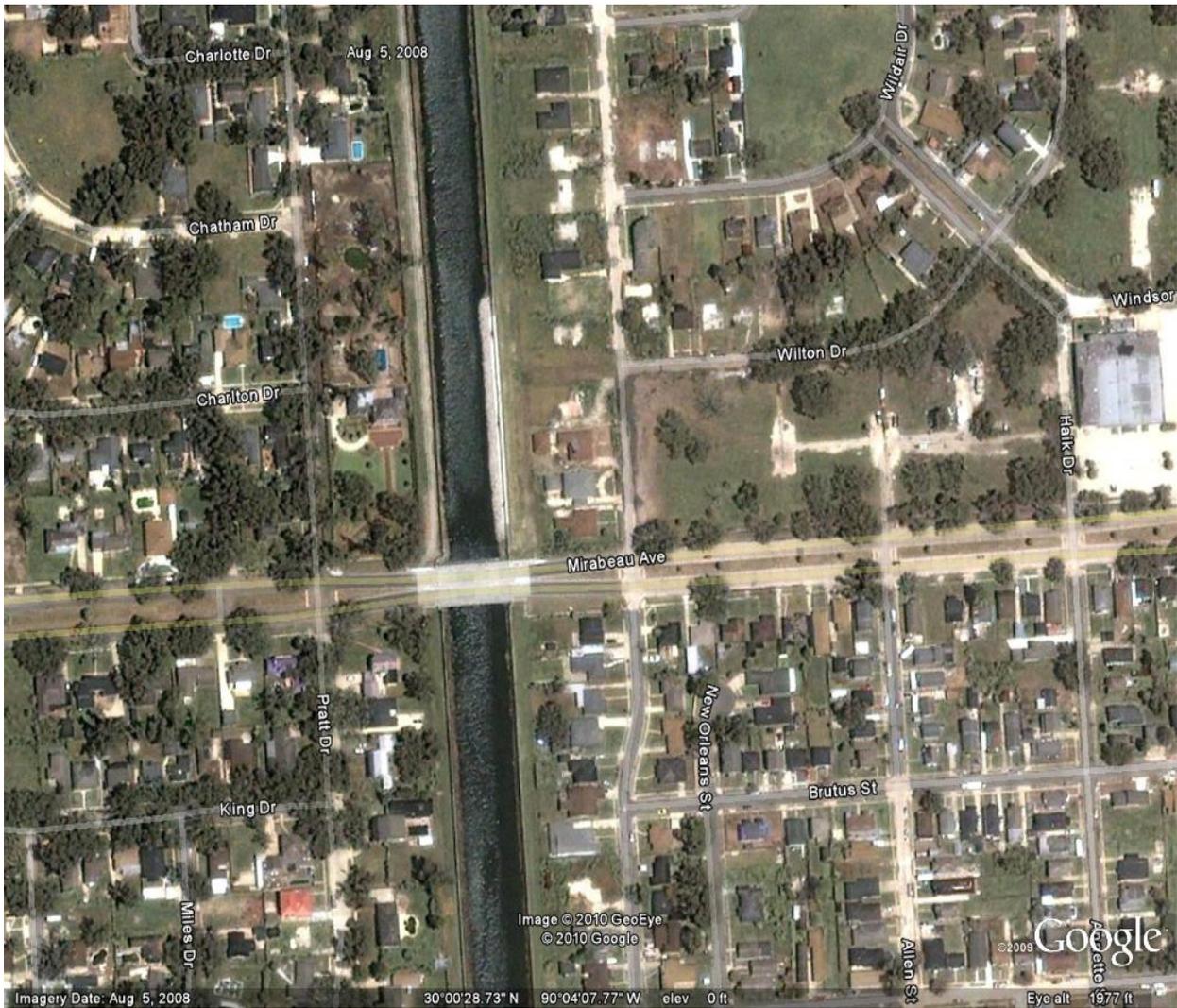
London Avenue Canal (Leon C. Simon Drive to Burbank Drive)



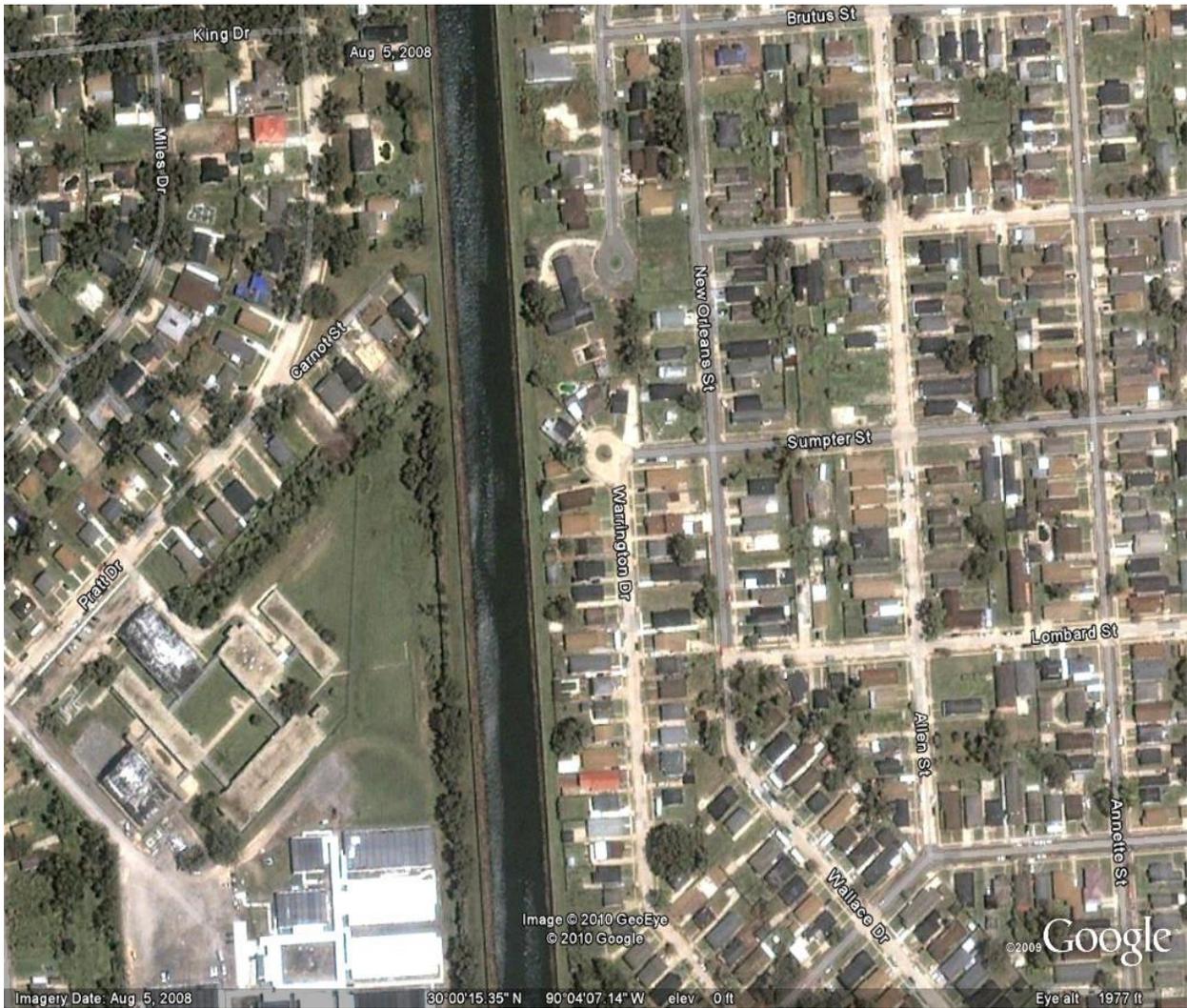
London Avenue Canal (Burbank Drive to Rapides Drive)



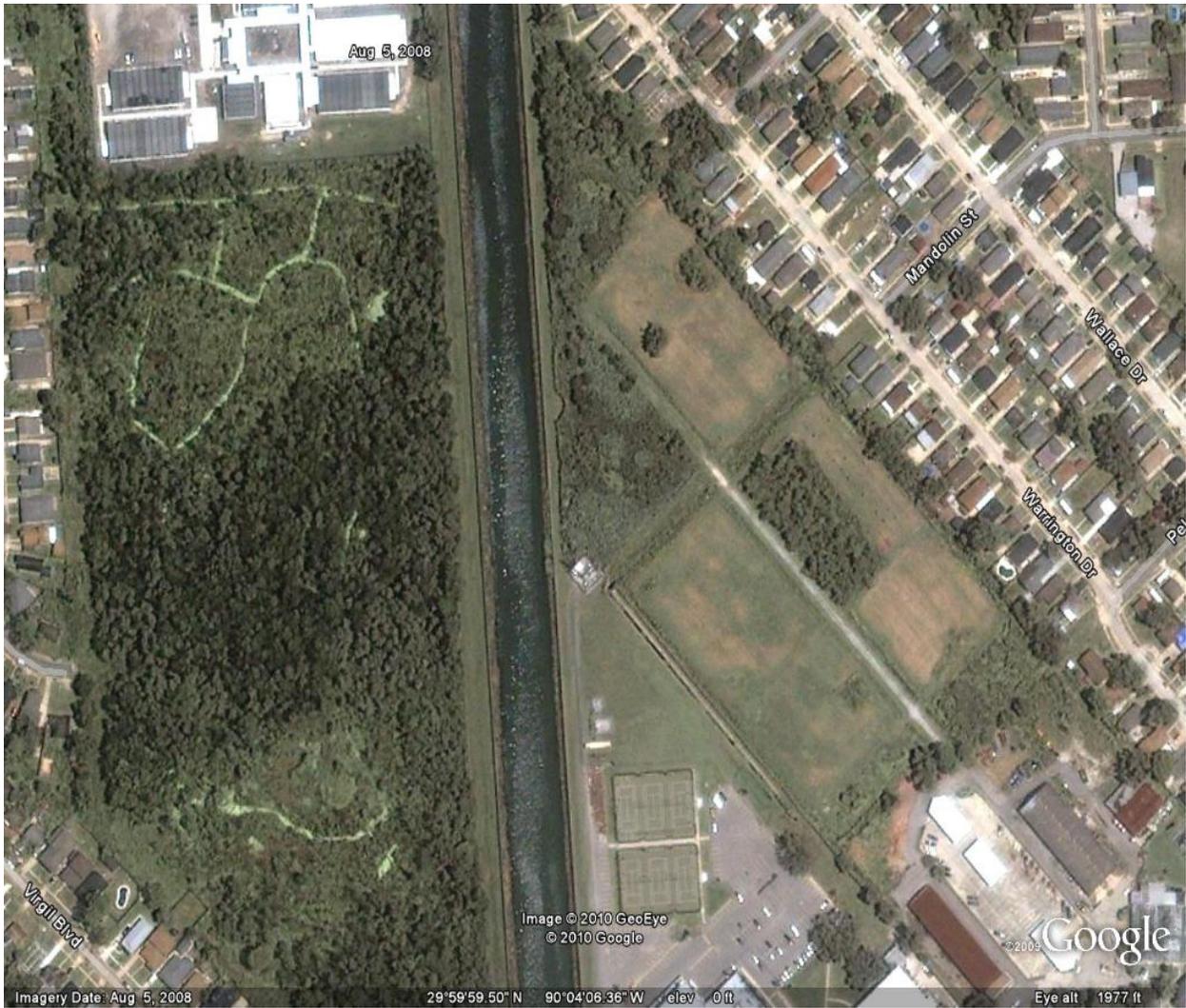
London Avenue Canal, Northern End (Rapides Drive to Wildair Drive)



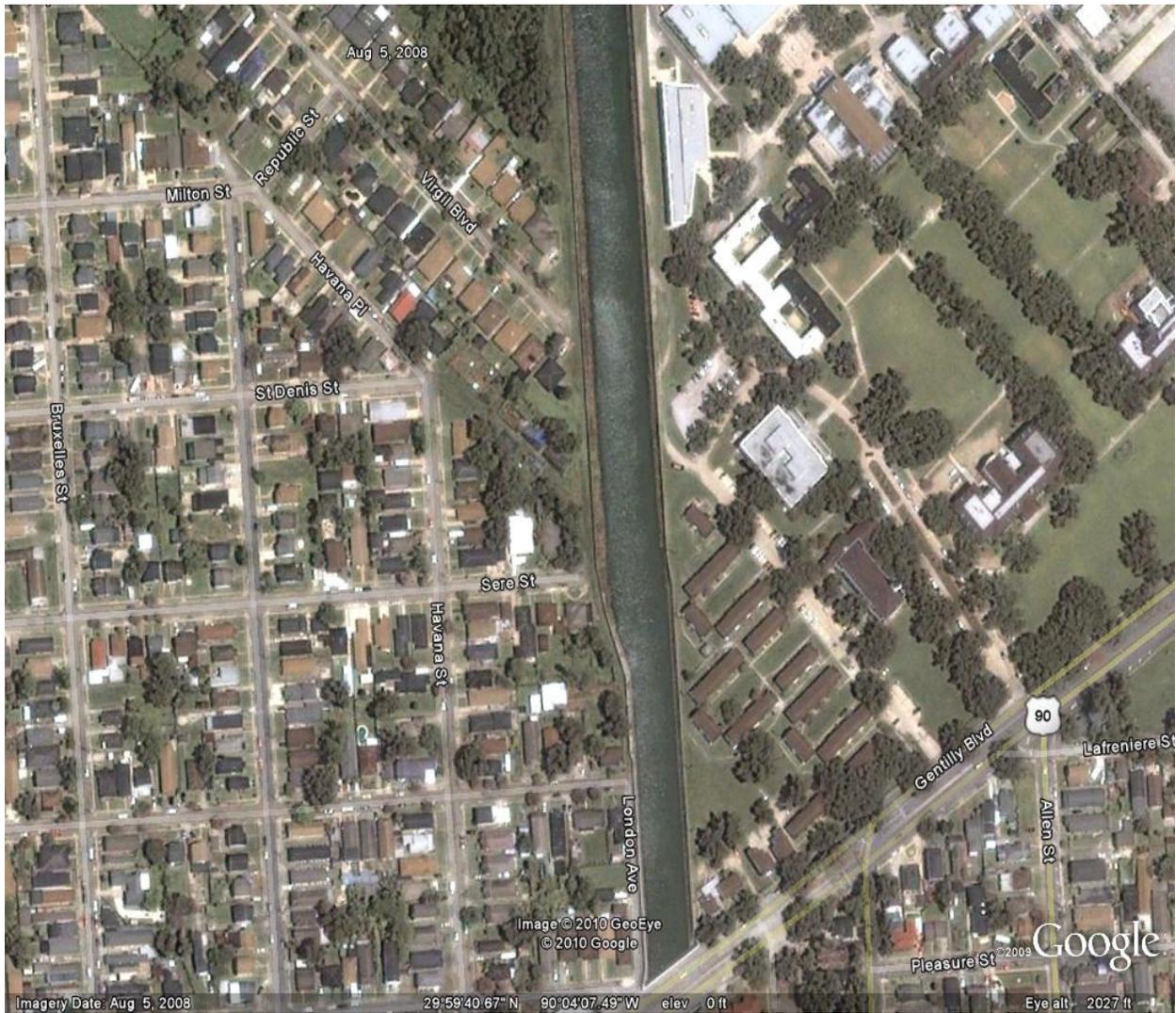
London Avenue Canal, Northern End (Wildair Drive To Brutus Street)



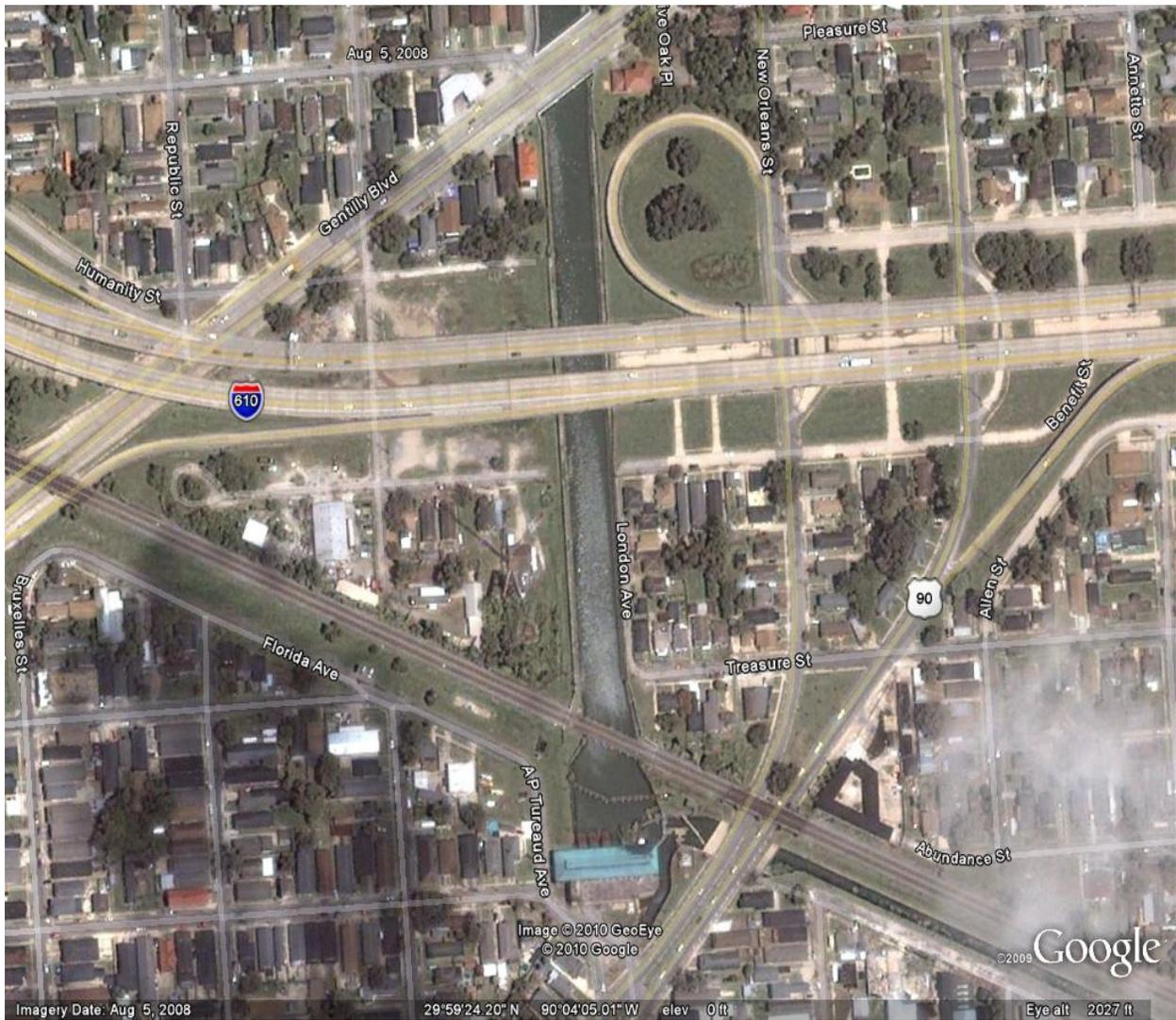
London Avenue Canal (Brutus Street South)



London Avenue Canal



London Avenue Canal (to Gentilly Boulevard)



London Avenue Canal, Southern End (Gentilly Boulevard to DPS 3)

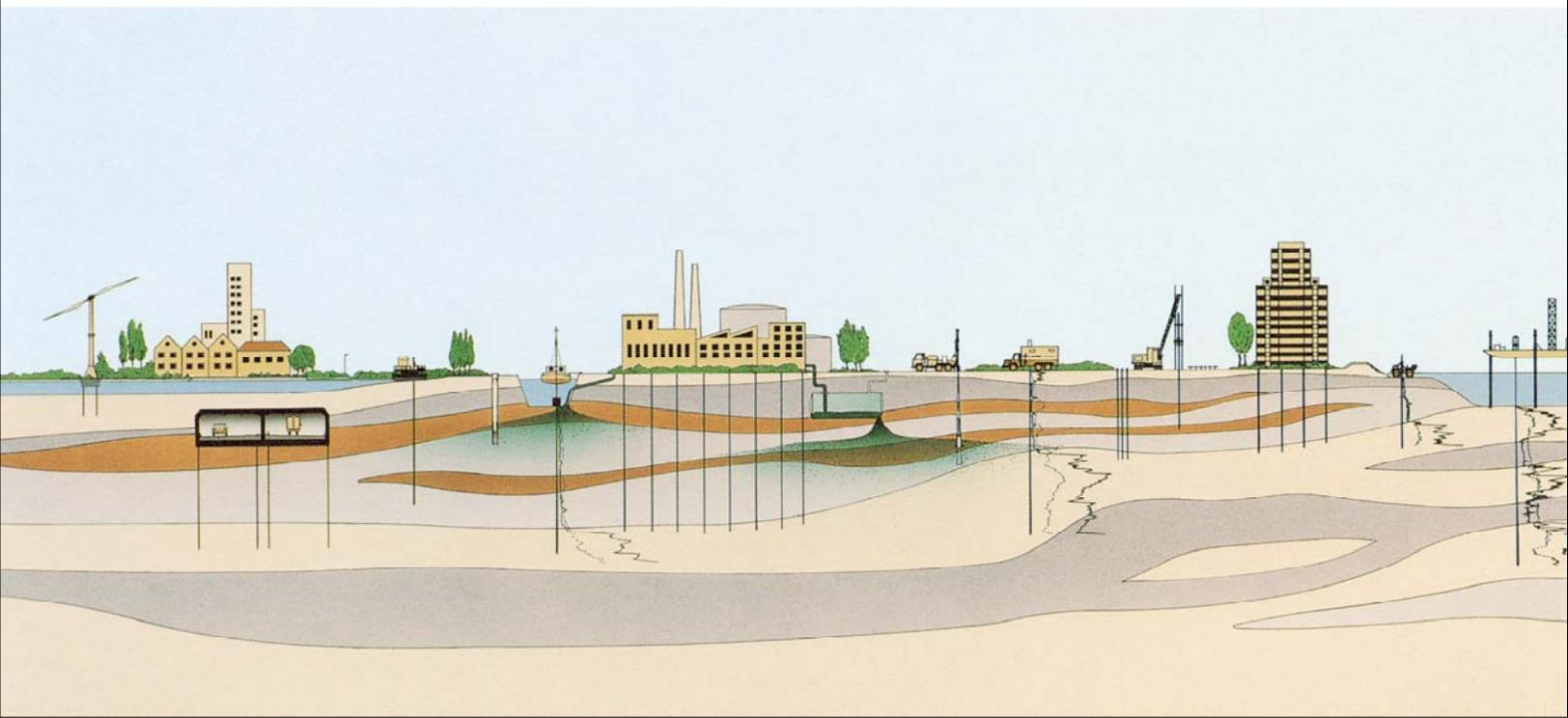
Geotechnical

FUGRO CONSULTANTS, INC.



**GEOTECHNICAL SERVICES
OPINION OF PROBABLE COST
NEW ORLEANS OUTFALL CANALS
JEFFERSON AND ORLEANS PARISH, LOUISIANA**

TRIGON ASSOICATES, LLC
NEW ORLEANS, LOUISIANA



Report No. 04.57104010
April 29, 2010

21 Veterans Highway, Suite A
Kenner, LA 70062
Tel: 504-464-5355
Fax: 504-464-5357

Trigon Associates, LLC
1515 Poydras Street
Suite 2200
New Orleans, Louisiana 70112

Attention: Mr. Sal Mansour

**Geotechnical Services
Opinion of Probable Cost
New Orleans Outfall Canals
Jefferson and Orleans Parish, Louisiana**

Introduction

Fugro Consultants, Inc. is pleased to submit this report of our geotechnical findings for the above-referenced project. A preliminary report was sent to Trigon Associates on April 15, 2010. We have incorporated additional comments and requests from the design team in this final report. We have been retained by Trigon Associates, LLC (Trigon) to perform geotechnical consultation services for the Opinion of Probable Cost Project for the 17th Street Canal, Orleans Canal, and London Avenue Canal Permanent Protection System. AECOM is the prime consultant for the Opinion of Probable Cost. Trigon has provided us a report performed by Black and Veatch¹ that discusses three alternatives for the permanent protection system designated Option 1, Option 2 and Option 2a.

AECOM has developed proposed canal cross-sections for Option 2 and Option 2a. We were requested by Trigon to perform a cursory review of the geotechnical analyses discussed in the Black and Veatch report and provide geotechnical input to the conceptual designs of the canal cross-sections and pump stations developed by AECOM for Option 2 and Option 2a. Our findings are included herein.

Applicability of Report. The analyses for this study, as well as the conclusions and recommendations in this report, were selected or developed based on our understanding of the project as described above. If there are differences in location or design features as we understand them, or if the locations or design features change, we should be authorized to review the changes and, if necessary, to modify our conclusions and recommendations.

¹ Black and Veatch, 90-Day Implementation Study Final Report, Phase 2.5 Continued Design Services for Permanent Protection System For the Outfall Canals at 17th Street, Orleans Avenue, and London Avenue, prepared for US Army Corps of Engineers, dated March 13, 2009.

We have prepared this report exclusively for Trigon Associates and AECOM for use as a guide for geotechnical aspects of the development of probable cost for the proposed Option 2 design of the Outfall Canals in Jefferson and Orleans Parish, Louisiana. We have conducted this study using the standard level of care and diligence normally practiced by recognized engineering firms now performing similar services under similar circumstances. We intend for this report, including all illustrations, to be used in its entirety. This report should be made available for information only and not as a warranty of subsurface conditions.

Existing Subsurface Information

We developed our understanding of the subsurface conditions at the canal locations from the data included in the Black and Veatch report, data from our existing database, and from our experience. The data from the Black and Veatch report was taken from the Interagency Performance Evaluation Task Force (IPET) report. We have performed numerous subsurface explorations across the New Orleans metropolitan area and specifically in the vicinity of the outfall canals. We have compared the data in our database with the stratigraphy and soil strength parameters included in the Black and Veatch report. The soil data is generally consistent with our expectations of the soil conditions near the site and accordingly, we used the information to develop our recommendations.

Areas of Discussion – Geotechnical Issues

We have included a discussion of the geotechnical issues related to Option 2/2A in this section. We have included discussions on the design concepts for the canal cross-sections, groundwater cutoff, pile capacity, temporary sheetpile walls and other geotechnical considerations.

Canal Cross-Sections. Two conceptual cross-sections for the outfall canals were provided by AECOM. A discussion of each alternative is included below.

Concrete Flume. The first design consists of a concrete flume with a design base elevation at approximately El -30 ft with a base width of approximately 65-ft. The side slopes of the concrete flume were on the order of 2:Horizontal to 1:Vertical. The design water elevation in the concrete flume is anticipated to be at El -14 ft. This design stays within the footprint of the existing outfall canal. The existing groundwater elevation outside the limits of the canal is currently at approximately El -5 ft. Based on our observations, we offer the following geotechnical comments for the concrete flume alternative:

- The gradient in water elevation from outside the canal to the design water elevation inside the canal will cause an uplift pressure at the base of the concrete flume canal. Based on the current design assumptions, the uplift will be on the order of 1,500 psf at the base of the channel.



- The calculated uplift pressure will need to be counter-acted through the use of driven piles or other acceptable deep foundation. Based on the anticipated uplift pressures at the base of the canal, a pile spacing of 4-ft is anticipated for driven timber piles to resist the uplift pressures with a factor of safety of 2.0. We have provided timber pile capacity calculations in a later section of this report.
- The concrete lining the base of the canal will need to act both as a pile cap for the uplift piles and as a seepage barrier. We anticipate a concrete thickness of at least two feet may be necessary to meet these objectives.
- Soil nailing has been suggested as a deep foundation alternative to support uplift loads on the side slopes. Soil nailing may be difficult in the geologic environment of the canals. In addition, creep may be a significant issue related to soil nailing in this geologic environment. Creep may compromise the structural integrity of the concrete during the design life of the project.
- As an alternative to soil nails or driven piles, helical anchors may be considered as an alternative to support uplift loads. A typical helical anchor section consists of three helix flights. The diameter of the helices can vary but a typical configuration includes a bottom helix 8-inches in diameter, a middle flight 10-inches in diameter and a top helix flight of 12-inches in diameter. The spacing between each flight is approximately 3.5-ft. The spacing of the helical anchors can be assumed to be approximately 5-ft.

Clay Liner. The second design concept consists of a drainage canal that is laid back to a stable slope without supplemental measures and incorporates a clay liner at the base to resist seepage. The design base elevation of the clay liner option is also at approximately EI -30 ft with a base width of approximately 90-ft. The side slopes of the clay liner were estimated to be on the order of 3:Horizontal to 1:Vertical. The design water elevation in the clay liner option is anticipated to be at EI -14 ft. To achieve the required cross-section for hydraulics, this design alternative extends outside of the existing protection on the perimeter of the existing outfall canal. As mentioned in the previous section, the existing groundwater elevation outside the limits of the canal is currently at approximately EI -5 ft. Based on our observations, we offer the following geotechnical comments for the clay liner alternative:

- The gradient in water elevation from outside the canal to the design water elevation inside the canal will cause an uplift pressure at the base of the clay liner alternative. Based on the current design assumptions, the uplift will be on the order of 1,500 psf at the base of the channel.
- The clay liner thickness will need to be adequate to resist the uplift pressure and have a thickness to limit the amount of seepage entering the canal. We



estimate a clay liner thickness on the order of 3-ft may be required to meet these objectives. In addition, we would recommend a geomembrane be included in the design as an additional seepage barrier.

- The proposed slope inclination of 3:Horizontal to 1:Vertical for the side slopes may be too steep to meet the required factors of safety established by the Corps of Engineers. As reported in the Black and Veatch report, slope inclinations on the order of 4:Horizontal to 1:Vertical were required to provide a factor of safety of 1.4 at the 17th Street Canal location. Slope inclinations on the order of 2.5:Horizontal to 1:Vertical were required at the Orleans Canal location and slope inclinations on the order of 3.5:Horizontal to 1:Vertical were required at the London Avenue Canal location. The additional real estate for the shallower slope inclinations should be considered.

Groundwater Cutoff. Excessive seepage into the canal excavation footprint may cause a drawdown in the natural groundwater level outside the limits of the canal. The effect of groundwater drawdown will result in settlement of structures in the vicinity of the canal. To enhance the designs of the two canal conceptual alternatives, groundwater cutoff should be considered. The groundwater cutoff design would extend along the perimeter of the new canals. The purpose of the groundwater cutoff would be to reduce, or “cut-off” inflow of seepage and associated drawdown of the groundwater from outside the canal excavation. The cutoff should extend from the existing ground surface to a layer of low permeability. An extensive field exploration will be required to determine the appropriate depth of this “low-permeability” layer. Based on our experience in the area, we anticipate the average depth of the groundwater cutoff will be on the order of 60-ft.

The groundwater cutoff will remove the necessity of deep foundation elements for uplift resistance for the concrete flume alternative. We anticipate any load induced by the concrete liner will also not require any additional deep foundations. In addition, the cutoff will reduce the required clay liner thickness for the other canal alternative. The canals will still require lining for hydraulic reasons and to provide resistance to potential erosion. Articulated concrete mats or other surface protection can be considered for this purpose.

Three different groundwater cutoff alternatives were evaluated for the site. They include slurry walls, diaphragm walls and steel sheetpiles. These options are discussed further below.

Slurry Wall. The conceptual design of a slurry wall would be a 3-ft wide trench that would extend to the low-permeability layer. The slurry wall is excavated and the side walls are kept open through the hydraulic pressure of a heavyweight slurry. The slurry generally consists of a cement/bentonite mixture. A slurry wall is generally not treated as a structural element, only as a seepage barrier. Estimated costs for installation of the slurry wall are on the order of \$20/square



feet of cross-sectional area. Approximately 500 to 1,000 lineal feet of slurry wall can be installed in a day.

If the slurry wall is placed immediately adjacent to the cut slope for the canal, some amount of bowing may be expected and tiebacks would be warranted. The amount of bowing would be related to the distance between the slurry wall and the top of the cut slope.

Diaphragm Wall. An alternative to the slurry wall would be a diaphragm wall. The benefit of a diaphragm wall is that it would cut-off the seepage into the canal and excavation and it could be used as a structural element to provide temporary flood protection during construction. The installation of the diaphragm wall is similar to a slurry wall with the exception that concrete and rebars are placed in the excavation. We estimate a diaphragm wall for this application would be on the order of 2-ft wide and again, extend to the low-permeability layer. Estimated costs for installation of the slurry wall are on the order of \$80/square feet of cross-sectional area, or 4 times the cost of the slurry wall.

Steel Sheetpile. Finally, steel sheetpiles can be installed to cutoff groundwater to the canal excavation. Steel sheetpiles are commonly used for this application in the area. The steel sheetpile can also be used as a structural element in certain applications. The concerns for steel sheetpiling in this area including ground vibrations, which are discussed in the general geotechnical considerations of this report. In addition, the interlocks need to be sealed to limit leakage. An industry standard for sealing steel sheetpiling is to insert silicone into the interlocks during driving. The quality control for this operation is difficult.

Tunneling. We understand tunneling has been proposed as an alternative to transmit the water to the outfall canal pump station locations. Due to the high groundwater levels, soft and highly variable soils and the size of the required tunnels, we do not believe that this will be a feasible alternative for the project.

Pile Capacity. Deep foundations will be required for various phases of the project including the support of the pump station, uplift resistance for the canals (if groundwater is not controlled), supplemental foundations to the bridges crossing the existing canals, and various other pipe crossings and structures. As such, we have calculated some generalized pile capacities for different pile sizes/types including timber piles, square concrete piles, and steel pipe piles. The computed capacities are general in nature and will need to be refined with site specific geotechnical exploration. The intent is to provide a reasonable assessment of the pile lengths/quantities for estimating purposes. As mentioned before, we used both the information in the Black and Veatch report and our historical information in the area to develop a conservative soil profile for pile capacity calculation.



Pile Type	Pile Length (ft)	Uplift Capacity (kips)	Compressive Capacity (kips)
12-inch butt diameter, 6-inch tip diameter, 50-ft long timber pile	25	9	10
	50	34	35
12-inch square concrete pile	25	22	28
	50	74	82
	75	153	164
16-inch square concrete pile	25	29	38
	50	94	108
	75	196	214
12-inch diameter steel pipe pile	25	15	18
	50	50	54
	75	103	109
18-inch diameter steel pipe pile	25	23	30
	50	77	88
	75	154	168

Temporary Sheetpile Walls. Temporary sheetpile cantilever walls are planned during various phases of the construction to keep water from Lake Pontchartrain and groundwater out of the excavations during the pump station/canal construction. The actual design of the sheetpile walls will depend on the amount of soil retained, the water levels on both sides of the excavation and soil strength parameters. In general, a “1 up, 2 down” design can be assumed to determine the length of the cantilevered sheetpile wall. For cantilevered walls retaining more than 15-ft of material, a composite section may be required that has the necessary moment capacity.

General Geotechnical Considerations. There are numerous other geotechnical considerations to evaluate during the cost estimate development. These include ground vibrations, long-term monitoring, removal of existing piles, bridge foundations and sequencing of construction. We have addressed some of these considerations in the sections below.

Ground Vibrations. Construction activities during construction will impose vibration on the adjacent structures. More significant vibration can be induced from pile driving activities. The vibration should be monitored during all phases of construction. In addition, even though vibrations on with



peak particle velocities less than 0.1 in/sec will have limited to no impact on structures, they can be perceived by the public as having impact. The results of perceived vibration may result in litigation and other issues that add delays and cost to the project. Consideration should be given to construction methods that reduce vibration to the adjacent areas.

Long-Term Monitoring. For some alternatives associated with the project, long-term monitoring may be required. This is especially true for the groundwater cutoff alternatives on the project. Instrumentation will need to be installed to validate the wall is performing adequately. In addition, frequent surveys and inspection of the canals will be required to observe the condition of the structure. The long-term monitoring should be considered when evaluating alternatives.

Removing of Existing Piles. The removal of any existing deep foundation element is generally discouraged due to the disturbance of the soils surrounding the existing foundation and potential voids that are created. The soil strength properties are significantly lowered in the areas where foundation elements are removed. Existing foundation elements should be used to supplement the existing design, where feasible.

Bridge Foundations. We understand that the widening and deepening of canal structures may impact the stability of the bridges that currently cross the existing canals. As mentioned in the previous section, removal of existing foundation elements is highly discouraged. While the existing deep foundation elements gain capacity through friction on the piles, the soil strength generally increases with depth. Removal of soil near the ground surface does not have a 1:1 ratio relative to removal of capacity. For example, excavating 15-ft of material from the top of the pile does not require an additional 15-ft of penetration.

We recommend that supplemental measures be performed on the existing pile foundations to determine if there is additional capacity not accounted for. Capacity of existing piles can be evaluated using pile load tests or dynamic monitoring with a Pile Driving Analyzer (PDA). The results of the tests may allow for the reduction in supplemental measures for the existing bridge foundation.

Sequencing of Construction. We understand that the existing storm protection along the canals must be maintained throughout construction. The sequencing of construction must allow for this design constraint. The design of the existing protection was based on certain geometry and soil conditions. Any modification to those parameters, including excavating material near the toe of the existing protection may impact the stability of the existing protection. Supplemental measures should be considered to provide support to the existing protection when developing the construction plan.

*

*

*



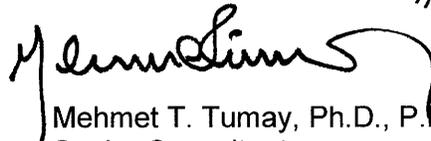
Closing

We appreciate the opportunity to be of service to Trigon and AECOM on this project. Please call us if you have any questions or comments concerning this report or when we may be of further assistance.

Sincerely,
FUGRO CONSULTANTS, INC.



Eric R. Marx, P.E.
Branch Manager



Mehmet T. Tumay, Ph.D., P.E., D.GE
Senior Consultant



Appendix C
Bridge Report

Memorandum

Options and Probable Cost for Bridge Reconstruction or Modification

Permanent Protection System
For
Outfall Canals Project
Opinion of Probable Cost

New Orleans, LA

Developed By: Wanzhi Li, Ph.D., PE
AECOM
Houston office

Project Manager: Dean Raborn, PE
AECOM
New Orleans Office

April 14, 2010

Bridge modifications for Options 2 and 2a

For both options 2 and 2a, 17th Street Canal, Orleans Avenue Canal and London Avenue Canal would be modified by deepening them in order to eliminate the current S&WB Pump Stations and approximately 13 miles of levees. There are 22 existing bridges that will be affected for Options 2 and 2a.

To save costs in the project while maintaining structural reliability of the bridges, studies on bridge structural reconstruction and modification were conducted. Different options for maintaining or rebuilding the bridges were investigated. Construction cost estimates for different options are developed. This memorandum will outline the conditions of the bridge structural systems and describe option features for bridge structural reconstruction or modification.

1 Canal Modification Scope

Current canal bed elevations are -14' for 17th Street Canal, and -8.43' for Orleans Avenue and London Avenue canals. While the natural ground elevations are -5.0', -5.3' and -2.5' for 17th Street, Orleans Avenue and London Avenue canals respectively. Current water levels are +7.0', for 17th Street and +8.0' for Orleans and London Avenues accordingly.

The proposed deepened elevations for the canals are -31.25, -22.61 and -26.54 for 17th Street, Orleans and London Avenues respectively. That means the canals will be deepened by approximately 18.0' and not more than 20'.

Current canal widths are 200' for 17th Street, 170' for Orleans Avenue and 135' for London Avenue. Due to canal deepening, actual canal width may have to be widened. Even though the canal width may be maintained with the current dimension, the bridges that have shorter structural lengths or shorter total span lengths may have to be extended in length in order to span the widened canals.

The soils along and in the vicinities of the canals are normally very soft except that of the soil along the London Avenue canal where there is a 30' thick layer of sand. The report describing exact soil conditions for 17th Street and Orleans Avenue has not been received.

2 Possible Options for Bridges

2.1 Existing Bridge Features

There are a total of 22 bridges: 3 railroad bridges, 8 major highway (including 2 busy minor roadway bridges) and 11 minor roadway bridges crossing the canals. The features of the bridges are presented in Table 1.

Studying the structural conditions of the bridges, we recommend that the bridge reconstruction or modification should be based on the natural features of the bridges. According to traffic natures, studies were conducted with three categories of bridges: the railroad bridges, major highway bridges and minor roadway bridges. Selection of reconstruction options or modification schemes will also be classified according to the three categories mentioned.

Table 1 Bridge Structural Nature Conditions

17 th St Cannel								
Bridge #	Roadway	Bridge	Length	Span Arrangement	Width	Structure-type	Bent-type	Footing-type
1	Railroad	Railroad Bridge	285	285	One track	steel	steel	steel pipe
2	Major HWY	I-10	215	67+81+67	108	concrete	concrete	concrete pile
3	Major HWY	I-610	215	67+81+67	83	concrete	concrete	concrete pile
4	Major HWY	Veterans-w	228.32	46.66+45+45+45+46.66	50	concrete	concrete	concrete pile
5	Major HWY	Veterans-E	228.32	46.66+45+45+45+46.66	50	concrete	concrete	concrete pile
6	Minor Road	Hammond	199.99	41+39.33+39.33+39.33+41	81	concrete	concrete	concrete pile
Orleans Cannel								
Bridge #	Roadway	Bridge	Length	Span Arrangement	Width	Structure-type	Bent-type	Footing-type
7	Railroad	Railroad Bridge	140	140	two track	steel	steel	Timber Pile
8	Major Hwy	I-10	340	170+170	65	steel	concrete	concrete pile
9	Major Hwy	I-610	340	170+170	50	steel	concrete	concrete pile
10	Minor Road	Harrison	154.64	39.66+37.66+37.66+39.66	49	concrete	concrete	concrete pile
11	Minor Road	Fillmore	178.64	45.66+43.66+43.66+45.66	49	concrete	concrete	concrete pile
12	Minor Road	Robert E Lee	139.99	47.33+45.33+47.33	77	concrete	concrete	concrete pile
13	Minor Road	Lakeshore	212	53+53+53+53	69	concrete	concrete	concrete pile
London Ave Cannel								
Bridge #	Roadway	Bridge	Length	Span Arrangement	Width	Structure-type	Bent-type	Footing-type
14	Railroad	Railroad Bridge	185	185	two-track	concrete	concrete	concrete pile
15	Major Hwy	I-10	297	83.5+130+83.5	65	concrete	concrete	Group piles
16	Major Hwy	I-610	297	83.5+130+83.5	53	concrete	concrete	Group piles
17	Minor Road	Gentilly	136.666	46.333+44+46.333	91	concrete	concrete	Encased Steel Pipe
18	Minor Road	Mirabeau	140	20+20+30+30+20+20	71	concrete	concrete	concrete pile
19	Minor Road	Fillmore	150	30+30+30+30+30	47	concrete	concrete	concrete pile
20	Minor Road	Robert E. lee	180.68	36.34+36+36+36+36.34	35.5	concrete	concrete	Encased Steel Pipe
21	Minor Road	Leon Simon	187.466	47.9+45.833+45.833+47.9	82	concrete	concrete	concrete pile

2.2 Bridge Structure Replacement

Replacing the existing bridges by constructing new ones may be the easiest way that would provide reliable bridge structural systems. However, it would not be the best way in this project due to following reasons.

First of all, replacement of all bridges will cost a considerable amount of money. Assume that concrete bridges cost \$15 and \$60 per square foot for demolishing existing bridges and building new bridges respectively, steel bridges cost \$18 and \$60 per square foot for demolishing existing bridges and building new bridges accordingly, while railroad bridges cost \$3,188 and \$4,250 per linear track length for building a temporary and permanent bridges separately, the estimated total cost for replacing all of the 22 bridges is over \$40,000,000.00 as shown in Table 2.

Table 2 Grand Total Replacement Cost for All Bridges

Bridge Name	Bridge Length	Bridge Span Arrangement	Bridge Width	Bridge Area To be Replaced	Demolish Existing Bridge	Replacement Bridges
17th Street						
Railroad	285	285	One track		\$ 1,211,250.00	\$ 2,119,687.50
I-10	215	67+81+67	108	23220.00	\$348,300.00	\$ 1,393,200.00
I-610	215	67+81+67	83	17845.00	\$267,675.00	\$ 1,070,700.00
Veterans-w	228.32	46.66+45+45+45+46.66	50	11416.00	\$171,240.00	\$ 684,960.00
Veterans-E	228.32	46.66+45+45+45+46.66	50	11416.00	\$171,240.00	\$ 684,960.00
Hammond	199.99	41+39.33+39.33+39.33+41	81	16199.19	\$242,987.85	\$ 971,951.40
Subtotal					\$ 2,412,692.85	\$ 6,925,458.90
Total Replacement Cost						\$ 9,338,151.75
Orleans Avenue						
Railroad					\$ 1,615,000.00	\$ 2,826,250.00
I-10	140	140	65	9100.00	\$163,800.00	\$ 1,456,000.00
I-610	340	170+170	50	17000.00	\$306,000.00	\$ 2,720,000.00
Harrison	340	170+170	49	16660.00	\$299,880.00	\$ 2,665,600.00
Fillmore	178.64	45.66+43.66+43.66+45.66	49	8753.36	\$157,560.48	\$ 1,400,537.60
Robert E Lee	139.99	47.33+45.33+47.33	77	10779.23	\$194,026.14	\$ 1,724,676.80
Lakeshore	212	53+53+53+53	69	14628.00	\$263,304.00	\$ 2,340,480.00
Subtotal					\$ 2,736,266.62	\$12,793,064.40
Total Replacement Cost						\$15,529,331.02
London Avenue						
Railroad	185	185	two-track		\$ 1,615,000.00	\$ 2,826,250.00
I-10	297	83.5+130+83.5	65	19305.00	\$347,490.00	\$ 3,088,800.00
I-610	297	83.5+130+83.5	53	15741.00	\$283,338.00	\$ 2,518,560.00
Gentilly	136.666	46.333+44+46.333	91	12436.61	\$186,549.09	\$ 746,196.36
Mirabeau	140	20+20+30+30+20+20	71	9940.00	\$149,100.00	\$ 596,400.00
Fillmore	150	30+30+30+30+30	47	7050.00	\$105,750.00	\$ 423,000.00
Robert E. lee	180.68	36.34+36+36+36+36.34	35.5	6414.14	\$96,212.10	\$ 384,848.40
Leon Simon	187.466	47.9+45.833+45.833+47.9	82	15372.21	\$230,583.18	\$ 922,332.72
Lake Shore	170	40+45+45+40	71	12070.00	\$181,050.00	\$ 724,200.00
Subtotal					\$ 3,195,072.37	\$12,230,587.48
Total Replacement Cost						\$15,425,659.85
Grand Total Replacement Cost						\$40,293,142.62
Eliminate Steel Bridge at London and Orleans Avenue				Grand Total Cost		\$29,409,154.62

If considering keeping the major highway bridges at London and Orleans Avenues due to span clearance which is suitable for canal widening, the total replacement cost is \$29,409,155.00, close to 30 millions. Adding the cost for extending the shorter bridges shown in Table 6 in Section 3.3, the total cost for replacing all bridges excluding the steel bridges at London and Orleans Avenues, the grand total estimated cost is \$30,964,162.86. On the other hand, there is a big impact on traffic due to roadway closures during bridge replacement. Shut down of roadways will create inconvenience for the local area residents and will result in significant cost for commuters.

Though the bridge replacement cost may not be significant relative to the total project cost of canal modification, the owner would have to pay more unnecessary costs for replacing the existing bridges.

If we can save some of the bridges from being replaced, we should do so. In order to save on bridge replacement and maintain continuous traffic for the majority of bridges, we would like to investigate feasible alternatives.

2.3 Foundation Modification Options

2.3.1 Deep Soil Mixture

We have discussed the deep soil mixture technique and cost with URETEK, a firm specialized in deep soil mixture. Depending on the structural and soil conditions of the bridges at London Avenue, it may be necessary to conduct deep soil as much as 15' below the sand layer or a total depth of 55' below the bottom of the current canal trench. Through that way, we could bypass any structural modification for having the bridge structure functioning reliably. Deep soil mixture may be the best option for the bridges over London Avenue due to existing 30' thick sand layer. There is no restricted vertical clearance requirement for conducting deep soil mixing and it is feasible for all minor bridges.

In order to demonstrate soil mixture efficiency, pile testing shall be conducted. At least two piles should be tested in similar soil conditions, matching the soil at the bridge location where the soil mixture method is to be applied. Soil mixture shall be applied to one pile and not to both. This will enable analysis of results and comparison of the two piles to verify improvement of soil properties and pile loading capacity, using the deep soil mixture method.

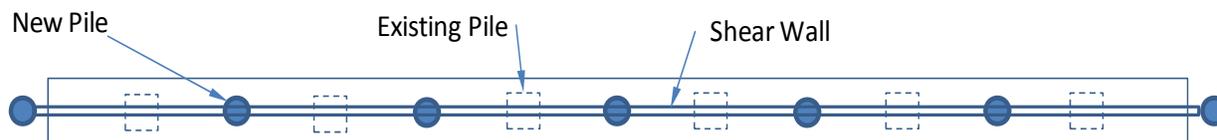
2.3.2 Concrete Pile Application

Considering that most of the bridge superstructures are in very good condition (with the exception of Robert E. Lee Boulevard over the London Avenue Canal) and embedment length reduction is in a range of 25% the original length of piles, we may keep the existing bridge structure by adding new concrete piles to the foundation to make up the pile loading capacities. Figure 1 shows two different layouts for new concrete pile applications depending on the dimensions and its buckling thresholds of the existing piles. Table 3 presents the buckling thresholds of two different sized piles in used in the bridges. The buckling thresholds are calculated based on the assumption that the pile length is 40' and concrete strength is 4,000 psi.

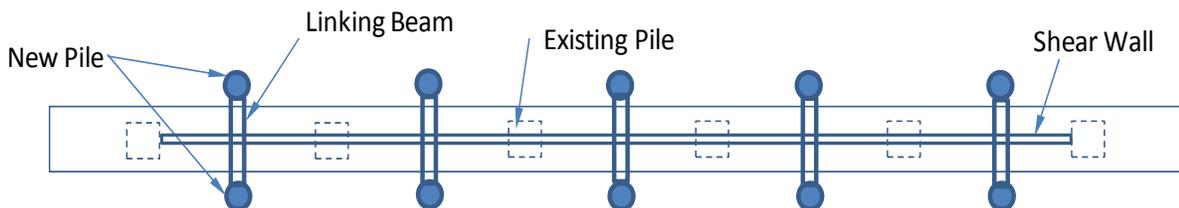
Table 3 Buckling Threshold for Existing Concrete Piles

Section of Piles		24" x 24"	18" x 18"
Modulus of Elasticity (ksi)	E	3605.00	3605.00
Section Modulus of Initia (in ⁴)	J	27648.00	8748.00
Gyred of Section	r	6.93	5.20
Slenderness Factor	K	0.75	0.75
Slenderness	S	51.96	69.28
Buckling Threhold (kips)	0.75EJ	3202.19	1013.19

Considering the pile length is 38' to 40' exposed above the bottom of the canal after the canals are deepened, the smaller pile with dimension of 18" x 18" may be subjected to buckling. Therefore, two new piles would be applied between the existing piles. More details of linking beam and shear wall connections will be developed when this option or the Helical Pile which will be discussed in Section 2.3.4.



A. If the Existing Pile Dimension is Greater than 20"



B. If the Existing Pile Dimension is Smaller than 20"

Figure 1 Layout of New Concrete Piles

2.3.3 H-Pile Application

H-piles with dimension of 14 x 89 are normally used in railroad bridge structures. This option may be used in the foundation modification of the railroad bridge at 17th street.

Generally, the railroad company would like to do bridge replacement or modification construction by themselves and have the canal modification program pay for the cost. Therefore, it is not likely that the railroad company would agree to modify the foundations using H-piles; however, we would provide this cost estimate for this option in the discussion in Section 3 as a method for modifying the railroad bridge considered for this Opinion of Probable Cost.

2.3.4 Helical Pile Application

We have also discussed the possibility for using Helical Piles in modifying the foundations of bridges except for the railroad bridges. Figure 1 illustrates the said pile working mechanism. This kind of pile can be used for foundations or strengthening foundations of most types of structural systems. The pile is to be installed by segments and each segment is less than 7.0' long so that it is suitable for applying in bridge foundation modifications in this project due to tight vertical clearance availability beneath the bridges.

When applying helical piles, concrete linking beams and shear walls mentioned in 2.3.2 for concrete piles could also be applied between the Helical piles and existing concrete piles. Similar to the location and spacing suggested in Section 2.3.2 for concrete piles, one Helical Pile will be applied in between the existing piles if the least dimension of the existing pile is greater than 20" and placing two helical piles between the existing piles if the least dimension of the existing pile is smaller than 20" as shown in Figure 2.

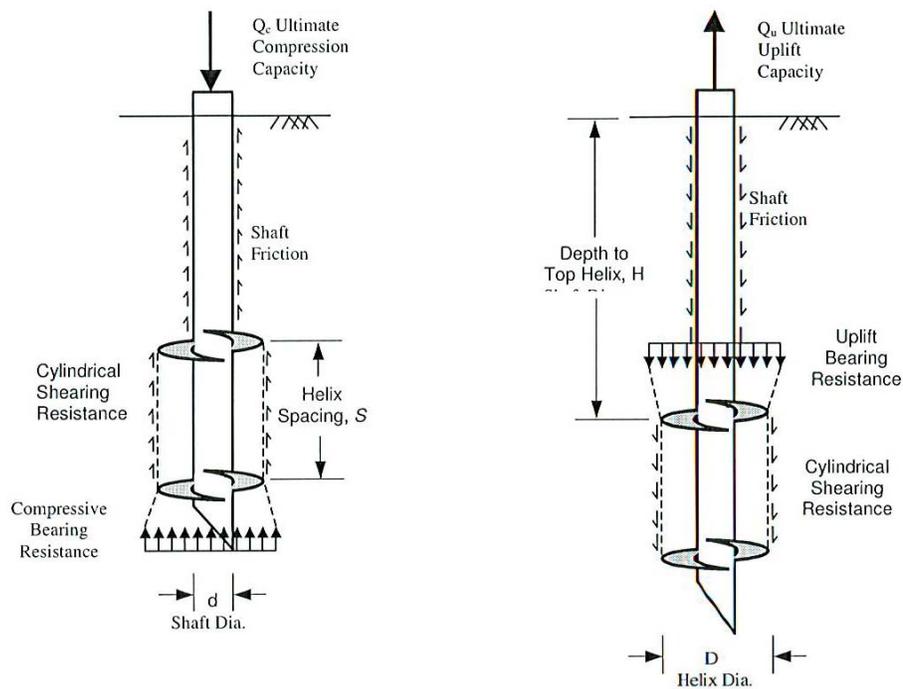


Figure 2 Helical Piles

2.4 Procedure of Construction

In order to maintain safety of the bridge structures, any construction of foundation modification must be completed prior to excavation of the canal regardless of the application methods of foundation modification chosen.

New added piles must be connected with existing piles prior to conducting canal trench excavation. When H-piles are used for the steel structure railroad bridge, they will be connected with the existing steel piles by welding braces between them. If concrete piles are used for bridge foundation modification, linking beams and shear walls between the new piles and between the new and existing piles must be cast and cured before excavating the canal trench.

If using Helical Piles are used to modify a bridge foundation, the depth H from the current canal trench bottom to the top Helix as shown in Figure 2 should be 2.0' greater than the total depth of canal excavation. When the pile tip reaches the designated level, a steel pipe with a diameter equal to that of the diameter of the Helix will be sleeved into the drilled hole at the top of the pile. Concrete will be poured into the steel pipe to embrace the top portion the of Helical Pile. Finally, the linking beams and shear walls will be constructed and cured before excavating the canal trench.

3. Application of Modification or Reconstruction

3.1 Railroad Bridges

Railroad bridges carry heavy and dynamic loadings and previous project experience tells us that we are always required to build new bridges instead of modifying the existing bridge when we encounter such situations similar to what we meet in this project. Therefore, rebuilding the railroad bridges may be the only option in this project. Otherwise, the owner of this project may be required to pay high insurance for the bridge structures if they are to be modified. However, we would still like to provide modification options for some of the railroad bridge structures in this project.

According to site inspection and engineering judgment, the superstructure of each railroad bridge is in sound condition. All super structures could be kept for the railroad bridges. However, every bridge has its unique features and reconstruction or modification should be selected according to the structural features of each bridge.

3.1.1 Bridge at 17th Street

The railroad bridge at 17th street may be the easiest one to be modified because it is furnished with a single track and its length is much longer than the proposed width of the widened canal. On the other hand, it is a steel structure with steel pipe piles and there is no obstruction for new pile construction. Therefore, foundation modification would much easier for this bridge structure. So, we strongly recommend modification of the existing foundation by applying H-piles for this bridge.

3.1.2 Bridge at Orleans Avenue

The Orleans Avenue Railroad bridge is located just south of the existing S&WB Pump Station at Orleans Avenue. The canal will remain in its current state at this point, however if the Pump Station will have to be removed, it is possible that the Railroad bridge may be affected due to it's close proximity. The following paragraph assumes that the bridge will be affected.

It is likely that the foundation of the railroad bridge at Orleans Avenue was built by timber piles and the bridge length of 140' has to be extended at least to 190' (10' beyond the canal width at each ends) for complying the canal widening. Due to the time span the timber pile has been built and possible erosion of the timber piles, they would not be able to continue functioning once the canal is widened and the timber piles are exposed. On the other hand, modification of the foundation of timber piles is difficulties. Therefore, it is likely that modification of this bridge would not be practical nor will it be accepted by railroad authorities. Additionally, considering that this bridge has to be extended from current length, the best option is to re rebuild the railroad bridge at Orleans Avenue.

3.1.3 Bridge at London Avenue

Considering that there is a 30' sand layer along London Avenue, deep Soil mixture may be the best option for the foundation modification of the railroad bridge at London Avenue. Current embedment of the piles is 73' for the bridge at London Avenue, when the canal is deepened by 18', the pile embedment length will also be reduced by 18'. However, there will be 23' sand layer out of the remaining 55' embedment length for the piles. Therefore, the total skin friction loss will be not significant because the excavated top soil doe not contribute significantly to the piles loading capacity of the railroad bridge at London Avenue. On the other hand, large diameter concrete piles with small spacing are used for the railroad bridge at London Avenue and construction of driving new piles is very difficult for this bridge having shorter spans. Therefore, deep soil mixture option is strongly recommended for this railroad bridge.

Table 4 Railroad Bridge Structural Construction Options and Estimates

Location Cannel Name	Structural Features					Rebuilding Bridge			Footing Modification		
	Bridge Length	Track Number	Super Structure	Bent Type	Pile Type	Temp. Bridge @\$3,188/LF Per Track	Final Bridge @ 4,250/LF Per Track	Total Rebuilding Cost	Deep Soil Mixture @ \$8,500/pile	H Piles 14x89 @ \$1.75/lb	PPC Piles 18" SQ @ \$120/LF
17th Street	285	1	Steel	steel	teel Pip	\$ 908,437.50	\$ 1,211,250.00	\$2,119,687.50	\$ 570,000.00	\$998,746.88	\$769,500.00
Orleans Avenue	140	2	Steel	R/C	Timber	\$1,211,250.00	\$ 1,615,000.00	\$2,826,250.00	-	-	-
London Avenue	185	2	R/C	R/C	R/C	\$1,211,250.00	\$ 1,615,000.00	\$2,826,250.00	\$ 740,000.00	\$1,296,618.75	\$999,000.00
Total Cost								\$7,772,187.50	\$4,136,250.00	\$5,121,615.63	\$ 4,594,750.00

The estimates for different options for reconstruction or modification of the railroad bridges are presented in Table 4. It is pointed out that the estimates of concrete pile option include costs of connections between the new added piles and the existing piles. It is also advised that the

foundation modification option can be applied only to the other two bridges than the bridge with timber piles at Orleans Avenue has to be replaced.

If we replace the bridge at Orleans Avenue, select deep soil mixture for the bridge at London Avenue and choose H-piles to modify the foundation of the bridge at 17th Street, the total cost will be \$ 4,564,996.88 for all of the railroad bridges

3.2 Major Highway Bridges

There are 6 major highway bridges, one for each direction of traffic for I-10/I-610, crossing the three Canals. In addition, considering that the roadway at Veterans is a very busy major route in the city, we classified the two bridges at Veterans Street as major bridges. To maintain traffic and to save money, these 8 bridges would not be replaced. We must find a way to keep these 8 bridges functioning throughout the modifications. Therefore, foundation modifications or other engineering schemes have to be adopted for these bridges.

3.2.1 Bridges at 17th Street

The foundation piles shall have to be strengthened on 2 Bents for the bridges of I-610 and I-10 and on 3 Bents for the bridge of Veterans. Either Helical Piles or concrete piles can be used for modifying the bridge foundations of the major bridges at 17th street.

To protect the excavated canal trench and the piles, including the existing and newly added piles, it is desired that the trench be protected by a concrete liner.

3.2.2 Bridges at Orleans Avenue

Due to the span lengths of the bridges at I-610, which are 170' each, these bridges are not necessarily replaced nor are their foundations modified. Instead, the canal alignment will be modified to have the canal to be relocated to the first spans of the steel bridges.

Considering the drilled shaft diameter is as large as 54" furnished for the foundation of these bridges and there will be no significant drilled shaft embedment reduction, no foundation modification is necessary for the bridges at I-610 along Orleans Avenue. However, concrete trench liner is desired as mentioned in the previous section.

3.2.3 Bridge at London Avenue

Similar to the major bridges at Orleans Avenue, the bridges at I-610 along London Avenue would not be replaced or modified. Though the center spans of the bridges are 130' which is shorter than the widened canal width of 170', the largest portion of the deepened canal trench would stay in the center span range and the foundations at the bents at both sides of the center span would not be greatly excavated. Therefore, these bridges will not be replaced nor will their foundation be modified.

Similar to the major bridges at 17th Street and Orleans Avenue, the concrete canal liner should be installed at the bridge crossing discussed in Section 3.2.1.

Estimates for the major bridges crossing each canal are presented in Table 5. Comparing three options, deep soil mixture, Helical Piles and concrete piles, the concrete pile option appears to be more cost effective than the other two options. However, construction of concrete pile option may not be practical due to vertical clearance beneath the bridge structures. Therefore, either deep soil mixture or Helical Piles would be a better choice for the bridges at I-610 and I-10 along 17th street. On the other hand, it is predicted that there would be no thick sand layer along 17th street, deep soil mixture may be not as efficient as it can be for the bridge foundation along London Avenue where there is a thicker sand layer of 30'. Taking into consideration cost effectiveness and construction difficulties, Helical Piles is recognized as the best option for the major bridges at I-610 and I-10 along 17th street. Coordination of bridge modifications must be coordinated with LDOTD.

Table 5 Major Bridge Modification Cost

Bridge Name	Span Arrangement (ft)	Features			Soil Mixture Cost \$120/LF	Helical Piles		Concrete Pile Option			1.5' RC Trench Liner @ \$360/CY	
		Bent Number	Pile Number	Pile Length		Pile Cost \$85/LF	Concrete Cost \$450/CY	Pile Cost \$65/LF	Foot Cap (CY)	Shear Wall (CY)		Concrete Cost \$450/CY
17 th CANNEL												
I-10	67+81+67	2	22	75.5	\$409,638.71	\$290,160.75	\$40,208.39	\$101,128.82	22.67	66.69	\$40,208.39	\$464,400.00
I-610	67+81+67	2	17	75.5	\$318,793.80	\$225,812.27	\$30,692.17	\$76,524.99	17.11	51.09	\$30,692.17	\$356,900.00
Veterans-w	46.66+45+45+45+46.66	3	7	70.5	\$206,665.71	\$146,388.21	\$23,531.43	\$84,448.93	29.33	22.96	\$23,531.43	\$228,320.00
Veterans-E	46.66+45+45+45+46.66	3	7	70.5	\$206,665.71	\$146,388.21	\$23,531.43	\$84,448.93	29.33	22.96	\$23,531.43	\$228,320.00
Subtotal					\$1,141,763.94	\$808,749.45	\$117,963.42	\$346,551.66	98.44	163.70	\$117,963.42	
Total Cost					\$1,141,763.94		\$926,712.88				\$464,515.08	\$1,277,940.00
Orleans Ave												
I-10	170+170											\$442,000.00
I-610	170+170											\$340,000.00
Subtotal												\$782,000.00
London Ave												
I-10	83.5+130+83.5											\$386,100.00
I-610	83.5+130+83.5											\$314,820.00
Total Cost												\$700,920.00
Grand Total Cost												\$3,687,572.88

If Helical Piles are used for modifying the foundations of the bridges at I-610 and I-10 along 17th street, the total major bridge modification is of \$3,687,573.00.

3.3 Minor Roadway Bridges

As discussed in Section 2.2 the total cost is \$29,409,155.00 for replacing all bridges excluding the steel bridge at I-610 and I-10 along Orleans and London Avenues. Subtracting the replacement costs for the major bridges at 17th street and all railroad bridges, the replacement cost for minor roadway bridge of the rest 11 bridges is \$17,195,717.00. Considering most of the minor roadway bridges are in good condition (except Robert E. Lee Boulevard over London Avenue Canal) and the excavation of canal deepening will not significantly reduce the pile loading capacities, modification of foundation for the minor roadway bridges would be a wise

choice. According the soil and structural features, different modification methods will be recommended for specific bridge structures.

3.3.1 Bridges at 17th Street

It is recommended that the bridge at Hammond Street along 17th Street can be modified by concrete piles if there is sufficient vertical clearance for concrete pile construction. Otherwise, it will be modified by Helical Piles if vertical clearance is not available for concrete pile construction. There would be no significant difference between the costs of the concrete pile or Helical Pile options. However, construction and installation of the Helical Pile option is much easier.

3.3.2 Bridges at Orleans Avenue

Regardless of whether we use concrete piles or Helical Piles, one pile will be applied between the existing piles for most of the minor bridges at Orleans Avenue Canal. However, if for some reason the bridge at Lakeshore would be affected (although it's not anticipated) it would require 18" x 18" piles. Two piles will be used between the existing piles for the bridge at Lakeshore.

3.3.3 Bridges at London Avenue

Regardless of whether the concrete pile or Helical Pile option is selected, two piles will be applied between the existing piles for all bridges other than the two at Gentilly Boulevard and Leon Simon Boulevard in which 30" diameter steel pipes encased with concrete are furnished for them. The Lakeshore drive bridge shouldn't be affected at London Avenue Canal, however, it was included in the event that it would need modifications.

For these two bridges with 30" diameter steel piles, deep soil mixture would be the best choice to modify their foundation based on that there is a 30' sand layer. Once the property of the soil below the sand layer is modified or improved, the foundation and pile loading capacity would be sufficient for sustain the bridge loads. Therefore, no further effort would be necessary in the foundation modification for the bridges at Gentilly and Leon Simon Streets.

Table 6 Minor Roadway Bridge Modification Cost

Bridge Name	Extend Minor Bridges \$60/ft^2	Existing Pile Features			Concrete Piles			Concrete Cost \$450/CY	Soil Mixture Cost \$120/LF	Helical Piles	
		Bent Number	Pile Number	Pile Length	Pile Cost \$65/ft	Foot Cap CY	Shear Wall CY			Pile \$85/LF	Concrete Cost \$450/CY
17th Street											
Hammond	0	3	10	60	\$ 106,762.50	50.00	33.67	\$ 37,650.00		\$ 170,212.50	\$ 37,650.00
Subtotal					\$ 106,762.50			\$ 37,650.00		\$ 170,212.50	\$ 37,650.00
Orleans Avenue											
Harrison	\$192,158.40	3	6	68.5	\$ 66,787.50	28.67	19.82	\$ 21,820.00		\$ 122,272.50	\$ 21,820.00
Fillmore	\$0.00	2	7	78	\$ 60,840.00	19.11	22.49	\$ 18,720.00		\$ 106,080.00	\$ 18,720.00
Robert E Lee	\$369,646.20	3	9	75	\$ 117,000.00	47.33	30.31	\$ 34,940.00		\$ 191,250.00	\$ 34,940.00
Lakeshore	\$0.00	2	14	62	\$ 206,336.00	28.00	42.40	\$ 31,680.00		\$ 269,824.00	\$ 31,680.00
Subtotal	\$561,804.60		87		\$ 450,963.50			\$ 107,160.00		\$ 689,426.50	\$ 107,160.00
London Avenue											
Gentilly	\$455,003.64	3	11	89.6	\$ 174,720.00	56.67	36.89	\$ 42,100.00	\$ 387,072.00		
Mirabeau	\$340,800.00	4	12	65.1	\$ 366,730.00	57.78	37.33	\$ 42,800.00		\$ 479,570.00	\$ 42,800.00
Fillmore	\$197,400.00	3	8	65.5	\$ 174,557.50	27.33	24.53	\$ 23,340.00		\$ 228,267.50	\$ 23,340.00
Robert E. lee	\$0.00	3	5	61.2	\$ 46,101.21	19.67	15.59	\$ 15,865.62		\$ 120,572.38	\$ 15,865.62
Leon Simon	\$0.00	2	12	83	\$ 118,690.00	33.78	38.76	\$ 32,640.00	\$ 258,960.00		
Lake Shore	\$0.00	2	12	64	\$ 180,266.67	28.89	37.33	\$ 29,800.00		\$ 235,733.33	\$ 29,800.00
Subtotal	\$993,203.64				\$1,061,065.37			\$ 186,545.62	\$ 646,032.00	\$ 1,064,143.22	\$ 111,805.62
Total Cost	\$1,555,008.24				\$1,618,791.37			\$ 331,355.62	\$ 646,032.00	\$ 1,923,782.22	\$ 256,615.62
Grand Total		Option-1 Concrete Pile			\$3,505,155.23			Option-2 Combine Mixture & Helical		\$ 4,124,822.46	

Table 6 illustrates the estimates for foundation modification of the minor roadway bridges. In the table, the concrete pile option is shown independently while the deep soil mixture and helical Pile options are presented coordinately with the soil and bridge feature.

4. Conclusions and Recommendations

We discussed the bridge replacement and foundation modification options and developed Opinions of Probable Cost for each option. In conclusion, foundation modification will save a significant amount of money and eliminate traffic shut down for all bridges.

As mentioned in Section 2.2, the total cost is \$30,964,162.86 for replacing all bridges other than the steel bridge at I-610 and I-10 along London and Orleans Avenues. On the other hand, selecting different foundation modification schemes for different bridge structures based on the soil condition, bridge structural features and foundation pile natures, the combined total cost for bridge foundation modification including one railroad bridge replacement is \$12,377,392.34. It indicates that we can save as much as \$18,586,770.52 by adopt different foundation modification methods for different bridge systems from the replacement cost of all bridges excluding the major steel bridges at I-610 and I-10 along London and Orleans Avenues.

To do so, the modification methods for different bridges are recommended as shown in Table 7.

Table 7 Recommendations of Bridge Replacement and Foundation Modification

17 th St Canal								Recommended	Modification
Bridge #	Roadway	Bridge	Length	Span Arrangement	Width	Structure-type	Bent-type	Modification	Estimated Cost
1	Railroad	Railroad Bridge	285	285	One track	steel	steel	H-Piles	\$ 998,746.88
2	Major HWY	I-10	215	67+81+67	108	concrete	concrete	Helical Piles	\$ 794,769.14
3	Major HWY	I-610	215	67+81+67	83	concrete	concrete	Helical Piles	\$ 613,404.44
4	Major HWY	Veterans-w	228.32	46.66+45+45+45+46.66	50	concrete	concrete	Helical Piles	\$ 398,239.64
5	Major HWY	Veterans-E	228.32	46.66+45+45+45+46.66	50	concrete	concrete	Helical Piles	\$ 398,239.64
6	Minor Road	Hammond	199.99	41+39.33+39.33+39.33+41	81	concrete	concrete	Helical Piles	\$ 926,712.88
Subtotal 17th Street Canal Recommendations									\$ 4,130,112.62
Orleans Canal									
Bridge #	Roadway	Bridge	Length	Span Arrangement	Width	Structure-type	Bent-type	Footing-type	
7	Railroad	Railroad Bridge	140	140	two track	steel	steel	Out of Scope	
8	Major Hwy	I-10	340	170+170	65	steel	concrete	Canal Alignment	
9	Major Hwy	I-610	340	170+170	50	steel	concrete	Modification	
10	Minor Road	Harrison	154.64	39.66+37.66+37.66+39.66	49	concrete	concrete	Helical Piles	\$ 336,250.90
11	Minor Road	Fillmore	178.64	45.66+43.66+43.66+45.66	49	concrete	concrete	Helical Piles	\$ 124,800.00
12	Minor Road	Robert E Lee	139.99	47.33+45.33+47.33	77	concrete	concrete	Helical Piles	\$ 595,836.20
13	Minor Road	Lakeshore	212	53+53+53+53	69	concrete	concrete	Out of Scope	
Subtotal Orleans Avenue Canal Recommendations									\$ 1,056,887.10
London Ave Canal									
Bridge #	Roadway	Bridge	Length	Span Arrangement	Width	Structure-type	Bent-type	Footing-type	
14	Railroad	Railroad Bridge	185	185	two-track	concrete	concrete	Soil Mixture	\$ 740,000.00
15	Major Hwy	I-10	297	83.5+130+83.5	65	concrete	concrete	No Action	
16	Major Hwy	I-610	297	83.5+130+83.5	53	concrete	concrete	No Action	
17	Minor Road	Gentilly	136.666	46.333+44+46.333	91	concrete	concrete	Soil Mixture	\$ 977,373.64
18	Minor Road	Mirabeau	140	20+20+30+30+20+20	71	concrete	concrete	Helical Piles	\$ 592,407.50
19	Minor Road	Fillmore	150	30+30+30+30+30	47	concrete	concrete	Helical Piles	\$ 333,838.00
20	Minor Road	Robert E. lee	180.68	36.34+36+36+36+36.34	35.5	concrete	concrete	Replacement	\$ 481,060.50
21	Minor Road	Leon Simon	187.466	47.9+45.833+45.833+47.9	82	concrete	concrete	Soil Mixture	\$ 265,533.33
22	Minor Road	Lake Shore	170	40+45+45+40	71	concrete	concrete	Out of Scope	
Subtotal London Avenue Recommendations									\$ 3,390,212.97
Total Bridge Recommendation Estimated Costs									\$ 8,577,212.69