



## PERMANENT ENHANCEMENT OF THE ICS FACILITIES

FINAL REPORT April 27, 2009



#### **Prepared** for

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In association with

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#### **EXECUTIVE SUMMARY**

The intent of this study is to determine the requirements for enhancing the existing ICS facilities so that the facilities could achieve a 50 year design life. The enhancements also address pump capacity improvements and operation and maintenance issues.

The ICS facility modifications required at the three canals include:

- Removal of the Phase 1 and Phase 2 pumps and power units. New 350 cfs form suction intake pumps and power units would be installed in place of the removed pump units.
- Provide an enclosure around the Phase 1 engine platforms and the Phase 3 pump platforms to protect the equipment from wind blown debris.
- Provide butterfly valves on the existing discharge pipes.
- Replace the existing knife gates and hoisting equipment with roller gates and hydraulic hoisting equipment.
- Provide coating and corrosion protection on the exposed steel material.

The ICS facility pump capacity improvements include:

- An additional 8-350 cfs form suction intake pumps at 17<sup>th</sup> Street along with two additional 9' diameter discharge pipes and a pump platform with a protective enclosure.
- An additional 2-350 cfs form suction intake pumps at Orleans Avenue along with one additional 9' diameter discharge pipes and a pump platform and a protective enclosure.
- An additional 6-350 cfs form suction intake pumps at London Avenue along with two additional 9' diameter discharge pipes and a pump platform with a protective enclosure.

The Capitol Costs and associated Operation and Maintenance costs for the enhanced facilities were evaluated. Tables E-1 and E-2 document the Capitol Costs and the Life Cycle Costs associated with the enhanced ICS facilities. Generally, the O&M requirements for the enhanced ICS facilities will be greater than the O&M requirements for the proposed Permanent Pump Stations. The reason for this is that the ICS facilities were not planned and constructed in a manner to reduce operation and maintenance needs. They were planned and constructed as an emergency action to temporarily protect the outfall canals and adjacent communities from flooding that might occur if a hurricane event occurred prior to construction of the permanent protection system.

	Permanent Enhancements of ICS				
Facility	ICS Enhancement Costs	Maint. Facility Costs	Capacity improvement Costs	TOTALS	
A. 17th STREET CANAL	\$ 125,039,826	Х	\$ 56,188,253	\$ 181,228,079	
B. ORLEANS AVE. CANAL	\$ 68,487,729	Х	\$ 15,015,699	\$ 83,503,428	
C. LONDON AVE. CANAL	\$ 82,598,997	Х	\$ 42,903,197	\$ 125,502,194	
D. MAINTENANCE FACILITY	Х	\$ 41,556,365	Х	\$ 41,556,365	
TOTALS =	\$276,126,552	\$ 41,556,365	\$ 114,107,149	\$ 431,790,066	

**Table E-1 – Cost Estimate for Enhanced ICS Facilities** 

	Life Cycle Costs for Permanent Enhancements of ICS					
Facility	Initial Capitol Costs (\$)	50 Year LCC Operating	50 Year LCC Maintenance	Historic O&M Costs from S&WB	Total Life Cycle Costs	
A. 17th STREET CANAL	\$ 181,228,079	\$ 8,765,499	\$ 14,180,752	\$ 6,475,000	\$ 231,150,470	
B. ORLEANS AVE. CANAL	\$ 83,503,428	\$ 7,747,030	\$ 10,190,011	\$ 4,550,000	\$ 162,395,443	
C. LONDON AVE. CANAL	\$ 125,502,194	\$ 6,450,798	\$ 5,354,002	\$ 2,100,000	\$ 104,057,245	
TOTALS =	\$ 431,790,066	\$ 22,963,327	\$ 29,724,765	\$ 13,125,000	\$ 497,603,158	

Table E-2 – Life Cycle Cost for Enhanced ICS Facilities

#### 1. INTRODUCTION

Interim Control Structures (ICS) are located in the 17<sup>th</sup> Street, Orleans Avenue and London Avenue Canals near the confluence with Lake Pontchartrain. The ICS facilities generally are assumed to have a 5 year life. The ICS facilities include a substantial amount of infrastructure consisting of non-overflow structures, gate closure structures, pumps and pump power units, pump platforms and engine platforms. An investigation was performed to determine what modifications are required to extend the life of the ICS facilities from a 5 year design life to a 50 year design life. The investigation answered three primary questions. These questions are:

- A. What modifications are required in order to make the ICS permanent assuming a 50 year design life as the basis?
- B. What modifications will have to be made to allow the capacity of the ICS to be increased to the required capacity at each of the three sites?
- C. What are the estimated Operations and Maintenance costs of the permanent facility?

Modifications to upgrade the ICS facilities to a 50 year design life considered aesthetic considerations, maintainability, operability, accessibility, corrosion protection, lightening protection, longevity and replacement of components, accessibility, safe room for operators, standby power, controls and other associated issues. The considerations are evaluated against their current state and the desired state with required modifications identified.

The evaluation of the hydraulic requirements of the ICS facilities intake and discharge capacity is based on model studies performed by ERCD. Additional, information associated with overall pump capacities is further evaluated by comparison the required canal flow rate and anticipated pump capacity to maintain the water elevation in the canals at a safe water elevation.

#### 2. ICS FACILITIES - 50 YEAR LIFE

#### 2.1 Existing ICS Facility Description

Review of the existing ICS facilities included review of existing reports, and contract plans. A site inspection of all three ICS facilities was performed to further understand the layout and overall size of the facilities. The following information was reviewed:

- Phase 2 Conceptual Design Services for Permanent Flood Stations and Canal Closures at Outfalls, Alternative Considerations Report, prepared by Black & Veatch, dated December 2006.
- ICS Phase 1 Construction Plans for the 17<sup>th</sup> Street Canal and Construction Plan Modifications, prepared by Linfield, Hunter, & Junius, INC., dated January 2006.
- ICS Phase 1 Construction Plans for the Orleans Avenue, prepared by URS, January 2006.
- ICS Phase 1 Construction Plans for the London Avenue prepared by URS, January 2006.
- Data Report on Phase 1 Model Study of Interim Pumping Station at London Avenue Canal, by Dr. Stephen T. Maynord, dated October 2006.
- Data Report on Model Study of Interim Pumping Station at 17th Street Canal-Existing 18 Hydraulic Pumps and Original Design of 11 Direct Drive Pumps, by Dr. John E. Hite, Jr. and Dr. Stephen T. Maynord, dated February 2007.

The ICS facilities are comprised of non-overflow structures, a gate closure structure, and pump systems. These facilities were constructed in three phases. Phase 1 included the non-overflow structures, the gate closure structure, MWI hydraulic pumps and pump platforms, power units and the engine platforms. Phase 2 included additional MWI hydraulic pumps, power units and pump platforms. Phase 3 included Fairbanks Morse and Patterson direct drive diesel pumps, power units and pump platforms. The 17<sup>th</sup> Street Canal ICS includes all three construction phases; the Orleans Avenue Canal ICS includes phase 1 construction only; and the London Avenue Canal ICS includes phases 1 and 3.

#### 2.1.1 Non-Overflow Structures

The non-overflow structures transition from the existing line of protection to the gate closure structure. In all cases, the non-overflow structures are sheet pile cofferdams that are filled with soil. Table 1 documents the specific geometry and cell types for each ICS Facility. The Orleans Avenue and London Avenue non-overflow structures are wider and the cell sheet piles are embedded to greater depths.

Depemeter	ICS Facility				
rarameter	17 <sup>th</sup> Street	<b>Orleans Ave</b>	London Ave		
Length of Left Non-Overflow	~315'	~125'	~97'		
	NA (Ties Into	~125'	~97'		
	Existing				
Length of Right Non-Overflow	Protection)				
Cofferdam Cell Type	Arch	Cellular	Cellular		
Cell Width (Gravity Section)	24'-10.25"	60.59'	45.94'		
Cell Height Above Grade	~12.0'	~16.0'	~16.0'		
Sheet Pile Penetration into Soil	-27.00'	-50.00'	-54.00'		
Sheet Pile Type	PZ 27.5	PZ 27.5	PZ 27.5		
Soil Fill	Yes	Yes	Yes		
		Reinforced	Reinforced		
Cell Cap Material	Crushed Stone	Concrete Cap	Concrete Cap		
Steel Piles (Placed in Interior of		H14x73	H14x73		
Cells to Support Concrete Cap)	NA	Tip Elev70.0	Tip Elev66.25'		

#### **Table 1 – Non-Overflow Information**

#### 2.1.2 Gate Closure Structure

The primary elements of the closure structures are foundation soil improvements (not provided at London Avenue ICS), riprap protection, structural steel substructure, structural steel superstructure, grated platform, abutments, gate seal, bulkheads, bulkhead hoist and bulkhead slots. Further investigation shows that scour pads and erosion prevention measures were constructed upstream, downstream and along the sides of the gate closure structures to ensure the closure remains in place during significant storm events. The gate closure structures house bulkheads that can be lowered through static water to separate the canals from Lake Pontchartrain. Table 2 summarizes the gate closure opening dimensions and capacity. A comprehensive description of the existing gate closure structures is provided in Appendix A.

Tuble 2 Gute clobal e Dimensions and capacities					
Devementar	ICS Facility				
rarameter	17 <sup>th</sup> Street	<b>Orleans Ave</b>	London Ave		
Low Lake Elevation	+1'	+1'	+1'		
Gate Sill Elevation	-10'	-8'	-8'		
Water Passage Height	11'	9'	9'		
Gate Opening Width	10.25'	10.25'	10.25'		
Number of Gates	11	5	13		
Water Passage Width	112.75'	51.25'	133.25'		
Water Passage Area	1240.25 sf	461.25 sf	1199.25 sf		
Flow-rate	12500 cfs	3390 cfs	8980 cfs		
Water Velocity	10.08 ft/sec	7.35 ft/sec	7.49 ft/sec		

#### Table 2 – Gate Closure Dimensions and Capacities

#### 2.1.3 Pumping Facilities

The pump facilities include the pumps, power units, pump platforms, discharge piping and engine platforms. The pump facilities can be organized in phases that reflect the construction activity at the ICS facilities. Details of the structures installed during each phase is provided in Appendix B (includes phase 1 description only, no specific data was provided for the phase 2 and 3 construction activities). The pump installation phases are defined as follows:

- Phase 1 Hydraulically driven pumps made by MWI with power units placed at the engine platforms on the protected side of the canals (except the west side engine platform at 17<sup>th</sup> Street is on the non-protected side of the canal.
- Phase 2 Hydraulically driven pumps made by MWI with power units placed at the phase 2 pump platforms.
- Phase 3 Diesel direct drive pumps made by Fairbanks Morse and Patterson with power unit at the phase 3 pump platforms.

During Phase 1, hydraulically driven pumps by MWI were installed on platforms over the canals. The hydraulic power units were placed on the engine platforms located on the high bank on each side of the canal. One of the engine platforms was constructed on the un-protected side of the canal levees due to site restrictions.

In a second phase, 6 hydraulically driven pumps by MWI were installed at 17<sup>th</sup> Street. Except in this installation, both the hydraulically driven pumps and the hydraulic power units were installed together on new platforms over the canals. These pump/power unit platforms are structural steel frames that support galvanized steel grating.

In the third phase which is currently under construction, 11 new Fairbanks Morse pumps are being installed at 17<sup>th</sup> Street and 8 Patterson pumps are being installed at London Street. These pumps are line-shaft pumps direct driven by diesel engines through a right angle drive. Both the pump and engine are installed on platforms over the canal. Also installed as part of the third phase were 14 additional MWI hydraulically driven pumps. These pumps are being installed in two rows along the gate closure platform just upstream of the knife gates. The hydraulic power units are being installed on the gate structure platform over the canal.

Table 3 shows the number of pumps, type of pumps and the location of the power units for each ICS Facility for each pump installation phase.

	Parameter			ICS Facility	
			17 <sup>th</sup> Street	Orleans Ave	London Ave
	Number of Pumps		12	10	12
e]	Pump Type		MWI	MWI	MWI
Phas	Power Unit Location		Engine Platforms	Engine Platforms	Engine Platforms
	Number of Pumps		6	NA	NA
e 2	Pump Type		MWI	NA	NA
las	Power Unit Location		Pump	NA	NA
PI			Platform		
	Number of Pumps		11/14	NA	8
	Pump Type		Fairbanks	NA	Patterson
			Morse/MWI		
e	Power Unit Location		Pump	NA	Pump
se			Platform/Gate		Platform
has			Closure		
Р			Platform		

Table 3 – Pump Systems at Each ICS Facility

Shop drawings were not available for review of the MWI, Fairbanks Morse, or Patterson Pumps. The pumping facilities are fairly consistent from canal to canal except for overall pump capacity. The pumps are placed in a line parallel to the flow in the canal. In some cases, the pumps are isolated with baffles and screens and in other cases they are not. At the 17<sup>th</sup> Street Canal, where a larger pumping capacity is required, the pumps are spread out along both sides of the canal and along the closure structure platform. The generator units are located below an open-air canopy (engine platforms) on pump platforms near the canal and on the closure structure platform.

The MWI pumps are fabricated pumps with the propellers made of stainless steel and carbon steel housings. The propeller is driven by a hydraulic motor directed attached to the propeller. As such, the drive unit is normally submerged in the canal where it is subject to leakage and corrosion. The hydraulic motor is driven by hydraulic fluid at pressures in excess of 3000 psig. The pressure is created by a hydraulic power unit which consists of a diesel engine and a hydraulic pump. Four 3 inch and 2 smaller hydraulic lines connect the hydraulic motor to the hydraulic power unit. To power the 32 MWI units at 17<sup>th</sup> Street, there is approximately 10 miles of hydraulic pipes and hoses with over half of these over the canal.

The original MWI units were hung from the platform into the canal without any baffling. The second set of pumping units were also hung from platforms, but divider walls were provided between the units and a back wall provided behind the pumps which was an improvement in the hydraulic design. The Fairbanks Morse and Patterson pumps are being installed with COE Type 10 Formed Suction Inlets (FSI), which is an improvement over the baffled chambers. The set of MWI pumps installed at the 17<sup>th</sup> Street gate closure structure are not baffled.

#### 2.1.4 Existing ICS Electrical System

The electrical systems are somewhat consistent at each of the three facilities. Generally, the 17<sup>th</sup> Street, Orleans Avenue and London Avenue ICS facility electrical and communication systems are almost identical in configuration.

#### 2.1.4.1 Monitoring & Control Communication

The monitoring and control functions at each of the ICS facilities are accomplished through a common Supervisory Control and Data Acquisition (SCADA) system. Canal level data is collected from level sensors ranging in quantities from 6 to 7, located along the length of the canal. This information is culminated during each SCADA scan which is approximately every second, through Data Collection Panel (DCP) located near each sensor. The DCP identification is the nearest east-west street which the panel is located. Data is culminated from each of the panels via one pair of a 12 pair fiber optic (FO) cable which routes through the length of the canal. This FO cable has nine spare pairs with the two remaining used for remote control and Ethernet communications. The FO cable terminates at the SCADA cabinet located in the ICS safe house, housing the SCADA server. SCADA monitoring and control of diesel engine and hydraulic pumping systems is accomplished through Modbus communications with the associated equipment control panels.

Primary communication from the ICS facilities is via microwave communications between the ICS facility and with their respective primary pumping stations, Drainage Pumping Stations (DPS) 3, 4, 6 and 7. The microwave system has two channels available which offers one channel for operation and a second for redundancy. Ultimately, all communications are received by DPS 6 which in turn transmits this information to the Emergency Operations Control (EOC) Center located in the USACE office via Southern Bell's communication network. Additional communication redundancy is through satellite communications via rivergages.com. Rivergages.com polls canal level information every 15 minutes, capturing comparisons between the last reading and the most current.

The SCADA system, as well as the diesel and hydraulic pumping equipment controls derive their primary power from the local utility. The utility service is backed up through an automatic transfer switch by redundant emergency diesel generation units, of which the selection of emergency generation unit operation is via a manual transfer switch. The SCADA system is additionally supported with an Uninterruptible Power System. System monitoring and control is performed at the EOC. At this location, operators are able to monitor the entire system, as well as monitor and control each canal and its associated ICS structure operating components through drill down screens on the human-machine interface (HMI) monitor/server. At present, SCADA monitoring and control of the gate structure equipment is being considered in a current modification.

#### 2.1.4.2 Electrical Systems Installation

The above grade electrical cable and raceway at each ICS facility consists of galvanized rigid steel conduit which is customary in industrial applications. Electrical boxes and enclosures installed are of the appropriate type and rating for there application.

#### 2.1.5 Corrosion Protection System

The ICS facilities were evaluated to determine construction materials and if corrosion protection was provided. The Phase I features, construction material and corrosion protection system that were installed at the three ICS facilities is presented in Table 4. The remaining Phase II and Phase III components at each location will be evaluated as the design information becomes available. The complete corrosion protection system investigation and evaluation is provided in Appendix C.

Location	Structure	Type of Construction	Materials	Existing Corrosion Protection
17 <sup>th</sup>	Non-Overflow Section	Sheet Piling	Carbon Steel	None
Street ICS	Gate Closure Structure Substructure	Pipe Piling	Carbon Steel	Protective Coating
Facility	Pumps	Vertical Turbine	Information Not Available	Protective Coating and Cathodic Protection
	Pump Platform Substructure	H Piling and Sheet Piling	Carbon Steel	None
	Power Unit Platform Substructure	Pipe Piling	Carbon Steel	None
Orleans	Non-Overflow Section	Sheet Piling	Carbon Steel	None
Avenue ICS	Gate Closure Structure Substructure	Pipe Piling	Carbon Steel	Protective Coating
Facility	Pumps	Vertical Turbine	Information Not Available	Protective Coating and Cathodic Protection
	Pump Platform Substructure	H Piling	Carbon Steel	None
	Power Unit Platform Substructure	H Piling	Carbon Steel	None
London	Non-Overflow Section	Sheet Piling	Carbon Steel	None
Avenue ICS Facility	Gate Closure Structure Substructure	Pipe Piling	Carbon Steel	Protective Coating
	Pumps	Vertical Turbine	Information Not Available	Protective Coating and Cathodic Protection
	Pump Platform Substructure	H Piling	Carbon Steel	None
	Power Unit Platform Substructure	H Piling	Carbon Steel	None

#### Table 4 – Existing Corrosion Protection System (Phase 1 Construction)

#### 2.2 ICS Facility Design, Operation and Maintenance Requirements

In order to determine whether the existing ICS facilities are acceptable or need to be modified, requirements need to be established that define the basic intent of the facility. Generally, the basic requirements associated with enhancing the existing facilities so that they achieve a 50 year design life were determined based on O&M issues, technical design and flood fighting issues. The following is the list of requirements each facility was evaluated against to determine if modification of the ICS facility was required:

- Pump Capacity the pump capacities for each canal need to achieve the required canal capacity. These capacities for each canal are 12500 cfs, 3390 cfs, and 8980 cfs for the 17<sup>th</sup> Street, Orleans Avenue and London Avenue Canals respectively.
- Pump Availability the pumps need to have the appropriate start-up time and availability to pump as necessary. The pump systems should be designed to allow for efficient start up times so that operations personnel have time to prepare the ICS facility for a potential storm event.
- Pump O&M the existing pump arrangement needs to be arranged to reduce the overall level of operation and maintenance or at least allow for acceptable levels of operation and maintenance.
- Pump Controls placement of pump controls to allow for operation from a centralized location on site needs to be provided. Remote operation of the pumps will allow for efficient and safe operation during storm events.
- Electrical and Communications the electrical and communications systems need to be reliable and redundant.
- Non-Overflow Sections the structural and geotechnical systems need to be able to transfer the storm event loading into the foundation safely.
- Gate Closure Structure the structural and geotechnical systems need to be able to transfer the storm event loading into the foundation safely.
- Canal Erosion the channel upstream and downstream of the gate closure structure needs to be protected against erosion.
- Knife Gates (Bulkheads) allow for remote operation of the knife gates and ability to close gates through differential head.
- Corrosion Protection protection to prevent failure of the structural systems. The exposed steel needs to be protected against corrosion to reduce maintenance costs associated with replacing or repairing damage structural steel members.
- Flood Fighting Philosophy provide access to the power units and fuel systems to allow for operation of pumps as necessary. The pump power units, hydraulic piping, fuel storage tanks and gate hoisting equipment need to be protected against flying debris associated with hurricane storm events.

#### **2.3 ICS Facilities Evaluation**

A list of deficiencies associated with the existing ICS facilities was developed based on comparison against the operation and maintenance requirements. The primary purpose of the list is to identify aspects of the existing facility that need to be modified to allow the ICS facilities to

function as permanent facilities with a 50 year life. A comprehensive list of the deficiencies for each ICS facility are included in Appendix D. The deficiencies are organized around the five main ICS features: non-overflow structures, gate closure structures, pumps, power units, and miscellaneous features.

The deficiencies documented in Appendix D were further screened to determine the best solution for modifying the ICS facilities. During the screening process the deficiencies and solutions were organized around main deficiency categories. The screening of the deficiencies showed that they could be organized around the following main categories:

- Pump Operation and Maintenance
- Hydraulic Fluid/Oil Control
- Power Unit Operation and Maintenance
- Gate Operation
- Coating Issues
- Need for a Maintenance Facility

Solutions for the main deficiency categories where then determined through a project team brainstorming process. Tables 5, 6 and 7 document the primary deficiencies and potential solutions for each deficiency. Other observations regarding the ICS facilities were documented as well.

#### 2.3.1 Non-Overflow Structures

The non-overflow structures appear to be stable against potential flood related loading conditions; however this should be verified. The depth of sheet pile, steel pile and concrete pile embedment matches and exceeds similar flood control foundation systems located in New Orleans. The most stable structures appear to be those installed at Orleans Avenue. The Orleans Avenue non-overflow cofferdam cell diameter (60 feet) is larger than the cofferdams constructed at 17<sup>th</sup> Street and London Avenue. The cofferdam cells are capped with reinforced concrete slabs that are supported by steel piles with a tip elevation of -70.0. London Avenue is similar to Orleans except that the cell diameter is 45 feet. An arch cellular cofferdam was installed at 17<sup>th</sup> Street. The arch depth is ~25 feet and the sheet piles are embedded to -27 feet. The cells are capped with gravel. In all cases, the non-overflow structures are stable. The 17<sup>th</sup> Street non-overflow section appears to be less conservative than the non-overflow sections constructed at Orleans and London Avenues.

#### 2.3.2 Gate Closure Structures

The gate closure structures appear to be stable against potential flood related loading conditions; however, this should be verified with a detailed analysis. The depth of sheet pile, steel pile and concrete pile embedment matches and exceeds similar flood control foundation systems located in New Orleans. The most stable structures appear to be those installed at 17<sup>th</sup> Street Canal. The 17<sup>th</sup> Street ICS gate closure structures include robust abutments with sheet pile embedment to elevation -64.0 feet. 28-30" diameter steel pipe piles are driven down in the interior of the

abutment cofferdams. The pipe piles have a tip elevation of -122.0'. The cofferdam is filled with granular fill from existing grade (varies from -5 to +0) and capped with a 1' thick reinforced concrete cap. The substructure of the gate closure structure is founded on 161-30" diameter steel pipe piles with a top elevation of -14.0' and a tip elevation of -106.0'. The pipe piles support an 8' thick reinforced concrete cap that has a top elevation of -10.0'. These piles are surrounded by jacket structure that is comprised of sheet pile (PZ-36 sheets) with a top elevation of -10.0' and a tip elevation of -64.0'. There is a 200 foot riprap pad upstream and downstream of the gate closure monolith. The soil below the 3' thick riprap pad was improved using soil mixing techniques down to elevation -70.0'. The soil mixing extends 50 feet upstream and downstream of the closure structure and as far as 200 feet in some locations. The Orleans Avenue ICS gate closure monolith includes a gate closure structure, and upstream and downstream soil mixing and riprap. The gate closure structure is founded on 18-24" diameter steel pip piles with a tip elevation of -112.0 feet and extend up to elevation +13.0 feet. Concrete is placed in the pipe piles from elevation -60.0 feet to elevation +13.0 feet. The soil mixing extends upstream and downstream of the closure structure 50 feet. The riprap area extends upstream and downstream of the closure structure 300 feet. London Avenue foundation system is similar to Orleans, except that no soil mixing was included. The connection between the closure structure and the nonoverflow cofferdams appears to have been field modified due to either miss-alignment or poor contract plan details. On both sides of the gate closure structure, sheet pile pieces are welded and bolted together to bridge between the two systems. This area appears to be susceptible to failure during flood loading conditions.

#### 2.3.3 Knife Gate Closure

The most likely scenario that would result in a need to close the knife gates is a hurricane event. The current standard operating plan for closing of the gates includes use of divers to remove sediment and closure while through static water conditions. The process to close the gates may take as long as 5 days. The closure time should be reduced to less that an hour.

The current gate closing process requires divers to remove sediment form the seal area. At all ICS facilities the gate seal is a recessed area that accumulates silts and debris. Removal of the recessed seal will eliminate the need for divers. Additionally, most emergency scenarios for closing the gates will require that the gates move through differential head. Gates with rollers are required to move through differential head.

#### 2.3.4 Pump Systems

The phase 1 and phase 2 pumps are hydraulic MWI pump units and the phase 3 pumps are diesel driven direct line Fairbanks Morse and Patterson pumps. The advantages and disadvantages of each are as follows:

Phase 1 and 2 MWI pump unit disadvantages are that the pump units are in-efficient; the hydraulic motor is submerged and subject to corrosion and leakage; the MWI units have six hydraulic hoses submerged in the canal; the units require two hydraulic cooling coil in the canal where it is subject to fouling with biologic growth and floating material; the units require a significant amount of hydraulic fluid which can be a disposal problem when changed, and has

the potential to leak a great deal of hydraulic fluid into the canal; and the Phase 1 pumps and power units are too far apart. The distance between the pumps and power units exceed the recommended distance per the manufacturer. The hydraulic fluid pressure in the pipe may exceed the allowable 3000 psi capacity of the pipe.

Indications from MWI catalogs indicate that potentially bio-degradable hydraulic fluid may be available, but without shop drawings it is unknown whether that can be used in this installation. Even if bio-degradable hydraulic fluid is used, leakage and spills will have a negative visual impact on the canal if not an environmental impact.

The main advantage of the Fairbanks and Patterson units are that the units are direct driven by the engines. This eliminates the in-efficiency of converting diesel power to a hydraulic pump, hydraulic losses in the long hydraulic pipelines, and than converting hydraulic energy at the pump through the hydraulic motor. This installation also eliminates the potential of major spills of hydraulic fluid. The disadvantage of this installation is that it has an internal shaft from the top of the platform down to the impeller. Steady bearings are required to keep the shaft straight. Failure of the bearing lubrication system can result in dramatic and catastrophic failure of the pump.

#### 2.3.5 Corrosion Protection.

Black & Veatch has assumed that the soils along each ICS installation vary widely in corrosive characteristics. Some areas are relatively noncorrosive, but many areas have the potential to be quite corrosive, especially when wet. The corrosive characteristics are low electrical resistivity and high concentrations of chloride and sulfate salts. Because of the potential for encountering corrosive soils, cathodic protection of the ICS structures will be necessary. Impressed current type cathodic protection is proposed for the structure.

Black & Veatch has assumed that the Lake Ponchartrain water around each ICS installation has the potential to be quite corrosive, especially when salinity levels increase. The corrosive characteristics of the lake water are low electrical resistivity and high concentrations of chloride and sulfate salts. Because of the potential for encountering corrosive waters in the splash, tidal and continuously submerged zones, a combination of protective coatings and cathodic protection of the ICS structures will be necessary. Coal tar epoxy, surface tolerant epoxies, epoxy mastics and polyurethane coating materials are proposed for the structure. Impressed current type cathodic protection is proposed for the structure.

The equations determining the allowable corrosion (sacrificial steel) at any point in the nonoverflow structure sheet piling indicate there is a large safety factor in the cofferdam design. About 0.25 inches (250 mils) of corrosion can be tolerated without catastrophic results. Based on the average (4.5 mils/year) and maximum (9.0 mils/year) submerged zone corrosion rates given in Appendix C Table 1.4-1, the estimated service life of the non-overflow structure is in the range of 28 to 55 years. Note that the estimated service life is calculated based on corrosion rates taken from the literature. Actual corrosion rates at each ICS can differ from the estimated corrosion rate by as much as an order of magnitude. A method for determining the actual corrosion rate at each ICS location is presented in Appendix C Section 6.0. Due to the lack of actual and historical information relative to the site corrosivity, the effect of corrosion allowance on the structure life has not been considered. For the purpose of this analysis, supplemental corrosion protection has been proposed so that net metal loss due to corrosion is negligible over the 50 year structure life.

#### 2.3.6 Electrical and Communication Systems.

The only observed lightning protection at each of the ICS was on the tower structures supporting the microwave communication hardware. As indicated on the construction drawings, grounding has been considered in all power circuitry. Grounding is provided at the equipment platform structures.

Though the diesels are rated for outdoor applications, all electrical starting and operating components are subject to the environment. This will attribute to connection corrosion and component life.

Main Deficiency Category	Description of Deficiency Issues	Potential Solutions for Each Issue
Pump Maintenance	<ul> <li>a. Existing pumps will require annual maintenance, thus need for pump lifting facility</li> <li>b. Pump supports at platforms include shear tabs and other shims to align with platform framing, may lead to significant vibrations</li> <li>c. Layout of 17th Street ICS increases O&amp;M requirements to the point that daily maintenance may need to be performed to ensure proper operation.</li> </ul>	a/b/c. Remove phase 1 pumps and replace with generator/motor set. Motor at pump platform and generator at engine platform along side of canal. Will require removal of existing platform and replacement with new pump platform.
Hydraulic Fluid/Oil Control	<ul> <li>a. Power Unit location over canal will allow for leakage of hydraulic fluid into canal. Phase 1 pumps only.</li> <li>b. Hydraulic fluid piping is single wall pipe, with fluid pressures near allowable pressure limits and exposed to hurricane wind blown debris. Fuel storage tanks are single walled tanks that are exposed to hurricane wind blown debris.</li> <li>c. Hydraulic fluid piping runs are too long.</li> <li>d. No fluid makeup or waste storage available on site. This will hamper proper O&amp;M of the pump systems</li> </ul>	<ul> <li>a/c. Remove phase 1 pumps and replace with generator/motor set. Motor at pump platform and generator at engine platform along side of canal. Will require removal of existing platform and replacement with new pump platform.</li> <li>b. Replace single wall piping and tanks with double wall piping and tanks.</li> <li>d. Need a site fluid storage facility.</li> </ul>
Power Unit Maintenance	<ul> <li>a. Phase 1 power units are located at engine platform along the canal bank, while phase 2 power units are located at pump platforms in canal. This complicates maintenance, exposes canal to leakage, and may place personnel in dangerous working conditions due to congestion at canal platforms.</li> <li>b. Phase 1, 2 and 3 power units are all exposed to hurricane wind blown debris.</li> </ul>	<ul> <li>a. Move all phase 2 power units to engine platform with phase 1 power units. This will improve O&amp;M of the pump systems. Provide an enclosure around the phase 3 pump an d power units at the pump platform.</li> <li>b. Provide hurricane enclosures for all power units. This will include protection around canal phase 3 and upper bank phase 1 and 2 based units.</li> </ul>
Gate Operation	<ul> <li>a. Gates with rollers to allow for response to emergency closures during differential head conditions. The operation of the gates will most likely occur during differential head situations.</li> <li>b. Need quicker response time for placement of gates. The preparation time needed to operate the existing gates is 5 days.</li> <li>c. Hoisting equipment is exposed to hurricane blown debris.</li> <li>d. Remote operation of gates is needed to protect personnel during storm events</li> </ul>	a/b Rolling Gates c. Protection of Hoisting Equipment with housing. d. Location of Controls at Safe House
Coating Issues	a. No coating provided on all major elements of the facility.	a Provide coating and cathodic protection for all major elements of facility.
Need for a Maintenance Facility	a. Lack of maintenance facility with room for storage of parts, maintenance bays, and O&M manual/as-built storage.	a. Construct maintenance facility, may be one facility that services all three ICS facilities.

### Table 5 – 17<sup>th</sup> Street Canal ICS Primary Deficiencies and Solutions

Table 6 – Orleans	Avenue Cana	l ICS Primary	<b>Deficiencies</b> a	and Solutions

Main Deficiency Category	Description of Deficiency Issues	Potential Solutions for Each Issue
Pump Maintenance	<ul> <li>a. Existing pumps will require annual maintenance, thus need for pump lifting facility</li> <li>b. Pump supports at platforms include shear tabs and other shims to align with platform framing, may lead to significant vibrations</li> </ul>	a/b. Remove phase 1 pumps and replace with generator/motor set. Motor at pump platform and generator at engine platform along side of canal. Will require removal of existing platform and replacement with new pump platform
Hydraulic Fluid/Oil Control	<ul> <li>a. Power Unit location over canal will allow for leakage of hydraulic fluid into canal. Phase 1 pumps only.</li> <li>b. Hydraulic fluid piping is single wall pipe, with fluid pressures near allowable pressure limits and exposed to hurricane wind blown debris. Fuel storage tanks are single walled tanks that are exposed to hurricane wind blown debris.</li> <li>c. Hydraulic fluid piping runs are too long.</li> <li>d. No fluid makeup or waste storage available on site. This will hamper proper O&amp;M of the pump systems</li> </ul>	<ul> <li>a/c. Remove phase 1 pumps and replace with generator/motor set. Motor at pump platform and generator at engine platform along side of canal. Will require removal of existing platform and replacement with new pump platform.</li> <li>b. Replace single wall piping and tanks with double wall piping and tanks.</li> <li>d. Need a site fluid storage facility.</li> </ul>
Power Unit Maintenance	a. Power units are not protected from hurricane wind blown debris.	<ul> <li>a. Provide hurricane enclosures for all power units.</li> <li>This will include protection around the upper bank based units.</li> </ul>
Gate Operation	<ul> <li>a. Gates with rollers to allow for response to emergency closures during differential head conditions. The operation of the gates will most likely occur during differential head situations.</li> <li>b. Need quicker response time for placement of gates. The preparation time needed to operate the existing gates is 5 days.</li> <li>c. Hoisting equipment is exposed to hurricane blown debris.</li> <li>d. Remote operation of gates is needed to protect personnel during storm events</li> </ul>	a/b Rolling Gates c. Protection of Hoisting Equipment with housing. d. Location of Controls at Safe House
Coating Issues	a. No corrosion protection provided for various ICS features.	a Provide coating and cathodic protection for all major elements of facility.
Need for a Maintenance Facility	a. Lack of maintenance facility with room for storage of parts, maintenance bays, and O&M manual/as-built storage.	a. Construct maintenance facility, may be one facility that services all three ICS facilities.

Main Deficiency Category	Description of Deficiency Issues	Potential Solutions for Each Issue
Pump Maintenance	<ul> <li>a. Existing phase 1 pumps will require annual maintenance, thus need for pump lifting facility</li> <li>b. Phase 1 pump supports at platforms include shear tabs and other shims to align with platform framing, may lead to significant vibrations</li> </ul>	a/b. Remove phase 1 pumps and replace with generator/motor set. Motor at pump platform and generator at engine platform along side of canal. Will require removal of existing platform and replacement with new pump platform.
Hydraulic Fluid/Oil Control	<ul> <li>a. Power Unit location over canal will allow for leakage of hydraulic fluid into canal. Phase 1 pumps only.</li> <li>b. Hydraulic fluid piping is single wall pipe, with fluid pressures near allowable pressure limits and exposed to hurricane wind blown debris. Fuel storage tanks are single walled tanks that are exposed to hurricane wind blown debris.</li> <li>c. Hydraulic fluid piping runs are too long.</li> <li>d. No fluid makeup or waste storage available on site. This will hamper proper O&amp;M of the pump systems</li> </ul>	<ul> <li>a/c. Remove phase 1 pumps and replace with generator/motor set. Motor at pump platform and generator at engine platform along side of canal. Will require removal of existing platform and replacement with new pump platform.</li> <li>b. Replace single wall piping and tanks with double wall piping and tanks.</li> <li>d. Need a site fluid storage facility.</li> </ul>
Power Unit Maintenance	a. Power units are not protected from hurricane wind blown debris.	a. Provide hurricane enclosures for all power units. This will include protection around the upper bank based units.
Gate Operation	<ul> <li>a. Gates with rollers to allow for response to emergency closures during differential head conditions. The operation of the gates will most likely occur during differential head situations.</li> <li>b. Need quicker response time for placement of gates. The preparation time needed to operate the existing gates is 5 days.</li> <li>c. Hoisting equipment is exposed to hurricane blown debris.</li> <li>d. Remote operation of gates is needed to protect personnel during storm events</li> </ul>	a/b Rolling Gates c. Protection of Hoisting Equipment with housing. d. Location of Controls at Safe House
Coating Issues	a. No corrosion protection provided for various ICS features.	a Provide coating and cathodic protection for all major elements of facility.
Need for a Maintenance Facility	<ul> <li>a. Lack of maintenance facility with room for storage of parts, maintenance bays, and O&amp;M manual/as- built storage.</li> </ul>	a. Construct maintenance facility, may be one facility that services all three ICS facilities.

#### Table 7 – London Avenue Canal ICS Primary Deficiencies and Solutions

#### 2.4 Alternative Screening.

The Project Team screened the ICS alternatives versus four primary alternatives. The primary alternatives are as follows:

- Alt 1. Cover Up Existing ICS Facilities.
- Alt 2. Do Nothing to Existing ICS Facilities and Simply Account for O&M Requirements.
- Alt 3. Develop a New Pump Facility using the ICS Non-Overflow and Gate Closure Structures.
- Alt 4. Re-Arrange and Replace Existing ICS Facility and Equipment.

The Project Team compared the deficiency solutions versus the primary alternatives. Table 8 documents the alternative screen process and defines the overall primary alternatives for each ICS Facility. The Alternative costs for each facility are built around these primary alternatives.

ICS Facility	Primary Alternative	Alternative Screening	
17th Street Canal ICS Facility	Alt 1	Not Acceptable, due to risk of hydraulic fluid spills into canal, and overall maintenance problems associated with layout of facility.	
	Alt 2	Not Acceptable because O&M requirements would demand daily maintenance over 50 year life and risk associated with hydraulic fluid spills and oil spills into canal.	
	Alt 3	Acceptable, a new plant incorporating non-overflow and gate closure structures.	
	Alt 4	Acceptable, re-arrangement of power units and replacement of pumps would reduce O&M, improve reliability and provide greater protection against fluid spills into canal.	
Orleans Avenue Canal ICS Facility	Alt 1	Acceptable with replacement of the phase 1 pumps with new pumps. The pumps would have a motor at the pump platforms and a generator unit at the engine platform.	
	Alt 2	Not Acceptable because O&M requirements would demand daily mainteance over 50 year life and risk associated with hydarulic fluid spills and oil spills into canal.	
	Alt 3	Accetable, a new plant incorporating non-overflow and gate closure structures; however, scurtiny of the canal hydraulic operations scenario implies this may be unnecessary.	
	Alt 4	Not Applicable based on Alt 1 Solution.	
London Avenue Canal ICS Facility	Alt 1	Acceptable with replacement of the phase 1 pumps with new pumps. The pumps would have a motor at the pump platforms and a generator unit at the engine platform. The Phase 3 pump platforms would be protected by a building enclosure.	
	Alt 2	Not Acceptable because O&M requirements would demand daily mainteance over 50 year life and risk associated with hydarulic fluid spills and oil spills into canal.	
	Alt 3	Accetable, a new plant incorporating non-overflow and gate closure structures; however, scurtiny of the canal hydraulic operations scenario implies this may be unnecessary.	
	Alt 4	Not Applicable based on Alt 1 Solution.	

**Table 8 – Alternatives Screening** 

#### 2.5 ICS Facility Modification Recommendations

#### 2.5.1 Alternate 3 – All ICS Facilities

Construction of replacement pump stations at the 17<sup>th</sup> Street Canal, Orleans Avenue Canal and the London Avenue Canal is based on the phase 1 permanent pump station study.

#### 2.5.2 Alternative 4 – 17<sup>th</sup> Street ICS Facility Modifications

The 17<sup>th</sup> Street ICS facility requires the following modifications to allow the facility to achieve a 50 year design life.

- A. Pump and Power Unit Replacement. Replace Phase 1 and Phase 2 Pumps and Power Units with a pump that is similar to the Phase 3 pumps, but has a motor at the pump platform and a generator at the engine platform. The existing pump platform and suction basin will remain. The pump platform decking support beams may need to be re-positioned to fit the new pumps. The new pumps will be ~350 cfs direct drive pumps. Specific construction activities associated with the replacement are as follows:
  - Remove 12 Phase 1 MWI Hydraulic Pumps (6 located on each side of channel)
  - Remove 12 Phase 1 MWI Hydraulic Pump Power Units (6 located on each side of channel on existing engine platforms)
  - Remove 6 Phase 2 MWI Hydraulic Pumps (4 located on west side of canal and 2 located on east side of canal)
  - Remove 6 Phase 2 MWI Hydraulic Pump Power Units (4 located on west side phase 2 pump platforms and 2 located on east side phase 2 pump platforms)
  - Install 18 new 350 cfs form suction intake pumps. The new pumps will be similar to the Phase 3 pumps.
  - Install 18 new electric drive power units.
  - It is assumed the phase 1 and phase 2 pump platform decking and beam systems may need to be re-arranged to accommodate the new pumps.
  - Remove the 14 temporary MWI Hydraulic Pumps and all appurtenances located on the gate closure structure access platform.
  - Remove the 14 temporary MWI Hydraulic Power Units located on the gate closure structure.
  - Remove the associated discharge piping. Assume approximately 30 feet of 3' diameter steel discharge piping per pump.
  - Install butterfly valves on existing 7-9' diameter steel discharge pipes. The butterfly valves will provide a positive cut-off to prevent water from flowing from the lake surge into the canal in the event that a discharge pipe fails.
  - Remove and replace gate closure access platform with a platform of enhanced support capacity.

- **B.** Engine Platform. The area of the Engine Platform needs to be increased to accommodate four additional power units on the west side and two additional power units on the east side. Options are to increase the size of the existing engine platform or to construct a stand-alone platform adjacent to the existing platform. The engine platform expansion will match the construction of the existing platforms. The existing engine platforms need to be expanded to house the 6 additional power units. Each power unit is allocated ~493 square feet (12.33' x 40 ') of floor space. The estimate provides for a 2500 SF area stand-alone platform both for east and west sides.
- **C.** Engine Platform Enclosure. The expanded engine platforms will be enclosed with a structure that protects the power units from hurricane wind blown debris, from daily weather and to improve the ability to perform maintenance and operation. The enclosure will also protect personnel from wind blown debris and rain during a hurricane event. The enclosures will require the following construction activity:
  - Demolish the existing security/debris fencing
  - Demolish the metal roofing and siding, including all siding and roof purlins
  - Assume the addition of new structural steel frames matching the existing frames are required, and new support columns at ends of the structure.
  - Assume purlins are installed that match the existing purlin size.
  - Assume a 6 inch thick reinforced pre-cast concrete wall panels are placed around the perimeter of the generator units.
  - Assume the roofing system is a standing seam metal roof is supported off a metal deck that is connected to the purlins.
- **D.** Phase 3 Pump Platform Enclosure. Provide a building around the Phase 3 pump platform to protect the power units from hurricane wind blown debris, from daily weather and to improve the ability to perform maintenance and operation. This enclosure is estimated to be similar to the engine platform enclosures. Specific details of the phase 3 pump platforms were not provided.
- **E.** Knife Gate Replacement. The existing gates will be demolished and new gates with rollers will be installed. The new gates will require new gate guides, and hoisting equipment. No demolition of the existing gate structure is required. The existing gate sill may need local demolition to allow the sill depression to be filled with concrete. The new gate hoisting equipment will be provided with an enclosure to protect against wind blown debris. Installation of new gate guides and new rolling gates will require a cofferdam system to dewater the area just upstream and downstream of the gate closure structure. The roller gate construction activities will include:
  - Install a steel sheet pile cofferdam both upstream and downstream of the gate closure structure. The cofferdam will tie-into the abutment cells.
  - Remove and dispose of the existing 11 knife gates.
  - Attach new structural steel wide flange gate guides to the existing gate guides.

- Weld a sill plate in between the new wide flange guides at the concrete sill cap. Plate to be leveled as required to align with bottom of new gates.
- Place grout under the sill plate and in the existing sill depression.
- Cap the sill depression with a plate that is welded to the existing metal embedments.
- Install 11 new rolling gates.
- Install horizontal channels and plates to form hoisting equipment rack at the top of the new gate guides. The channels and plates shall be attached to the gate guides using bolted connections.
- Install hoisting equipment for each gate. The hoisting equipment shall be motor driven hydraulic gate operators and be attached to the hoisting equipment rack.
- Install metal housing around hoisting equipment to protect the equipment from wind blown debris.
- Make electrical connection between gate operation control box and each gate motor.
- **F.** Removal of Hydraulic Fluid Piping. Remove and dispose of the existing 3" dia. and 1" dia. existing hydraulic piping. The hydraulic systems are being replaced with electrical direct drive pumps that are operated using diesel fuel. The existing piping shall be drained, flushed & cleaned prior to offsite removal. The electrical power supply conduit to operate the new pump motors will be placed on the existing hydraulic pipe supports.
- **G.** Fuel Tank Replacement. Replace single wall fuel storage tanks with double wall storage tanks. The new tanks shall have a 20,000 gallon capacity. The maximum size of the tanks shall be 10.5 feet in diameter and 31 feet long. The existing single-wall tank shall be drained, flushed & cleaned prior to offsite removal.

#### 2.5.3 Alternative 1 - Orleans Avenue ICS Facility Modifications

The Orleans Avenue Canal ICS alternative includes the following requirements based on the deficiency evaluation:

- **A.** Pump and Power Unit Replacement. Replace Phase 1 Pumps and Power Units with a pump that is similar to the Phase 3 pumps, but has a motor at the pump platform and a generator at the engine platform. The existing pump platform and suction basin will remain. The pump platform decking support beams may need to be re-positioned to fit the new pumps. Specific construction activities associated with the replacement are as follows:
  - Remove 10 Phase 1 MWI Hydraulic Pumps (5 located on each side of channel)
  - Remove 10 Phase 1 MWI Hydraulic Pump Power Units (5 located on each side of channel on existing engine platforms)
  - Install 10 new 350 cfs FSI pumps. The new pumps will be similar to the Phase 3 pumps.
  - Install 10 new electric drive power units.
  - It is assumed the phase 1 pump platform decking and beam systems may need to be rearranged to accommodate the new pumps.

- Install butterfly valves on the existing 4-9' diameter steel discharge pipes. The butterfly valves will provide a positive cut-off to prevent water from flowing from the lake surge into the canal in the event that a discharge pipe fails.
- **B.** Engine Platform Enclosure. The engine platforms will be enclosed with a structure that protects the power units from hurricane wind blown debris, from daily weather and to improve the ability to perform maintenance and operation. The enclosure will also protect personnel from wind blown debris and rain during a hurricane event. The enclosures will require the following construction activity:
  - Demolish the existing security/debris fencing
  - Demolish the metal roofing and purlins and siding, incl all siding and roof purlins
  - Assume three additional structural steel frames matching the existing frames are required.
  - Assume purlins are installed that match the existing purlin size.
  - Assume a 6 inch thick reinforced pre-cast concrete wall panels are placed around the perimeter of the generator units.
  - Assume the roofing system is a standing seam metal roof is supported off a metal deck that is connected to the purlins.
- **C.** Knife Gate Replacement. The existing gates will be demolished and new gates with rollers will be installed. The new gates will require new gate guides, and hoisting equipment. No demolition of the existing gate structure is required. The existing gate sill may need local demolition to allow the sill depression to be filled with concrete. The new gate hoisting equipment will be provided with an enclosure to protect against wind blown debris. Installation of new gate guides and new rolling gates will require a cofferdam system to dewater the area just upstream and downstream of the gate closure structure. The roller gate construction activities will include:
  - Install a steel sheet pile cofferdam both upstream and downstream of the gate closure structure. The cofferdam will tie-into the abutment cells.
  - Remove and dispose of the existing 5 knife gates.
  - Attach new structural steel wide flange gate guides to the existing gate guides.
  - Weld a sill plate in between the new wide flange guides at the concrete sill cap. Plate to be leveled as required to align with bottom of new gates.
  - Place grout under the sill plate and in the existing sill depression.
  - Cap the sill depression with a plate that is welded to the existing metal embedments.
  - Install 5 new rolling gates.
  - Install horizontal channels and plates to form hoisting equipment rack at the top of the new gate guides. The channels and plates shall be attached to the gate guides using bolted connections.
  - Install hoisting equipment for each gate. The hoisting equipment shall be motor driven hydraulic gate operators and be attached to the hoisting equipment rack.
  - Install metal housing around hoisting equipment to protect the equipment from wind blown debris.
  - Make electrical connection between gate operation control box and each gate motor.

- **D.** Removal of Hydraulic Fluid Piping. Demolish existing hydraulic piping. The hydraulic systems are being replaced with electrical direct drive pumps that are operated using diesel fuel. The electrical conduit to operate the pump motors will be placed on the existing hydraulic pipe supports. The existing piping shall be drained, flushed & cleaned prior to offsite removal.
- **E.** Fuel Tank Replacement. Replace single wall fuel storage tanks with double wall storage tanks. The new tanks shall have a 20,000 gallon capacity. The maximum size of the tanks shall be 10.5 feet in diameter and 31 feet long. The existing single-wall tank shall be drained, flushed & cleaned prior to offsite removal.

#### 2.5.4 Alternative 1 - London Avenue ICS Facility Modifications

The London Avenue Canal ICS alternative includes the following requirements based on the deficiency evaluation:

- **A.** Pump and Power Unit Replacement. Replace Phase 1 Pumps and Power Units with a pump that is similar to the Phase 3 pumps, but has a motor at the pump platform and a generator at the engine platform. The existing pump platform and suction basin will remain. The pump platform decking support beams may need to be re-positioned to fit the new pumps. Specific construction activities associated with the replacement are as follows:
  - Remove 12 Phase 1 MWI Hydraulic Pumps (5 located on each side of channel)
  - Remove 12 Phase 1 MWI Hydraulic Pump Power Units (5 located on each side of channel on existing engine platforms)
  - Install 12 new 350 cfs FSI pumps. The new pumps will be similar to the Phase 3 pumps.
  - Install 12 new electric power units.
  - It is assumed the phase 1 pump platforms decking and beam systems may need to be rearranged to accommodate the new pumps.
  - Install butterfly valves on the existing 8-9' diameter steel discharge pipes. The butterfly valves will provide a positive cut-off to prevent water from flowing from the lake surge into the canal in the event that a discharge pipe fails.
- **B.** Engine Platform Enclosure. The engine platforms will be enclosed with a structure that protects the power units from hurricane wind blown debris, from daily weather and to improve the ability to perform maintenance and operation. The enclosure will also protect personnel from wind blown debris and rain during a hurricane event. The enclosures will require the following construction activity:
  - Demolish the existing security/debris fencing
  - Demolish the metal roofing and purlins
  - Assume three additional structural steel frames matching the existing frames are required.
  - Assume purlins are installed that match the existing purlin size.
  - Assume a 12 inch thick reinforced pre-cast concrete wall panels are placed around the perimeter of the generator units.

- Assume the roofing system is a standing seam metal roof is supported off a metal deck that is connected to the purlins.
- **C.** Phase 3 Pump Platform Enclosure. Provide a building around the Phase 3 pump platform to protect the power units from hurricane wind blown debris, from daily weather and to improve the ability to perform maintenance and operation. This enclosure is estimated to be similar to the engine platform enclosures. Specific details of the phase 3 pump platforms were not provided.
- **D.** Knife Gate Replacement. The existing gates will be demolished and new gates with rollers will be installed. The new gates will require new gate guides, and hoisting equipment. No demolition of the existing gate structure is required. The existing gate sill may need local demolition to allow the sill depression to be filled with concrete. The new gate hoisting equipment will be provided with an enclosure to protect against wind blown debris. Installation of new gate guides and new rolling gates will require a cofferdam system to dewater the area just upstream and downstream of the gate closure structure. The roller gate construction activities will include:
  - Install a steel sheet pile cofferdam both upstream and downstream of the gate closure structure. The cofferdam will tie-into the abutment cells.
  - Remove and dispose of the existing 13 knife gates.
  - Attach new structural steel wide flange gate guides to the existing gate guides.
  - Weld a sill plate in between the new wide flange guides at the concrete sill cap. Plate to be leveled as required to align with bottom of new gates.
  - Place grout under the sill plate and in the existing sill depression.
  - Cap the sill depression with a plate that is welded to the existing metal embedments.
  - Install 13 new rolling gates.
  - Install horizontal channels and plates to form hoisting equipment rack at the top of the new gate guides. The channels and plates shall be attached to the gate guides using bolted connections.
  - Install hoisting equipment for each gate. The hoisting equipment shall be motor driven hydraulic gate operators and be attached to the hoisting equipment rack.
  - Install metal housing around hoisting equipment to protect the equipment from wind blown debris.
  - Make electrical connection between gate operation control box and each gate motor.
- **E.** Removal of Hydraulic Fluid Piping. Demolish existing hydraulic piping. The hydraulic systems are being replaced with electrical direct drive pumps that are operated using diesel fuel. The electrical conduit to operate the pump motors will be placed on the existing hydraulic pipe supports. The existing piping shall be drained, flushed & cleaned prior to offsite removal.
  - **F.** Fuel Tank Replacement. Replace single wall fuel storage tanks with double wall storage tanks. The new tanks shall have a 20,000 gallon capacity. The maximum size of

the tanks shall be 10.5 feet in diameter and 31 feet long. The existing single-wall tank shall be drained, flushed & cleaned prior to offsite removal.

#### 2.5.5 Maintenance Facility

Each ICS facility needs a maintenance and storage building. Construction of a common heavy maintenance facility that includes storage space for parts, tools and equipment and maintenance areas (with overhead cranes) would significantly reduce the redundancy of constructing three separate buildings. The 25,000 square foot single story building will be a pre-engineered rigid frame building with a roof deck supporting a standing seam metal roof. The foundation system will include standard shallow footings with a slab on grade working floor level.

#### 2.5.6 Fluid Storage Facility (On-site)

Each ICS facility needs a fluid storage facility. A 2,000 square foot waste oil storage, make up oil storage and maintenance building would be constructed at each ICS facility. This would allow for on-site operation and maintenance support. These buildings would be constructed using similar structural systems as the larger maintenance building.

#### 2.5.7 Corrosion Modifications to ICS Facilities

Corrosion protection at each ICS facility is required to allow the structures to maintain a 50-year life. The corrosion protection recommendations are as follows:

• Atmospheric Zone - Steel structures exposed in the atmospheric zone should be protected against corrosion by application of a protective coating. ICS components that require coating include the: 1) engine platform substructures, 2) hydraulic piping and pipe supports, 3) pump platform substructures, 4) discharge piping supports, 5) discharge piping internal surfaces, 6) non-overflow substructures and 7) gate closure structures.

Acceptable, alternative coating materials and methods of application are listed in Table 9.

Coating System	Number of Coats	DFT (mils)	Surface Preparation
Coal Tar Epoxy	2	16 - 20	Commercial Blast Cleaning (SP6)
Surface Tolerant Epoxy / Urethane	2	6 - 8	High Pressure Water Jetting (SP 12)
Epoxy Mastic (Aluminum Pigmented)	2	12-16	Power Tool Clean (SP 3)

 Table 9 – Atmospheric Zone Coating Materials and Methods

• **Splash Zone** - Steel structures exposed in the splash zone should be protected against corrosion by application of a protective coating. ICS components that require coating

include the: 1) hydraulic piping supports, 2) pump platform substructures, 3) discharge piping supports, 4) non-overflow substructures and 5) gate closure structures.

Acceptable, alternative coating materials and methods of application are listed in Table 10.

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Coating System	Number of Coats	DFT (mils)	Surface Preparation		
Coal Tar Epoxy	2	16 - 20	Commercial Blast Cleaning (SP6)		
Surface Tolerant Epoxy / Surface Tolerant Epoxy	2	10 -12	High Pressure Water Jetting (SP 12)		
Epoxy Mastic (Aluminum Pigmented)	2	12-16	Power Tool Clean (SP 3)		

Table 10 - Splash Zone Coating Materials and Methods

Tidal Zone - Steel structures exposed in the tidal zone should be protected against corrosion by application of a protective coating and impressed current cathodic protection. ICS components that require coating and cathodic protection include the: 1) hydraulic piping supports, 2) pump platform substructures, 3) discharge piping supports, 4) non-overflow substructures and 5) gate closure structures.

Acceptable, alternative coating materials and methods of application are listed in Table 11.

Protective coatings should extend to elevation 3 feet below MLW. To accomplish this, dewatering of the structure on the protected side and flood site will be required.

Coating System	Number of Coats	DFT (mils)	Surface Preparation
Coal Tar Epoxy	2	16 - 20	Near White Metal Blast Cleaning (SP 10)
Surface Tolerant Epoxy / Surface Tolerant Epoxy	2	10 -12	High Pressure Water Jetting (SP 12)
Elastomeric Polyurethane	1	30	Near White Metal Blast Cleaning (SP 10)

 Table 11 - Tidal Zone Coating Materials and Methods

- **Continuously Submerged Zone** Steel structures exposed in the continuously submerged zone should be protected against corrosion by application of an impressed current cathodic protection system. ICS components that require cathodic protection include the: 1) hydraulic piping supports, 2) pump platform substructures, 3) discharge piping supports, 4) non-overflow substructures and 5) gate closure structures.
- Soil Zone Steel structures exposed in the soil zone should be protected against corrosion by application of an impressed current cathodic protection system. ICS

components that require cathodic protection include the: 1) engine platform substructures, 2) hydraulic piping supports, 3) pump platform substructures, 4) discharge piping supports, 5) non-overflow sub structures and 6) gate closure structures.

#### 2.5.8 Electrical Improvements

Lightning protection is recommended for the gate structure, equipment platforms & enclosures, any other proposed structure, or existing structures not otherwise grounded.

Though metal handrails, platforms and supporting members form a contiguous assembly through both welded and bolted connections, the integrity of the later can vary over time due to corrosion. To aid in the protection of facility personnel, it is recommended that additional earthen ground connections be provided through exothermic connections. Additionally, the equipment platform enclose structure and the fabric of the equipment platform security fence should be grounded.

Based on facility visits, the observation and recommendation is to include additional fastening of exterior walkway lighting fixture supports to both horizontal members of the walkway handrails.

Based on the recommendation that motor driven pumps replace the existing hydraulic driven pumps, diesel engine driven generators with associated motor circuit protection and starter will be provided to support each pump motor. Due to the size of the motors, medium voltage (MV) generation, circuit protection, motor starting equipment and circuit cabling has been considered within the costing alternatives.

#### 2.5.9 Communications

It is considered that incremental SCADA (<u>Supervisory Control And Data Acquisition</u>) interface will be required, but the magnitude may be minimal based on the systems present interface with the diesel driven hydraulic assembly as compared to a diesel driven generator with respective circuit protection and starting equipment.

<u>Incremental SCADA</u> modifications to interface with ICS enhancements. Provide for upgrade of SCADA monitoring and control equipment to accommodate transition from a hydraulic driven system to a diesel driven system. Includes installation of conduit, wiring, devices, interface with existing / new equipment and current SCADA monitoring system. Includes SCADA upgrades per pump and to remote motors. Assume existing SCADA system is adequate for all Phase 3 monitoring.

It is considered that incremental SCADA interface will be required, but the magnitude may be minimal based on the systems present interface with the diesel driven hydraulic assembly as compared to a diesel driven generator with respective circuit protection and starting equipment.

#### 3.0 ICS HYDRAULIC CAPACITY

The process of modifying the ICS facilities to allow them to achieve a 50 year design life included an evaluation of the existing pump capacity. The ICS facility gate system will be closed for certain lake surge situations. When the gates close, the pump systems will be used to transfer canal water into Lake Pontchartrain.

The 17<sup>th</sup> Street ICS facility currently has a total of 43 pumps (phase 1, 2 and 3 combined) while the Orleans Avenue ICS facility has 10 total pumps (phase 1) and the London Avenue ICS facility has 20 pumps (phase 1 and 3 combined). These pumps need to match the canal maximum flow capacity of 12500 cfs, 3390 cfs, 8980 cfs for the 17<sup>th</sup> Street, Orleans and London Canals respectively.

The pump capacity of the ICS facilities was determined based on review of model study reports produced in December 2006 and February 2007, and using pump curves acquired from the manufactures for the type of pumps at each facility.

Based on review of this information, the total ICS pump capacity does not achieve the canal flow capacity for normal lake conditions and surcharged lake conditions. Thus, additional pump capacity is required at each ICS facility.

#### 3.1 Existing ICS Facility Pump Capacities

Performance curves for the three pumps were obtained from the pump manufactures. There are 32 pumps manufactured by MWI at the 17<sup>th</sup> Street ICS facility, 10 pumps manufactured by MWI at the Orleans ICS facility and 12 pumps manufactured by MWI at the London Avenue ICS facility. Additionally, there are 11 pumps manufactured by Fairbanks Morse at the 17<sup>th</sup> Street ICS facility and 8 pumps manufactured by Patterson at the London Avenue ICS facility.

A review of the performance curves indicate that the MWI pumps were rated for a maximum head of approximately 16.5 feet. The new Patterson Pumps and Fairbanks Morse Pumps are rated for over 20 feet of head. The exact head ratings are not clear from the data obtained. A note on the MWI curve indicates that the engine furnished is rated 720 horsepower. A review of the MWI performance curves demonstrates that at similar heads that the MWI pumps will overload the 720 horsepower engines.

At 20 feet of head, the MWI units have a brake horsepower requirement of about 720. Allowing for the efficiency of the hydraulic pumps, hydraulic motor, and losses in the hydraulic pipes and hoses, the brake horsepower requirement of the units should be well in excess of the nameplate rating of the engine.

Therefore it is doubtful that the MWI pumps can operate at lake levels resulting from a lake surge. The core requirement for the permanent pumping stations for the enhanced ICS facilities is that they should be able to pump the full canal capacity during a lake surge.

Based on the performance curves obtained from the manufactures, the estimated flow rate of the ICS facilities is indicated in Tables 12, 13, and 14. The pump capacity of each station as currently configured is not capable of matching the required capacity of the canal when the gates are closed. These values are rough estimates based on acquired information and are not based on any hydraulic calculations. Additionally, the supplied performance curves are not specific to the installed pumps. Performance curves for the supplied pumps were not available.

Parameter		17 <sup>t</sup>	<sup>h</sup> Street ICS Fa	cility	
		MWI Pumps	Fairbanks Morse Pumps	Patterson Pumps	
Ч	No. of Pumps	32	11	0	
wit	Capacity (each cfs)	190	350	0	
apacity v o Storm 1rge	Pump Type Total Capacity (cfs)	6,080	3,850	0	
	ICS Total Capacity (cfs)	9,930			
S Z S	Total Canal Capacity (cfs)		12,500		
h	No. of Pumps	32	11	0	
wit rge	Capacity (each cfs)	0	350	0	
apacity v orm Sun	Pump Type Total Capacity (cfs)	0	3,850	0	
	ICS Total Capacity (cfs)	3,850			
S C	Total Canal Capacity (cfs)	12,500			

Table 12 – 17<sup>th</sup> Street ICS Facility Existing Pump Capacity

Table 13 –	<b>Orleans</b> Avent	ie ICS Fac	ility Existing	Pump C	apacity
	Officans mount	ic rep rac	muy L'Aisting	I ump C	apacity

Parameter		Orleans Avenue ICS Facility		
		MWI Pumps	Fairbanks Morse Pumps	Patterson Pumps
Ч	No. of Pumps	10	0	0
wit	Capacity (each cfs)	190	0	0
apacity v o Storm ırge	Pump Type Total Capacity (cfs)	1,900	0	0
	ICS Total Capacity (cfs)	1,900		
S Z C	Total Canal Capacity (cfs)	3,390		
Ч	No. of Pumps	10	0	0
wit rge	Capacity (each cfs)	0	0	0
apacity orm Su	Pump Type Total Capacity (cfs)	0	0	0
	ICS Total Capacity (cfs)	0		
S C	Total Canal Capacity (cfs)	3,390		

Parameter		Lond	on Avenue ICS	Facility	
		MWI Pumps	Fairbanks Morse Pumps	Patterson Pumps	
Ч	No. of Pumps	12	0	8	
wit	Capacity (each cfs)	190	0	350	
apacity v o Storm ırge	Pump Type Total Capacity (cfs)	2,280	0	2,800	
	ICS Total Capacity (cfs)		5,080		
S Z C	Total Canal Capacity (cfs)		8,980		
Ч	No. of Pumps	12	0	8	
wit rge	Capacity (each cfs)	0	0	350	
apacity v torm Sun	Pump Type Total Capacity (cfs)	0	0	0	
	ICS Total Capacity (cfs)		2,800		
S C	Total Canal Capacity (cfs)	8,980			

 Table 14 – London Avenue ICS Facility Existing Pump Capacity

#### 3.2 Modified ICS Facility Pump Capacities

The modified ICS facilities include replacement of the MWI pump systems with new 350 cfs form suction intake pumps. Using the manufacturer acquired pump rating curves, these pumps appear to have the capacity to pump against the potential lake surge near the rated capacity. Review of the pump capacities of the modified plants show that additional pumps need to be added to the 17<sup>th</sup> Street, Orleans Avenue and London Avenue ICS facilities to match the canal flow capacity. The pumps will require additional pump platforms, power units, oil supply lines, controls, and other support items. The additional pumps required to match the canal capacity are developed into pump capacity alternatives.

The pump capacity of each modified ICS facility along with the additional pumps required to meet or exceed the canal flow capacity are documented in Tables 15, 16, and 17.

Parameter		Modified 17 <sup>th</sup> S Facilit	Modified 17 <sup>th</sup> Street ICS Facility		
		Fairbanks Morse Pumps	Patterson	or Exceed	
	No. of Pumps	18	11 11	8	
witl	Capacity (each cfs)	350	350	350	
apacity v o Storm 1rge	Pump Type Total Capacity (cfs)	6,300	3,850	2,800	
	ICS Total Capacity (cfs)	12,950			
S Z C	Total Canal Capacity (cfs)	12,500			
д	No. of Pumps	18	11	8	
wit rge	Capacity (each cfs)	350	350	350	
apacity torm Su	Pump Type Total Capacity (cfs)	6,300	3,850	2,800	
	ICS Total Capacity (cfs)		12,950		
S C	Total Canal Capacity (cfs)	12,500			

# Table 15 – Modified 17<sup>th</sup> Street ICS Facility Pump Capacity With Additional Pump Capacity

# Table 16 – Modified Orleans Avenue ICS Facility Pump Capacity With Additional Pump Capacity

Baramatar		Modified Orlea ICS Fac	Modified Orleans Avenue ICS Facility		
		Fairbanks	Patterson	or Exceed	
		Morse Pumps	Pumps	Canal Capacity	
Ч	No. of Pumps	0	10	2	
wit	Capacity (each cfs)	0	350	350	
acity torm e	Pump Type Total Capacity (cfs)	0	3,500	700	
ap: 0 S	ICS Total Capacity (cfs)	4,200			
ΩZΩ	Total Canal Capacity (cfs)	3,850			
Ч	No. of Pumps	0	10	2	
wit rge	Capacity (each cfs)	0	350	350	
acity m Sur	Pump Type Total Capacity (cfs)	0	3,500	700	
ap	ICS Total Capacity (cfs)	4,200			
S C	Total Canal Capacity (cfs)		3,850		

Parameter		Modified Lond ICS Fac	Modified London Avenue ICS Facility		
		Fairbanks Morse Pumps	Patterson Pumps	or Exceed Canal Capacity	
ų	No. of Pumps	0	20	6	
wit	Capacity (each cfs)	0	350	350	
apacity v o Storm 1rge	Pump Type Total Capacity (cfs)	0	7,000	2,100	
	ICS Total Capacity (cfs)	9,100			
S N S	Total Canal Capacity (cfs)		8,980		
h	No. of Pumps	0	20	6	
wit rge	Capacity (each cfs)	0	350	350	
apacity torm Su	Pump Type Total Capacity (cfs)	0	7,000	2,100	
	ICS Total Capacity (cfs)		9,100		
S	Total Canal Capacity (cfs)	8,980			

 Table 17 – Modified London Avenue ICS Facility Pump Capacity

 With Additional Pump Capacity

#### 3.3 ICS Facility Intake and Discharge Hydraulics

Evaluation of the ICS facility intake and discharge hydraulics is based on comparison to established standards, review of the model studies and information gathered during site inspections.

The standards set up by the Hydraulic Institute provides recommendations for pump intake layout and size. This information is often used to perform initial pump design. As long as significant deviations from the standards are not made, then the designer may assume that the pumps will move water near their rated capacity.

The Hydraulic Institute recommendations provides guidance that accounts for many aspects of pump performance. The guidance accounts for the following:

- Isolate the pumps to prevent pump interference. The inflow to one pump should never have to flow under or past the inlet to a second pump as this causes increased velocity under the second pump.
- Confine the flow to the pump intake by providing a narrow baffled channel to the pump. The channel width should not exceed twice the diameter of the inlet to the pump.
- Provide fillets at the edges of the channel and under the pump to further confine the flow and to prevent underwater vortices from forming.
- Provide a straight length of approach to the pump that is five times the diameter of the inlet to the pump.
- Provide screens at the entrance to the channel where the main flow is at right angles to the channel to reduce the rotation at the entrance of the channel due to the right angle change of direction in the channel.

• Minimize the ratio of cross-flow velocity. The velocity of the main flow should not be greater than 1.5 times the velocity in the pump channel. This helps reduce the tendency to develop rotation in the pump inlet.

The MWI pumps are propeller pumps. Propeller pumps position the pump propeller very close to the pump inlet. Thus, the propeller is sensitive to the inlet flow conditions to the pump. The Hydraulic Institute has set up standards designed to provide uniform flow to the pump and minimize the amount of swirl or rotation of the water under the inlet. Unsteady flow into the impeller can result in un-balanced loading of the propeller with increased vibration, cavitation, reduced flow and shortened pump life. Swirl or rotation under the impeller changes the angle of attach of the propeller which can result in reduced flow and reduced horsepower or increased flow and increased horsepower depending on whether the swirl is in the same direction or opposite direction of the propeller.

If the pumping station does not meet the Hydraulic Institute recommendations for pump intake layout and size, the Hydraulic Institute recommends a physical model test of the pump station be performed. The model test should evaluate the affects the proposed intake and discharge geometry may have on pump performance. Features such as baffling, fillets, flow vanes, etc should be modeled to evaluate their affects on performance.

Physical model tests were performed on the 17<sup>th</sup> Street and London Avenue Pumping Stations. The reports indicated that the modeling was preliminary and the model tests did not completely model the pumping stations as they are actually configured. Sometime after the model testing was initiated, the Phase 3 pumps were provided with Formed Suction Inlets (FSI). Some effort was made to test the effect of the FSI. However, the impact of the FSI units was not modeled beyond the preliminary evaluation.

The report indicated that the performance of the pumping station intakes was un-acceptable. There were strong vortices shown for many of the pump locations. Almost all pump locations had un-acceptable pre-swirl or pre-rotation of the water in the pumps. Both of these conditions will lead to operational problems such as reduced capacity, excessive power draw, excessive vibration, and pre-mature failure of the pumping units.

The report indicated potential fixes such as vertical baffle plates around the pump to straighten the flow and prevent the pre-rotation and a horizontal grating suspended from the platform to break up surface vortices. Preliminary evaluation of the impacts of these fixes was performed; however, a complete evaluation of these fixes was not modeled.

Replacement of the existing phase 1 and phase 2 pumps with form suction intake pumps is recommended. Future physical model testing at the time of the Phase 1 and 2 pump replacement should explore the impact that baffling and screening may have on the performance of the FSI units.

The following observations were made regarding the pumping station intake hydraulics:

• The pumping units installed during the three phases of pump installation had increasing levels of compliance.

- The first set of pumps just hang into the canal with limited baffling or channelization. The 17<sup>th</sup> Street Pumps were provided with baffles behind the pumps and end plates at the ends of the pumping station with no internal baffles. The Orleans and London Avenue ICS facilities have the pumps hanging free into the canal from a platform with no baffles. Based on review of the Hydraulic Institute recommendations and the model studies, this pump configuration will reduce the performance of the pumps. This pump configuration will result in high vibration, low capacity, shortened bearing life, and high pump wear. This inlet layout is unacceptable for the existing pumps. Replacement of the existing pumps with FSI pumps appears to be acceptable. Though a model study of this configuration with the FSI pumps should be performed.
- The 17<sup>th</sup> Street ICS phase 2 pumps are installed in baffled channels. No drawings were available so the dimensions were not checked. There intake to the pumps was not screened. The cross flow velocities may impact the pump performance without the screens. Again, replacement of the existing pumps with FSI pumps appears to be acceptable. Though a model study of this configuration with the FSI pumps should be performed.
- The phase 3 pumps are direct drive pumps with COE Formed Suction Inlet. These inlets provide a special channelization to the pumps, which is intended to address the inlet hydraulic issues. The FSI do not provide protection against high cross flow velocities or the lack of screens. Model testing of the FSI units is recommended.
- The temporary pumps located on the gate closure structure at 17<sup>th</sup> Street will increase the velocity of flow in the canal in front of the other pumps. This will increase the cross flow velocity, which will aggravate the unsteady flow situation.

#### 3.4 Pump Capacity Improvements

The proposed ICS facility modification alternatives presented in Section 3 include the recommendation for replacement of the phase 1 and phase 2 pumps with form suction intake pumps. However, the new FSI pumps along with the existing phase 3 pumps do not allow the ICS facilities to match the maximum flow capacity of the canals. Thus, the following Capacity Improvements are recommended for each ICS facility.

- **A. 17th Street ICS facility Capacity Improvement.** Add an additional 8 FSI pumps with diesel driven power units. The construction activities associated with this improvement includes:
  - Add 8 additional 350 cfs FSI pump units. Assume all 8 pumps are added along the west bank.
  - Add 8 additional diesel driven electric power units.
  - Provide a structural steel pump platform. The platform will be similar to the phase 3 pump platforms. The pumps, and power units will be supported on the platform.
  - Provide an enclosure around the power units.
  - Provide diesel fuel pipe supply lines to the power units.
  - Provide SCADA and control connection to the power units.
- Install two 9' diameter steel discharge pipes. The discharge pipes will be supported on pipe supports similar to the phase 1 pipe supports. The pipes will pass through the cellular cofferdam non-overflow structure.
- A rip-rap scour protection pad will be provided at the discharge pipe outlets. 48" riprap will be placed around the outlets in a 10' radial pattern.
- **B.** Orleans Avenue ICS Facility Capacity Improvement. Add an additional 2 FSI pumps with diesel driven power units. The construction activities associated with this improvement includes:
  - Add 2 additional 350 cfs FSI pump units. Assume all 2 pumps are added along the west bank.
  - Add 2 additional diesel driven electric power units.
  - Provide a structural steel pump platform. The platform will be similar to the phase 3 pump platforms. The pumps, and power units will be supported on the platform.
  - Provide an enclosure around the power units.
  - Provide diesel fuel pipe supply lines to the power units.
  - Provide SCADA and control connection to the power units.
  - Install one 9' diameter steel discharge pipe. The discharge pipe will be supported on pipe supports similar to the phase 1 pipe supports. The pipe will pass through the cellular cofferdam non-overflow structure.
  - A rip-rap scour protection pad will be provided at the discharge pipe outlet. 48" riprap will be placed around the outlet in a 10' radial pattern.
- **C. London Avenue ICS facility Capacity Improvement.** Add an additional 6 FSI pumps with diesel driven power units. The construction activities associated with this improvement includes:
  - Add 6 additional 350 cfs FSI pump units. Assume all 6 pumps are added along the west bank.
  - Add 6 additional diesel driven electric power units.
  - Provide a structural steel pump platform. The platform will be similar to the phase 3 pump platforms. The pumps, and power units will be supported on the platform.
  - Provide an enclosure around the power units.
  - Provide diesel fuel pipe supply lines to the power units.
  - Provide SCADA and control connection to the power units.
  - Install two 9' diameter steel discharge pipes. The discharge pipes will be supported on pipe supports similar to the phase 1 pipe supports. The pipes will pass through the cellular cofferdam non-overflow structure.
  - A rip-rap scour protection pad will be provided at the discharge pipe outlets. 48" riprap will be placed around the outlets in a 10' radial pattern.

#### 4.0 OPERATION AND MAINTEANCE COSTS FOR THE ICS FACILITIES

The scope of work is to determine operations and maintenance costs of the modified ICS, life cycle costs (LCC) over their design life of 50 years, and the capital costs of the modifications required to allow the Interim Closure Structures to function at full required capacity.

The LCC will be added to the initial capital costs for modifying and improving the ICS facilities and thus allow for comparison with the Permanent Pump Station Options previously presented. Therefore, the LCC will be generated using the same basis as the Permanent Pump Station Options. The fundamental O&M consideration in the previous LCC used a factor provided by the New Orleans Sewerage and Water Board (SWB) of \$500,000/1000 cfs as a labor and materials historical O&M factor. This factor remains valid and serves as common point for both the pump stations O&M in the Conceptual Design Report for Permanent Flood Gates and Pump Stations dated July 31, 2006 and for the ICS facilities.

#### 4.1 Operation and Maintenance Staff Requirements

The enhanced ICS facilities will require a full time operation and maintenance staff to perform daily and yearly O&M work. Additional support will be required to accomplish major maintenance activities due to the facility condition and configuration. This additional support operations and maintenance staff is above and beyond that required for a typical permanent facility. The added staff required is indicated below:

**Operations Staff:** 

- Operation and Maintenance Chief (over all three facilities)
- Three Operators (one per facility)

Maintenance Staff:

- Operation and Maintenance Chief (see above)
- Electrical Foreman (over all three facilities)
- Mechanical Foreman (over all three facilities)
- Three Electrical Trade Laborers
- Three Mechanical Trade Laborers

### 4.2 Specific Operation and Maintenance Requirements

Specific operation and maintenance requirements typical for facilities of this type would include the following:

- The pumps have grease lubricators. Typically these require daily inspection while operating and charging with grease every five days of operation. Inspection and topping off engine fluid levels during the lubrication process is required. Operation and charging with grease occurs quarterly during every year.
- Engines will require an oil change and new oil filters once every year.

- Flush engine radiators after every other oil change (two year).
- Pumps will be pulled for inspection every ten years.
- Check and adjust propeller clearance every five years.
- The form suction intake pumps are susceptible to biological growth. Pumps should be run every two to four weeks to dislodge the growth.
- The engines will require a top end overhaul every 20,000 hours of operation. This will occur once (at the 20th year) during the 50 year design life of the facility.
- The engines will require a full overhaul every 40,000 hours of operation. Assume that this will occur once (at the 40th year) during the 50 year design life of the facility. Truck mounted cranes will remove the engines and place them on flatbed trucks.
- The motors (gear box) will require an oil change every five years. Work will be accomplished on the pump platforms.
- The motors (electric) will require cleaning and inspection every 10 years.
- Pumps (Patterson and Fairbanks) should last the full 50 year design life of the facility. Pumps are pulled for a re-build once (at the 25th year) during the design life of the facility.
- Replace accessory equipment, oil pump, fuel pumps, battery chargers, jacket water heaters, flexible connectors, radiators and related parts every 10 years.
- Inspect and clean engines every ten years.
- Clean and flush fuel oil storage tanks and piping annually.
- Operate the rolling gates annually. The operation of the gates will include an evaluation of the gate hoisting system as well.
- Operate the discharge pipe butterfly valves annually.
- Daily inspection and lubrication of rotating equipment during operation.

#### 4.2.1 Pump & Engine Maintenance Rationale

Historically these pump installations have operated in the range of 150 to 320 hours per year. Following discussions with pump and engine manufacturer representatives it was determined due to this limited run time complete pump and engine overhauls would be estimated to occur once in the life cycle, roughly at the 25<sup>th</sup> year. A Morrison Pump manufacturer representative recommended to budget 20 percent of the new pump cost for a complete rebuild. Engine O&M costs were provided for routine consumable materials, as well as one complete overhaul, by a local Caterpillar representative, Louisiana Machinery Inc.

#### 4.3 Operation and Maintenance Costs

To identify and quantify the O&M issues, Table 18 provides categorization of O&M functions into groups that indicate the relative degree of O&M effort required for the enhanced ICSs as compared to the permanent pump stations in the Conceptual Design Report for Permanent Flood Gates and Pump Stations dated July 31, 2006. A three tier rating system is employed against these categories to facilitate this comparison. New pump stations similar to the ones described in

the Conceptual Design Report are considered the Baseline (B) and form the benchmark for determining the relative O&M required as described below:

- B- Indicates that modified ICS facility will require substantially less O&M funds for the O&M category than baseline
- B Indicates that modified ICS facility will require similar O&M funds for the O&M category to baseline
- B+ Indicates that modified ICS facility will require substantially less O&M funds for the O&M category than baseline

#### 4.3.1 Operation and Maintenance Cost Rationale.

Calculations utilized to prepare the LCC analysis are being prepared in accordance with Department of the Army Engineering Technical Letter ETL 1110-2-361. This letter, titled Engineering and Design Life Cycle Design and Performance of Structures for Local Flood Protection, presents the following formula for determining life cycle costs; PV = C (IIF)<sup>n</sup>. Where PV is the present value, C is the current cost of the work, IIF is the inflation interest factor, and n is the number of years. This method seems especially appropriate for life cycle evaluations of infrastructure for flood protection structures which have a long life expectancy and a need for continuous high reliability. IIF is a single parameter which combines the effects of inflation and discounting over long periods of time. This factor of 0.98 represents historic discount rates 2 percent higher than inflation rates.

In addition, the following criteria were used to develop the various costs:

- Electrical energy costs were calculated at \$.03024 per kWh
- Functional life of the ICS 50 years.
- Costs of labor are adjusted to reflect "area cost factor" based on Davis-Bacon wage rates as applied to the Jefferson Parrish, Louisiana. Labor costs include base rates and fringes.

O&M Category	Rating	Notes
Labor - Operations	B+	See description in section below for
		rating rationale
Labor - Maintenance	B+	See description in section below for
		rating rationale
Structural – includes non-overflow	В	The modifications included in the capital
section, platforms, gates and		cost increase longevity of modified ICS
buildings		to 50 years without significant O&M.
Canals/Floodwalls including	В	The corrosion protection modifications
transitions		included in the capital cost increase
		longevity of modified ICS to 50 years.
Mechanical including HVAC,	В	The modifications included in the capital
piping, and fuel farm		cost increase longevity of modified ICS
		to 50 years without significant O&M.
Electrical including generators,	В	The modifications included in the capital
distribution, and communications		cost increase longevity of modified ICS
		to 50 years without significant O&M.
Pumping including pumps, drives,	B+	See description in section below for
and ancillary equipment		rating rationale
Corrosion Protection including all	B+	See description in section below for
metallic surfaces on site		rating rationale

# Table 18 – O&M Comparison - ICS Facilities & Permanent Pump Stations

#### 4.3.2 Additional Operation and Maintenance Labor Costs.

The staffing requirements are included in the O&M cost analysis. Periodic metal surface preparation, painting, and coating is anticipated to be subcontracted. Thus, additional maintenance staff for these activities has not been considered.

#### 4.3.3 Additional Pumping Unit Costs.

Modified ICS facilities will require additional pumps, pump platforms, power units, oil supply lines, controls, and other support items. These costs are reflected in the cost analysis. In addition to the material costs of the items above, additional energy costs, losses in efficiencies, costs of consumables, and inventories were considered in the lifecycle calculations.

#### 4.3.4 Corrosion Protection Costs.

Steel components of the ICS structures, subject to corrosion, are required to be protected from corrosion to reduce repair and/or replacement costs and maximize life cycle. Various solutions to mitigate corrosion have been estimated and included in the lifetime cycle cost estimate. Mitigation solutions costs include: coal tar epoxy, surface tolerant epoxies, epoxy mastics,

polyurethane coating materials and impressed current cathodic protection systems. In addition to the initial capital costs, periodic inspections, re-applications, energy costs and lifecycle replacements of sacrificial anodes were considered. This periodic metal surface preparation, painting, and coating activities are anticipated to be subcontracted. Thus, additional maintenance staff for these activities has not been considered.

#### 5. COST ESTIMATE

The basis of cost estimate is intended to reflect level of concept development for the designated enhancements of Interim Control Structures (ICS) located in the 17<sup>th</sup> Street, Orleans Avenue and London Avenue Canals near the confluence with Lake Pontchartrain. These enhancements are applied to extend the present 5-yr life of the ICS to a 50-yr life. Table 19 provides the summary estimated capitol costs for each ICS facility. Table 20 provides the summary of the estimated life cycle costs for each ICS facility. Refer to Appendix E for the cost evaluation documentation.

Application of design and construction contingencies within the evaluation addresses the issues of uncertainties relating to the current level of understanding within this reconnaissance level study. The breakdown description of task items describes the various significant components to which costs are applied.

Quantities associated with material reflect the level of conceptual development defined in this report. Cost of materials is based on application of typical and usual materials applied to an RCC dam project as described in this Study. Costs of various tasks reflect the level of magnitude of concept development. The cost evaluation is developed basis on the level of understanding and uncertainty as described in the Study, and is within the parameters of inclusions, limitations and exclusions as defined within the report.

The cost evaluation develops separate construction costs for ICS enhancements in the 17<sup>th</sup> Street, Orleans Avenue and London Avenue Canals. Additionally, estimated costs are provided for a common *Maintenance Facility* intended to support maintenance, parts, and records storage. The estimate reflects costs for *Capacity Improvements* associated with report recommendations to provide additional new pumps, associated platforms, and appurtenances to increase pumping capacity at each canal. *Capacity Improvements* construction costs are provided separate from the primary ICS enhancement construction costs. These summary costs are considered of a rough-order-of-magnitude in nature, and are not intended to be interpreted as definitive construction costs, nor are recommended to be utilized for budgetary purposes.

	Permanent Enhancements of ICS					
Facility	ICS Enhancement Costs	Maint. Facility Costs	Capacity improvement Costs	TOTALS		
A. 17th STREET CANAL	\$ 125,039,826	Х	\$ 56,188,253	\$ 181,228,079		
B. ORLEANS AVE. CANAL	\$ 68,487,729	Х	\$ 15,015,699	\$ 83,503,428		
C. LONDON AVE. CANAL	\$ 82,598,997	Х	\$ 42,903,197	\$ 125,502,194		
D. MAINTENANCE FACILITY	X	\$ 41,556,365	X	\$ 41,556,365		
TOTALS =	\$276,126,552	\$ 41,556,365	\$ 114,107,149	\$ 431,790,066		

#### Table 19 – Cost Estimate for Enhanced ICS Facilities

	Life Cycle Costs for Permanent Enhancements of ICS					
Facility	Initial Capitol Costs (\$)	50 Year LCC Operating	50 Year LCC Maintenance	Historic O&M Costs from S&WB	Total Life Cycle Costs	
A. 17th STREET CANAL	\$ 181,228,079	\$ 8,765,499	\$ 14,180,752	\$ 6,475,000	\$ 231,150,470	
B. ORLEANS AVE. CANAL	\$ 83,503,428	\$ 7,747,030	\$ 10,190,011	\$ 4,550,000	\$ 162,395,443	
C. LONDON AVE. CANAL	\$ 125,502,194	\$ 6,450,798	\$ 5,354,002	\$ 2,100,000	\$ 104,057,245	
TOTALS =	\$ 431,790,066	\$ 22,963,327	\$ 29,724,765	\$ 13,125,000	\$ 497,603,158	

# Table 20 – Life Cycle Cost for Enhanced ICS Facilities

Appendix A

# Gate Closure Monoliths

Each closure structure monolith consists of upstream and downstream soil improvements, erosion protection, abutments, soil improvements, deep soil foundations, steel framing and gates. The specific details for each gate closure monolith are discussed in this appendix.

# 17<sup>th</sup> Street Gate Closure Monolith includes:

The 17<sup>th</sup> Street Gate Closure Monolith can be defined by the following features:

- Abutments
- Upstream and Downstream Erosion Protection
- Closure Monolith Substructure
- Closure Monolith Superstructure
- Bulkheads

Figure 1 shows the overall gate monolith site plan. The existing system appears to be well detailed to prevent erosion damage caused by scouring or head cutting in the canal. The structures are well connected and the foundation systems are robust. The foundation depth appears to be acceptable for these types of structures in the New Orleans area. The major features of the gate closure monolith are indicated.

The left and right abutments of the gate closure structures consist of PZ-35 sheet piles with a top elevation of +16.0 and a tip elev. Of -64.0 feet. The piles are arranged in a rectangular form that measures 27'-5 5/8" by 55'-2 <sup>3</sup>/4" and 28'-9 <sup>3</sup>/4" by 55'-2 <sup>3</sup>/4". Two 9' diameter discharge pipes pass through the abutments at elevation +3.000. The pipes are supported on a 4' thick reinforced concrete slab that rests on 28-30" diameter steel pipe piles. The pipe piles have a tip elevation of -122.0'. The cofferdam is filled with granular fill from existing grade (varies from -5 to +0) and capped with a 1' thick reinforced concrete cap. Figure 2 shows the abutment features.

The left and right abutments of the gate closure structures consist of PZ-35 sheet piles with a top elevation of +16.0 and a tip elevation of -64.0 feet. The piles are arranged in a rectangular form that measures 27'-55/8" by  $55'-2^{3}4"$  and  $28'-9^{3}4"$  by  $55'-2^{3}4"$ . Two 9' diameter discharge pipes pass through the abutments at elevation +3.000. The pipes are supported on a 4' thick reinforced concrete slab that rests on 28-30" diameter steel pipe piles. The pipe piles have a tip elevation of -122.0'. The cofferdam is filled with granular fill from existing grade (varies from -5 to +0) and capped with a 1' thick reinforced concrete cap.

There is a 200 foot riprap pad upstream and downstream of the gate closure monolith. The soil below the 3' thick riprap pad was improved using soil mixing techniques down to elevation -70.0'. The soil mixing was to achieve 1000 psf cohesion at 28 days. The soil mixing pattern on the upstream or canal side of the gate closure monolith forms a "U" shape that follows the existing canal I-walls that form the canal banks and the gate closure monolith with the open end of the "U" towards the canal. The legs and base of

the "U" are 50 feet wide and the legs of the "U" extend to the downstream end of the riprap. Downstream or on the Lake Side of the gate closure monolith the soil mixing pattern forms an "L" shape that is ~ 50' wide against the closure monolith and 75' wide along the east canal bank. The legs of the "L" are located along the gate closure monolith and the east bank line along the existing I-wall that forms the canal banks. The soil mixing along the canal I-wall extends downstream to a pipe outfall structure which is short of the end of the riprap pad.



Figure 1 - 17<sup>th</sup> Street ICS Phase 1 Gate Closure Monolith Site Plan



Figure 2 - 17<sup>th</sup> Street ICS Phase 1 Gate Closure Monolith Plan

The gate closure monolith substructure includes a jacket structure that is comprised of sheet pile (PZ-36 sheets) with a top elevation of -10.0' and a tip elevation of -64.0'. Figure 3 shows the jacket structure and interior pipe piles supporting a concrete slab and the superstructure. The jacket structure sheet piles extend across the canal in line with the upstream and downstream face of the abutments. The interior of the jacket structure is filled with 161-30'' diameter steel pipe piles with a top elevation of -14.0' and a tip elevation of -106.0'. The pipe piles support an 8' thick reinforced concrete cap that has a top elevation of -10.0'.

The gate closure monolith super structure is comprised of steel frames made from 30" diameter steel pipe piles that are welded together. Details of the superstructure are shown in Figure 4. The pipe pile frames support a 4" galvanized steel grating that forms the downstream decking for the gate closure monolith. The decking is located at elevation +14.33'. There are 11 bulkheads that can be lowered to separate the canal from Lake Pontchartrain. The support structure for the bulkheads consists of 30" diameter pipe piles that support the bulkhead guides and bulkheads. W21x101 steel beams are used as the guides. The bulkhead guides are embedded in the substructure concrete slab at elevation -10.0' and extend up to elevation +29.0 feet. The guides are tied back to the pipe pile frames with W24x68 lateral support beams.

The bulkhead leafs consist of structural steel plates and W15x49.5 steel shapes that are welded together to support a  $\frac{1}{2}$  inch skin plate. The skin plate is located on the upstream side of the bulkheads. The bulkheads do not have wheels and can be lowered through static water.



Figure 3 - 17<sup>th</sup> Street Phase 1 Gate Closure Monolith Substructure



Figure 4 - 17<sup>th</sup> Street Phase 1 Gate Closure Monolith Superstructure

The riprap protection extends upstream and downstream of the gate seal approximately 300 feet. 36" riprap is placed to elevation -8.0 feet and extends up the channel banks to elevation +5.0 feet. Figures 3, 4, and 5 show general plans and sections of the riprap protection area. 48" riprap is located at the pipe discharge outlet as shown in figure 6.



Figure 3 – Orleans Avenues Phase 1 ICS Riprap Details



Figure 4 – Orleans Avenue Phase 1 Gate Closure Monolith Riprap Pad Detail

#### The Orleans Avenue Gate Closure Monolith:

The Orleans Avenue Gate Closure Monolith can be defined by the following features:

- Upstream and Downstream Erosion Protection
- Closure Monolith Substructure
- Closure Monolith Superstructure
- Bulkheads

Figure 1 shows the overall gate monolith site plan. The existing system appears to be well detailed to prevent erosion damage caused by scouring or head cutting in the canal. The non-overflow section performs the abutments of the closure structure monolith and thus acts to prevent scour and head cutting around the closure structure. The foundation depth appears to be acceptable for these types of structures in the New Orleans area. The major features of the gate closure monolith are indicated.



Figure 1 – Orleans Avenue Phase 1 ICS Gate Closure Monolith Layout

The major elements of the Orleans Avenue Gate Closure Monolith substructure consists of soil improvements using deep soil mixing, riprap erosion protection, gate seal and the gate monolith superstructure. Improvement of the foundation soils using soil mixing was performed upstream and downstream of the gate seal. Details of the soil mixing program are shown in Figure 2. Generally, the soil mixing improved the soils directly in the channel bottom for a distance of 50 feet upstream and downstream of the gate seal with a tip elevation of -50.0'. The top elevation of the soil mixing system is -11.0 feet.



Figure 2 – Orleans Avenue Phase 1 Gate Closure Monolith Soil Mixing Details



Figure 5 – Orleans Avenues Phase 1 Discharge Pipe Scour Pad

The gate closure monolith substructure consists of 18-24" diameter steel pip piles with a tip elevation of -112.0 feet and extend up to elevation +13.0 feet. Concrete is placed in the pipe piles from elevation -60.0 feet to elevation +13.0 feet. The gate superstructure was constructed by placing a 30" diameter steel pipe pile over the 24" pipe piles from elevation -10.0 feet up to elevation +13.0 feet. The annular space between the pipe piles is filled with grout. Pile shear connectors are used to connect the 24" and 30" piles. 18" and 10" structural steel pile are welded to the 30" steel pipe piles to form a structural frame that supports the closure gate platform. The platform consists of galvanized steel grating that is supported by W16x50 and W14x90 steel beams connected to the pipe frames. The bulkhead guides are fabricated from W21 steel members that are supported off of the pipe frames by W36x150 steel beams and embedded into the gate seal 7 feet (tip elevation -15.0 feet). Figures 6 and 7 show details of the substructure and superstructure.

The gate seal is located downstream of the gate closure monolith superstructure. The gate seal acts to prevent head cutting and to provide a seal for the bulkheads. Two lines of PZ 27 sheet pile are driven into the soil and extend between the left and right non-overflow monoliths. The sheet pile have a top elevation of -8.0 feet and a tip elevation of

-50.0 feet. An 8 foot thick reinforced concrete cap is placed at the top of the gate seal. Studs from the sheet pile tie into the concrete cap. Figures 7 and 8 show the gate seal location and details.

The bulkhead leafs consist of structural steel plates and WT15x45 steel shapes that are welded together to support a  $\frac{1}{2}$  inch skin plate. The skin plate is located on the upstream side of the bulkheads. The bulkheads do not have wheels and can be lowered through static water.



Figure 6 – Orleans Avenue Phase 1 Gate Closure Monolith Superstructure Plan



Figure 7 – Orleans Avenue Phase 1 Gate Closure Monolith Substructure and Superstructure



Figure 8 – Orleans Avenue Phase 1 Gate Seal Detail

#### The London Avenue Gate Closure Monolith:

The London Avenue Gate Closure Monolith can be defined by the following features:

- Upstream and Downstream Erosion Protection
- Closure Monolith Substructure
- Closure Monolith Superstructure
- Bulkheads

Figure 1 shows the overall gate monolith site plan. The existing system appears to be well detailed to prevent erosion damage caused by scouring or head cutting in the canal. The non-overflow section are the abutments of the closure structure monolith and thus act to prevent scour and head cutting around the closure structure. The foundation depth appears to be acceptable for these types of structures in the New Orleans area. The major features of the gate closure monolith are indicated.



Figure 1 – London Avenue Phase 1 ICS Gate Closure Monolith Plan

The major elements of the London Avenue Gate Closure Monolith substructure consists of riprap erosion protection, gate seal and the gate monolith superstructure. The riprap erosion protection area extends upstream and downstream of the gate seal approximately 300 feet. The 36" riprap is placed with a bottom elevation of -11.0 feet and a top finished elevation of -8.0 feet. The riprap extends up to elevation +5.0 along the canal banks

through the riprap protection area. 48" riprap is placed under the discharge pipe outfall to provided additional scour protection. Figure 2 shows the riprap details at the gate closure monolith.



Figure 2 – London Avenue Phase 1 Riprap Protection Pad Detail

The gate closure monolith substructure consists of 42-24" diameter steel pip piles with a tip elevation of -110.0 feet and extend up to elevation +13.0 feet. Concrete is placed in the pipe piles from elevation ~ -20.0 feet to elevation +13.0 feet. The gate superstructure was constructed by placing a 30" diameter steel pipe pile over the 24" pipe piles from elevation -10.0 feet up to elevation +13.0 feet. The annular space between the pipe piles is filled with grout. Pile shear connectors are used to connect the 24" and 30" piles. 18" and 10" structural steel pile are welded to the 30" steel pipe piles to form a structural frame that supports the closure gate platform. The platform consists of galvanized steel grating that is supported by W16x50 and W14x50 steel beams connected to the pipe frames. The bulkhead guides are fabricated from W18 steel members that are supported off of the pipe frames by W36x150 steel beams and embedded into the gate seal 24 feet (tip elevation -30.0 feet). Figures 3, 4 and 5 show details of the substructure and superstructure.

The gate seal is located downstream of the gate closure monolith superstructure. The gate seal acts to prevent head cutting and to provide a seal for the bulkheads. Two lines of PZ 27 sheet pile are driven into the soil and extend between the left and right non-overflow monoliths. The sheet pile have a top elevation of -8.0 feet and a tip elevation of -68.0 feet. An 8 foot thick reinforced concrete cap is placed at the top of the gate seal. Studs from the sheet pile tie into the concrete cap. Figures 6 and 7 show the gate seal location and details.

The bulkhead leafs consist of structural steel plates and WT15x45 steel shapes that are welded together to support a  $\frac{1}{2}$  inch skin plate. The skin plate is located on the upstream

side of the bulkheads. The bulkheads do not have wheels and can be lowered through static water.



Figure 3 – London Avenue Phase 1 Superstructure Partial Plan



Figure 4 – London Avenue Phase 1 Gate Closure Monolith Decking Partial Plan







Figure 6 – London Avenue Phase 1 Gate Sill Cap Partial Plan



Figure 7 - London Avenue Phase 1 Gate Sill Cap Detail

Appendix B Types of Facility Installations (By Phases) There are three pump installation phases. During each phase pumps were added to specific ICS facilities to increase the overall pumping capacity. The pump installation phase includes a significant amount of foundation, substructure and superstructure construction. The type of facility installed during each phases is described below.

#### **Phase 1 Pump Installation.**

The phase 1 pump installation included installation of pumps, power units, pump platform foundation substructure, suction basins, pump platform superstructure and discharge piping. Table 1 provides a summary of the number of pumps, pump types and power unit locations for each ICS Facility.

Parameter		ICS Facility				
		17 <sup>th</sup> Street	<b>Orleans Ave</b>	London Ave		
	Number of Pumps	12	10	12		
hase 1	Pump Type	MWI	MWI	MWI		
	Power Unit Location	Safe House	Safe House	Safe House		
Ρ		Platforms	Platforms	Platforms		
hase 2	Number of Pumps	6	NA	NA		
	Pump Type	MWI	NA	NA		
	Power Unit Location	Pump Platform	NA	NA		
_ <b>d</b>						
	Number of Pumps	12/14	NA	12		
ie 3	Pump Type	Fairbanks	NA	Patterson		
		Morse/MWI				
	Power Unit Location	Pump	NA	Pump		
has		Platform/Gate		Platform		
P		<b>Closure Platform</b>				

#### Table 1 – Pump Systems at Each ICS Facility (Same as Table 3 from Main Report)

# 17<sup>th</sup> Street ICS Facility Pump Systems.

The 17<sup>th</sup> Street Phase 1 Pump Facilities includes 12 MWI pumps, 12 power units, two pump platforms, two safe house platforms, suction basins, and discharge piping. Figure 1 shows the overall plan of the 17<sup>th</sup> Street ICS facility layout.

There are no specific foundation soil improvements that were performed at the ICS facilities for the pump installation. The foundation substructure includes H-pile and sheet pile installation. This pile system supports a concrete slab and forms the suction basin for each pump.

The  $17^{\text{th}}$  Street pump intakes are located at elevation -6.0 feet. This is just above top of the suction basin which is at elevation -9.0. The  $17^{\text{th}}$  Street ICS phase 1 pump platform foundation substructure includes 36-HP14x73 piles with a tip elevation of -100.00 feet. PZ 36, 27, and 22 sheet pile was installed to form the perimeter of the suction basin and to separate each basin. However, the sheet pile is cutoff at elevation -9.0 feet which coincides with the top elevation of the suction basin concrete slab. The sheet pile is -50.0 around the suction basin. The suction basin reinforced concrete slab is 14" thick. The pump platform superstructure is comprised of structural steel W shapes and channels that are attached to the HP piles. The structural steel shapes for the support structure for  $1 \frac{1}{2}$ " ( $1 \frac{1}{2}$ " x 3/16" bearing bar) galvanized steel grating and the pumps. The top of steel elevation of the pump platforms is elevation +9.5 feet. Figures 2 through 5 show details of the pump platforms.

The Phase 1 pumps discharge into 9' diameter steel pipes. Three pumps discharge into one 9' discharge pipe. Figures 3 and 4 show the discharge pipe manifold system at the pump platforms. The discharge pipes pass through the gate closure monolith abutments (two through each abutment). The discharge pipe outlets are located just downstream of the gate closure monolith. Figures 6 and 7 show the layout of the discharge pipe outlets. There are an additional 28-HP14x73 piles with a tip elevation of -100.00 supporting the discharge pipes. Structural steel shapes are attached to the piles to form the pile bents, see Figure 8 for a typical pipe support detail at the pump platforms.

The phase 1 pump power units are located on the engine platforms located on each bank. Each engine platform houses a 20,000 gallon single wall fuel tank that is 10.5 feet in diameter and 31 feet long. The other end of the engine platform houses a 4 room safe house that includes a storage area, operator's room, control room and restroom. The pump power units are located in between the fuel tank and safe house. There are 6 power units on each engine platform. Figures 9 through 14 show the various details of the engine platform.

The engine platform is a reinforced concrete slab that is 1'-4" thick and supported by 66-14" diameter concrete piles with a tip elevation of -72.0 feet. The engine platform is protected by a pre-engineered rigid frame building. A security/debris fence is placed around the perimeter of the platform.



Figure 1 – 17<sup>th</sup> Street ICS Facility Site Plan



**Figure 2 – 17<sup>th</sup> Street Pump Platform Foundation** 



**Figure 3 – 17<sup>th</sup> Street Pump Platform Superstructure** 



Figure 4 – 17<sup>th</sup> Street Pump Platform Elevation



Figure 6 – 17<sup>th</sup> Street Discharge Pipe Layout West Bank





Figure 8 – 17<sup>th</sup> Street Phase 1 Discharge Pipe Support at Pump Platform



Figure 10 – 17<sup>th</sup> Street West Engineer Phase 1 Platform Plan




Figure 13 – 17<sup>th</sup> Street West Engine Platform Fuel Oil Storage Area



Figure 14 – 17<sup>th</sup> Street West Phase 1 Engine Platform Safe House Plan

## **Orleans Avenue ICS Facility Pump Systems.**

The Orleans Avenue Phase 1 Pump Facilities includes 10 MWI pumps, 10 power units, two pump platforms, two safe house platforms, suction basins, and discharge piping. Figure 1 shows the overall plan of the Orleans Avenue ICS Pump Facilities.

There are no specific foundation soil improvements that were performed at the ICS facilities for the pump installation. The foundation substructure includes H-pile and sheet pile installation. This pile system supports a concrete slab and forms the suction basin for each pump.

The Orleans Avenue pump intakes are located at elevation -5.0 feet. This is just above top of the suction basin which is at elevation -8.0. The Orleans ICS phase 1 pump platform foundation substructure includes 24-HP14x73 piles with a tip elevation of -70.0 feet. PZ 27 and PZ 22 sheet piling is installed to form the perimeter of the suction basin. The top of the sheet pile is at elevation -8.0 which coincides with the top of the suction basin concrete slab. There appears to be a few locations where the top of the PZ 27 sheets extends up to elevation -5.0 to meet existing grade. The sheet pile tip elevation is -50.0 feet.

The suction basin reinforced concrete slab is 36" thick. The pump platform superstructure is comprised of structural steel W shapes and channels that are attached to the HP piles. The structural steel shapes support Borden RW-18A galvanized steel grating and the pumps. The top of steel elevation of the pump platforms is elevation +10.0 feet. Figures 2 through 4 show details of the pump platforms.

The phase 1 pumps discharge into 9' diameter steel pipes. Three pumps discharge into one 9' discharge pipe and the remaining two pipes discharge into the second 9' discharge pipe (similar for each side of the canal). Figures 2 and 3 show the discharge pipe manifold system at the pump platforms. The discharge pipes pass through the non-overflow cofferdam cells (two through the left non-overflow and two through the right non-overflow). The discharge pipe outlets are located just downstream of the gate closure monolith. Figures 2 and 3 show the layout of the discharge pipe outlets. There are an additional 48-HP14x73 piles with a tip elevation of -65.0 supporting the discharge pipes. Structural steel shapes are attached to the piles to form the pile bents, see Figures 4 and 5 for a typical discharge pipe support details.

The phase 1 pump power units are located on the engine platforms located on each bank. Each engine platform houses a 20,000 gallon single wall fuel tank that is 10.5 feet in diameter and 31 feet long. A 4 room safe house that includes a storage area, operator's room, control room and restroom is located on the same end of the platform. There are 5 power units on each engine platform located on under a pre-engineered rigid steel frame building. A security/debris fence is placed around the power units. The engine platform is a reinforced concrete slab that is 1'-4" thick and supported by 68-H14x73 piles with a tip elevation of -65.0 feet. Figures 6 through 10 show the various details of the engine platform.



Figure 1 – Orleans Avenue ICS Facility Phase 1 Site Plan



Figure 2 – Orleans Avenue West Bank Pump Platform and Discharge Pipe Location



Figure 3 – Orleans Avenue West Bank Pump Platform and Discharge Pipe Section



Figure 4 – Orleans Avenue Phase 1 Pump Platform Structural Section



Figure 5 – Orleans Avenue Phase 1 Discharge Pipe Support Section



Figure 6 – Orleans Avenue Typical Phase 1 Engine Platform Plan



Figure 7 – Orleans Avenue Typical Phase 1 Engine Platform Pile Layout



Figure 8 – Orleans Avenue Phase 1 Engine Platform End Elevation



Figure 9 – Orleans Avenue Phase 1 Engine Platform Cross-Section



Figure 10 – Orleans Avenue Storage Tank and Safe House Cross Section

## London Avenue ICS Facility Pump Systems.

The London Avenue Phase 1 Pump Facilities includes 12 MWI pumps, 12 power units, two pump platforms, two safe house platforms, suction basins, and discharge piping. Figure 1 and 2 shows the overall plan of the London Avenue ICS Pump Facilities.

There are no specific foundation soil improvements that were performed at the ICS facilities for the pump installation. The foundation substructure includes H-pile and sheet pile installation. This pile system supports a concrete slab and forms the suction basin for each pump.

The London Avenue pump intakes are located at elevation -5.0 feet. This is just above top of the suction basin which is at elevation -8.0. The London ICS phase 1 pump platform foundation substructure includes 24-HP14x73 piles with a tip elevation of -70.0 feet. PZ 27 and PZ 22 sheet piling is installed to form the perimeter of the suction basin. The top of the sheet pile is at elevation -8.0 which coincides with the top of the suction basin concrete slab. There appears to be a few locations where the top of the PZ 27 sheets extends up to elevation -2.0 to meet existing grade. The PZ 27 sheet pile tip elevation is -68.0 feet and the PZ 22 sheet pile tip elevation is - 30.0 feet.

The suction basin reinforced concrete slab is 24" thick. The pump platform superstructure is comprised of structural steel W shapes and channels that are attached to the HP piles. The structural steel shapes support Borden RW-18A galvanized steel grating and the pumps. The top of steel elevation of the pump platforms is elevation +10.0 feet. Figures 3 and 4 show details of the pump platforms.

The Phase 1 pumps discharge into 9' diameter steel pipes. Three pumps discharge into one 9' discharge pipe (similar for each side of the canal). Figures 1, 2 and 3 show the discharge pipe manifold system at the pump platforms. The discharge pipes pass through the non-overflow cofferdam cells (two through the left non-overflow and two through the right non-overflow). The discharge pipe outlets are located just downstream of the gate closure monolith. Figures 1, 2 and 3 show the layout of the discharge pipe outlets. There are an additional 60-HP14x73 piles with a tip elevation of -65.0 supporting the discharge pipes. Structural steel shapes are attached to the piles to form the pile bents, see Figure 4 for a typical discharge pipe support detail.

The phase 1 pump power units are located on the engine platforms located on each bank. Each engine platform houses a 20,000 gallon single wall fuel tank that is 10.5 feet in diameter and 31 feet long. A 4 room safe house that includes a storage area, operator's room, control room and restroom is located on the same end of the platform. There are 6 power units on each engine platform located on under a pre-engineered rigid steel frame building. A security/debris fence is placed around the power units. The engine platform is a reinforced concrete slab that is 1'-4" thick and supported by 78-H14x73 piles with a tip elevation of -68.0 feet. Figures 5 through 9 show the various details of the engine platform.



Figure 1 – London Avenue East Bank Pump Facility Site plan



Figure 2 – London Avenue West Bank Pump Facility Site plan



**Figure 3 – London Avenue Pipe Discharge Section** 



**Figure 4 – London Avenue Pump Platform and Hydraulic Fluid Piping Support** 



Figure 5 – London Avenue Phase 1 Engine Platform Typical Plan



Figure 6 – London Avenue Phase 1 Engine Platform Pile Plan



Figure 8 – London Avenue Engine Platform Typical Section



Figure 9 – London Avenue Phase 1 Fuel Tank and Safe House Typical Section

Appendix C Corrosion Protection

# **BLACK & VEATCH CORPORATION**

# TECHNICAL MEMORANDUM Corrosion Assessment

U.S. Army Engineer District, New Orleans Corps of Engineers 17th Street, Orleans Avenue and London Avenue Canals Interim Closure Structures (ICS) B&V Project 041669 B&V File: June 2007



Seal

To:

- From: Mike Boehler, PE Project Manager
- Prepared By: Bryan Louque, PE NACE Corrosion Specialist #5191
- Reviewed By: Internal Review



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# **Executive Summary**

This technical memorandum (TM) identifies and evaluates the 17<sup>th</sup> Street, Orleans Avenue and London Avenue canal interim closure structure (ICS) project components that require corrosion risk assessment and supplemental corrosion protection. The ICS components discussed in this TM include Phase I construction at each location as follows:

Location	Structure	Type of	Materials	Existing Corrosion
th		Construction		Protection
17 <sup>m</sup>	Non-Overflow Section	Sheet Piling	Carbon Steel	None
Street	Gate Closure Monolith	Pipe Piling	Carbon Steel	Protective Coating
Canal	Substructure			
	Pumps	Vertical	Information	Protective Coating and
		Turbine	Not Available	Cathodic Protection
	Pump Platform	H Piling and	Carbon Steel	None
	Substructure	Sheet Piling		
	Power Unit Platform	Pipe Piling	Carbon Steel	None
	Substructure			
Orleans	Non-Overflow Section	Sheet Piling	Carbon Steel	None
Avenue	Gate Closure Monolith	Pipe Piling	Carbon Steel	Protective Coating
Canal	Substructure			
	Pumps	Vertical	Information	Protective Coating and
	-	Turbine	Not Available	Cathodic Protection
	Pump Platform	H Piling	Carbon Steel	None
	Substructure	_		
	Power Unit Platform	H Piling	Carbon Steel	None
	Substructure	-		
London	Non-Overflow Section	Sheet Piling	Carbon Steel	None
Avenue	Gate Closure Monolith	Pipe Piling	Carbon Steel	Protective Coating
Canal	Substructure			_
	Pumps	Vertical	Information	Protective Coating and
	_	Turbine	Not Available	Cathodic Protection
	Pump Platform	H Piling	Carbon Steel	None
	Substructure			
	Power Unit Platform	H Piling	Carbon Steel	None
	Substructure			

The remaining Phase II and Phase III components at each location will be evaluated as the design information becomes available.

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The primary objective of this TM is to assess conditions and recommend a corrosion protection system for the ICS. The intent is to develop a strategy to ensure that the proposed facilities achieve a service life of 50 years, while requiring minimal maintenance.

# **Evaluation Methods**

An investigation was performed to determine the ICS materials of construction and to identify supplemental corrosion control measures where deemed necessary. The investigation included the following:

- Field investigation to identify ICS components that are subject to corrosion.
- Review of Phase I design drawings.
- Assumptions regarding soil resistivity and chemistry.
- Assumptions regarding water resistivity and chemistry.
- Assumptions regarding atmospheric corrosivity.
- Assumptions regarding the rate of corrosion at each site.

# Results

Black & Veatch has assumed that the soils along each ICS installation vary widely in corrosive characteristics. Some areas are relatively noncorrosive, but many areas have the potential to be quite corrosive, especially when wet. The corrosive characteristics are low electrical resistivity and high concentrations of chloride and sulfate salts. Because of the potential for encountering corrosive soils, cathodic protection of the ICS structures will be necessary. Impressed current type cathodic protection is proposed for the structure.

Black & Veatch has assumed that the Lake Ponchartrain water around each ICS installation has the potential to be quite corrosive, especially when salinity levels increase. The corrosive characteristics of the lake water are low electrical resistivity and high concentrations of chloride and sulfate salts. Because of the potential for encountering corrosive waters in the splash, tidal and continuously submerged zones, a combination of protective coatings and cathodic protection of the ICS structures will be necessary. Coal tar epoxy, surface tolerant epoxies, epoxy mastics and polyurethane coating materials are proposed for the structure. Impressed current type cathodic protection is proposed for the structure.

The equations determining the allowable corrosion (sacrificial steel) at any point in the nonoverflow structure sheet piling indicate there is a large safety factor in the cofferdam design. About 0.25 inches (250 mils) of corrosion can be tolerated without catastrophic results. Based

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on the average (4.5 mils/year) and maximum (9.0 mils/year) submerged zone corrosion rates given in Table 1.4-1, the estimated service life of the non-overflow structure is in the range of 28 to 55 years. Note that the estimated service life is calculated based on corrosion rates taken from the literature. Actual corrosion rates at each ICS can differ from the estimated corrosion rate by as much as an order of magnitude. A method for determining the actual corrosion rate at each ICS location is presented in Section 6.0.

Due to the lack of actual and historical information relative to the site corrosivity, the effect of corrosion allowance on the structure life has not been considered. For the purpose of this analysis, supplemental corrosion protection has been proposed so that net metal loss due to corrosion is negligible over the 50 year structure life.

# Recommendations

The results of the investigation led to several recommendations for corrosion protection of ICS structures.

• Atmospheric Zone - Steel structures exposed in the atmospheric zone should be protected against corrosion by application of a protective coating. ICS components that require coating include the: 1) engine platform substructures, 2) hydraulic piping and pipe supports, 3) pump platform substructures, 4) discharge piping supports, 5) discharge piping internal surfaces, 6) non-overflow substructures and 7) gate closure monoliths.

Acceptable, alternative coating materials and methods of application are listed below:

Coating System	Number of Coats	DFT (mils)	Surface Preparation
Coal Tar Epoxy	2	16 - 20	Commercial Blast
			Cleaning (SP6)
Surface Tolerant Epoxy /	2	6 - 8	High Pressure Water
Urethane			Jetting (SP 12)
Epoxy Mastic	2	12-16	Power Tool Clean (SP 3)
(Aluminum Pigmented)			

• **Splash Zone** - Steel structures exposed in the splash zone should be protected against corrosion by application of a protective coating. ICS components that require coating include the: 1) hydraulic piping supports, 2) pump platform substructures, 3) discharge piping supports, 4) non-overflow substructures and 5) gate closure monoliths.

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Acceptable, alternative coating materials and methods of application are listed below:

Coating System	Number of Coats	DFT (mils)	Surface Preparation
Coal Tar Epoxy	2	16 - 20	Commercial Blast Cleaning (SP6)
Surface Tolerant Epoxy / Surface Tolerant Epoxy	2	10 - 12	High Pressure Water Jetting (SP 12)
Epoxy Mastic (Aluminum Pigmented)	2	12-16	Power Tool Clean (SP 3)

• **Tidal Zone** - Steel structures exposed in the tidal zone should be protected against corrosion by application of a protective coating and impressed current cathodic protection. ICS components that require coating and cathodic protection include the: 1) hydraulic piping supports, 2) pump platform substructures, 3) discharge piping supports, 4) non-overflow substructures and 5) gate closure monoliths.

Acceptable, alternative coating materials and methods of application are listed below:

Coating System	Number of Coats	DFT (mils)	Surface Preparation
Coal Tar Epoxy	2	16 - 20	Near White Metal Blast Cleaning (SP 10)
Surface Tolerant Epoxy / Surface Tolerant Epoxy	2	10 - 12	High Pressure Water Jetting (SP 12)
Elastomeric Polyurethane	1	30	Near White Metal Blast Cleaning (SP 10)

Protective coatings should extend to elevation 3 feet below MLW. To accomplish this, dewatering of the structure on the protected side and flood site will be required.

• **Continuously Submerged Zone** - Steel structures exposed in the continuously submerged zone should be protected against corrosion by application of an impressed current cathodic protection system. ICS components that require cathodic protection include the: 1) hydraulic piping supports, 2) pump platform

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substructures, 3) discharge piping supports, 4) non-overflow substructures and 5) gate closure monoliths.

• Soil Zone - Steel structures exposed in the soil zone should be protected against corrosion by application of an impressed current cathodic protection system. ICS components that require cathodic protection include the: 1) engine platform substructures, 2) hydraulic piping supports, 3) pump platform substructures, 4) discharge piping supports, 5) non-overflow sub structures and 6) gate closure monoliths.

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# CORROSION PROTECTION FOR STEEL PILE STRUCTURES IN MARINE ENVIRONMENTS

# 1.0 FUNDAMENTALS OF STEEL CORROSION

# 1.1 Corrosion Mechanism of Steel in Seawater

On steel piling in seawater, the more chemically active surface areas (anodes) are metallically coupled through the piling itself to the less chemically active surface areas (cathodes) resulting in corrosion of the anodic areas.

# **1.2** Corrosion Mechanism of Steel in Marine Atmospheres

The corrosion of steel in marine atmospheres proceeds by two mechanisms: electrolytic and direct chemical attack. The degree of wetting on the metal surface will greatly affect the corrosion rate.

A wet marine atmosphere, where condensed moisture is visible (corresponding to 100 percent relative humidity), is a very aggressive environment for steel. Under such conditions, the corrosion process is analogous to that of continuous seawater immersion.

In moist marine atmosphere (at relative humidity of less than 100 percent), the electrolytic films on the metal surfaces are invisible to the naked eye and extremely thin. Under these circumstances, dust, salt deposits and corrosion products enhance the corrosion process by entrapping moisture and allowing the electrolytic films to become continuous.

In industrial marine atmospheres, sulfur compounds that are present. under moist conditions the presence of sulfur compounds on the metal surface will greatly accelerate the corrosion rate of steel.

In general, the thickness of the moisture films, the cleanliness of the metal surface, atmospheric temperature and rates of evaporation all influence the corrosion rate of steel above the high waterline.

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# **1.3** Zones of Corrosion of Steel Piles

Examination of corroded marine piles reveals several distinct areas of attack (refer to Figures 1.3-1 and 1.3-2). It is convenient to divide these areas into five zones, each having a characteristic corrosion rate:

- **Atmospheric Zone** This is the area at the top of the piles which is continuously exposed to the atmosphere above the splash zone. This area is accessible for maintenance.
- **Splash Zone** This is the area from mean high water level upward to the bottom of the atmospheric zone. In this area, moisture droplets and continuous water films are maintained on the pile surfaces exposed to the atmosphere. These areas are accessible for maintenance, with some inconvenience, at low tide.
- **Tidal Zone** This is the area between mean low water level and high water level. This zone is subject to alternate periodic immersion owing to tide changes and is accessible for maintenance at low tide with difficulty.
- **Continuously Submerged Zone** This is the area of the piles which is always submerged extending from the mud line upward to mean low water level. This area is not readily accessible for maintenance without recourse to cofferdamming techniques, structure dewatering, or specialized underwater painting techniques.
- **Soil Zone** This is the area of total burial in mud or soil and generally does not require maintenance.

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Figure 1.3-1. 17th Street Canal Sheet Piling – Typical Atmospheric and Soil Zones of Corrosion

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Figure 1.3-2. Orleans Avenue Canal Sheet Piling – Typical Splash, Tidal and Submerged Zones of Corrosion

# 1.4 Environmental Factors Affecting Marine Corrosion Rates of Steel Piling

**Corrosion Rates by Zone** - The corrosion rates on steel piling surfaces normally vary considerably by zone. The corrosion rate profile for steel sheet piling, averaged for several harbor installations, is shown on Figure 1.4-1. The varying corrosion loss indicated in each zone is the average of eight harbor installations after 19 years exposure. In general, the maximum reduction in metal thickness occurs in the splash zone immediately above mean high water level.

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A significant loss usually occurs a short way below mean low water in the continuously submerged zone. Where steel sheet piling is exposed to water on both sides, the total rate of corrosion of the member is doubled.

The least affected zone is usually found below the mud line, with higher losses at the water-mud line interface. Another low loss area exists in the tidal zone about halfway between mean high water and mean low water levels. Corrosion loss is generally very low on areas of steel piling driven into undisturbed soils.

**Erosion** - Corrosion in the immersed zones in combination with erosion can produce severe localized attack. Steel in marine environments corrodes initially at a relatively high rate until protective films of corrosion reaction products form on the surface. In stagnant waters, the film is effective. The destruction of these protective films by the mechanical forces of severe wave action increases the corrosion rate in the splash zone.

**Water Temperature -** Seawater temperature is a complex variable in corrosion reactions. Chemical reactions, which include corrosion reactions, are accelerated in warmer water. However, this increase in corrosion rate is usually offset by an increase in marine fouling rate, which provides a protective covering over the metal surface. There is a decrease in oxygen solubility at higher temperatures which also exerts a retarding influence on the corrosion rate. Thus, contrary to expectations, corrosion rates in tropical seawaters (immersion zone) have not been found to differ significantly from those measured in the temperate and northern latitudes.

**Oxygen Concentration** - Oxygen is the principal corroding agent of steel in seawater. The rate and concentration at which oxygen arrives at the metal surface determines, to a large measure, the rate of corrosion. Variations in oxygen concentration on the surface of the steel, as a function of water depth, accelerate the corrosion reaction by formation of differential aeration cells along the length of the pile analogous to a galvanic cell. Areas of low concentrations of oxygen are anodic to areas of higher concentration.

The increased corrosion rate in the submerged zone just below mean low water as compared to the tidal zone is attributed to the action of such a differential aeration cell.

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Figure 1.4-1. Corrosion Rate Profile of Steel Sheet Piling

Any mechanism that enhances the arrival of oxygen to the bare steel surface immersed in seawater, such as wave action, water velocity, abrasion by mud or sand, or increasing temperature, will generally increase the corrosion rate, provided the oxygen concentration remains the same and there are no barriers at the metal interface.

**pH Value** - The pH (degree of acidity or alkalinity) of seawater is almost a constant, ranging narrowly from 7.2 to 8.2. A pH value below 7 is acidic, and above 7 is alkaline. In polluted waters, the pH may vary somewhat, but over the mid-range the corrosion rate of steel is almost constant. The effect of pH changes within the expected norms is of little consequence in influencing the corrosion rate of steel piling.

**Salinity** - Water in the open sea has a salt content of about 3.5 percent. Dilution occurs with fresh water runoff in lakes and estuaries, but the proportions of the various salts relative to each

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other remain virtually the same. Corrosion increases with increasing salinity until it reaches a peak at about one percent sodium chloride and then decreases with increasing salinity. Significantly, the amount of dissolved oxygen is constant up to the one percent sodium chloride concentration and then begins to drop off markedly with increasing salinities. Fresh water and seawater are not as aggressive as brackish waters containing over 0.1 percent chloride ion concentration.

**Water Velocity** - Increasing velocity of seawater results in an increase in the rate of corrosion of steel piling. With zero velocity (stagnant conditions), the overall corrosion rate of steel in seawater is lower. However, the incidence of pitting, with its higher localized corrosion rate, is greater.

**Marine Organisms** - Organic matter in natural waters has a marked effect on corrosion. A variety of marine plants and animals can attach themselves to marine structures. These organisms, such as barnacles and grasses, generally accelerate the corrosion rate in localized areas because of differential environmental conditions caused by their biologic processes. Dense, continuous marine growths can sometimes stifle general corrosion by impeding the diffusion of oxygen to the metal surface.

**Pollution** – Polluted waters may contain anything from domestic sewage to complex industrial wastes, oil well brines and spilled oil. Pollution generally causes harm to biological species by its toxic effect or by depletion of the dissolved oxygen. Contaminants that reduce pH or introduce sulfides locally at the site of the piles increase the corrosion rate of steel.

**Wind** - Wind is the major cause of wave action, which results in intermittent wetting in the splash zone. Wind also whips up the water surface and captures salt spray from breaking waves. The salt-laden air evaporates and the remaining salt dust is deposited on horizontal and inclined metal surfaces. These salt particles accelerate the corrosion of the steel surfaces to which they adhere because they attract and retain moisture and form aggressive local cells.

**Rain** - Rain leaves thin films of water which dissolves salt deposits on the surface of the metal. This promotes corrosion due to rapid oxygen diffusion through the thin film electrolyte. Heavy rains also serve to wash debris and salt from steel surfaces and, thereby, reduce the corrosion rate.

**Humidity** - Atmospheric corrosion, as described earlier, occurs when visible moisture films are present on the surface at 100 percent relative humidity. Under conditions of less than 100 percent humidity, corrosion proceeds under an extremely thin, invisible film of electrolyte formed on the surface. In dry atmospheres, in the complete absence of moisture, corrosion is relatively mild and proceeds by direct chemical attack, such as the oxidation of iron by air.

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**Sun** - The sun causes an increase in temperature of the surrounding atmosphere and influences the relative humidity, the rate of evaporation and the temperature of the structure. This influences the corrosion rate in complex ways. The alternate drying and wetting of metal surfaces in salt-laden atmospheres causes localized acceleration of corrosion because of the disruption of natural protective films on steel. Long-term ultraviolet exposure from the sun has a damaging effect on the pigmentation and composition of many coating systems.
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### 2.0 ECONOMICS OF CORROSION CONTROL

### 2.1 Economic Analysis of Corrosion Control Methods

To justify the application of any corrosion control method or combination of methods, an economic analysis has to be made. This is necessary to determine whether additional investment for corrosion control will result in a lower overall cost for the structure than the cost for repair or replacement of the structure periodically.

Several factors' have to be taken into account when making an economic analysis. These factors include the following:

- Corrosion will inevitably result in costs.
- Corrosion should be controlled in the most economical way possible.

### 2.2 Economic Factors Affecting Cost Estimates of Corrosion Control Methods

The following paragraphs discuss the separation of costs into those due to capital investment and those due to operation and maintenance of the system.

**Initial Investments** - These are the additional initial costs incurred due to the application of corrosion control to the structure. They include the following:

- The additional cost (or savings) in the structural design due to corrosion design considerations.
- The additional cost of corrosion control materials or methods including:
  - Cost of sacrificial steel.
  - Materials and procedures for providing electrical continuity.
  - Cathodic protection rectifier and associated hardware.
  - Anodes and associated hardware.
  - Cable.
  - Protective coatings.
- Additional labor costs include the following:
  - Electricians.
  - Welders.
  - Coating applicators.

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**Operating Costs** - Additional costs incurred due to the operation and maintenance of the corrosion control system include the following:

- Power for rectifier operation.
- Anode replacement (materials and labor).
- Annual corrosion surveys.
- Bi-monthly checking of rectifier operation.
- Inventory and spare parts.
- Periodic coating maintenance (materials and labor).

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### 3.0 DESIGN AND FABRICATION PRACTICES

### 3.1 Design Provisions

**Provision for Corrosion Allowance -** In the design of steel structures for marine use, if structural shapes can be increased in cross section to allow for loss of thickness by corrosion, factors of safety and structural integrity can be maintained without the further necessity of additional corrosion control measures.

It is not uncommon to apply excellent coatings at costs on new construction of \$2.50 to \$3.00 per square foot which will provide effective protection for periods up to ten years or more. Protective coatings can provide an economical alternative to a sacrificial steel corrosion allowance. However, renewal of coatings underwater, while feasible, is costly.

The cost of cathodic protection for bare steel also can be compared to the costs for a sacrificial steel corrosion allowance. Cathodic protection costs would normally not exceed \$1.00 per square foot, and substantially lower costs could normally be anticipated. Thus, it appears that corrosion allowances are not necessarily the economic route for providing corrosion protection to fully submerged underwater structures. However, in the tidal zone, where cathodic protection is only partially effective, corrosion allowance costs may be justifiable when compared to other methods.

**Provision for Cathodic Protection** - Submerged portions of marine structures may require cathodic protection sometime during their service life. Installation during construction of wire ways, brackets and bonding cables, and bonding the structure together as an electrical unit are well justified against such costs of installation after erection of the structure.

### 3.2 Fabrication Practices

**Protective Coating During Fabrication** - Marine structures that will be exposed in the atmospheric and splash zones for which painting is specified would benefit from shop treatment of the steel, as it is usually more economical at that time to blast clean steel and apply the protective coating than after erection. Shop applied coatings also permit better quality control.

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### 4.0 **PROTECTIVE COATINGS**

Protective coatings offer a means of providing additional life to piles in marine structures at moderate additional first cost. Coatings often need be applied only to those portions of the piles severely exposed to obtain a structure that will meet the service life requirements of the facility. Coatings combined with thicker steel shapes will often enable the designer to meet extra long-term life requirements.

Many coatings have been formulated and evaluated for marine service. The types of coatings commonly used for atmospheric and immersion (splash, tidal and submerged zones) service are coal tar epoxies, surface tolerant epoxies, epoxy mastics and polyurethanes.

**Coal-Tar Epoxies** - The coal-tar epoxies are believed to have the largest current use in coating steel marine structures for immersion service. This large usage is due to a combination of good service record, ease of application and economy. It is recommended that, for immersion service, a minimum of 16 mils dry film thickness be applied. This system is suitable for structures exposed to immersion. It is also suitable for underground exposure. The system exhibits excellent adhesion when applied over blast cleaned surfaces.

**Epoxies** - Epoxies form hard coatings with good chemical and water permeation resistance. They offer good corrosion protection in all zones of a marine structure. However, they tend to discolor and look unattractive in atmospheric exposure. Surface tolerant variations can be applied up to 10 mils dry film thickness over marginally prepared steel surfaces and in the presence of moisture. Aluminum pigmented epoxy mastics are suitable for atmospheric exposure as well as areas that are frequently wet (excluding immersion). This system exhibits excellent adhesion when applied over blast cleaned surfaces or hand tool / power tool cleaned surfaces.

**Urethanes** – Urethane painting systems are intended principally for steel exposed to the atmosphere where excellent weathering, color retention and chemical resistance is desired. One hundred percent solids elastomeric urethanes are suitable for structures in immersion service. This high film build, flexible system offers outstanding abrasion and impact resistance as well as extremely quick cure capabilities for fast turnaround applications. Elastomeric urethanes exhibit excellent adhesion when applied over a blast cleaned surface.

### 4.1 Surface Preparation

The ultimate life of a protective system is dependent upon substrate cleanliness and proper anchor profile.

Blast cleaning is commonly used in the surface preparation of steel piling when protective coatings are indicated. Although varying degrees of surface blast cleaning are used, a surface

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blasted to a near-white (SSPC-SP 10) condition is expected to give best results and is deemed a necessity for long-term service of coatings immersed in seawater. Blast cleaning to this extent is not economical for many structures and, therefore, for less corrosive environments such as atmospheric exposure, a quality commercial blasting (SSPC-SP 6) is considered adequate.

Other cleaning methods available for preparing steel piling surfaces for coating are solvent cleaning (SSPC-SP 1) hand tool and power tool cleaning (SSPC-SP 2 and SP 3), and high pressure water jetting (SSPC-SP 12). These methods are considered to be more limited in use and effectiveness than blast cleaning and are generally employed on localized areas needing touch up and coating repair.

### 4.2 Coating Application

For coating application on existing structures within the splash or tidal zone, drying time or curing of the coating system must be considered, since the time interval between low and high tide is relatively short.

Most coatings can be applied by airless spray, conventional spray, brush or roller methods. For specific details on mixing, thinning, application techniques, thickness of coats and drying or curing times, the recommendations of the manufacturer should be followed.

As the purpose of the coating is to isolate the steel substrate physically and electrically from its environment, it is most important that the coating system be free of pinholes and voids (holidays).

### 4.3 Inspection

The proper application of a coating to a marine structure is vital to achieving the desired service life. This requires close attention and adherence to specifications by the applicator. It is most important that inspection of the coating be performed during and after completion of the application.

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### 5.0 CATHODIC PROTECTION

Cathodic protection is an electrochemical method of corrosion control. It is frequently used to protect submerged and buried structures from corrosion. Cathodic protection transfers uncontrolled corrosion of the structure to controlled corrosion of external anodes, which are easily replaced after being consumed. It is an effective method of protecting both bare and coated steel pilings under total immersion conditions; it is also partially effective in providing protection in the tidal zone under alternate conditions of immersion.

### 5.1 Types of Cathodic Protection Systems

Underground or submerged metallic structures can be protected by two types of cathodic protection systems:

- Galvanic anode systems.
- Impressed current systems.

A galvanic anode system consists of a sacrificial anode which is electrically connected to the structure and immersed in an electrolyte (seawater). The anode is consumed to produce the required current to maintain the structure in a cathodic condition. Certain metals, such as zinc, magnesium and aluminum, make effective galvanic anodes if the proper alloys are used.

An impressed current system utilizes dc power from an external source to drive current to the protected structure. Anodes are consumed slowly under the action of the impressed current.

An impressed current system normally consists of the following:

- Anodes and associated dc positive wiring.
- Dc power supply and means of current regulation.
- Negative return circuit from protected structure to dc power supply, including tying the structure together (bonding).
- Reference electrode and means for measuring structure potential (optionally, portable test equipment can be used).

### 5.2 Design of Cathodic Protection Systems

The general design practice that is followed in selecting and sizing a cathodic protection system is the same for galvanic anode or impressed current systems. The objective is to provide a

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system capable of delivering and distributing sufficient direct current to maintain the buried or submerged structure in a passive (non-corroding) condition for a specified period of time. To achieve this objective, the following steps are considered:

- Determine the initial and nominal protective current requirements for the structure.
- Select appropriate anode materials and determine size and number of anodes required for a given service life requirement.
- Locate and space anodes to obtain uniform and efficient current distribution to the structure taking account of such factors as anode repair and replacement.
- Provide suitable mounting methods for mechanically and electrically securing anodes to the structure.
- Provide suitable wiring circuits for impressed current systems.
- Provide suitable bonding means for the structure.
- Determine rectifier requirements for impressed current systems.

**Protective Current Requirements** - To obtain corrosion protection of the structure, it is necessary to provide sufficient external current from the cathodic protection system protect the structure against corrosion.

Once the current density requirement is identified, it is simply multiplied by the total submerged surface area (up to MHW) to determine the current requirement for the bare structure in the submerged and tidal zone. Additional current must be added for the surface area in the submerged zone (front and backside on sheet piling). This requirement will depend on soil conditions. If the structure is coated in some or all of the tidal, submerged and soil zones, a factor must be applied to the current density for bare steel to compute the current density for coated steel.

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### 6.0 PRACTICAL APPROACHES TO THE DESIGN OF CORROSION CONTROL SYSTEMS

The design procedures outlined below are intended to provide a guide for the engineer to select and design the most cost-effective corrosion control system for a steel structure in a marine environment.

### 6.1 Collection of Design Data

Complete information on the steel pile structure (installation and design details) and the surrounding environment are the most important factors in evaluating the corrosion hazard and selecting the proper corrosion control system.

**Steel Pile Structure to be Protected -** Complete knowledge of the structure under consideration should be obtained and the construction specifications and drawings should be reviewed for the following:

- Description of materials used.
- Welding procedures (grounding connections, welding materials, etc.).
- Design details for calculating the steel areas in the atmospheric, splash, tidal, submerged and soil zones.

**Environmental Data** - As steel piles in a marine environment are exposed to different type of corrosion attack in the atmospheric, splash, tidal, submerged and soil zones, it is important that detailed data on the surrounding environment be collected. This will allow design of the most suitable and economical method or combination of methods for corrosion control. These data should include the following:

- Information on atmospheric and water pollution.
- Water resistivity and pH.
- Range of relative humidity.
- Range of water temperatures.
- Range of oxygen concentration.
- Salinity.

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- Range of water velocity.
- Marine organisms.
- Tidal range.
- Any other pertinent data.

These factors will determine the severity of corrosion attack to be expected in the respective exposure zones of the piles.

### 6.2 Assessment of the Corrosion Hazards

When all the pertinent data related to the material description and design of the steel pile structure and the corrosivity of the environment have been collected, an evaluation of the corrosion hazards of the steel piles can be made. This evaluation has to be made by zones as, in all probability, different corrosion control methods or combination of methods will be required.

The information obtained should be divided in accordance with the zones affected by it, as follows:

- Atmospheric
- Splash
- Tidal
- Submerged
- Soil

**Atmospheric Corrosion -** The top portion of the pile that is exposed to atmospheric conditions is susceptible to electrolytic and/or chemical attack. The rate of atmospheric corrosion varies according to the following factors:

- Range of relative humidities.
- Degree of pollution of the atmosphere.
- Chemical composition of the steel.

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**Corrosion in the Splash and Tidal Zones** - The most serious form of corrosion attack in the splash and tidal zones is pitting. Pitting is a form of localized galvanic cell corrosion and its rate is considered to be much higher than the corrosion rates encountered in the form of general corrosion. Some of the most important information required to evaluate fully the corrosion hazards in these zones are:

- Corrosivity of water (resistivity, pollutants, pH, etc.).
- Atmospheric conditions.
- Extent of tidal and splash zones.

This information is important for the selection of the appropriate corrosion control system.

**Corrosion in the Submerged Zone -** Two types of corrosion may be encountered in this zone: general and localized pitting types. Uniform corrosion occurs over the entire exposed metal surface of the pile, while localized pitting is confined to a discrete area of the pile.

Information required to evaluate the corrosion hazards in the submerged zone includes the following:

- Water pollution, velocity and temperature.
- Salinity and pH.
- Oxygen concentration and marine organisms.
- Sulfate-reducing bacteria.

**Corrosion in the Soil Zone -** Generally, the corrosion rates in the soil zone have been found to be much less than the average corrosion rates in the submerged zone.

Information, in addition to that already collected, which may be useful in evaluating the corrosion hazards in this area, includes the soil characteristics. Corrosion control methods used to reduce corrosion in this area are similar to those for the submerged area.

### 6.3 Corrosion Control Measures

There are four basic corrosion control methods:

• Good design and fabricating practices.

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- Steel selection by composition.
- Coating (isolation of steel surface from the surrounding environment).
- Cathodic protection (mitigation of corrosion in the submerged/soil zones and partially in the tidal zone).

**Coatings** - Coatings provide corrosion protection to the steel piling by isolating the steel surfaces from the surrounding environment. There are certain types of coatings that may be used to provide corrosion protection to one or more zones (atmospheric, splash, tidal, submerged, and soil). The type of coating to be used depends on the following:

- Economics.
- Degree of performance desired in the particular environment.
- Whether supplementary corrosion protective measures are used, such as cathodic protection.

**Cathodic Protection** - Cathodic protection is an electrochemical method that can provide corrosion protection to the tidal, submerged and soil zones of any steel structure.

There are two basic types of cathodic protection systems: the galvanic and the impressed current. The selection of the system to be used will depend mainly on design parameters and economics.

*Galvanic Anode System* - This system is a simple application of a dissimilar metal corrosion cell. When the steel piling is electrically connected to a metal (zinc, magnesium or aluminum anodes) higher in the electromotive series (more negative galvanic potential) and both are in a common electrolyte (sea water), the more active metal (anode) is consumed to protect the steel cathode.

*Impressed Current System* - An impressed current system is similar to a galvanic system with the exception that a source of direct current (usually rectifiers) is introduced into the circuit to increase the driving voltage between the anode and the cathode.

With this system, the materials most frequently used for anodes are as follows:

- High silicon content cast iron.
- Graphite.

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• Mixed metal oxide.

The selection would depend on availability and economics. The source of direct current is usually a rectifier that converts ac current into dc current.

# Deficiencies

(By ICS Facility)

Appendix D

### London Canal ICS - List of Deficiencies

Structure	Deficiency	Description
Non-overflow	Coating	Closed cell sheet piling, atmospheric zone.
	Coating	Closed cell sheet piling, splash zone.
	Coating	Closed cell sheet piling, intertidal zone.
	Coating	Closed cell sheet piling, permanent immersion zone.
	Coating	Closed cell sheet piling, underground exposure zone.
	Sheet pile Embedment Depth	Maybe not deep enough to prevent global failure
Gate Closure Monolith	Cathodic Protection	Steel jacket substructure.
	Cathodic Protection	Needle gate.
	Cathodic Protection	Needle gate guide beam.
	Sedimentation in Bulkhead Closure Slots	No bubbler system
	No Wheels on Bulkheads	No ability to close or open gates with adverse head present
	Exposed Bulkhead Hoisting Equipment	May be damaged during storm event
	Gate Closure Monolith Grating	Requires cribbing to support cranes
	Gate Operation	Location of Controls
Pumps	Coating	Platform framing, intertidal zone.
	Coating	Discharge header internal surfaces.
	Coating	Discharge header pile bents, intertidal zone.
	Cathodic Protection	Vertical turbine pumps, external surfaces.
	Material Selection	Discharge piping flange nuts and bolts.
	Exposed Hydraulic Lines	Potential to breakdown due to weather exposure & spill into canal
	Pump Supports at Platform Level	Poor mounting may increase vibrations and maintenance issues
	Pump Maintenance Access	Requires large crane capacity
	Hydraulic Line Connection Location	Reduces ability to perform adequate maintenance
	Hydraulic Cooling Unit Location Underwater	Biological growth may compromise cooling unit reducing capacity
	Number of Pumps	Requires full time maintenance, may require maintenance facility
	Pump Maintenance Access	During event the access is limited, non hurricane operation issues

### London Canal ICS - List of Deficiencies Continued

Power UnitsCoating Coating CoatingHydraulic conduit supports, atmospheric zone. Hydraulic conduit supports, splash zone. Hydraulic conduit supports, intertidal zone. Hydraulic conduit supports, underground exposure zone. CoatingHydraulic conduit supports, atmospheric zone. Engine platform pilings, underground exposure zone. Fuel oil supply piping. Hydraulic oil vent piping.	Structure	Deficiency	Description
Power UnitsCoatingHydraulic conduit supports, atmospheric zone.CoatingHydraulic conduit supports, splash zone.CoatingHydraulic conduit supports, intertidal zone.CoatingHydraulic conduit supports, underground exposure zone.CoatingEngine platform pilings, atmospheric zone.CoatingEngine platform pilings, underground exposure zone.CoatingEngine platform pilings, underground exposure zone.CoatingEngine platform pilings, underground exposure zone.CoatingFuel oil supply piping.CoatingFuel oil supply piping.CoatingHydraulic oil vent piping.		•	
CoatingHydraulic conduit supports, splash zone.CoatingHydraulic conduit supports, intertidal zone.CoatingHydraulic conduit supports, underground exposure zone.CoatingEngine platform pilings, atmospheric zone.CoatingEngine platform pilings, underground exposure zone.CoatingEngine platform pilings, underground exposure zone.CoatingFuel oil supply piping.CoatingFuel oil supply piping.CoatingHydraulic oil vent piping.	Power Units	Coating	Hydraulic conduit supports, atmospheric zone.
CoatingHydraulic conduit supports, intertidal zone.CoatingHydraulic conduit supports, underground exposure zone.CoatingEngine platform pilings, atmospheric zone.CoatingEngine platform pilings, underground exposure zone.CoatingFuel oil supply piping.CoatingHydraulic oil vent piping.		Coating	Hydraulic conduit supports, splash zone.
CoatingHydraulic conduit supports, underground exposure zone.CoatingEngine platform pilings, atmospheric zone.CoatingEngine platform pilings, underground exposure zone.CoatingFuel oil supply piping.CoatingHydraulic oil vent piping.		Coating	Hydraulic conduit supports, intertidal zone.
CoatingEngine platform pilings, atmospheric zone.CoatingEngine platform pilings, underground exposure zone.CoatingFuel oil supply piping.CoatingHydraulic oil vent piping.		Coating	Hydraulic conduit supports, underground exposure zone.
CoatingEngine platform pilings, underground exposure zone.CoatingFuel oil supply piping.CoatingHydraulic oil vent piping.		Coating	Engine platform pilings, atmospheric zone.
CoatingFuel oil supply piping.CoatingHydraulic oil vent piping.		Coating	Engine platform pilings, underground exposure zone.
Coating Hydraulic oil vent piping.		Coating	Fuel oil supply piping.
		Coating	Hydraulic oil vent piping.
Coating Hydraulic oil vent piping hangers.		Coating	Hydraulic oil vent piping hangers.
Fuel Storage Unit Single Wall Container Needs to be double wall for hurricane zone		Fuel Storage Unit Single Wall Container	Needs to be double wall for hurricane zone
Lack of Spill Containment below units Holes in floor and no curbs		Lack of Spill Containment below units	Holes in floor and no curbs
Open Platform Work Surface Potential for hydraulic fuel spills and tool loss into canal		Open Platform Work Surface	Potential for hydraulic fuel spills and tool loss into canal
Lack of Storage Space for Spare Parts No storage space available to support high maintenance equipment		Lack of Storage Space for Spare Parts	No storage space available to support high maintenance equipment
Lack of facilities for makeup and waste oil No storage space for makeup and waste oil		Lack of facilities for makeup and waste oil	No storage space for makeup and waste oil
Power Units are partially and fully exposed Rain water and weather may impact engine performance		Power Units are partially and fully exposed	Rain water and weather may impact engine performance
Widely Dispersed Equipment Impacts quality and ability to perform adequate maintenance		Widely Dispersed Equipment	Impacts quality and ability to perform adequate maintenance
Hydraulic Line Pressures Operate near or above 3000 psig which is capacity		Hydraulic Line Pressures	Operate near or above 3000 psig which is capacity
Interconnected Diesel Fuel Day Tank Vents Failure of the day tank inlet valve on one unit will fill the vent		Interconnected Diesel Fuel Day Tank Vents	Failure of the day tank inlet valve on one unit will fill the vent
system higher than the vent header result surcharged condition.		·	system higher than the vent header result surcharged condition.
Congestion on Exposed Platforms No room to move around units, may be dangerous		Congestion on Exposed Platforms	No room to move around units, may be dangerous
Unit Vibration on Platforms May result in stress and fatigue problems on structure		Unit Vibration on Platforms	May result in stress and fatigue problems on structure
Exposed Electrical Components on Diesel Drives May be damage during storm		Exposed Electrical Components on Diesel Drives	May be damage during storm
Length of Hydraulic Fluid Lines Exceed recommended length of run per manufacturer		Length of Hydraulic Fluid Lines	Exceed recommended length of run per manufacturer
Miscellaneous Safe Houses Not large enough to house required information to support O&M	Miscellaneous	Safe Houses	Not large enough to house required information to support O&M
No Ability to Move Heavy Parts on Site Reduces ability to perform adequate maintenance		No Ability to Move Heavy Parts on Site	Reduces ability to perform adequate maintenance
Cyclone Fencing May not stop hard projectiles		Cyclone Fencing	May not stop hard projectiles
No facility lightning protection May result in equipment damage or personnel safety issues		No facility lightning protection	May result in equipment damage or personnel safety issues
No facility grounding May result in equipment damage or personnel safety issues		No facility grounding	May result in equipment damage or personnel safety issues
Lighting Support Not adequate to survive hurricane event		Lighting Support	Not adequate to survive hurricane event
Equipment is not protected No acceptable level of anti-terrorism or vandalism protection		Equipment is not protected	No acceptable level of anti-terrorism or vandalism protection

Appendix E

## **Cost Estimate**

### E.1 Basis of Estimate

This submittal reflects a draft level of the cost estimate, in MCACES for Windows format (Micro Computer Aided Cost Engineering System), provided within the scope of the Permanent Enhancement of the ICS Facilities in the 17<sup>th</sup> Street, Orleans Avenue and London Avenue Canals. The cost evaluation is based on the work described in this study.

Costs for various features are based on professional judgment coupled with construction experience; cost data resources; and detailed quantity estimates to the extent possible. The cost estimate is developed to a level of detail that reflects the level of detail provided for the various concepts presented in the report. Where the level of design detail was insufficient to support a detailed breakdown of costs in estimate, lump sum allowances were used based on historical experience for similar tasks.

The cost estimate assumes construction efforts by a self-performing general prime contractor and supporting subcontractors.

Cost impacts to existing features and appurtenances generally apply to modifications of the existing ICS features or new facilities required for ICS permanent enhancements. The estimate reflects the three primary construction locations (17<sup>th</sup> Street, Orleans Avenue and London Avenue Canals); separate construction costs for a common Maintenance Facility; capacity enhancements to the modified ICS pumping systems; and separate Life Cycle Operations and Maintenance (O&M). Costs for Primary systems structured in the estimate as follows :

- A. 17<sup>th</sup> Street Avenue Canal ICS
- B. Orleans Avenue Canal ICS
- C. London Avenue Canals ICS
- D. Maintenance Facility
- E. Capacity Enhancements
- F. Life Cycle Operations and Maintenance (O&M)

### E.2 Methodology

This cost estimate reflects a work breakdown structure (WBS) of the primary systems, subsystems, and significant components associated with the construction of permanent enhancements, and impacts to existing site conditions at each ICS facility. The WBS format provides for the development of enhancement construction costs independent from costs of improvements in capacity, and separate from Life Cycle O&M costs. Costs such as design fees, and construction contingencies are likewise applied accordingly. Contractor markups costs such as for profit, field and home office overheads and bonds are applied to the estimate.

### **E.3** Assumptions

This section lists those items which fundamentally serve as a basis for assumptions and inclusion for cost determination within the estimate. (note: items considered for exclusion from basis of cost are listed later in this appendix). The assumptions may be direct and indirect items and considered to provide cost impacts to the project.

### E.3.1 Basic Assumptions

Costs are base lined to 2007 Dollars.

Costs are escalated to a hypothetical mid-point of construction. (see Escalation discussion below)

Costs are primarily derived or abstracted from MCACES price guides and "RS MEANS" cost data; and pricing data abstracted from B&V historical data.

Costs of labor are adjusted to reflect "area cost factor" based on Davis-Bacon wage rates as applied to the Jefferson Parrish, Louisiana region, although contractors may mobilize from outside the region. Labor costs would include base rates and fringes. Incentive pay is factored as a percentage markup to the prime, and not distributed across various task items.

Construction will be with a self-performing prime contractor and supporting subcontractors.

Evaluation assumes prime contractor and subcontractors are "local" to the Jefferson Parrish region, and shall have minimum mobilization and demobilization costs, and as stated above.

Contractors may be required to offer labor incentives for an effective work force due to the demand for skilled labor by significant projects in the southeast region of the U.S.

Assumed project to be 100% funded, not impacting schedule and project costs.

### E.4 Discussion of contingencies

### E.4.1 Engineering and Design

A 12 percent *Engineering and Design* factor is applied to the estimate as an "Owner Cost". This factor allows for engineering fees, investigations, studies, etc. which would support the design process for the permanent enhancements of the ICS facilities. This factor is not considered a design contingency.

(Note: For the purpose of this study NO specific design contingency is applied to the estimate. A design contingency is incorporated into and becomes an integral part of the estimated construction cost to accommodate those features of the work that cannot be adequately assessed due to the partially developed design. The amount of contingency reflects both the degree of risk associated with uncertainties, particularly with respect to geotechnical conditions, and the completeness of the design detail for the major elements of work. The design contingency is based on and applied as an "Owner" cost to the subtotal of construction costs, because it represents an unknown portion of the total estimated construction cost. The contingency decreases as the project moves forward into final design as more information becomes available, project requirements become better defined, and more of the design detail is captured in the subtotal of construction costs.

### E.4.2 Construction Contingency

A construction growth contingency should be planned to pay for the costs of owner-directed changes after the project is under contract, changed conditions that occur or are encountered during construction, and other unforeseen conditions or changes. The contingency allows for unexpected costs in labor, material, site condition impacts, etc., which may result in additional costs specific to the project. The contingency is applied to the estimated construction value of the project.

(Note: A 30% contingency was applied to the cost estimate for Option 1 and Option 2 of the Final Conceptual Design Report for Permanent Flood Gate and Pump Stations. This

contingency was in consideration of new construction which was not impacted heavily by existing site features and facilities.)

A 35% contingency was applied to this ICS cost estimate due the nature of the existing conditions at each ICS following the construction of Phase 1, Phase 2, and Phase 3 ICS facility modifications. Phase 2 and Phase 3 detailed drawings were not available to effectively evaluate complete site conditions at each facility. An extensive array of existing pumping equipment, support platforming, and appurtenances are found at each ICS facility. Demolition and facility modifications are inherent at each ICS location, the details of which are not fully determined. The unknowns relating to demolition and existing facility modifications are considerations not otherwise applied to the cost estimate for Option 1 and Option 2 of the Final Conceptual Design Report for Permanent Flood Gate and Pump Stations.

### E.4.3 Escalation

Costs are escalated to a hypothetical mid-point of construction of March 2010 using 2.5% costs inflation per annum. To determine mid-point of construction, the following phases of design development and construction are assumed:

Design Phase:	9 months	(08/2007 to 05/2008)
Bid Phase:	4 months	(05/2008 to 09/2008)
Construction Phase:	24 months	(09/2008 to 09/2010)

An escalation factor of 5.75% is applied to the estimate.

### E.4.4 Item breakdown description

Following is a listing of primary systems associated with the ICS enhancements by canal location, forming the basic structure of the cost estimate:

### A. 17<sup>th</sup> Street Avenue Canal ICS

- Exist Engine Platform Enclosures
- New Engine Platform & Enclosures
- Phase 3 Pump Platform Enclosure

- Gate Operations
- Mechanical Systems
- Electrical Systems
- Miscellaneous Items

### **B.** Orleans Avenue Canal ICS

- Exist Engine Platform Enclosures
- New Engine Platform & Enclosures (N/A)
- Phase 3 Pump Platform Enclosure (N/A)
- Gate Operations
- Mechanical Systems
- Electrical Systems
- Miscellaneous Items

### C. London Avenue Canals ICS

- Exist Engine Platform Enclosures
- New Engine Platform & Enclosures (N/A)
- Phase 3 Pump Platform Enclosure
- Gate Operations
- Mechanical Systems
- Electrical Systems
- Miscellaneous Items

### E. Maintenance Facility

- Land Acquisition
- Maintenance & Storage Facility (Off-Site)

### F. Capacity Enhancements

- 17<sup>th</sup> Street Avenue Canal ICS
- Orleans Avenue Canal ICS
- London Avenue Canal ICS

### E.4.5. ICS Facility Tasks

Facility tasks associated within the Primary Systems are described as a subsystem or significant component to the ICS enhancements. The following breakdown of the tasks describes the significant subsystem components associated within each primary task:

Primary System	Subsystem
Exist. Engine Platform Enclosures:	Demolition and structure modifications required to enclosure the existing Engine Platform
New Engine Platform & Enclosures:	Expanded Engine Platforming (17 <sup>th</sup> St. Canal only)
Phase 3 Pump Platform Enclosure:	Enclosure of exist. Phase 3 platform (17 <sup>th</sup> Street and London Ave. Canals only)
Gate Operations:	Installation of new roller gates and guides, replacing existing needle gates
Mechanical Systems:	Replacement of existing Phase 1 and Phase 2pumps and appurtenances with new pumps and electric drivers Requires demo and platform modifications

Lightning Protection and grounding, Lighting, SCADA
Corrosion Protection; On-site Fluid Storage;

### **Maintenance Facility:**

The estimate reflects the cost for a recommended common Maintenance Facility intended to support heavy maintenance, parts and records storage. The cost is separated from the construction costs for enhancements to 17<sup>th</sup> Street, Orleans Avenue and London Avenue Canal locations. The location for such a facility is undetermined, and it is assumed land acquisition is required for construction of the facility. As discussed in the report a 25,000 SF facility is assumed.

### **Capacity Improvements:**

Capacity Improvements costs include new Engine Platform(s) & Enclosure(s); new mechanical systems including pumps, drivers, and piping; new electrical systems to provide power supply to the pumps; lighting and grounding protection; and SCADA capability. Additionally the estimate provides for costs of corrosion protection of the new platforming. Capacity Improvements construction costs are separated by the 17<sup>th</sup> Street, Orleans Avenue and London Avenue Canal locations.

### Life Cycle Operations & Maintenance (O&M) Costs:

Life Cycle Operations & Maintenance (O&M) costs are developed independent from the construction costs of ICS enhancements. The MCACES formatted cost estimate does not include O&M costs. See Section 5 of the report for discussion and cost development of the O&M costs.

### MCACES Cost Estimate

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DRAFT

DATE: June 29, 2007

CLIENT: UCACE - NASHVILLE PROJECT: Permanent Enhancements of ICS LOCATION: New Orleans, Louisiana

Prepared By: G. Hicks Checked By: M. Ledbetter Approved By: L. Schieber SHEET 1 OF 1

# TOTAL PROJECT COST SUMMARY #1:

	<b>1</b>									PROJECT TOTAL	\$ 431.790.066
of ICS	Capacity improvement Costs	×	×	×	×		\$ 56,188,253	5 15,015,699	\$ 42,903,197		\$ 114,107,149
ent Enhancements	Maint. Facility Costs	×	×	×	\$ 41,556,365	<u></u>	×	×	×		\$ 41,556,365
Permane	ICS Enhancement Costs	\$ 125,039,826	\$ 68,487,729	\$ 82,598,997	×		×	×	×		\$ 276,126,552
	ICS Facility Location	A. 17th STREET CANAL	B. ORLEANS AVE. CANAL	C. LONDON AVE. CANAL	D. MAINTENANCE FACILITY	E CAPACITY IMPROVEMENTS	17th Street Canal:	Orleans Ave Canal:	London Ave Canal:		TOTALS =

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DRAFT

CLIENT: UCACE - NASHVILLE PROJECT: Permanent Enhancements of ICS LOCATION: New Orleans, Louisiana

Prepared By: G. Hicks Checked By: M. Ledbetter Approved By: L. Schleber

DATE: June 29, 2007

SHEET 1 OF 1

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		Permanent En	hancements	of ICS	
Permanent Enhancements of ICS	ICS Enhancement Costs	Maint. Facility Costs	Capaci improven Costs	ty nent	TOTALS
A. 17th STREET CANAL	\$ 125,039,826	×	\$ 56,1	88,253	\$ 181,228,079
B. ORLEANS AVE. CANAL	\$ 68,487,729	×	\$ 15,0	15,699	\$ 83,503,428
C. LONDON AVE. CANAL	\$ 82,598,997	×	\$ 42,9	03,197	\$ 125,502,194
D. MAINTENANCE FACILITY	×	\$ 41,556,36	×		\$ 41,556,365
			ninelisieinniiten		
TOTALS =	\$ 276,126,552	\$ 41,556,365	\$ 114,107	7,149	\$ 431,790,066

TIME 14:10:21 TITLE PAGE 1									CREW ID: ICSCRW UPB ID: UP99EA
Tri-Service Automated Cost Engineering System (TRACES) PROJECT NOCBPS: Permanent Enhancement of ICS - New Orleans Hurricane Prot Proj	Permanent Enhancement of ICS New Orleans Hurricane Prot Proj Enhancement of ICS Facilities New Orleans, Louisiana	Designed By: Black & Veatch Estimated By: Mike Ledbetter	Prepared By: Fred Pratt, Gary L. Hicks	Preparation Date: 06/28/07 Effective Date of Pricing: 06/28/07 Est Construction Time: 1092 Days	Sales Tax: 0.0%	This report is not copyrighted, but the information contained herein is For Official Use Only.		M C A C E S F O R W I N D O W S Software Copyright (c) 1985-1998 by Building Systems Design, Inc. Release 1.2c	Currency in DOLLARS
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Fri 29 Jun 2007 Eff. Date 06/28/0									LABOR ID: ICSNLR

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MCACES Estimate, as provided within the general scope of the Hurricane stion Project provides cost information pertaining to the permanent sement of the interim Control Structures (ICS). The estimate reflects igation of construction costs for modifications required to make the permanent facility, allowing for a 50 year life.	
ttimate reflects a general work breakdown of primary systems, stems, and significant components of the existing ICS facilities, ted to correspond to the main deficiencies developed for the facility.	
Life Cycle Operation & Maintenance coats are not included in this 3 formatted construction cost estimate. See Section 5 of the report for osts.	
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teant iteant ifeant i i i i i i i i i i i i i i i i i i i	The refracts a general work breakdown of grimmry systems, the refracts a general work breakdown of grimmry systems, s, and significant components of the component component to correspond for the facility. Cycle Operation & Maintenance costs are not included in this matted construction cost estimate. See Section 5 of the report for

Fri 29 Jun 2007 Eff. Date 06/28/07 TABLE OF CONTENTS	Tri-Service Automated Cost PROJECT NOCBPS: Permanent Enhancement	Engineering System (TRACES) of ICS - New Orleans Hurricane Prot Proj	TIME 14:10:21 CONTENTS PAGE 1
	SUMMARY REPORTS	SURMARY PAGE	
	PROJECT OWNER SUMMARY - Scope PROJECT INDIRECT SUMMARY - Scope PROJECT DIRECT SUMMARY - Scope	1	
	DETAILED ESTIMATE	DETAIL PAGE	
	<ul> <li>A. 17th Street Canal ICS</li> <li>01. Exist Engine Platform Enclosures.</li> <li>02. New Engine Platform &amp; Enclosures.</li> <li>03. Phase 3 Pump Platform Enclosure.</li> <li>04. Gate Operations.</li> </ul>	[2· 9] [2] 	
	05. Mechanical Systems		
	<ul> <li>0.1. Exist Engine Valuat ICS</li> <li>0.1. Exist Engine Platform Enclosures.</li> <li>0.2. New Brgine Platform &amp; Encl (N/A).</li> <li>0.3. Phase 3 Pump Platform Encl (N/A).</li> <li>0.4. Gate Operations.</li> </ul>		
	05. Mechanical Systems		
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	06. Electrical Systems. 07. Miscellaneous Items. D. Maintenance Facility 01. Land Acquisition. 02. Maint & Stor Facility (off-Site).		
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Fri 29 Jun 2007 Eff. Date 06/28/07

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· · · · · · · · · · · · · · · · · · ·		QUANTITY UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	BOND	TOTAL COST UNIT COST
	A 17th Street Canal ICS B Orleans Avenue Canal ICS C London Avenue Canal ICS D Maintenance Facilty E Capacity Improvements		67,447,601 36,920,679 44,528,876 23,125,000 61,557,164	3,372,380 1,846,034 2,226,444 2,06,250 3,077,858	2,832,799 1,550,669 1,870,213 1,870,213 2,585,401	3,774,645 2,091,735 2,521,593 989,625 3,437,248	774,274 424,091 511,471 207,821 706,577	78,201,700 42,833,208 51,658,597 25,989,946 71,364,247
	TOTAL Permanent Enhancement of ICS		233, 579, 320	11,428,966	9, 600, 331	12,814,846	2,624,235	270,047,698
	OTHER							15,527,743
	SUBTOTAL ESCALATN							
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	TOTAL INCL OWNER COSTS							431,790,066

Currency in DOLLARS

LABOR ID: ICSNLR EQUIP ID: EQNICS

CREW ID: ICSCRW UPB ID: UP99EA

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	C	13,187	521,727	30, 310 41, 948	44000123138387770 557743138387770	36,320,619 44,528,876	
	Paintenance Facility ECapacity Improvements	0 11,993	0 474,817	29 <b>,</b> 683	023125000 686562854167035	23,125,000 61,557,164	
	TOTAL Permanent Enhancement of ICS	52,558	2077063	152,893		233,579,320	
	OVERHEAD					11,428,966	
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						9,600,331	
	SUBTOTAL PROFIT					254,609,618 12,814,846	
	CIBTOTAL USTAL					267,423,463	
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	SUBTOTAL Own Furn					319,844,493 111,945,573	
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	A., 17th Street Canal	ICS						DETAIL PAGE	(~)
AOl. Exist Engine Platform Enclosures		MON TIMANO	MANHRS	LABOR E	W LNWSIOO	aterial.	Other 1	TINU TOST UNIT	COST
A. 17th Street Canal ICS A01. Exist Engine Platform Enclosur Notes:	01 D		2 E F F F F S S S S S S S S S S S S S S S	per per von tan mit un		2 	na one ener van man		
1. Phase 1, 2, 3 Power Units	are exposed to hurricane wind blown debris.								
2. Hoisting equipment needs so	We level of protection from flying debris.								
3. Quantitles reflect total fo	or both east / west side platforms.								
A01.01 . Demolition									
A01.01 . 01. Chain Link F	encing								
L RGW	i SS < > > Site dml, chain link, remove	450.00 LE	0.00	0.00	0.00	0.00	3.00 1,350	3.00 1,350	3.00
	TOTAL Chain Link Fencing	450,00 LF	0	- 0			1,350	1,350	3.00
A01.01 . 02. Metal Roof-5	iding Panels								
15 NGW	1 SS < > Remove wetal roof and metal	11300 SF	0.00	0.00	0.00	0.00	1.00 11,300	1.00 11,300	3.00
	TOTAL Metal Roof-Siding Panels	11300 SF	- 0	- 0	0		11,300	11,300	1.00
A01.01 . 03. Misc Steel -	- Roof Purlins								
L RSM	1 SS < > Remove metal purlins supporting	23400 LBS	0.00	0.00	0.00	0.00	0.25 5,850	0.25 5,850	0.25
	TOTAL Misc Steel - Roof Purlins	23400 LBS			- 0		5, 850	5,850	0.25
	TOTAL Demolition	i		0			18,500	18,500	
A01.02 . Structure Modificatio	Su								
A. 01.02 . 01. Add Misc Ste	el Framing								
A. 01.02 . 01.01. Add W Note:	elded Structural Frame								
1. Allo	w 5500 LBS each Welded Frame (say 58 LF x 100 =	5800 lbs).							
2. 6 69	. x 5800 = 34,800 lbs.								
з. Зф, <sup>8</sup>	00 / 2000 = 17.4 tons								
LABOR ID: ICSNLR EQUIP ID: EQNICS	Currency in DOLLARS					CREW ID	D: ICSCRW	UPB ID: UP99	AS.

Fri 29 Jun 2007 Eff. Date 06/28/07 DETAILED ESTIMATE	PROJECT	Tri-Service Automated Cost Engineeri NOCBPS: Permanent Enhancement of ICS -	ing System (TR/ New Orleans Ru	(CES) (rricane E	rot Proj			ANT.	14:10:21
		A 17th Street Canal	ICS						AGE
AOl. Exist Engine Platform Enclosures	99 90 90 90 90 90 90 90 90 90 90 90 90 9		QUANTY COM	MANHRS	LABOR EQ	UIPHNT MATER	TAL Other	TOTAL COST	JNIT COST
4. hand	Cost based o dling.	n \$1.50/LB for material, labor, equip. inc	cl dwellvery ar	Ţ					947 (A) min and and and and and
2	B MIL SS <	> Add Welded Steel Frame	NOL-05-11	0.00	0°.0	0.00	.00 3000.00 0 52,200	3000.00 52,200	3000.00
		TOTAL Add Welded Structural Frame	6,00 EA	0			0 52,200	52,200	8700.00
A01.02 . 01.02. A Note	Add W10 Col's es:	at Eaves of Ridg							
1. A east	Allow for the t and west en	addition of (4)- new W10x30 columns (at ] closures.	l6-ft length) a	(ئ					
a.	B MIL SS <	> Add W10 Wide-Flange Columns at	2.40 TON	0.00	0.00	0 00 0	.00 2100.00 0 5,040	2100.00 5,040	2100.00
		TOTAL Add W10 Col's at Eaves of Bldg	4800.00 1.28		- 0	0	0 5,040	5,040	1,05
A01.02 , 01.03. A	Add New Roof	Purtins							
£	B MIL SS <	> Add new purlins to support	47520 LB	0.00	0.00	0.00	.00 1.10 0 52,272	1.10 52,272	1.10
		TOTAL Add New Roof Purlins	38400 LB			· · · · · · · · · · · · · · · · · · ·		52,272	1.36
A01.02 . 01.04. A	Add MC6 Girts	at Bldg Perimeter							
2	b MIL SS <	> Add new MC6x8.2 Girts btwn	22000 LB	0,00	0.00	0.00	.00 3.00 0 66,000	3.00 66,000	3.00
		TOTAL Add MC6 Girts at Bidg Ferimeter	9600.00 LB			0	0 66,000		6.88
		TOTAL Add Misc Steel Framing		10			0 175,512	175,512	
A. 01.02 . 02. Add Preci	cast Wall & R	of Panels							
1. Estima 2. Cost in bldg.	ates assumes ( incl materils,	o" +/+ thick precast panels. • labor, equip, etc for installation onto	existing						
Ω.	3 MIL SS <	> Add new perimeter wall panels	16000 SF	0.00	0.00	0 00 0	.00 10.00 0 160,000	10.00 160,000	10.00
LABOR ID: ICSNLR EQUIP ID: EQUICS		Currency in DOLLARS				CRI	EW ID: ICSCR	W UPB ID: L	899EA

Eff. Date 06/28/07 DETAILED ESTIMATE	PROJECT N	ILL-SEFFICE AUTOMATED COST ENGINEE VOCBPS: Permanent Enhancement of ICS A 17th Street Cana	ring System (TF - New Orleans F I ICS	ACES) Aurricane E	èrot Proj				TIME DETAIL P	14:10:21 AGE 4	
A. 01. Exist Engine Platform Enclosures	999 MV (ch. etc. fram etc. (ch. etc. (n) and (ch. etc. (n) etc. (ch. (	*	MOLE A AMELIO	and the second					and the second se		
и		· · · · · · · · · · · · · · · · · · ·	MOD I ENDAZ				EX1AL	Uther P	OTAL COST U	NIT COST	
		TOTAL Add Precast Wall & Roof Fanels	16000 SF		- 0	. 0			160,000	10.00	
A01.02 . 03. Add Over	head á Personn	lel Doors									
Notes: 1. Allow 2. Allow at each en	<ul><li>(2) - commercial</li><li>(1) - commercial</li><li>(1) sure. Assu</li></ul>	al grade hollow metal doors at each enc l grade, sectional, steel, heavy duty, me l0-ft x 10-ft size.	losure. Sverhead door								
a	> SS TIM 8	> Overhead coml, no frame, manua	l, 2.00 EA	0.00 0	0.00	0.00	0,00 12 0	.00.00 2,400	1200.00 2,400	1200.00	
α	> SS TIM 8	> Comistidr, fl, 3'-4" x 7'-0"	4,00 EA	0.00	0.00	0.00	0.00 5	.00.00 2,000	500,00 2,000	500.00	
		TOTAL Add Overhead & Personnel Doors		- 0			- 0	4,400	4,400		
A01.02 . 04. Add Louve Notes: Provide at	ers & Ventilat 1. Install lo East and Wes	ors buvers for air intake each side of encl et enclosures	osure.								
2. Assume 4-ft Size.	: (14) ea side	, at 4-ft x									
3. Total 14 SF. (1	ouver area = { SAY 1000 SF to	[14 ea x 2 sides x 4 x 4 ] x 2 enclosur stal)	896								
4. Provide :	a protective a	llumínum shroud over top & sídes of lou	ler,								
5. Provide protection	(2)- powered .	wall exhausters at ea enclosure; with	shroud								
m	> rr TIN	> Wall louvers, aluminum, with	1000.00 SF	0.00	0.00	0.00	0.00 0 4	40.00 0,000	40.00 40,000	40.00	
α	· NIL JJ <	> Protective aluminum shroud ove	: 36.00 EA	0.00	0.00	0.00	0.00	50.00 4,000	250.00 14,000	250.00	
æ	AF JJ <	> Fan, wall exhers, 1 HP, cutfgl	4,00 EA	0.00	0.00	0.00	0.00 15	00.00 6,000	1500.00 6,000	1500.00	
		TOTAL Add Louvers & Ventilators				0	0	0,000	60,000		
A01.02 . 05. Nodify Ex	xist Gen Exhau	st Vents									
Ω	NIL JU <	> Allowance to modify exist	12.00 EA	0.00	0.00	00.0	9 0 0	00.00 6,000	500,00 6,000	500.00	
LABOR ID: ICSNLR EQUIP ID: EQNICS		Currency in BOLLA	ş				CREW ID:	ICSCRW	UPB ID: UI	A9EA	
: 14:10:21 bace	n dogu	UNIT COST			10000.00				10000,00		222206,00
---	---------------------	---------------------------------------	--------------------------------------	-------------------------------------	------------------------------------	---------------------------------	-------------------------------	--	------------------------------------	--	--
ant a a a	TYYN	TOTAL COST	6,000		1000.00 10,000	10,000	415,912		10000.00 30,000	10,000	444,432
		Other	6,000		10000 10,000	10,000	15,912		10,000	10,000	
		ATERIAL	0		0.00				0.00		
		M J.NMA I.NC			0.00		- 0		0.00	-	
rot Proj		LABOR EC	0		0.00				0.00	- 0	
JES) rrícane P		MANHRS	- 0		0.00	0	10		0.00		
i System (TRA) se Orleans Hu	CCS	QUANTY DOM	i		ST 00 T	i	ł		1.00 LS	•	2.00 EA
Tri-Service Automated Cost Engineerin NOCBPS: Permanent Enhancement of ICS - N	A 17th Street Canal	· · · · · · · · · · · · · · · · · · ·	TOTAL Modify Exist Gen Exhaust Vents	Suns	> Allowance to modify utility runs	TOTAL Modify Exist Utility Runs	TOTAL Structure Modifications	\$\$C	> Allowance for misc modifications	TOTAL Allowance for Misc Modifications	TOTAL Exist Engine Platform Enclosures
Fri 29 Jun 2007 Eff. Date 06/28/07 DETAILED ESTIMATE		A01. Exist Engine Platform Enclosures		A01.02 . 06. Modify Exist Utility F	> 22 TIM 8			A01.03 . Allowance for Misc Modification	L RSM SS <		

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/07	Tri-Service Automated Cost Er PROJECT NOCBPS: Permanent Enhancement of	igineering S I ICS - New	ystem (TRAC Orleáns Hur	ES) ricane Pr	ot Proj			IN L	14:10:21
DELATERD FOLIWIE	A. 17th Street	Canal ICS						DETAIL	PAGE 6
A 02. New Engine Platfour & En	JCJOSUTES	90	ANTY UOM M	ANHRS	LABOR EQ	UIPMNT MA	TERIAL Other	TOTAL COST	UNIT COST
A02. New Engine Platf. Notes:	form & Enclosures		19 19 20 40 10 10 10 10 10 10 10 10	2 3 4 8 4 4 4				ne en an	11 (c) at (at (at (at (at (at (at (at (at (at
<ol> <li>At 17th St. on both east and each.</li> </ol>	canal ICS only, a new expanded Engine Platform is require 1 west side to house (3) additional pumps and power units	ą							
<ol> <li>The estimate existing Engine .</li> <li>elevated concret.</li> <li>structure to be .</li> <li>precast concrete</li> </ol>	<pre>provides for a free-standing structure, adjacent to the platform Structure, constructed upon a pile-supported te slab similar to the existing structure. The new framed with rigid welded frames, with a superstructure c a wall and roof panels.</pre>	<b>1</b> 9-4							
3. Overhead doo. and ventilation	or and personnel door access provided, in addition to louv system appurtenances.	er							
4. The size of t 50-ft in area:	che new expanded Engine Platform is assumed to be 50-ft x 50 x 50 = 2500 SF x 2 = 5000 SF								
5. Cost per SF a misc mechanical a	allows for misc eletrical (i.e., lighting, recepticles) a appurtenances for new enclosed platform.	pu							
	L RSM SS < > Allowance for (2) -2500 S	н 200	0,00 SF	0.00	0.00	00-0	0.00 785.00	785.00 3,925,000	785,00
	TOTAL New Engine Platform & Enc	Losures	2.00 EA				0 3925000	3,925,000	1962500
		·							

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/07 Demarted commune	Tri-Service Automated Cost Engineeri ECT NOCBPS: Permanent Enhancement of ICS - 1	ng System (TRA) New Orleans Hu	JES) rricane P	rot Proj				TIME 14	:10:21
divition contraint	A 17th Street Canal	ros						DETALL PAG	e-
A	***************************************	QUANTY UOM 1	TANHRS	LABOR EQ	UIPMNT MAT	ERIAL	Other 7	TOTAL COST UNI	T COST
A									F F 4 4
1. Phase 3 Power Units are exposed	to hurricane wind blown debris.								
2. For purpose of cost development, size and framing to London Ave. Gene	estimate assumes enclosure similar in erator Platform.								
3. Quantities reflect total for one	platform.								
A03.01 . Demolition									
A.,03.01 . 01. Chain Link Fencing	17								
L RSM SS <	> Site dml, chain link, remove	265,00 LF	0.00	0.00	0.00 0	0.0	3,00	3,00 795	3.00
	TOTAL Chain Link Fencing	265,00 LF	- 0			- 0			3.00
A03.01 . 02. Metal Roof-Siding	Panels								
L RSM SS <	> Remove metal roof and metal	5150.00 SF	0.00	0.00	0,00	0.00	1.00 5,150	1.00 5,150	1.00
	TOTAL Metal Roof-Siding Panels	5150.00 SF	0		0		- - - - - - - - - - - - - - - - - - -	5,150	1.00
A. 03.01 . 03. Misc Steel - Roof	Puriins								
L RSM SS <	> Remove metal purlins supporting	10750 LBS	0.00	0.00	0.00	0.00	0,25 2,688	0.25 2,688	0.25
	TOTAL Mise Steel - Roof Purlins			- 0			2,688	2,668	0.25
	TOTAL Demolition	1	0				8,633	8,633	
A03.02 . Structure Modifications									
A03.02 . 01. Add Misc Steel Fra	and ng								
A.,03.02 , 01.01. Add Welded Note:	Structural Frame								
<ol> <li>Allow 5500</li> <li>2.8 ea. x 55</li> <li>3.44,000 / 2</li> <li>4. Cost based</li> <li>handling.</li> </ol>	J LBS each Welded Frame (say 55 LF x 100 = 1 500 = 44,000 lbs. 2000 = 22 tons 3 on \$1.50/LB for material, labor, equip. inc	5500 lbs). 1 dwelivery and	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						

Fri 29 Jun 2007 Eff. Date 06/28/07 APPTATED SCTMATE	Tri-Service Automated Cost Engineeri NOCBPS: Permanent Enhancement of ICS -	ng System (TRU New Orleans H	ACES) Arricane I	rot Proj				1 1 ME	4:10:2]
ALANTING /ARTING	A 17th Street Canal	ICS						DETAIL PA	20 10
A.03. Phase 3 Pump Flatform Enclosure	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	MON. YTWANQ	MANHAS	LABOR EQ	OUTPMNT MP	TERIAL OUP	ter TOT?	T COST UN	TT COST
> SS TIM R	> Add Welded Steel Frame	NOL 00 TI		0.00	00.0	0.00 3000.	- 00 000	000.00 33,000	3000.00
	TOTAL Add Weided Structural Frame	4 . 00 EA			· · · · · · · · · · · · · · · · · · ·	0 33,6		33,000	8250,00
A03.02 . 01.02. Add W10 Col's	at Eaves of Bldg								
B MIL SS <	> Add W10 Wide-Flange Columns at	0.96 TON	0.00	0.00 0	0.00 0	0.00 2100. 0 2,0	.00 016	100.00 2,016	2100.00
	TOTAL Add W10 Col's at Eaves of Bldg	1920.00 LB	0	0	0	0 2,0	910	2,016	1.05
A03.02 . 01.03. Add New Roof F	eurlins								
> SS IN 8	> Add new purlins to support	21600 LB	0.00	0.00	0.00	0.00 1. 0 23,7	.10	1.10 23 <b>,</b> 760	0 
	TOTAL Add New Roof Purlins	Z1600 LB		0		0 23, 7	760	23,760	1.10
A_,03.02 . 01.04. Add MC6 Girts	at Bldg Perímeter	·							
B MIL SS <	> Add new MC6x8.2 Girts biwn	11000 LB	0.00	0.00	0.00	0.00 3. 0 33,0	00	33,000	3.00
	TOTAL Add MC6 Girts at Bldg Perimeter	11000 IB	- 0		0	0 33,0	000	33,000	3.00
	TOTAL Add Misc Steel Framing	1			- 0	116 0 0 11'		911,126	
A03.02 . 02. Add Frecast Wall & Ro Note:	of Fanels								
1. Estimates assumes 6	0" +/- thick precast panels.								
2. Cost incl materils, bidg.	. labor, equip, etc for installation onto	existing							
> oo TIN a	> Add new perimeter wall panels	7920.00 SF	0.00	0.00	0.00	0.00 10. 0 79,2	00	10.00 79,200	10.00
	TOTAL Add Precast Wall & Roof Panels	7920.00 SF				0 19,2	500	79,200	10.00

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/07 Servises eccrimate	PROJECT NOCBI	Tri-Service Automated Cost Engineerin PS: Permanent Enhancement of ICS - M	g System (TRA) ew Orleans Hu	CES) rricane P	rot Proj			ţ	INE 14:10:21
AINATION CONTAINS		A_, 17th Street Canal	ICS					DET	IL PAGE
A.03. Phase 3 Pump Platform	Enclosure	" "	QUANTY UOM	MANHRS	LABOR EQ	AM TUMAIU	TERIAL OUN	er TOTAL CC	ST UNIT COS
A03.02	03. Add Overhead & Personnel   Notes:	Doors							
	1. Allow (2)- commercial g	rade hollow metal doors at each enclos	are.						
	2. Allow (1)-commercial gr at each enclosure. Assume	ade, sectional, steel, heavy duty, ove 10-ft x 10-ft size.	rhead door						
	B MIL SS <	> Overhead comi, no frame, manual,	1.00 EA	0.00	0.00	0,00 0	0.00 1200. 0 1,2	30 1200 1,2	00 1200.00
	B MIL SS <	<pre>&gt; Com1 st1 dr, f1, 3'-4" x 7'-0",</pre>	2.00 EA	0.00	0.00	0.00 0	0.00 500. 0 1.0	30 500, 30 1,,(	00 00 500.00
	μ	JTAL Add Overhead & Personnel Doors	i	0		- 0	0 2,2	2,2	- 00
A_,03.02 .	04. Add Louvers & Ventilators Notes:								
	<ol> <li>Install louvers for air and West enclosures</li> </ol>	intake each side of enclosure. Provid	de at East						
	2. Assume (14) ea side , af	t 4-ft x 4-ft size.							
	3. Total louver area = [14 e SF. (SAY 1000 SF total	ea x 2 sides x 4 x 4 ) x 2 enclosures *	8 8 9 6						
	4. Provide a protective alur	minum shroud over top & sides of louve							
	5. Provide (2)- powered wal. protection.	l exhausters at ea enclosure, with shr	pnd						
	B MIL 33 <	> Wall louvers, aluminum, with	500.00 SF	0.00	0.00	0.00	0.00 40.	00 40. 00 20, C	00 00 40.00
	> <i>II</i> 118 8	> Protective aluminum shroud over	28.00 EA	0.00	0.00	0.00	0.00 250.	00 250. 20 7, C	00 20 250.00
	B AF - JJ <	> Fan, wall exhers, 1 HP, cntfgl,	2.00 EA	0.00	0.00	0.00	0.00 1500.	00 1500. 37,0	00 1500.00
	).L	37AL Add Louvers & Ventilators		٥	0		0 30,0		1 0

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/07	Tri-Service Automated Cost Engineerin T NOCBPS: Permanent Enhancement of ICS - N	g System (TRAC) ew Orleans Hur:	3S) ricane Pr	ot Proj				TIME	14:10:21
DETAILED ESTIMATE	A 17th Street Canal	I CS		ì				DETAIL P	AGE 10
A. 03. Phase 3 Pump Platform Enclosure		QUANTY UOM M	ANHRS	LABOR EQ	UIPMNT MAT	TERTAL	Other T	OTAL COST U	NIT COST
A03.02 . 05. Modify Exist Gen Exi Notes:	haust Vents					-       1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	401 401 HB (MA)	ne is de me me ve ve ve ve ve	and prove your your your your your
1. Existing exhaust '	vents pentrate the metal siding of the bldg.								
2. Vents need to be a concrete panel system	modified to function with the new exterior )	precast							
3. Includes adapting concrte panels.	exterior shrouds on vent penetration thru n	ew precast							
> CC TIW H	> Allowance to modify exist	6.00 EA	0.00	0.00	0°00	0.00	00.00 3,000	500,00 3,000	\$00.00
	TOTAL Modify Exist Gen Exhaust Vents		0	0			3,000	3,000	
A03.02 . 06. Modify Exist Utilit.	y Runs								
B MIL JJ <	> Allowance to modify utility runs	1.00 LS	0.00	0.00	0.00	0.00 50	00.00 5,000	5000.00 5,000	5000.00
	TOTAL Modify Exist Utility Runs	tra esta	0	- 0			5,000	5,000	
	TOTAL Structure Modifications	e der ver			0	0 23	L, 176	211,276	
A03.03 . Allow for Misc Enclosure Mod	U)								
L RSM SS <	> Allowance for misc modifications	1.00 IS	0.00	0.00	00.0	0,00	25000 5,000	25000,00 25,000	25000.00
	TOTAL Allow for Misc Enclosure Mods	a voor van	- 0		- 0	0	2,000	25,000	
	TOTAL Phase 3 Pump Platform Enclosure	1.00 EA	- 0	- 0		0 24	4,809	244,809 2	44808.50

Fri 29 Jun 2007 Eff. Date 06/28/07 DETATLED ESTIMATE	PROJECT	Tri-Service Automated Cost Engineeris VOCBPS: Permanent Enhancement of ICS - N	ng System (TRA Vew Orleans Nu	(CES) Arricane F	rot Proj			Ω Σ μ→ μ→ μ→	10:21
		A 17th Street Canal	I CS					OSTALL	276E 11
A. 04. Gate Operations			QUANTY UOM	MANHKS	LABOR EC	ULPMNT MATER	alAL Other	TOTAL COST U	JNIT COST
A04. Gate Operations Note:							- 90- 90- 90- 10- 10- 10- 10- 10- 10- 10- 10- 10- 1		
<ol> <li>Allow for removal and disporement with (11) roller c</li> </ol>	osal of exi gates and a	isting (11) needle gates, and associated framing.							
<ol> <li>Provide gates with rollers during differential head condi for placement of gates.</li> </ol>	to allow J Itions, and	response to emergency closures i heed for guicker repsponse time				,			
A04. 01. Roller Gates and Guic	des								
A_04. 01 01. Roller Gates	(7)								
L RSN	× 88 8	> Allowance for fabrication and	128,00 TON	0.00	0.00	) 0010	0.00 1700.00 0 217,600	1700.00 217,600	1700.00
NSR 1	V 88 8	> Allowance for Corrosion	13000 SF	0.00	0,00	00.0	0,00 3.00 0 39,000	3,00 39,000	3.00
T. RSP	N SS ≺	> Allowance for installation of	128.00 TON	0.00	0.00	0,00	0.00 1000.00 0 128,000	1000.00 128,000	1000.00
		TOTAL Roller Gates	11.00 EA			0	0 384,600	384,600	34963,64
A. 01. 02. Gate Guide C	Columns								
L. RSN	× SS ≺	> Allow for fab and delivery of	S5.00 TON	0.00	0.00	0 0 0	00 1700.00 0 93,500	1700.00 93,500	1700.00
L RGN	× SS ×	> Allowance for Corrosion	7000.00 SF	0.00	0.00	0°00	0.00 3.00 0 21,000	3,00 21,000	3.00
L RSW	M SS <	> Allowance for installation of	55,00 TON	0.00	0.00	0 0 0	00 1000.00 0 55,000	1000,00 55,000	1000.00
		TOTAL Gate Guide Columns	I				0 169,500	169,500	
A.,04, 01, 03. Add Flatforn	m Expansior	ı û ladders							
L RSM	∨ 00 20	> Allowance for fabrication and	10.00 TON	0.00	0.00	0.00	00 1700.00 0 17,000	17,000	1700.00
L RSW	V SS SS	> Allowance for installation of	10.00 TON	0.00	0.00	0 0 0	00 1000.00 0 10,000	1000.00 10,000	1000.00
LABOR ID: ICSNLR EQUIP ID: EQUICS		Currency in DOLLARS				C	REW ID: ICSCRN	UPB ID; U	A99EA

Fri 29 Jun 2007 Eff. Date 06/28/07	Tri-Service Automated Cost Engineerir SCT NOCBPS: Permanent Enhancement of ICS - N	ig System (TRAC lew Orleans Hur	RS) ricane P	rot Proj			TIME	14:10:21
DETAILED ESTIMATE	A 17th Street Canal			1			DETALL	2AGE 12
AOd. Gate Operations		QUANTY UOM N	TANBRS	LABOR EQ	TAM TWM910	RIAL Other	TOTAL COST	JNIT COST
			200 - 101 - 101 - 101 - 101 - 101 - 101 - 101 - 101 - 101 - 101 - 101 - 101 - 101 - 101 - 101 - 101 - 101 - 101	* = * * * * *	an	n 100 000 no no tao an		
	TOTAL Add Platform Expansion & Ladders		0			0 27,000	27,000	
$A_{\rm m}$ .04. 01. 04. Removal / Dispose	of Exist Gates							
L RSM SS <	> Allowance for gate removal from	128.00 TON	0.00	0.00	0.00	0.00 1000.00 0 128,000	1000,00 128,000	1000,00
L RSM SS <	> Allowance for off-site removal	256000 185	0.00	0.00	0.0	0.00 0.02 0 5,120	0.02 5,120	0.02
	TOTAL Removal / Dispose of Exist Gates	11,00 EA				0 133,120	133,120	12101.82
A.,04. 01. 05. Fill Void of Needl Notes:	.e Gate Seat							
1. Allow 12-ft / ga	te x ll gates = $132 \ \mathrm{LF}$							
L RSM SS <	> Fill void of Needle Gate Seats	132.00 I.F	0.00	0.00	00.0	0.00 100.00 0 13,200	100.00 13,200	100.00
	TOTAL FILL Void of Needle Gate Seat	11.00 EA		0	0	0 13,200	13,200	1200.00
A.,04. 01. 06. Install Gate Opera	itor / Motor							
L RSM SS <	> Install gate operator; reuse	11.00 EA	0.00	0.00	0.00	0.00 2500.00 0 27,500	2500.00 27,500	2500.00
	TOTAL Install Gate Operator / Motor	11.00 EA				0 27,500	27,500	2500.00
	TOTAL Roller Gates and Guides	t i	- 0	- 0		0 754,920	754,920	
	TOTAL Gate Operations					0 754,920	754,920	

Currency in DOLLARS

Eri 29 Jun 2007 Eff. Date 06/28/07 Dereated Fourtware	PROJECT N	Tri-Service Automated Cost Engineerin NOCBPS: Permanent Enhancement of ICS - N	g System (TRA ew Orleans Hu	CES) rricane P	rot Proj				14:10:21
THATTON NOTION		A_, 17th Street Canal	ICS					DETAIL	24GE 13
A. 05. Mechanical S	ystems second second		QUANTY UOM	MANHRS	LABOR EC	OLPMNT MATERL	AL Other	TOTAL COST 1	NIT COST
Å05. Mech	anical Systems		oor van men om ande men gen men om van van van van		19 year oo waxaa waxaa ahaa ahaa	· • • • • • • • • • • • • • • • • • • •			90 VII IN 40 40 40 40 40 40 40
A05.	01. Phase I Pumps Sys Modifications Notes;	<i>a</i>							
	<ol> <li>Replace existing Phase 1 pum FSI type.</li> </ol>	mps (12 ea) with new 350 cfs pumps (12 ea)	ł						
	<ol> <li>See "Item E_Capacity Modific additional pumping equipment and enhanced capacity.</li> </ol>	cations" for alternative of providing d expanded facilities to accommodate							
4	05, 01. 01. Demo Exist Phase 1 Pum	sdu							
	L RSM JJ <	> Allowance for disconnect & prep	12,60 EA	0.0	0.00	0.00 0	00 7100.00 0 85,200	7100.00 85,200	7100.00
	L RSM JJ <	> Allowance for removal and	12.00 EA	0.00	0.00	0.00 0	00 3750.00 0 45,000	3750,00 45,000	3750,00
		TOTAL Demo Exist Phase 1 Pumps	- 12.00 EA	0		0	0 130,200	130,200	10850.00
. "H	05. 01. 02. Demo Exist Hydraulic P	Piping Sys							
	A05. 01. 02.01. Install Valves	6 drain Hyd Fluid							
	L RSM JJ <	> Purchase (8)-3" gate valves1	8.00 EA	0.00	0.00	0.00	00 500.00 0 4,000	500.00 4,000	500.00
	L RSM JJ <	> Purchase (2)-1" gate valves1	2,00 84	0.00	0.00	0.00	00 200,00 0 400	200.00 400	200.00
	L RSM JJ <	> Allowance for installing valves	11880 IF	0.00	0.00 0	0.00	00 3.25 0 38,610	3.25 38,610	3.25
	L RSM JJ <	> Allowance for installing valves	2970.60 LF	0.00	0.00	0.00	00 3.25 0 9,653	3,25 9,653	9 7 9
	L RSM JJ <	> Fluid Containment and Disposal	4883.00 GAL	0.00	0.00	0.00 0.0	00 10.00 0 48,830	10,00 48,830	10.00
		TOTAL Install Valves & drain Hyd Fluid	ŝ	0		0	0 101,493	101,493	
	A05, 01, 02.02. Clean interior	of piping							
	L RSM J <	> Allowance for flushing 4	11880 LF	0.00	00.0	0.00	00 2.00 0 23,760	2.00 23,760	2.00
LABOR ID: ICSNLR	EQUIP ID: EQNICS	Currency in DOLLARS				1 2 2	807974 1978 1979		4 G G G G G

Eri 29 Jun 2007 Eff. Date 06/28/07	Tri-Service Automated Cost Engi FECT NOCBPS: Permanent Enhancement of I	neering System (T) CS - New Orleans (	MCES)	Prot Prot				123 255 255 255 255 257	14:10:21
DETAILED ESTIMATE	A. 17th Street C	anal ICS	-	m 3 4 3 4.				DETAIL P	3GE 14
A	······································	QUANTY UOM	MANHRS	LABOR EC	AM INMUIUC	TERIAL	Other 3	TOTAL COST U	NIT COST
L RSM JJ <	> Allowance for flushing 6	2970.00 LF	0.00	0.00	0.00	00.0	0.50 1,485	0.50	0.50
	TOTAL Clean interior of piping			10			25,245	25,245	
A05. 01. 02.03. Demo exist!	hyd fluid piping								
L RSM JJ <	> Demo existing 3" hydraulic	41 0881I	0.00	0.00	0 0 * 00	0.00	10.50 24,740	10.50 124,740	10.50
L RSM JJ <	> Demo existing 1" hydraulic	2970.00 LF	0.00	0.00	0,00	0,00	10.50 31,185	10.50 31,185	10.50
	TOTAL Demo exist hyd fluid piping			- 0		0	55,925	155,925	
	TOTAL Demo Exist Hydraulic Piping	Sys			0		82,663	282,663	
A05. 01. 03. Demo Exist Power Ur	Units								
L RSM JJ <	> Allowance for disconnect &	ртер 12.00 ЕА	0.00	0.00	0.00	0.00 %	600.00 43,200	3600,00 43,200	3600.00
L RSM JJ <	> Allowance for removal and	12.00 EA	0.00	0,00	0.00	0.00	800.00 21,600	1800.00 21,600	1800.00
	TOTAL Demo Exist Power Units	12.00 EA			- 0	10	64,800	64,800	5400.00
A.,05. 01, 04. Miscellaneous Demo	9								
L RSM JJ <	> Allowance for Misc Pump Sys	1.00 LS	0,00	0.00	0.00 0	0000 0	50000 50,000	50000.00 50,000 (	000000000
	TOTAL Miscellaneous Demo		- 0		0			20,000	
A05. 01. 05. Modify Exist Pump :	Supt Platforms								
A05. 01. 05.01. Demo Exist :	Stl & Grating (E-W)								
L RSM SS <	> Allowance for demo of exist	13,00 TON	0.00	0.00	0°00	00-0	250.00 3,250	250.00 3,250	250.00
l RSM SS <	> Allowance for demo of exist	2640.00 SF	0.00	0.00	0.00	0.00	5.00 13,200	5.00 13,200	5.00
L RSM SS <	> Allowance for disposal of d	ащо 35.00 ТОМ	0.00	0.00	0, 00 0	0.00	50.00 1,750	50.00 1,750	50.00
LABOR ID: ICSNLR EQUIP ID: EQNICS	Currency in DO	LARS				CREW ID;	: ICSCRW	UPB ID: UI	A3664

Fri 29 Jun 2007 Eff. Date 06/28/07 DETAILED ESTIMATE	PROJECT	Tri-Service Automated Cost Engineerir NOCBPS: Permanent Enhancement of ICS - h	ng System (TR New Orleans H	ACES) urricane I	Prot Proj					14:10:21
		A., 17th Street Canal	tos						DETAIL	5768 5768
A. 05. Mechanical Systems	19 77 79 79 19 79 79 79 79 79 79 79 79 79 79 79 79 79		QUANTY UOM	MANHRS	LABOR EQ	AM THMATUC	ATERIAL	Other	TOTAL COST	JNIT COST
		TOTAL Demo Exist Stl & Grating (E-W)		·	0			18,200	18,200	
A05. 01.	. 05.02. Install New S	tl & Grating (E-W)								
	7 83 WS8 7	> Allow for fab and delivery of	13.00 TON	0,00	0.00	00.0 0	0.00	700.00 22,100	1700.00 22,100	1700.00
	L RSM SS <	> Allowance for Corrosion	3300.00 SF	00.00	0.00	0.00	0.00	3,000 9,900	3.00 9,900	3.00
	L RSM SS <	> Allowance for installation of	13, 60 TON	0.00	0.00	0.00	1 00 °0	000.00 13,000	1000.00 13,000	1000.00
	L RSM SS <	> Allowance for new Grating	2640.00 SF	0.00	0.00	0.00	0.00	25,00 66,000	25.00 66,000	25.00
		TOTAL Install New Stl & Grating (E-W)		0			10	11,000	111,000	
		TOTAL Modify Exist Pump Supt Platforms			- 0		0 11	29,200	129,200	
A05.01.06	. Install New Pumps w/	Elec Driver								
	L RSM JJ <	> New pump with electric driver	12.00 EA	0.00	0.00	0.00	0,00 I' 020	700000 400000	1700000.00 20,400,000	1700000
	L RSM JU <	> Install New pump with electric	12.00 EA	0.00	0.00	0.00	0.00	415000 980000	415000,00 4,980,000	115000.00
		TOTAL Install New Pumps w/ Elec Driver	12.00 EA	- 0		- 0	025	380000	25,380,000	21.15000
A05. 01. 07	. Install New Motor Pow	wer Units								
	> 22 MSN 1	> Motors for New pumps, installed	12.00 EA	0.00	0.00	0.00	0,00 0.00	500000 000000	50000.00 6,000,000	00000,00
		TOTAL Install New Motor Power Units	12.00 EA	- 0		- 0	00		6,000,000	00000,00
80 10 80	Ronjaro Storaza									

A\_.05. 01. 08. Replace Storage Tks w/ Dbl Wall

A\_.05. 01. 08.01. Disconnect-Clean Exist Fuel Tank Notes:

1. Assume tank 5% full 20,000 gal x .05 = 100 gal

LABOR ID: ICSNLR EQUIP ID: EQNICS

Fri 29 Jun 2007 Eff. Date 06/28/07	PROJECT	Tri-Service Automated Cost Engineeri NOCBPS: Permanent of ICS - )	ng System (TR New Orleans H	ACES) urricane F	×0+ ₽				3MI L	14:10:21
DETAILED ESTIMATE		A_ 17th Street Canal	TCS	2 2 2 2 2 2 2 2 2 2 2 2 2					DETAIL	PAGE 16
A			QUANTY UOM	MANHRS	LABOR EC	M TNM9100	ATERIAL	Other	TOTAL COST	UNIT COST
	L RSM JJ <	> Disconnect existing fuel oil		0.00	0.00	0000	0.00	500,00	500.00	
	L RSM JJ <	> Transfer re-usable Fuel, incl	100.00 GAL	0.00	0.00	0,00	0 00 0	1.00 100	1.00 1.00	
	L RSM JJ <	> Clean and Flush tank prior to	1.00 IS	00.0	0.00	0,00	0.00	500.00 500	500.00 500.00	200.00
		TOTAL Disconnect-Clean Exist Fuel Tank	2.00 EA		- 0	-		T, 100	001'T	550.00
A. 05. 01. 08	8.02. Removal and D	isposal of Exist Tk								
	L RSM JJ <	> Removal and disposal of existing	2.00 EA	0.00	0.00	0.00	0.00 2	(000.00 4,000	2000.00 4,000	2000.00
		TOTAL Removal and Disposal of Exist Tk	2.00 EA		10			4,000	4,000	2009.00
A05.01.08	8.03. Install Double	)-Wall Storage Tank								
	L RSM JJ <	> New Dbl Wall Storage Tank(s) ;	2.00 EA	00.0	0.00	0.00	0.00	22500 45,000	22500.00 45,000	22500.00
	L RSM JJ <	> Install new Dbl Wall Storage	2.00 EA	0.00	0.00	0.00	0.00	000.00 4,000	2000,00 4,000	2000.00
	L RSN JJ <	> Reconnect fuel piping; allow	2.00 EA	0.00	0.00	0,00	0.00	.000.00 2,000	1000,00 2,000	1000.00
		TOTAL Install Double-Wall Storage Tank	2.00 EA	0				51,000	51,000	25500.00
		TOTAL Replace Storage Tks w/ Dbl Wall	2.00 EA		- 0	0			56,100	28050,00
		TOTAL Phase 1 Pumps Sys Modifications		0	- 0		032		32,092,963	
A05. 02. Phase 2 Pum Notes:	mps Sys Modification	ଣୁ								
1. Replace FSI type.	existing Phase 1 pu	mps (12 ea) with new 350 cfs pumps (6 ea)	ų							
2. Assume f in Phase 1 E	fuel supply from exi Engine Platform (ear	sting 20,000 gal fuel storage tank located is & west).	73							
3. See "Ite additional p	em E_Capacity Modifi pumping equipment an	cations" for alternative of providing d expanded facilities to accommodate								

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/0 DETAILED ESYMATE	7 PROJECT	Tri-Service Automated Cost Engineerin NOCBPS: Permanent Enhancement of ICS - N	ıg System (TR7 Vew Orleans Hu	CES) Kricane F	rot Proj				awr -	::10:21
		A 17th Street Canal	I CS					<u></u>	JEFAIL PAG	
A.,05. Mechanical	Systems	· · · · · · · · · · · · · · · · · · ·	QUANTY DOM	MANHRS	LABOR EQ	dellyn Thwello	ATAL OU	her TOTAI	L COST UN	TT COST
	enhanced capacity.	异学 医学学 医子宫 医子宫 化化合物 医骨骨 医骨骨骨 化化合物 化合物 化合物 化合物 化合物 化合物 化合物 化合物 化合物 化合			11 JUL 40 10 10 10	90 may an and 100 may and 1				
i et,	.05. 02, 01, Demo Exist Phase 1 Pr	sdum								
	L RSM JJ <	> Allowance for disconnect & prep	6.00 EA	0.00	0.00	0,00	0.00 7100 0 42,	.00 600 7]	100.0042,600	7100.00
	L RSM JJ <	> Allowance for removal and	6.00 EA	0.00	0.00	0 0 0	0.00 3750 0 22,	• 00 500	750.00	3750.00
		TOTAL Demo Exist Phase 1 Pumps	6.00 EA			0	0 65,	100	65,300 1	0850.00
¢'	.05. 02. 02. Demo Exist Hydraulic	Piping Sys								
	A05. 02. 02.01. Install Valves	s & drain Hyd Fluid								
	L RSM JJ <	> Furchase (8)-3" gate valves1	9,00 EA	0.00	0.00	0 00 0	).00 500 0 4,	.00.	500.00 4,000	500.00
	L RSM JJ <	> Purchase (2)-1" gate valves1	2.00 EA	0.00	0.00	0,00	0 200	.00	200.00 400	200.00
	L RSM JJ <	> Allowance for installing valves	594.00 LF	0.0	0.00	0.00	0.00 3.	- 25 931	3.25 1,931	3.25
	L RSM J <	> Allowance for installing valves	594.00 LF	0.00	0,00	0.00	0,000 J.	. 25 931	3.25 1,931	s. S
	L RSM JJ <	> Fluid Containment and Disposal	225.00 GAL	0.00	0.00	0.00	00 10	-00	10.00 2,250	10.00
		TOTAL Install Valves & drain Hyd Fluid	1	0	- 0	0	0 10,			
	A_,05. 02. 02.02. Clean interior	r of piping								
	L RSM JJ <	> Allowance for flushing &	594.00 LF	0.00	0.00	0.00	0.00 2 0 1,	.00 188	2.00 1,188	2.00
	L RSM JU <	> Allowance for flushing &	149.00 IF	0.00	0.00	0.00	0 00	.50	0.50 75	0.50
		TOTAL Clean interior of piping	1		- 0			263 253	1,263	
	A05. 02. 02.03. Demo exist hyd	i fluid piping								
	L RSM JJ <	> Demo existing 3" hydraulic	594.00 LF	0.00	0.00	0 0 0	.00 10	. 50	10.50 6,237	10.50
LABOR ID: ICSNLR	EQUIP ID: EQNICS	Currency in DOULARS				CR	EW ID: L	CSCRW UP	PB ID: UP9	¥361

Fri 29 Jun 2007 Eff. Date 06/28/07	PROJECT	Tri-Service Automated Cost Engineeri NOCBPS: Permanent Enhancement of ICS - 1	ng System (TR New Orleans H	ACES) urricane	Prot Proj				ant t	14:10:21
DETAILED ESTIMATE		A 17th Street Canal	TCS						DETAIL P	AGE 18
A., 05. Mechanical Systems			QUANTY UOM	MANHRS	LABOR EQ	UI PMNT MAY	TERIAL	Other 1	CTAL COST U	NIT COST
	1 H H H K K K K K K K K K K K K K K K K						****	* * *		3 7 1 1
	A NOM A	> Demo existing 1" hydraulic	149.00 LF	0.00	0.00	0.00	0.00	10.50 1,565	10.50 1,565	10.50
		TOTAL Demo exist hyd fluid piping		0		0		7,802	7,802	
		TOTAL Demo Exist Hydraulic Piping Sys		- 0				19, 575	19,575	
A. 05. 02. 03	. Demo Exist Power Unit	ő								
	L RSM JJ <	> Allowance for disconnect & prep	6.00 EA	0.00	0.00	0, 00 0	0.00 3	600.00 21,600	3600.00 21,600	3600.00
	L RSM JJ <	> Allowance for removal and	6.00 EA	0.00	0.00	0.00	0.00 1	800.00 10,800	1800,00 10,800	00*008t
		TOTAL Demo Exist Power Units	6.00 EA					32,400	32,400	5400.00
A05. 02. 04	I. Miscellaneous Demo									
	L RSM JJ <	> Allowance for Misc Pump Sys	1.00 LS	00.0	0.00	0.00	0.00	25000 25,000	25000.00 25,000	25000.00
		TOTAL Miscellaneous Demo		- 0		- 0	- 0	25,000	25,000	
A	. Modify Exist Pump Sup Notes:	t Flatforms								
	<ol> <li>Costs for Phase 2 p costs for modifications</li> </ol>	latforming abstracted from Phase 1 quantil of existing pump support platforms.	ties and							
	<ol> <li>Abstracted costs ba replacement of (12)-Pha</li> </ol>	sed on replacement of (6)-Phase 2 pumps it set 1 pumps.	n lìcu of							
A. 05. 02.	05.01. Demo Exist Stl	4 Grating (E+W)								
	L RSM SS <	> Allowance for demo of exist	6.50 708	0.00	0.00	0.00	0.00 0	250.00 1,625	250.00 1,625	250,00
	L RSM SS <	> Allowance for demo of exist	1320.00 SF	0.00	0.00	0.00	0.00	5.00 6,600	5.00 6,600	5,00
	L RSM SS <	> Allowance for disposal of demo	17.50 TON	0.00	0.00	0.00	0.00	50.00 875	50.00 875	50.00
		TOTAL Demo Exist Stl & Grating (E-W)		0	0	0		001.6	9,100	

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/07 DETAILED ESTMATE	PROJECT	Tri-Service Automated Cost Engineerir NOCBPS: Permanent Enhancement of ICS - N	ng System (TR/ New Orleans Hu	ACES) Arricane E	rrot Proj				32 NI 1 L+	14;10:21
		A. 17th Street Canal	I CS						DETAIL	2AGE 19
A. 05. Mechanical Systems			QUANTY UOM	MANHRS	LABOR EQ	UIPMNT MA	TERIAL	Other 1	FOTAL COST (	JNIT COST
A05. 02. 05	.02. Install New S	tl & Grating (E-W)							,	a mas ∞ r − − k + •
	4 KSM SS K	> Allow for fab and delivery of	6.50 TON	0.00	0.00	0,00	0.00 17	00.00 1,050	1700.00 11,050	1700.00
	L RSM SS <	> Allowance for Corrosion	1650.00 SF	0.00	0.00	0.00	0.00	3.00 4,950	3.00 4,950	3.00
	L RSM S5 <	> Allowance for installation of	6,50 TON	0.00	0,00	0,00	0.00 10	6, 500	1000.00 6,500	1000.00
	L RSM SS <	> Allowance for new Grating	1320.00 SF	0.00	0.00	0.00	0.00	25,00 3,000	25,00 33,000	25.00
		TOTAL Install New Stl & Grating (E-W)	1	- 0	- 0		10	5,500	55,500	
		TOTAL Modify Exist Pump Supt Platforms	ł	- 0		- 0		4,600	64,600	
A.,05, 02, 06, Ins	stall New Pumps w/	Blec Driver								
	L RSM JJ <	> New pump with electric driver	6.00 EA	0,00	0.0	0.00	0.00 17 0102	1 00000 1 00000	.700600.00 0,200,000	170000
	L RSM JJ <	> Install New pump with electric	6.00 EA	0.00	0.00	0.00	0.00 4 0.24	15000 90000	415000.00 2,490,000 4	15000.00
		TOTAL Install New Pumps w/ Elec Driver	6.00 EA	- 0	-		0126	1 00006	.2, 690, 000	2115000
A.,05, 02, 07, Ins	stall New Motor Pow	er Units								
	L RSM JJ <	> Motoros for New pumps, installed	6,00 EA	0.00	0.00	0.00	0.00 5 0.30	00000	500000.00 3,000,000 5	000000000000000000000000000000000000000
		TOTAL Install New Motor Power Units	6.00 EA	- 0			0 30		3,000,000 5	00000.00
		TOTAL Phase 2 Pumps Sys Modifications	**	0	r O		0108		5,896,675	
A05. 03. Gate Closure Notes:	e Pump System Mods									
1. Allows for modifications	or demo of the exists is to the existing p	sting hydraulic pumping system and Matform.								
A05. 03. 01. Dem	no Exist Gate Closu	ire Pumps								
	L RSN JJ <	> Allowance for disconnect & prep	14.00 EA	0,00	0.00	0.00	17 00.0 0 9	00.00 9,400	7100.00 99,400	7160.00
LABOR ID: ICSNLR EQUIP ID: EQUICS	10	Currency in DOLLARS					CREW ID:	ICSCRW	UPB ID: U	V366a

Fri 29 Jun 2007 Eff. Date 06/28/07	PROJECT N	Tri-Service Automated Cost Engineeri OCBPS: Permanent Enhancement of ICS - 1	ng System (TRV 9ew Orleans Hu	ACES) urricane F	rot Proj				GWIL	14;30;21
DETAILED ESTIMATE		A., 17th Street Canal	TCS						DETAIL P	4GE 20
A	100 000 000 000 000 000 000 000 000 000		ÖUANTY UOM	MANBRS	LABOR EQ	UIPMNT MA	TERIAL	Other TC	TAL COST U	NIT COST
L RSM	20 V	> Allowance for removal and		0.00	0.00	0,00	0.00 37		3750.00	E F I I I
			14.00 EA	0	0	0	9 0	52,500	52,500	3750.00
		TOTAL Demo Exist Gate Closure Fumps	14.00 EA						151,900	10850.00
A05. 03. 02. Demo Exist Hy	draulic P	iping Sys								
A_05. 03. 02.01. Instal	11 Valves	š drain Hyd Fluid								
L RSM	> PP	> Purchase (8)-3" gate valves1	8.00 EA	0,00 0	0.00	0°.0	0°.0	500,00 4,000	500.00 4,000	500,00
L RSM	3J <	> Furchase (2)-1" gate valves1	2,00 84	0.00	0.00	0.00	0.00	200.00 400	200.00 400	200.00
ti RSM	JJ <	> Allowance for installing valves	1400.00 LF	0.00	0,00	0 0	0.00	3,25 4,550	3.25 4,550	3.25
L RSM	× ℃	> Allowance for installing valves	1400.00 LF	0.00	0.00	0.00	0.00	3.25 4,550	3.25 4,550	3,25
L RSM	۲ د د	> Fluid Containment and Disposal	528.00 GAL	0.00	0.00	0.00	0.00	10.00 5,280	10.00 5,280	10.00
		TOTAL Install Valves & drain Hyd Fluid	,	0				18,780	18,780	
A. 03. 02.02. Clean	interior	of piping								
MSN 1	çç V ∨	> Allowance for flushing &	1400.00 LF	0.00	0.00	0.00	0.00	2,000 2,800	2.00 2,800	2.00
NSN 1	> pp	> Allowance for flushing &	350,00 LF	0.00	0°00	0.00 0	0.00	0.50 175	0.50 175	0.50
		TOTAL Clean interior of piping	T		- 0			2,975	2,915	
A.,05, 03, 02,03, Demo e	xist hyd	fluid piping								
L RSM	V DD	> Demo existing 3" hydraulic	1400.00 LF	0.00	0.00 0	0.00	0.00	10.50 14,700	10.50 14,700	10.50
I. RSM	v bb	> Demo existing 1" hydraulic	350.00 LF	0.00	0.00	0.00	0.00	10,50 3,675	10.50 3,675	10.50
		TOTAL Demo exist hyd fluid piping	κ. 					.8,375	18,375	

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/07	PROJECT NO	Tri-Service Automated Cost Engineerin CBPS: Permanent Enhancement of ICS - N	ng System (TR) New Orleans H	ACES) arricane F	ford gor				NI NI NI NI	14:10:21
DETAILED ESTIMATE		A., 17th Street Canal	ICS						DETAIL	21 21 21
A. 05. Mechanical Systems			QUANTY UOM	MANHRS	LABOR EC	ULI PMNT MAD	CERIAL	Other 1	LSOD TVLO	NIT COST
		TOTAL Demo Exist Hydraulic Piping Sys		0	0	0	0	40,130	40,130	
A05. 03. 01	3. Demo Exist Power Units									
	1. RSM JJ <	> Allowance for disconnect & prep	14.00 EA	0.00	0.00	0.00	0.00 3	600.00 50,400	3600,00 50,400	3600.00
	L RSM JJ <	> Allowance for removal and	14.00 EA	0.00	0.00	0.00	0.001	800.00 25,200	1800.00 25,200	1800.00
		TOTAL Demo Exist Power Units	14.00 EA				-	75,600	75, 600	5400.00
A05.03.04	1. Demo Exist Disch Pipe+M Notes:	isc Demo								
	1. Assume discharge pipes	are $3$ -ft diameter. x $30$ -ft length each	pipe.							
	2. 30-ft ea x 14 pipes =	420 LF.								
	3. Say \$75 per LF for dem	o and disposal.								
	1. RSM JJ <	> Allowance for demo & disposal of	420.00 LF	0.00	0.00	0.00	0.00	75.00 31,500	75.00 31,500	75.00
	L RSM JJ <	> Allowance for Misc Pump Sys	1.00 LS	0.00	0.00	0.00	0000	25000 25,000	25000.00 25,000	25000.00
		TOTAL Demo Exist Disch Pipe+Misc Demo				0		56,500	56, 500	
A.,05. 03. 0	i, Modify Exist Pump Supt Notes:	Platforms								
	1. Say Platform approx 30	-ft wide x 140-ft lg. = 4200 SF								
	<ol> <li>Allow 25lbs / SF for e salvage value incl).</li> </ol>	xisting platform framing at \$5.00 per SI	0m) •							
	3. Allow \$50 lbs / SF fo delivery, corrsion protec	r new platform framing, including fabric tion, and installation.	cation,							
	L RSM JJ <	> Allowance for demo & disposal of	4200.00 SF	0.00	0.00	0.00	0.00	5.00 21,000	5.00 21,000	5.00
	L RSM JJ <	> Allowance for new replacement	4200.00 SF	0.00	0.00	0.00	0.00 0.2	50,00 10,000	50,00 210,000	50.00

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/07 DETALLED ESTIMATE	Tri-Service Automated Cost Engineer) PROJECT NOCBPS: Permanent Enhancement of ICS - A 17th Street Canal	ng System (TRACE) New Orleans Hurr ICS	S) icane Pr	ot Proj			TIME 14:10 DETAIL PAGE	: 55
A.05. Mechanical System	·····································	QUANTY . UOM MA	NHRS	LABOR EQU	IL PMNT MATERIAL	. Other	TOTAL COST UNIT C	0.87
		v na vou vou ten 1 Nor vin von inn ten sen sen vou open men om open inn von voe				A part and the state of the sta		
	TOTAL Modify Exist Pump Supt Flatforms		0	0	0	0 231,000	231,000	
	TOTAL Gate Closure Pump System Mods	v vor von men	- 0	0		0 555,130	555,130	
	TOTAL Mechanical Systems		0	0	0	)48544768	48,544,768	
LABOR ID: ICSNLR EQUIE	P ID: EQNICS				N N N N N N N N N N N N N N N N N N N	ID: ICSCR	Kaeean :01 Edu	

Fri 29 Jun 2007 Eff. Date 06/28/07 Derestien sectionare	Tri-Service Automated Cost Engineerir PROJECT NOCBPS: Permanent Enhancement of ICS - N	ig System (TRAC lew Orleans Hux	ES) ricane F	rot Proj				GNIL	14:10:21
JINTICA ANALA	A. 17th Street Canal	rcs						DETALL P	AGE 23
A06. Electrical Systems	· · · · · · · · · · · · · · · · · · ·	QUANTY UOM N	ANHRS	LABOR EQ	M TNM4IU	ATERIAL	Other T	OTAL COST U	NIT COST
A.,06. Electrical Systems		on for and for the last for and the last for the last the me	1	and and 100 Mar 100 Mar 100 Am		PA 100 101 201 -004 104 106 100 100	1 L L L .	per no per vel un un un ma an van en	
A.,06. 01. Lightning	) and Grounding System								
A. 06. 01. 01.	Lightning Protection								
<pre>16000 0000 Electrical, Generally 16100 0000 Conductors &amp; Ground 16180 0000 Grounding 16181 0010 Grounding devic 16181 5999 Wire, laid in 16181 5999 Copper, ban</pre>	/ excludes crane services ding ces i trench ce stranded								
	MIL GG <16181 6010 > Grounding, laid in trench,	JIN 05 0	6.96 3	221,53 89	0.00	545,00 218	0.00	766.53 307	766.53
<pre>16000 0000 Electrical, Generally 16600 0000 Special Systems 16801 0000 Special Systems 16840 0010 Lightning prote 16840 0010 Lightning prote</pre>	/ excludes crane services ection 9. copper								
	L MIL GG <16840 4040 > Lightning protection, air	29.00 EA	0.48 14	19,28 259	0.00	14-67 425	0.00	33,95 984	39° 58°
16840 0010 Lightning prote 16840 4200 Air terminal	ction bases, copper								
	M MIL GG <16840 4220 > Lightning protection, air term	29.00 EA	0.89 26	35.72 1,036	0.00 0	21.50 624	0.00	57.22 1,659	57.22
	TOTAL Lightning Protection		42	1,683		1,267		2,950	
A06.01.02.0	Grounding								
16000 0000 Electrical, Generally 16100 0000 Conductors & Ground. 16180 0000 Grounding 16181 0010 Grounding devic 16181 0010 Prounding devic	/ excludes crane services ling tes								
	MIL GG <16181 0100 > Grounding, rod, copper clad, 10'	20.00 EA	1.82 36	73.05 1,461	0.00	29.40 588	0.00	102.45 2,049	102.45
	MIL GG <16181 6020 > Grounding, laid in trench,	1.00 MLF	9.43. 9	304.60 305	0.00	1060.00 1,060	0.00 0	1364.60 1,365	1364.60
16181 0010 Grounding devic 16181 6299 Ground conduct	tes tor bonding, cadweld								
LABOR ID: ICSNER EQUEP ID; EQN	sics Currancy in DOLLARS					CREW ID	: ICSCRW	UPB ID: U	43664

Eri 29 Jun 2007 Eff. Date 06/28/07 DETATIED ESTIMATE	Tri-Service Automated Cost Engineeri PROJECT NOCBPS: Permanent Enhancement of ICS -	ng System (TR New Orleans H	ACES) urricane	Prot Proj				Endi Maria a Anti a Anti a Anti a	14:10:21
A VARIA FOR ARRESTA	A., 17th Street Canal	sor						DEFALL	AGE 24
A06, Electrical Systems	· · · · · · · · · · · · · · · · · · ·	QUANTY UOM	MANHRS	LABOR EQ	N THMAIUG	ATERIAL	other	TOTAL COST U	NIT COST
	医布罗克 医外外外 化化化化化化化化化化化化化化化化化化化化化化化化化化化化化化化化化	a and want and and the line and new year and man and		n var om tan van An de me an an an					
	MIL GG <16181 6350 > Grounding, gnd conductor bond,	20,00.EA	1.82 36	73.42 1,468	0.00	19,89 398	0.00	93.31 1,866	93.31
	MIL GG <16181 6380 > Grounding, gnd conductor bond,	50,00-EA	2.08 104	84.12 4,206	0.00	17.29 865	0.00	101.41 5,071	101.41
	TOTAL Grounding			7,440		2,910		10,350	
	TOTAL Lightning and Grounding System		229	9,123		4,177		13,301	
A.06. 02. Electrical	Power								
A06. 02. 01. Pow	184								
16000 0000 Electrical, Generally ex 16000 0000 Raceways, Generally ex 16016 0000 Consults	ccludes crane services ccludes crane services								
16017 0010 Conduit, to 15', 1 16017 9889 Rental, hydrauli	lncl. terminations & elbows 10 bender								
	L MIL GG <16018 0000 > Remove generator power and	1.00 LS	24.00 24	964.80 965	0.00	9,58 10 2	206868 06,868	207842.38 207,842 2	07842.38
16016 0000 Conduits 16018 0010 Conduit, to 15', 1 16018 0499 Steel, rigid gal	ncludes couplings only vanized [RGS]								
	MIL GG <16018 0640 > Conduit to 15' H, 3" dia, incl	20350 LE	0.25 5,088	10.05 204,516	0.00	9,58 194,953	0.00	19.63 399,471	19.63
<pre>16000 0000 Electrical, Generally ex 16100 0000 Conductors &amp; Grounding 16108 0000 Conductors 16115 0010 Shielded cable 16115 0039 Copper, XLP shie 16115 0039</pre>	cludes crane services 1 iding, 5 KV								
	M MIL GG <16115 0400 > Shielded cable, 5kV, 1/0, no	32.00 MLF	42.11 3,347	1691,79 54,137	0.00	2184.00 69,838	0.00	3875,79 124,025	3875.79
16108 0000 Conductors 16119 0010 Wire 16119 0919 600 volt, type T 16119 0999 Copper, strand	HWNTHHN tec								
	MIL GG <16119 1350 > Wire, 600 volt, type THWN-THHN,	11.30 MLF	12,33 139	494.52 5,588	0.00	274.50 3,102	0.00	769.02 8.690	769.02
16000 0000 Electrical, Generally ex	ccludes crane services								
LABOR ID: ICSNLR EQUIP ID; EQNICS	Currency in DOLLARS					CREW ID	: ICSCRW	UPB ID: U	A98A

Fri 29 Jun 2007 Eff. Date 06/28/07 DFTATLED ESTTMATE	Tri-Service Automated Cost Engineer PROJECT NOCBPS: Permanent Enhancement of ICS -	ing System (TR New Orleans H	ACES) urricane	Prot Proj				7W1.7	14;10;21
	A. 17th Street Canal	ICS						DETAIL	PAGE 25
A.06. Electrical Systems	· · · · · · · · · · · · · · · · · · ·	QUANTY DOM	MANHRS	LABOR	L LNWA E GŎ	ATERIAL	Other	TOTAL COST	UNIT COST
16300 0000 Motors, Starters, F 16330 0000 Switches 16330 0010 Distribution se 16330 0100 Aiuminum bus	Boards & Switches ection bars, not including breakers								
	B AF GG <16331 0000 > Medium voltyage soft start	18.00 EA	40.00 720	1615.20 29,074	0,00	39600.00 712,800	0.00	41215.20 741,874	41215.20
16000 0000 Electrical, Generally 16500 0000 Power Systems & Car 16510 0000 Power Systems 16513 0010 Generator set 16513 2000 Diesel engine	y excludes crane services pacitors								
	M MIL GG <16513 3270 > Remove generator set	18.00 EA	177.78 3,200	6787.85 122,181	778.37 14,011	0.00	0.00	7566,22 136,192	7566.22
	B MIL GG <16513 3270 > Generator set, dal eng, xfr	18.00 EA	250.00 4,500	9545.41 171,817	1094.58 19,702	350000 630000	0.00	360640.00 6,491,520	360640.00
	TOTAL POWER	·	15,018	588,280	33, 713	7280752 2		8,109,614	
A06.02.03.	Gate Motor Operators								
16000 0000 Electrical, Generally 16300 0000 Motors, Starters, E 16350 0000 Motors	y excludes crane services Boards & Switches								1
	B MIL GG <16353 0000 > Gate motor operator	11.00 EA	0.00	76,53 842	0.00	5000,00 55,000	00.0	5076.53 55,842	5076.53
	TOTAL GALE MOTOR OPERATORS		0	842		55,000		55,842	
A., 06, 02, 08, No.	Control Dtes:								
L. Da	. The report considers that incremental SCADA (Supervisory C ata Acquisition) interface will be required in considerations inancements.	ontrol And of ICS							
2. tc	. Estimate provides for upgrade of SCADA monitoring and contro > accommodate transition from a hydraulic driven system to a d /stem.	l equipment lesel dríven							
, κ. γ	Allowance includes installation of conduit, wiring, devices, ith existing / new equipment and current SCADA monitoring sys	interface .em.							
4.	. Allowance based on cost of SCADA upgrades per pump.								

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/07	Tri-Service Automated Cost Engineering System ( PROJECT NOCEPS: Permanent Enhancement of ICS ~ New Orleans	TRACES) Hurricane	Prot Proj					14:10:21
AIWIYA WATELA	A 17th Street Canal ICS						DETAIL P	AGE 26
A	CUANTY	M MANHRS	LABOR E	OUI PMNT N	ATERIAL	Other	TOTAL COST UN	NIT COST
	Total allowance of \$3000 as follows: \$1000 - Pump House SCADA upgrade cost per pump \$2000 - SCADA routing cost to remote pump motors, etc 					1 1 2 2 2		
	5. Estimate assumes existing SCADA system is adequate for all Phase 3 monitoring.							
16000 0000 Electrical, General 16800 0000 Special Systems 16801 0000 Special Systems 16862 0010 Closed circui 16862 0010 Closed circui 16862 6999 Microproces	ly excludes crane services .t TV system .sor, matrix switcher/controller							
	M CIV GG <16865 0000 > Scada control system for canal 18.00 EA	1.00 18	40.38 727	0.00	0.00 30	00.00 4,000	3040.38 54,727	3040.38
	TOTAL Control		727		- 0	4,000	54,727	
	TOTAL Electrical Power	15,036	589,849	33,713	7335752 26	0,868	8,220,182	
	TOTAL Electrical Systems	15,265	598,972	33, 713	7339930 26	0,868	8,233,483	

Fri 29 Jun 2007 Eff. Date 06/28/07 DFPAILED ESTIMATE	PROJECT	Tri-Service Automated Cost Engineering NOCBPS: Permanent Enhancement of ICS - New	System (TRA / Orleans Hu	CES) rricane P	rot Proj			BWI L	14:10:21
		A 17th Street Canal IC	S					DETAI 10	PAGE 27
A.07. Miscellaneou	15 Items		UANTY UOM	MANHRS	LABOR EC	ULPMNT MATE	KIAL Other	TOTAL COST	UNIT COST
A07. Misc	ellaneous Items								(
A., 07.	01. Corrosion Protection Note:								
	1. Provide coating on all majo	or elements of the facility.							
	<ol> <li>Soil excavation and backfil structure supports in order to</li> </ol>	il required at all platform columns and provided corrosion protection below grade.							
	<ol> <li>A cofferdam is required on t adequate depth to provide corro water line on Flood side.</li> </ol>	che Flood side to enable drawdown of water to osion protection at a nominal depth below							
	<ol> <li>On Protected side, it is ass draw-down of canal for purpose nominal depth below water line</li> </ol>	sumed the pump station pumps can be used for of applying corrosion protection at a on Protected side.							
A	07. 01. 01. Protective Coatings								
	A.,07. 01. 01.01. Soil Excavatio	n / Backfill							
	L MIL AA <	> Excav / Backfill around existing	1.00 LS	0.00	0.00	00.0	0.00 60000 0 60,000	60000.00 60,000	60000,00
		TOTAL Soil Excavation / Backfill	î		0	0	0 60,000	60,000	
	A07. 01. 01.02. Construct Temp	) Cofferdam							
	L MIL AA <	> Construct Temp Cofferdam on	1.00 LS	0.00	0.00	0.00	0.00 1912500 0 1912500	1912500.00 1,912,500	1912500
		TOTAL Construct Temp Cofferdam	i			· · · · · · · · · · · · · · · · · · ·	0 1912500	1,912,500	
	A07. 01. 01.03. Dewater Frotec	ted Side							
	L MIL AA <	> Allowance for dewatering of	1,00 LS	0.00	0.00	0.00	0,00 300000 0 300,000	300000,00 300,000	300000,00
		TOTAL Dewater Protected Side	i		10	0	0 300,000	300, 000	
	A07. 01. 01.04. Apply Protecti	ve Coating							
	L MIL AA <	> Apply protective coating to	1.00 LS	0.00	0.00	0.00	0.00 425000 0 425,000	425000.00 425,000	\$25000.00
		TOTAL Apply Protective Coating	5 - 65 9			0	0 425,000	425,000	
LABOR ID: ICSNLR	EQUIP ID: EQNICS	Currency in DOLLARS				Ċ	REW ID: ICSCRI	t UPB ID:	\$366 d.C

Fri 29 Jun 2007 Eff. Date 06/28/07	PROJECT N	Tri-Service Automated Cost Engineer OCBPS: Permanent Enhancement of ICS -	ing System (TR/ New Orleans Hu	NCES) urricane P	rot Proj			TIME	14:10:21
DEIAILEU ESTIMATE		A 17th Street Canal	ICS					DETATL	26E 28
A.OT. Miscellaneous Items			QUANTY UOM	MANHRS	LABOR EQ	UIPMNT MA	TERIAL Other	TOTAL COST (	NIT COST
		TOTAL Protective Coatings	4 F F F F F F F F F F F F F F F F F F F				0 2697500	2,697,500	ne van wee mee int on int oo oo
A07. 01. 02. Ca	athodic Protection							; ; ; ;	
	l mil AA <	> Allowance to install cathodic	1.00 LS	0.00	0.00	0.00	0.00 425000 0 425,000	425000.00 425,000 ·	125000.00
		TOTAL Cathodic Protection	•				0 425,000	425,000	
		TOTAL Corrosion Protection	2	- 0	0	- 0	0 3122500	3,122,500	
A07. 02. Fluid Store Note:	age Facility (On-Site								
<ol> <li>The esti area for src and fluid ch</li> </ol>	imate assumes The Flu ockpile of waste flui banging of equipment.	id Storage Facility shall contain a 200 ds; an 1800 Sf area for new fluid stora	in N Ci						
	L RSM SS <	> Allow for (1)- onsite stor &	1500.00 SF	0.00	0.00	0.00	0,00 725,00 0 1087500	725.00	725,00
		TOTAL Fluid Storage Facility (On-Site		0	0	0	0 1087500	1,087,500	
A07. 03. Addt'l Fuel Notes:	l farm Installed								
<ol> <li>Addition facility.</li> <li>6 OPTION 2</li> </ol>	nal Fuel Tanks are pr The additional of the 2 Conceptual Designs	ovided to enhance fuel reserves at to I se tanks align reserve capacity with OP for New Pump Station Facilities.	CS						
2. The addec replaced by	d tanks are in additi double wall tanks as	on to the existing single wall tanks to shown elewhere in the estimate.	<u>ଝ</u> ପ						
	> VV TIM T	> Install fuel Farm Tarks and	5.00 EA	0.00	0.00	0 0	0.00 54000 0 270,000	54000.00 270,600	54000.00
		TOTAL Add'l Fuel Farm Installed	5.00 EA	0	0		0 270,000	270,000	54000.00
A07. 04. 96-in Butte	erfly Valves								
02000 0000 Site Work 02100 0000 Site Preparation & Ex 02160 0000 Sheet Piling 02161 0009 Sheet piling 02161 3900 Wood, including	xcavation Support g wales, braces and s	а ц со со со со со со со со со со со со со							

Currency in DOLLARS

CREW ID: ICSCRW UPB ID: UP99EA

Fri 29 Jun 2007 Eff. Date 06/28/07 DETAILED ESTIMATE	Tri-Service Automated Cost Engineering CT NOCBPS: Fermanent Enhancement of ICS - New	System (TR2 v Orleans Hu	CES) rricane	Prot Proj				an A	14:10:21
	A 17th Street Canal IC	80							AGK 29
A		DUANTY UOM	MANHRS	LABOR F	OUTPMNT MA	TERIAL	Other 1	TOTAL COST (	NIT COST
I NIL AA <02	2200 0000 > Allowance for delivery of Valves	7.00 EA	0.00	0.00	0.00	0.00 15	0,500	1500.00	1500.00
11000 0000 Equipment 11000 0000 Equipment									
B MIL AA <11	1000 0001 > Allowance for modifying and	7.00 EA	0.00	0.00	0.00	0.00	25000 15,000	25000,00 175,000	25000.00
<pre>15000 0000 Mechanical, Generally excludes crane ser 15100 0000 Pipe &amp; Fittings 15191 0000 Valves 15193 0010 Valves, bronze 15193 8500 Tempering water 15193 8550 Threaded connections</pre>	rvices								
B MIL AA <15	5194 0000 > 96" dia Butterfly Valve	7.00 EA	200.00 1,400	3238.90 57,672	2434.02 80 17,038 5	000.00 60,000	0.00	90672.92 634,710	90672.92
	TOTAL 96-in Butterfly Valves	7.00 EA	1,400	57,672	1,038 5	60,000 18 60,000 18	12,500	820,210	17172.92
	TOTAL Miscellaneous Items	ſ	1,400	57,672	17,038 5	60,000 46		5,300,210	
	TOTAL 17th Street Canal ICS		16,665	556, 644	50,751 7	899930588	40276	57,447,601	

Fri 29 Jun 2007 Eff. Date 06/28/07 PROJEC	Tri-Service Auromated Cost Engineerin CT NOCBPS: Permanent Enhancement of ICS - N	g System (TRA ew Orleans Hu	CES) Tricane F	rot Proj				TIME 14:10:21	
DETAILED ESTIMATE	B., Orleans Avenue Canal	ICS		ı				DETAIL PAGE 30	0
B01. Exist Engine Platform Enclosures		QUANTY UOM	MANNRS	LABOR E(	ULPMNT MATER	TAL (	ther T(	DTAL COST UNIT COST	1 8-1
B., Orleans Avenue Canal ICS B.,01. Exist Engine Platform Enclosures Notes:									
1. Phase 1, 2, 3 Power Units are exp	posed to hurricane wind blown debris.								
2. Hoisting equipment needs some leve	el of protection from flying debris.								
<ol> <li>For purpose of cost development, e size and framing to London Ave. Gener</li> </ol>	estimate assumes enclosure similar in rator Platform.								
4. Quantities reflect total for both	east / west side platforms.								
B01.01 . Demolition									
B_ 01.01 . 01. Chain Link Fencing									
L RSM SS <	> Site dml, chain link, remove	530.00 LF	0.00	0.00	0.00	.00	3.00 ,590	3.00 1,590 3.00	0
	TOTAL Chain Link Fencing	530.00 LF	10	0			·	1,590 3.00	0
B01.01 . 02. Metal Roof-Siding E	Panels								
L RSM SS <	> Remove metal roof and metal	10300 SF	0.00	0.00	0 00 0	.00	1.00	1.00 10,300 1.00	0
	TUTAL Metal Roof-Siding Panels	10300 SF	0		0	- 0	, 300	10,300 1.00	0
B.,01.01 . 03. Misc Steel - Roof F	Purlins								
12 KSM 000 <	> Remove metal purlins supporting	21500 LBS	0.00	0.00	0.00	00.00	0.25	0.25 5,375 0.25	ن (ئا
	TOTAL Mise Steel - Roof Purlins	21500 LBS					, 975 1	5,375 0.25	ري.
	TOTAL Demolition			- 0		0 1)	, 265	17,265	
B_,01.02 . Structure Modifications									
B01.02 . 01. Add Misc Steel Fran	ті пд								

Fri 29 Jun 2007 Eff. Date 06/28/07 DETAITEN DERMANE	Tri-Service Automated Cost Engineeri PROJECT NOCBPS: Permanent Enhancement of ICS - 1	ng System (TR2 New Orleans Hu	CES) rrícane F	rot Proj					14:10:21
UGINTER ESI IMAR	B Orleans Avenue Cana	1 ICS						a Trung	AGE 31
B.01. Exist Engine Flatform Enclosures		QUANTY DOM	MANHRS	LABOR EQ	NULPMNT N	ATERIAL	Other 1	TOTAL COST U	NIT COST
B01.02 . 01.01. Add ' Nove: 1. All 2. 8 e 3. 44/ 4. Cost handlin	Welded Structural Frame ow 5500 LBS each Welded Frame (say 55 LF x 100 = 1 a. x 5500 = 44,000 lbs, 000 / 2000 = 22 tons based on \$1.50/LB for material, labor, equip, incl g.	5500 lbs). dwelivery and							
7 W	L SS < > Add Welded Steel Frame	22.00 TON	9.14 201	398.12 8,759	92.94 2,045	1220.00 26,840	0.00	1711.06 37,643	1711.06
	TOTAL Add Welded Structural Frame	8.00 EA	201	8,759	2,045	26, 840		37,643	4705,42
B01.02 . 01.02. Add V	#10 Col's at Eaves of Bldg								
IW S	L SS < > Add W10 Wide-Flange Columns at	1.92 TON	0.00	0.00	0.00	0.00 2:	100.00 4,032	2100.00 4,032	2100.00
	TOTAL Add W10 Col's at Eaves of Bidg	3840.00 LBS		- 0	- 0		4,032	4,032	1.05
B_,01.02 . 01.03. Add 1	New Roof Purlius								
EM 8	E SS < > Add new purlins to support	43200 LB	0.00	0.00	0.00	0.00 0	1.10 47,520	1.10 47,520	1,10
	TOTAL Add New Roof Furiins	43200 LB		0		. 0	47,520	47,520	1.10
B_,01.02 . 01.04. Add !	MCG Girts at Bldg Perimeter								
IN S	L SS < > > Add new MC6x8.2 Girts btwn	22000 LB	0.00	0,00	0.00	00°0	3.00 66,000	3.00	3,00
	TOTAL Add NC6 Girts at Bldg Perimeter	- 22000 LB		- 0	- 0	- 0		66,000	3.00
	TOTAL Add Misc Steel Framing	3	201	8,759	2,045	26,840 11	17,552	155, 195	
B01.02 . 02. Add Precast Note: 1. Estimates	Wall & Roof Panels ässumes 6" +/- thick precast panels.								
2. Cost incl bldg.	materils, labor, equip, etc for installation onto (	existing							
I M I	L SS < > Add new perimeter wall panels	15840 SF	0.00	0.00	0.00	0.00 0.11	10.00 58,400	10.00 158,400	10.00
	TOTAL Add Precast Wall & Roof Panels	15840 SF	0	0	0		58,400	158,400	10.00
LABOR ID: ICSNLR EQUIP ID: EQNICS	Currency in BOILARS					· (1 %32.)	Majour .	8011 1011	4 2 0 0 0

Fri 29 Jun 2007 Eff. Date 06/28/07 DETAILED ESTIMATE	FROJECT ?	Tri-Service Automated Cost Engineering NOCBPS: Permanent Enhancement of ICS - Ne	ig System (TRA lew Orleans Hu	CES) rricane P	rot troj				T INST	4:10:21
		B Orleans Avenue Canal	rcs						o arvie	104 1
B.01. Exist Engine Flatform	Enclosures	· · · · · · · · · · · · · · · · · · ·	QUANTY UOM	MANHRS	LABOR EQ	UIPWNT MAT	rerial.	Other T(	DTAL COST U	AIT COST
B01.02	<ol> <li>Add Overhead &amp; Person Notes:</li> <li>Allow (2) - conmercia</li> </ol>	nel Doors al grade hollow metal dcors at each enclos	ere							
	<ol> <li>Allow (1)-commercial at each enclosure. Assu</li> </ol>	l grade, sectional, steel, heavy duty, over ume 10-ft x 10-ft size.	rhead door							
	> SS TIM 8	> Coml stl dr, fl, 3'-4" x 7'+0",	4.00 EA	0.00	0,00	0.00	0.00	500.00 2,000	500.00 2,000	500.00
08000 0000 Doors & Windows 08300 0000 Special Doors 08360 0000 Sectional Ove 08361 0010 Overhead, cc 08361 2599 Steel, sec	rhead Doors Amercial rtional									
	E MIL SS <0836	l 2650 > Overhead comi, no frame, manual,	2,00 EA	0.00	0°.00	0.00	0.00	200.00 2,400	1200.00 2,400	1200.00
		TOTAL Add Overhead & Personnel Doors	8	0	0	- 0		4,400	4,400	
B.,01.02 . (	04. Add Louvers & Ventilat Notes: 1. Install louvers for and West enclosures	cors air intake each side of enclosure. Provic	de at East							
	2. Assume (14) ea side	, at 4-ft % 4-ft size.								
	3. Total louver area =   SF. (SAY 1000 SF to	[14 ea x 2 sides x 4 x 4 ] x 2 enclosures = stal}	- 896							
	4. Províde a protective	aluminum shroud over top & sides of louver	La							
	5. Provide (2)- powered protection.	wall exhausters at ea enclosure; with shro	oud							
	B MIL SS <	> Wall Louvers, aluminum, with	1000.00 SF	0.00	0.00	0.00	0.00	40.00 10,000	40.00 40,000	40.00
	B MIL SS <	> Protective aluminum shroud over	56.00 EA	0.00	0.00	0.00	0.00	250.00	250.00 14,000	250.00
	B AF JJ <	> Fan, wall exhers, 1 HP, cntfgl,	4.00 EA	0.00	0.00	0.00	0.00 15	500.00 6,000	1500.00 6,000	1500.00
		TOTAL Add Louvers & Ventilators	3					00,000	60,000	

Currency in DOLLARS

Fri 29 Jun 2007 Bff. Date 06/28/07 Promytry Dominiant	Tri-Service Automated Cost Engineerin NOCBPS: Permanent Enhancement of ICS - M	j System (TRA ew Orleans Hu	CES) rricane I	rot Proj				TME	14:10:21
VERALLED ESTIMATE	B Orleans Avenue Canal	T C S						DETAIL	AGE 33
BOl. Exist Engine Platform Enclosures		QUANTY UOM	MANHRS	LABOR E(	M TNM IU	VTERIAL	Other	TOTAL COST	INIT COST
B01.02 . 05, Modify Exist Gen Exh. Notes:	aust Vents								
1. Existing exhaust w	ents pentrate the metal siding of the bidg.								
2. Vents need to be m concrete panel system.	odified to function with the new exterior p	precast							
3. Includes adapting . concrte panels,	exterior shrouds on vent penetration thru no	aw precast							
B MIL JJ <	> Allowance to modify exist	10.00 EA	0.00	0.00	0.00	0.00	500.00 5,000	500,00 5,000	500.00
	TOTAL Modify Exist Gen Exhaust Vents	i				0	5,000	5,000	
B01.02 . 06. Modify Exist Utility	Runs								
8 MTL JJ <	> Allowance to modify utility runs	1.00 LS	0.00	0.00	0,00	0.00	10000	10000.00	10000.00
	TOTAL Modify Exist Utility Runs	5				0	10,000	10,000	
	TOTAL Structure Modifications	2	201	8,759	2,045	26,840		392,995	
B01.03 . Allow for Misc Enclosure Mods									
L RSM SS <	> Allowance for misc modifications	1.00 LS	0.00	0.00	0.00	0.00	25000 25,000	25000.00 25,000	25000.00
	TOTAL Allow for Misc Enclosure Mods	<b>1</b>		0			25,000	25,000	
	TOTAL Exist Engine Platform Enclosures	8	201	8,759	2,045	26,840		435,260	

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/07 DETATIED ESTIMATE	PROJECT	Tri-Service Automated Cost Engineerin NOCBPS: Permanent Enhancement of ICS - N	g System (TRA lew Orleans Hu	CES) rricane P	rot Proj				awit i	14:10:21
		B Orleans Avenue Canal	び ン						USIALL P	40E 34
B02. New Engine Platform &	Encl (N/A)		OUANTY UOM	MANHRS	LABOR EQ	UT PMNT MAD	rerial (	Other TO	TAL COST U	NIT COST
B.,02. New Engine Fla Notes:	ttform & Encl (N/A)						2 00 3 0 4 4 4 4 4 4 4 4 4 4 4 4 4	9 E t 8 		3 8 F 6
New Engine Pla Pump Station.	itforms with Enclosures ar	e not required at Orleans Avenue TOTAL New Engine Platform & Encl (N/A)		0	0	0	c	C	c	
B03. Phase 3 Pump E Notes:	Platform Encl (N/A)							÷	5	
1. Phase 1, 2	2, 3 Power Units are expos	ed to hurricane wind blown debris.								
2. Holsting ec	puipment needs some level	of protection from flying debris.								
3. Quantities	reflect total for both ea	st / west side platforms. TOTAL Phase 3 Pump Platform Encl (N/A)		0	0	0	o	0	Ö	
B04. Gate Operation Note:	55									
<ol> <li>Allow for r replacement with</li> </ol>	emoval and disposal of ex .th (5) roller gates and a	isting (5) needle gates, and ssoctated framing.								
<ol> <li>Provide gat during differe for placement</li> </ol>	es with rollers to allow ential head conditions, an of gates.	response to emergency closures d need for quicker repsponse time								
B_,04. 01. Rolle	er Gates and Guides									
B04. 01.	01. Roller Gates									
	L RSM SS <	> Allowance for fabrication and	60.00 TON	0.00	0.00	0.00 0	0,00 170	00.00 2,000	1700.00 102,000	1700.00
	L RSM SS <	> Allowance for Corresion	6000.00 SF	0.00	0.00	0.00	0.00	3.00 3,000	3.00	3,00
	L RSM SS <	> Allowance for installation of	60.00 TON	0.00	0.00	0.00 0	0.00 100 0 60	)0.00 ),000	1000,00 60,000	1000.00
		TOTAL Roller Gates	5.00 EA	10	0	0	0 180	, 000	190,000	36000.00
B_,04, 01.	02. Gate Guide Columns									
	L RSM SS <	> Allow for fab and delivery of	28.00 TON	0.00	0.00	0.00	0,00 170 0 47	00.00 7,600	1700,00 47,600	1700.00
LABOR ID: ICSNLR EQUIP ID:	EQNICS	Currency in DOLLARS					CREW ID:	ICSCRW	U :UI EQU	4366¢

Fri 29 Jun 2007 Eff. Date 06/28/07 DETAILED ESTIMATE	PROJECT 1	Tri-Service Antomated Cost Engineeri OCBPS: Permanent Enhancement of ICS -	ng System (TR New Orleans H	ACES) urricane	erot Proj				T T T T T T T T T T T T T T T T T T T	14:10:21 MCE 35
		B Orleans Avenue Cana	11 ICS							2 2 2 2 2
B04. Gate Operations			QUANTY UOM	MANHRS	LABOR EC	AM TNM9 LUC	TERIAL	Other 3	rotal cost (	NIT COST
				n yeen yaar waa waa maa kula maa kula maa		2 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	<b></b> oo ah ah ah ah			1 1 1 1
2 2 2	SM SS <	> Allowance for Corrosion	2800.00 SF	0.00	0.00	0.00	0.00	3.00 8,400	3.00 8,400	3.00
M 	SM SS <	> Allowance for installation of	28.00 TON	0.00	0.00	0.00	T 00.0	000.00 28,000	1000.00 28,000	1000.00
		TOTAL Gate Guide Columns					0	84,000	84,000	
B04. 01. 03. Add Platfo	rm Expansion	. & Ladders								
2. 2.	> SS %S	> Allowance for fabrication and	4.50 TON	0.00	0.00	0.00	0.00	700.00	1700.00 7,650	1700.00
L R	> SS WS	> Allowance for installation of	4,50 TON	0.00	0.00	0.00	0.00 1	000.00 4,500	1000.00 4,500	1000.00
		TOTAL Add Platform Expansion & Ladders		0		0		12,150	12,150	
B04, 01. 04, Removal /	Dispose of F	xist Gates								
21 I	SM 55 <	> Allowance for gate removal from	60.00 TON	0.00	0.00	0.00	00.0	000.00 60,000	1000.00 60,000	1000.00
2. I	SM SS <	> Allowance for off-site removal	120000 LBS	0.00	0.00	0.00	0.00	0.02 2,400	0.02 2,400	0,02
		TOTAL Removal / Dispose of Exist Gates	. 2,00 EA			0		62,400	62,400	12480.00
B04, 01, 05, Fill Void / Notes:	of Needle Ga	te Seat								
1. Allow 12	-ft / gate >	. 5 gates = 60 LF								
ش 	SM SS <	> Fill void of Needle Gate Seats	60.00 LE	0.00	0.00	0.00 0	0.00	100.00 6,000	100.00 6,000	100.00
		TOTAL Fill Void of Needle Gate Seat	5.00 EA					6,000	6,000	1200.00
B04. 01. 06. Install Ga	te Operator	/ Motor								
Ϋ́ Ϋ́	SN SS ×	> Install gate operator; reuse	5.00 EA	0.00	0.00	0.0	0.00	500.00 12,500	2500.00 12,500	2500.00
		TOTAL Install Gate Operator / Motor	11.00 EA	0	0			12,500	12,500	1136.36
LABOR ID: ICSNLR EQUIP ID: EQNICS		Currency in DOLLARS					CREW ID	: ICSORW	UPB ID: U	V166d

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/07 DETATIERD ESYTMAVE	PROJECT N	Tri-Service Automated Cost Engineerin NOCBPS: Permanent Emhancement of ICS - N	ig System (TRA New Orleans Hu	CES) rricane P	rot Proj			TIME	14:10:21
		B., Orleans Avenue Canal	ICS					SETALE	PAGE 37
B05. Mechanical System			QUANTY UOM	MANHRS	LABOR EQ	ABINA TAMEIU	ALAL Other	TOTAL COST	UNIT COST
B05. Mechanica	.1 Systems	医骨骨骨 医温度 医鼻子子 资本 医丁基基 医异原素 医子宫 医鼻骨囊 医鼻骨囊 医鼻骨囊 医鼻骨囊 化合物				70 707 707 707 707 707 707 108 108 108 108 108	na per ana man ana ana ana ana ana ana ana	an na tao an	
в05. 01. N	Phase 1 Pumps Sys Modifications otes:								
~~1 (Lr	. Replace existing Phase 1 pun SI type.	ps (12 ea) with new 350 cfs pumps (12 ea)	1						
○ Ø Ø	<ul> <li>See "Item E_Capacity Modifica dditional pumping equipment and nhanced capacity.</li> </ul>	itions" for alternative of providing I expanded facilities to accommodate							
в. 05.	01. 01. Demo Exist Phase 1 Pun	នលី							
	L RSM dd <	> Allowance for disconnect & prep	10.00 EA	0,00	0.00	0 0 0	0.00 7100.00 0 71,000	71,000	7100.00
	L RSM JJ <	> Allowance for removal and	10.00 EA	0.00	0.00	0.00 0	0.00 3750.00 0 37,500	3750.00 37,500	3750,00
		TOTAL Demo Exist Phase 1 Pumps	10.00 EA				0 108,500	108,500	10850.00
B., 05.	01. 02. Demo Exist Hydraulic F	iping Sys							
ຕ. 	5. 01. 02.01. Install Valves	& drain Hyd Fluid							
	L RSM JJ <	> Purchase (8)-3"gate valves1	8.00 EA	0.00	0.00	0.00	0.00 500.00 0 4,000	500,00 4,000	500.00
	L RSM JJ <	> Furchase (2)-1" gate valves1	2.00 EA	0.00	0.00 0	0.00	0.00 200.00 0 400	200.00 400	200.00
	L RSM JJ <	> Allowance for installing valves	12600 LF	0.00	0.00	0.00	0.00 3.25 0 40,950	3.25 40,950	5 . 5 . 6
	L RSM JJ <	> Allowance for installing valves	3150.00 LF	0.00	0.00	0.00	0.00 3.25 0 10,238	3.25 10,238	3.25
	L RSM JJ <	> Fluid Containment and Disposal	4755.00 GAL	0.00	0.00	0.00	0.00 10.00 0 47,550	10.00	10.00
		TOTAL Install Valves & drain Hyd Fluid	I	0			0 103,138	103,138	
a a	5. 01. 02.02. Clean interior	of piping							
	L RSM JJ <	> Allowance for flushing &	12600 LF	00 O 0	0.00	000	0.00 2.00 0 25,200	25,200 25,200	2.00
LABOR ID: ICSNLR EQUI	P 1D: EQNICS	Currency in DOLLARS				č	NEW ID: ICSCR	KUP8 ID:	द्वा 9 6 ता

Eri 29 Jun 2007 Eff. Date 06/28/07	PROJECT N	Tri~Service Automated Cost Engineeri OCBPS: Permanent Enhancement of TCS -	.ng System (TR New Orleans H	ACES) Nrricane	тола 40ла 10ла				NMT S	14:10:21
DETAILED ESTIMATE		B Orleans Avenue Cana	1 rcs						DETAIL P	36E 36
B05. Mechanical Systems	an Anda Yuga Yuga Juga Juga Juga Juga Juga Juga Juga J	, , , , , , , , , , , , , , , , , , ,	QUANTY UOM	MANHRS	LABOR E	TIMA TUĞ	TERIAL	Other T	OTAL COST U	NIT COST
	V 	۲ متنامینام مرمعیار[ش ۷		( (				E C F C T L F C		
	2	a purchasti TOT pointworth v	3150.00 LF	0.0	000	0.00	00.0	0.50 1,575	0.50 1,575	0.50
		TOTAL Clean interior of piping		0				26,775	26,775	
B05. 01. 02.03. Demo	exist hyd	fluid piping								
NGN T	> m	> Demo existing 3" hydraulic	12600 LF	0.00	0.00	0,00	0,00 0	10.50 32,300	10.50 132,300	10.50
NSN 1	> DD 1	> Demo existing 3" hydraulic	3150,00 LF	0.00	0.00	0,00 0	0.0	7.50 23,625	7.50 23,625	7.50
		TOTAL Demo exist hyd fluid piping						55, 925	155,925	
		TOTAL Demo Exist Hydraulic Piping Sys					0 26	85,838	285, 838	
B., 05. 01. 03. Demo Exist P	Power Units									
L RSM	> ng 1	> Allowance for disconnect & prep	10.00 EA	0 00 ° 0	0,00 0	0.00	0°*0 0°3	600.00 36,000	3600.00 36,000	3600.00
L RSM	V DD J	> Allowance for removal and	10.00 84	0.00	0.00	0.00	0.00 16	800.00 18,000	1800,00 18,000	1800,00
		TOTAL Demo Exist Power Units	10.00 EA		- 0	0	0	54,000	54,000	5400,00
B05. 01, 04, Miscellaneou	ls Demo									
NSN 1		> Allowance for Misc Fump Sys	1.00 LS	0.00	0.00	0.00	0.00	50000 50,000	50000.00 50,000	0000.00
		TOTAL Miscellaneous Demo						50,000	50,000	
B05. 01. 05. Modify Exist Note:	: Pump Supt	Platforms								
<ol> <li>Assumed str similar to exi abstracted for</li> </ol>	cel framin sting (12) : (10) pump	g of existing pump platform deck and gra Phase 1-17th Street pump platforms, exc s for Orleans Avenue Canal.	ting ept costs							
B.,05. 01. 05.01. Demo 1	Exist Stl	& Grating (E-W)								
NSX I	> \$\$	> Allowance for demo of exist	TO.00 TON	00.00	0,00	0.00	0.0	250.00 2,500	250.00 2,500	250.00
LABOR ID: ICSNLR EQUIP ID: EQNICS		Currency in DOLLARS					CREW ID:	: ICSCRW	UPB ID: U	¥3662

Fri 29 Jun 2007 Eff. Date 06/28/07	PROJECT	Tri-Service Automated Cost Engineerir NOCBPS: Permanent Enhancement of ICS - N	ng System (TR New Orleans H	ACES) urricane E	Prot Proj				T TML	4:10:21
NELPLIEU DALIMALE		B Orieans Avenue Canal	T TCS						DETAIL PA	ന ന ല ഗ
B.,05. Mechanical Systems		······································	QUANTY UOM	MANHRS	LABOR EC	UI PMNT MAT	ERIAL OU	her TOT?	AL COST UN	TT COST
	L RSM SS <	> Allowance for demo of exist	2200.00 SF	0.00	0.00	0.00	0.00 5	000	5,00 11,000	2.00
	-> 83¥ 83 1	> Allowance for disposal of demo	29.20 TON	0.00	0.00	0.00	0.00 50 0 1,	.00 460	50.00 1,460	50.00
		TOTAL Demo Exist Stl & Grating (E-W)		0		0	0 14,	360	14,960	
B <sub>-</sub> .05.01.05.	.02. Install New St	cl & Grating (E-W)								
	L RSM SS <	> Allow for fab and delivery of	10.00 TON	0.00	0, QQ	0'00'0	0.00 1700 0 17,	r 000	1700.00 17,000	1700.00
	L RSM SS <	> Allowance for Corrosion	2750.00 SF	0.00	0.00	0.00	0.00 3 0 8,	.00 250	3.00 8,250	3.00
	l rsm ss <	> Allowance for installation of	10.00 TON	0.00	0.00	0.00	0.00 1000 0 10,	00.	1000,00 10,000	1000,00
	L RSM SS <	> Allowance for new Grating	2200.00 SF	0.00	0.00	0.00	0.00 25	000	25.00 55,000	25.00
		TOTAL Install New Stl & Grating (E+W)				0	0 6 0	250	90,250	
		TOTAL Modify Exist Pump Supt Platforms		- 0 			0 105,	210 3	105,210	
B05. 01. 06. Ins	stall New Pumps w/	Elec Driver								
	L RSM JJ <	> New pump with electric driver	10.00 EA	0.00	0.00	0.00	0.00 1700	000 1700 000 17,0	3000.00 300,000	170000
	L RSM JJ <	> Install New pump with electric	10.00 EA	0.00	0.00	0,00	0.00 4150	000 415 000 4 <b>,</b> 1	5000.00 150,000 41	5000.00
		TOTAL Install New Pumps w/ Elec Driver	10.00 EA	0		-	021150	000 21,1	150,000	2115000
B05. 01. 07. Ins	stall New Motor Pow	ver Units								
	L RSM JJ <	> Motors for New pumps, installed	10.00 EA	0.00	0.00	0.00	0.00 500	000 500 000 5,0	2000.00 200,000 50	0000.00
		TOTAL Install New Motor Power Units	10.00 EA	- 0		0	0 2000	 000 5,0	000,000 50	0000.000

Fri 29 Jun 2007 Eff. Date 06/28/07	PROJECT	Tri-Service Automated Cost Engineerin NOCBPS: Permanent Enhancement of ICS - N	g System (TRA ew Orleans Hu	CES) rricane P	rot Proj			WII	14:10:21
DETALLED ESTIMATE		B Orleans Avenue Canal						DETAIL	PAGE 40
B. 05. Mechanical Systems		***************************************	QUANTY UOM	MANHRS	LABOR EQ	UTAM TWM4 IU	CRIAL Othe	r TOTAL COST	UNIT COST
B.,05, 01. 08, Repla	ace Storage Tks w	/ Dbl Wall							111
B_,05,01,08.01	1. Disconnect+Cle. Notes:	an Exist Fuel Tank							
	<ol> <li>Assume tank 5% 20,000 gal x .05</li> </ol>	full - 100 gal							
	L RSM JJ <	> Disconnect existing fuel oil	1.00 LS	0.00	0,00	0.00	0.00 500.0 0 500.0	0 500.00 0	500.00
	L RSM JJ <	> Transfer re-usable Fuel, incl	100.00 GAL	0.00	0.00	0.00	0.00 1.( 0 10	0 J.00	1.00
	E RSM JJ <	> Clean and Flush tank prior to	1.00 LS	0,00	0.00	0.00	0,00 500.G	0 \$00.00 0 500.00	500.00
		TOTAL Disconnect-Clean Exist Fuel Tank	2.00 EA			0	01110	0 1,100	550.00
B05. 01. 08.02	2. Removal and D1	sposal of Exist Tk							
	l RSM JJ <	> Removal and disposal of existing	2.00 EA	0.00	0.00	00.0	0.00 2000.0	0 2000.00 0 4,000	2000.00
		TOTAL Removal and Disposal of Exist Tk	2.00 EA				0 4,00	4,000	2000.00
B.,05, 01, 08,03	3. Install Double	-Wall Storage Tank							
	L RSM JJ <	> New Dbl Wall Storage Tank(s) ;	2.00 EA	0.00	0.00	0.00	0.00 2250 0 45,00	0 22500.00 0 45,000	22500.00
	L RSM JJ <	> Install new Dbl Wall Storage	2.00 EA	0.00	0.00	0.00 0	0.00 2000.0 0 4,00	0 2000.00 0 4,000	2000.00
	L RSM JJ <	> Reconnect fuel piping, allow	2,00 23	0.00	0.00	0.00	0.00 1000.0 0 2,00	0 1000.00 0 2,000	1000.00
		TOTAL Install Bouble-Wall Storage Tank	2.00 EA	0		0	0 51,00	0 51,000	25500.00
		TOTAL Replace Storage Tks w/ Dbl Wall	- 2.00 EA	0	0	0	0 56,10	0 56,100	28050.00
		TOTAL Phase 1 Pumps Sys Modifications		0	0		02680964	8 26,809,648	
		TOTAL Mechanical Systems		0	o	0	02680964	8 26,809,648	

Currency in DOLLARS
Fri 29 Jun 2007 Eff. Date 06/28/07 Derbarten mertanre	Tri-Service Automated Cost Engineerin PROJECT NOCBPS: Permanent Enhancement of ICS - N	g System (TRA ew Orleans Hu	CES) rricane	rot Proj				요]  	14;10:21
	B Orleans Avenue Canal	SOS						DETAIL P.	AGE 41
B06. Electrical Systems	""""""""""""""""""""""""""""""""""""""	QUANTY UOM	dANHRS	LABOR EQ	ZW LNWITO	ATERIAL.	Other T	OTAL COST U	ISOD LIN
B06. Electrical Systems						19 mar 19 mar 19 mar 19 mar 19 mar 19	ana ana ana ana ana ana ana ana	. B E B B B A A B B B A A B B B A A B B B B	1 1 and the set of the
B06. 01. Lightning and	d Grounding System								
B.,06. 01. 01. Ligh	thing Protection								
<pre>16000 0000 Electrical, Generally exc 16100 0000 Conductors &amp; Grounding 16180 0000 Grounding 16181 0010 Grounding devices 16181 5999 Wire, laid in tre 16181 5999 Copper, bare st</pre>	ludes crane services inch randed								
	MIL GG <16181 6010 > Grounding, laid in trench,	0.40 MLS	<b>6.</b> 86 3	221.53 89	0.00	545.00 218	0.00	766.53 307	766.53
16000 0000 Electrical, Generally exc 16800 0000 Special Systems 16801 0000 Special Systems 16840 0010 Lightning brefectio	ludes crane services								
16840 4000 Air terminals, co									
	L MIL GG <16840 4040 > Lightning protection, air	22.00 EA	0.48 11	19.28 424	0,00	14.67 323	0.00	33.95 747	33 <b>.</b> 95
16840 0010 Lightning protectic 16840 4200 Air terminal base	s, copper								
	M MIN GG <16840 4220 > Lightning protection, air term	22.00 EA	0,89 20	35.72 786	0.00	21.50	0,00	57.22 1,259	57.22
	TOTAL Lightning Protection			1,299		1,014		2,312	
B06. 01. 02. Grou	nding								
16000 0000 Flectrical, Generally exc 16100 0000 Conductors & Grounding 16180 0000 Grounding 16181 0010 Grounding devices 16181 0029 Rod	ludes crane services								
	MIL GG <16181 0109 > Grounding, rod, copper clad, 10'	16.00 EA	1.82 29	73.05 1,169	0.00	29.40 470	0.00	102.45 1,639	102.45
	MIL GG <16181 6020 > Grounding, laid in trench,	1.00 MLF	64.9 64.0	304.60 305	0.00 1	.060.00 1,060	0.00	1364.60 1,365	1364,60
16181 0019 Grounding devices 16181 6299 Ground conductor	bonding, cadweid								

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/07 DETAILED ESTIMATE	Tri-Service Automated Cost Engineering PROJECT NOCBPS: Permanent Enhancement of ICS - N	3 System (TRV	CES) irricane	Prot Proj				TIME DETAIL :	14:10:21 AGE 42
	B., Orleans Avenue Canal	rcs.							
8.06. Electrical Systems	· · · · · · · · · · · · · · · · · · ·	MON' YTWA	MANHRS	LABOR EC	NT PMNT M	ATERIAL	Other ]	TOTAL COST (	NIT COST
	MIL GG <16181 6350 > Grounding, gnd conductor bond,	16.00 EA	1. 82 1.	73.42 1,175	0.00	19-89 318	0.00	93.31 1,493	93.31
	MIL GG <16181 6380 > Grounding, gnd conductor bond,	50.00 EA	2,08 104	64.12 4,206	0.00	17.29 865	0.00	101.41 5,071	101.41
	TOTAL Grounding		172	6,854		2,713	- 0	6,567	
B06. 02. Electrical Powe.	TOTAL Lightning and Grounding System r	1	205	8,153		3,727		11,880	
B.,06, 02, 01, Power									
<pre>16000 0000 Electrical, Generally exclud 16000 0000 Raceways, Generally exclud 16016 0000 Conduits 16017 0010 Conduit, to 15', incl. 16017 0010 Conduit, to 15', incl.</pre>	es crane services es crane services terminations & elbows nder								
	L MIL GG <16018 0000 > Remove generator power and	1.00 LS	24.00 24	964,80 965	0.00	9.58 10.20	206868 06,868	207842,38 207.842,38	07842.38
16016 0000 Conduits 16018 0010 Conduit, to 15', inclu 16018 0499 Steel, rigid galvani	des couplings only zed (RGS)								) )
	MIL GG <16018 D640 > Conduit to 15' H, 3" dia, incl	15000 LF	0.25 3,750	10.05 150,750	0.00	9,58 143,700	0.00	19.63 294,450	19.63
<pre>16000 0000 Electrical, Generally exclude 16100 0000 Conductors &amp; Grounding 16108 0000 Conductors 16115 0010 Shielded cable 16115 0010 Shielded cable 16115 0039 Copper, XLP shielding</pre>	es crane services 3, 5 KV								
	4 MIL GG <16115 0400 > Shielded cable, 5kV, 1/0, no	22.50 MLF	42.11 947	1691,79 38,065	0.00	2184.00 49,140	0.00	3875,79 87,205	3875.79
<pre>16108 0000 Conductors 16119 0010 Wire 16119 0919 600 volt, type THWN~7 16119 0999 Copper, stranded</pre>	NHH							* - -	
	MIL GG <16119 1350 > Wire, 600 volt, type THWN-THHN,	8.00 MLF	12.31 98	494.52 3,956	0.00	274.50 2,196	0.00	769.02 6,152	769.02
16000 0000 Electrical, Generally exclude	es crane services								
LABOR ID: ICSNLR EQUIP ID: EQNICS	Currency in DOLLARS					CREW ID:	ICSCRW	UPB ID: U	P99EA

Fri 29 Jun 2007 Eff. Date 06/28/07 Demarter certhare	Tri-Service Automated Cost Engineeri PROJECT NOCBPS: Permanent Enhancement of ICS -	ng System (TF New Orleans H	ACES) urricane	Prot Pro				1974 1974 1974 1977 1977	14:10:21
GINITICS MATTRICE	B Orleans Avenue Cana	SOT						DETAIL	PAGE 43
B.06. Electrical Systems		QUANTY UOM	MANHRS	LABOR	TUNNE LOOS	MATERIAL	Other	TOTAL COST	UNIT COST
16300 0000 Motors, Starters, 1 16330 0000 Switches 16330 0010 Distribution se 16330 0100 Aluminum bus	Boards & Switches ection bars, not including breakers				1) 2) 5) 6) 7) 6) 7)		- <b>1</b>		
	B AF GG <16331 0000 > Medium voltyage soft start	10.00 EA	40.00 400	1615.20 16,152	0.00	39600,00 396,000	0.00	41215.20 412,152	41215,20
16000 0000 Electrical, Generally 16500 0000 Power Systems & Cat 16510 0000 Power Systems 16513 0010 Generator set 16513 2000 Diesel engin	y excludes crane services pacitors								
	M MIL GG <16513 3270 > Remove generator set	10.00 EA	177, 78 1, 778	6787.85 67,879	736,37	0.00	0.00	7566.22 75,662	7566.22
	B MIL GG <16513 3270 > Generator set, dsl eng, xfr	10.00 EA	250.00 2,500	9545.41 95,454	1094.58 10,946	350000 350000	0.00	360640.00 3,606,400	360640.00
	TOTAL, Power		9,498 9,498	373, 221	18,730	4031046	206,868	4,689,864	
B.,06, 02, 03.	Gate Motor Operators								
16000 0000 Electrical, Generally 16300 0000 Motors, Starters, E 16350 0000 Motors	y excludes crane services Boards & Switches								
	B MIL GG <16353 0000 > Gate motor operator	5.00 EA	0.00	76,53 383	0.00	5000.00 25,000	0.00	\$076.53 25,383	5076.53
	TOTAL Gate Motor Operators		- 0	1 6 8 6		25,000		25,383	
B_,06.02.08. Nr 1 06	Control tes: The report considers that incremental SCADA (Supervisory Con ata Acquisition) interface will be required in considerations on thancements.	ntrol And E ICS							
2 tt	. Estimate provides for upgrade of SCADA monitoring and control accommodate transition from a hydraulic driven system to a di-	equipment asel driven							
9 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	<pre>/stem. . Allowance includes installation of conduit, wiring, devices, . Allowance includes installation of conduit, wiring, devices, . Allowance based on cost of SCADA upgrades per pump. . Allowance of SOBO as follows: 1900 - Fump House SCADA upgradecost per pump 1900 - SCADA routing cost to remote pump motors, etc -</pre>	interface am.							

Currency in DOLLARS

<pre></pre>	LARGER BULLINGER STON STOL		U. PAGE 44
06. Electrical Systems 0.06. Electrical Systems 0.000 Electrical Systems 2.000 - Total estimated SCADA upgrade cost per pump 5. Estimate assumes existing SCADA system is adequate for all Phase 3 monitoring. 0.000 Electrical, Generally excludes crane services 6800 0000 Special Systems 16801 0000 Special Systems 16802 0010 Closed circuit TV system 16862 0010 Closed circuit TV system 16862 0010 Closed circuit TV system 16865 0000 > Scada control system for canal 10.00 EA	ŝ	< > 1 × 1 × 1 × 1 × 1 × 1 × 1 × 1 × 1 × 1	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
<pre>3000 - Total estimated SCADA upgrade cost per pump 5. Estimate assumes existing SCADA system is adequate for all Phase 3 monitoring. 000 0000 Electrical, Generally excludes crane services 1660 0000 Special Systems 1680 0000 Special Systems 16862 0910 Closed circuit TV system 16862 0999 Microprocessor, matrix switcher/controller 16862 0999 Microprocessor, matrix switcher/controller 16862 0999 Microprocessor, matrix switcher/controller 16862 0010 Closed circuit TV system 16862 0999 Microprocessor, matrix switcher/controller 10.00 EA</pre>	NTY UOM MANHRS LABOR EQUIPMNT MATE	UAL Other TOTAL COS	ST UNIT COST
<pre>5. Estimate assumes existing SCADA system is adequate for all Phase 3 monitoring. 000 0000 Electrical, Generally excludes crane services 16800 0000 Special Systems 16801 0000 Special Systems 16802 0010 Closed circuit TV system 16862 0999 Microprocessor, matrix switcher/controller M CIV GG &lt;16865 0000 &gt; Scada control system for canal 10.00 EA TOTAL Control</pre>	1	医清淀素 医消毒 医骨骨骨骨 医骨骨骨骨骨骨骨骨骨骨骨骨骨骨骨骨骨骨骨骨骨骨骨骨骨骨骨骨	4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
000 0000 Electrical, Generally excludes crane services 16800 0000 Special Systems 16801 0000 Special Systems 16862 0010 Closed circuit TV system 16862 0010 Closed circuit TV system 16862 6999 Microprocessor, matrix switcher/controller M CIV GG <16865 0000 > Scada control system for canal M CIV GG <16865 0000 > Scada control system for canal TOTAL Control	<b>6</b> 3		
M CIV GG <16865 0000 > Scada control system for canal 10.00 EA TOTAL Control			
TOTAL Control	1.00 EA 10 40.38 0.00 .00 EA 10 404 0	.00 3000.00 3040.3 0 30,000 30,40	38 04 3040.38
	10 404 0	0 30,000 30,40	1
TOTAL Electrical Power	9,508 374,007 18,730 411		- 0
TOTAL Electrical Systems	9,712 382,160 18,730 411		30

LABOR ID: ICSNLR EQUIP ID: EQNICS

PB ID: UP99EA	CREW ID: ICSCRW U					Currency in DOLLARS	ABOR ID: ICSNLR EQUIP ID: EQNICS
80, 000	0 280,000 2	0	0	0		TOTAL Apply Protective Coating	
000.00 280,000 280000.00	0.00 280000 280	0.00	0.00	0.0	1.00 LS	. MIL AA < > Apply protective coating to	
						pply Protective Coating	B07. 01. 01.04.1
800, 000	0 300,000	0	0	0		TOTAL Dewater Protected Side	
300.00 300,000 300000.00	0.00 300000 300 0 300,000	0.00	0.00	0.00	1.00 LS	. MIL AA < > Allowance for dewatering of	
						Dewater Protected Side	B07, 01. 01.03.1
100,000	0 2100000 2,1	0	0	o		TOTAL Construct Temp Cofferdam	
100,000 2100000	0.00 2100000 210 0 2100000 2,:	0.00	0.00	00.0	1.00 LS	2 MIL AA < > Construct lemp Cofferdam on	
						Construct Temp Cofferdam	B07. 01. 01.02.
50,000	0 50,000	0				TOTAL Soil Excavation / Backfill	
3000.00 50,000 50000.00	0.00 50000 50 0 50,000	0.00	0.00	0.00	1.00 LS	. MIL AA < > Excav / Backfill around existing	•
						soil Excavation / Backfill	B07. 01. 01.01.
						lve Coatings	B07. 01. 01. Protect
						ide, it is assumed the pump station pumps can be used for I for purpose of applying corrosion protection at a DW water line on Protected side.	<ol> <li>A. On Protected s draw-down of cana nominal depth bel</li> </ol>
					0	required on the Flood side to enable drawdown of water t provide corrosion protection at a nominal depth below od side.	<ol> <li>A cofferdam is adequate depth to water line on Flo</li> </ol>
						on and backfill required at all platform columns and s in order to provided corrosion protection below grade.	2. Soll excevati structure support
						ng on all major elements of the facility.	1. Provide coati
						cion	B07. 01. Corrosion Protec Note:
							B07. Miscellaneous Items
TT COST UNIT COST	TERIAL Other TOT	EQUI PMNT MA	LABOR	MANHRS	QUANTY UOM	中,有是有"有"有",有"有",有"有",有"有",有"有",有"有",有"有",	
CP INC 40					ICS	B Drleans Avenue Canal	
TIME 14:10:21		4 <sup>mm</sup> 1	Prot Pr	ACES) Irricane	System (TR w Orleans H	Tri-Service Auromated Cost Engineering PROJECT NOCBPS: Permanent Enhancement of ICS - Ne	ri 29 Jun 2007 ff. Date 06/28/07 ETAILED ESTIMATE

Fri 29 Jun 2007 Eff. Date 06/28/07 DETAILED ESTIMATE	Tri-Service Automated C PROJECT NOCBPS: Permanent Enhancem	Cost Engineering Went of ICS - New	System (TRU Orleans Hu	ACES) LTTÍCANE F	rot Proj			IWI J	14:10:21
	B Orlean	is Avenue Canal	TCS					DETAIL	PAGE 46
B. 07. Miscellaneous Items	*****	· · · · · · · · · · · · · · · · · · ·	TIME TAME	MANAGES CONTRACT			******		** ** ** ** ** **
"小师"的"子,有有别是一个,你们没有这个人的是你?" 医克尔特氏管 医子子 医普勒氏试验检尿酶酶	医马马马氏 医手骨骨 医骨上的 医鼻子 医鼻子 医子子 医子子 医子子 医子子 医子子 医子子		ECO TINUO		LABOK E(	M TNMIU	VTERIAL Other	TOTAL COST	UNIT COST
	TOTAL Protective Coatings			0	- 0		0 2730000	2, 730, 000	
PVV. VI. UZ. Lathodic	c Protection L MIL AA < > Allowance to instal	د بر بر بر بر بر بر بر بر بر بر بر بر بر		<	-				
	TURNER CO HIRICH	L Calhoolc	1.00 LS	0.00	0.0	0.00	9.00 275000 0 275,000	275,000,00 275,000	275000.00
	TOTAL Cathodic Protection			0	0		0 275,000	275,000	
	TOTAL Corrosion Protection	G	3	- 0	- 0		0 3005000	3,005,000	
B. 07. 02. Fluid Storage Fac Note: 1. The e a 200 SF area for storage and fluid	pility (On-Site) astimate assumes The Fluid Storage Facility stockpile of waste fluids; an 1800 Sf area changing of equipment.	y shall contain a for new fluid							
μ.	- RSM SS < > Allowance for (1)+ 2	2,000 SF 150	30.00 SF	0.00	0.00	0.00	0.00 725.00 0.087500	725.00 1,087,500	725.00
	TOTAL Fluid Storage Facili	ity (On-Site)	8	0		- 0	0 1087500	1,087,500	
B07. 03. Addt'l Fuel Farm Notes:	Installed (N/A)								
1. No additional ICS facility.	Fuel Tanks are provided to enhance fuel re	sserves at to							
	TOTAL Addt'l Fuel Farm Ins	stalled (N/A)		0	0	0	0	0	
B07. 04. 96-in Butterfly Ve	alves								
02000 0000 Site Work 02100 0000 Site Freparation & Excavation 02160 0000 Sheet Piling 02161 0009 Sheet piling 02161 3000 Wood, including wales.	on Support , braces and spacers								
i-i	MIL AA <02200 0000 > Allowance for delive.	ry of Valves	4.00 EA	0.00	0.00	0.00	0.00 1500.00 0 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	1500.00	
11000 0000 Equipment 11000 0000 Equipment					2	3	000 6	000 '4	1500.00
ΩÎ	MIL AA <11000 0001 > Allowance for modify	ing and	4.00 EA	0.00	0.00	0.00	0.00 Z5000 0.100,000	25000.00 100,000	25000.00
ABOR ID: ICSNLR EQUIP ID: EQNICS	Currency	y in DOLLARS					CREW ID: ICSCRW	UPB ID: U	P99EA

4:10:21 GE 47		UIT COST		0672,92	.7172.92		
TIME TIME DETAIL PJ		TOTAL COST UN		90672.92 362,692 5	468,692 11	4,561,192	36, 920, 679
		Other		0.00	106,000	4198500	
		MATERIAL		80000.00 320,000	320,000	320,000	4 4 6 6 6 1 2 3
فيبط		EQUIPMNT		2434.02 9,736	9, 736	9,736	
Prot Pro		LABOR		8238,90 32,956	32,956	32,956	423,84
ACES) Nrricane		MANHRS		200,00 800	8	800	
ring System (Ti - New Orleans P	nal ICS	QUANTY UOM		4.00 EA	4.00 88		
Tri-Service Automated Cost Enginee PROJECT NOCBPS: Permanent Enhancement of ICS	B_, Orleans Avenue Ca	医子宫 医马马尔氏 医二甲基 医弗尔氏 医子子 医子子 法法法 法法 法法 医子子 医子子 医子子 医子子 医子子 医	xcludes crane services	B MIL AA <15194 0000 > 96" dia Butterfly Valve	TOTAL 96-in Butterfly Valves	TOTAL Miscellaneous Items	TOTAL Orleans Avenue Canal ICS
Fri 29 Jun 2007 Eff. Date 06/28/07 DETAILED ESTIMATE		B.,07. Miscellaneous Items	<pre>15000 0000 Mechanical, Generally e 15100 0000 Pipe &amp; Fittings 15191 0000 Valves 15193 0310 Valves, bronze 15193 8350 Tempering water 15193 8550 Threaded conn</pre>				

Fri 29 Jun 2007 Eff. Date 06/28/07	Tri-Service Automated Cost Engineeri CT NOCBPS: Permanent Enhancement of ICS - 1	ng System. (TRAC Vew Orleans Hur	ES) ricane P	rot Proj				TINE T	1:10:21
DETALLED ESTIMATE	C London Avenue Canal	ICS						DETAIL PAG	년 65
C.01. Exist Engine Platform Enclosures		QUANTY UOM N	ANHRS	LABOR EQ	UIPMNT MA	TERIAL	Other 7	FOTAL COST UN	T COST
C London Avenue Canal ICS C01. Exist Engine Platform Enclosures Notes:									
1. Phase 1, 2, 3 Power Units are exp	posed to hurricane wind blown debris.								
2. Hoisting equipment needs some leve	el of protection from flying debris.								
3. Quantities reflect total for both	east / west side platforms.								
C01.01 . Demolition									
C01.01 . 01. Chain Link Fencing									
L RSM SS <	> Site dml, chain link, remove	530.00 LF	0,00	0.00	0.00	0.00	3,00 1,590	3.00	3.00
	TOTAL Chain Link Fencing	530.00 LF		- 0	- 0	10	T, 590	1,590	3.00
C01.01 . 02. Metal Roof-Siding 1	Panels								
> 55 KSH 4	> Remove metal roof and metal	10300 58	0.00	0.00	0.00	0.00	1.00 10,300	10,300	1.00
	TOTAL Metal Roof-Siding Panels	10300 SF		- D	0		10,300	10,300	1.00
C.,01.01 . 03. Misc Steel - Roof I	Furins								
L RSM SS <	> Remove metal purlins supporting	21500 LBS	0,00	0.00	0.00	0.00	0.25 5,375	0.25 5,375	0.25
	TOTAL Misc Steel - Roof Purlins	21500 LBS	0			- 0	5, 375	5, 375	0.25
	TOTAL Demolition	1		- 0		10	17,265	17,265	
C01.02 . Structure Modifications									
C01.02 . 01. Add Misc Steel Fran	ming								
C01.02 . 01.01. Add Welded S Note:	Structural Frame								
1. Allow 5500 2. 8 ea. x 556 3. 44,000 / 26 4. Cost based handling.	LBS each Welded Frame (say 55 LF x 100 = ( 00 = 44,000 lbs. 000 = 22 tons on \$1.50/LB for material, labor, equip. inc.	5500 lbs). I dwelivery and							

Currency in DOLLARS

TIME 14:10:21 DETAIL PAGE 49	TOTAL COST UNIT COST	3000.00 66,000 3000.00	66,000 8250,00			2100.00 4,032 2100.00	4,032 1,05		1.10 47,520 1.10	47,520 1.00		3.00 66,000 3.00	66,000 3.44	183,552				10.00 158,400 10.00	10.00
	SRIAL Other	0.00 3000.00 0 66,000	0 66,000			0.00 2100.00 0 4,032	0 4,032		0,00 1.10 0 47,520	0 47,520		0.00 3.00 0.66,000	0 66,000	0 183,552				0.00 10.00 0 158,400	0 158,400
	SOUTPMNT MATI	0,00 0				0.00			0.00	0		0.00		0				0.00	
Prot Proj	LABOR E	0.00				0,00 0			0.00			0.00		- 0				0.00	
ACES) urricane	MANHRS	00.00	0		1) 10	0.00			0.00	0		0.00	0	- 0				0.00	
ng System: (TF New Orleans H ICS	QUANTY DOM	22.00 TON	8.00 EA		6-ft length)	1.92 TON	3840.00 LB		43200 LB	47520 LB		22000 LB	19200 LB				axisting	J2840 SE	15840 SF
Tri-Service Automated Cost Engineeri NOCBPS: Fermanent Enhancement of ICS - C London Avenue Canal		> Add Welded Steel Frame	TOTAL Add Welded Structural Frame	at Eaves of Bldg	addition of (4) - new WIDx30 columns (at 1 closures.	> Add W10 Wide-Flange Columns at	TOTAL Add W10 Col's at Eaves of Bldg	urlins and a second	> Add new purlins to support	TOTAL Add New Roof Furlins	at Bldg Perimeter	> Add new MC6x8.2 Girts btwn	TOTAL Add MC6 Girts at Bldg Perimeter	TOTAL Add Misc Steel Framing	of Panels	" +/- thick precast panels.	labor, equip, etc for installation onto	> Add new perimeter wall panels	TUTAL Add Precast Wall & Roof Panels
un 2007 e 06/28/07 ESTIMATE	Xist Engine Platform Enclosures	> SS < WIF SS		C01.02 . 01.02. Add W10 Col's a Notes:	1. Allow for the $\varepsilon$ east and west encl	B MIL 53 <		C01.02 . 01.03. Add New Roof Pu	> SS TIW 8		C01.02 . 01.04. Add MC6 Girts a	> SS /IW B			C. 01.02 . 02. Add Precast Wall & Roc Note:	1. Estimates assumes 6"	2. Cost incl materils, bldg.	B MIL SS <	

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/07	PROJECT :	Tri-Service Automated Cost Engineering NOCBPS: Permanent Enhancement of ICS - Ne	g System (TRA. ew Orleans Hu.	CES) rricane P	rot Proj				înt.	14:10:21
DETALLED ESTIMATE		C London Avenue Canal	TCS		5				DETAIL P	AGE 50
C.01. Exist Engine Platform E	Enclosures		QUANTY DOM	MANHRS	LABOR EQ	UI PMNT MAT	TERIAL	Other 1	FOTAL COST U	NIT COST
c01.02 . (	03. Add Overhead & Person Notes:	nel Doors						de verden inner verden om en bene verd	2 2 2 4 4 4 4 4 4 4	ner um fen mu inf. um fen
	1. Allow (2) - connerci	al grade hollow metal doors at each enclosu	. oru							
	<ol> <li>Allow (1)-commercia at each enclosure. Ass</li> </ol>	l grade, sectional, steel, heavy duty, over ume l0-ft x 10-ft size.	rhead door							
	> 88 TIN 8	> Overhead comi, no frame, manual,	2.00 EA	0.00	0.00	0.00	0.001	200.00 2,400	1200.00 2,400	1200.00
	B MIL SS <	> Coml stl dr, fl, 3'-4" x 7'-0",	4.00 EA	0.00	0.00	0.00 0	0.00	500.00 2,000	\$00.00 2,000	\$00.00
		TOTAL Add Overhead & Fersonnel Doors	ţ	0	0	0		4,400	4,400	
c01.02 . (	04. Add Louvers & Ventila Notes:	tors								
	<ol> <li>Install louvers for and West enclosures</li> </ol>	air intake each side of enclosure. Frovid	de at East							
	2. Assume (14) ea side	, at 4-ft x 4-ft size.								
	3. Total louver area = SF. (SAY 1000 SF t	<pre>[14 ea x 2 sides x 4 x 4 ] x 2 enclosures = otal)</pre>	896 8							
	4. Províde a protective	aluminum shroud over top & sides of louver	r.							
	5. Provide (2)- powered protection.	i wall exhausters at ea enclosure, with shrc	pno							
	B MIL JU <	> Mall louvers, aluminum, with 1	1000.00 \$F	0.00	0.00	0.00	0.00 0	40,000	40,00 40,000	40.00
	B Mit UV <	> Protective aluminum shroud over	56.00 EA	0,00	0.00	0.00	0.00	250.00 14,000	250.00 14,000	250.00
	B AF JJ <	> Fan, wall exhers, 1 HP, cutfgl,	4,00 EA	0.00	0.00	0.00	0.00 1	500.00 6,000	1500.00 6,000	1500.00
		TOTAL Add Louvers & Ventilators	1		- 0			60,000	60,000	

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/07	PROJECT	Tri-Service Automated Cost Engineerin NOCBPS: Permanent Enhancement of ICS + N	g System (TRA ew Orleans Hu	(CES) rricane 1	rot Proj			T tr	ME 14:10:21
URANALERO DOLEMERE		C London Avenue Canal	 SOI					DETAI	L PAGE 51
COl. Exist Engine Platform	Enclosures	· · · · · · · · · · · · · · · · · · ·	QUANTY COM	MANHRS	LABOR EQ	UIPMNT MATER	AIAL Othe	er TOTAL COS	T UNIT COST
c01.02 .	05. Modify Exist Gen Exh. Notes:	aust Vents							
	1. Existing exhaust ve	ants pentrate the metal siding of the bldg.							
	2. Vents need to be m concrete panel system.	odified to function with the new exterior (	precest.						
	3. Includes adapting concrte panels.	axterior shrouds on vent penetration thru n	ew precást						
	s NIL JJ <	> Allowance to modify exist	12,00 EA	0.00	0.00	0.00	0.00 500.( 0 6,0(	00 500.0 00 6,00	0 500.00
		TOTAL Modify Exist Gen Exhaust Vents		0	0		0 6,00		10
c_,01.02 .	06. Modify Exist Utility	Runs							
	B MIL JJ <	> Allowance to modify utility runs	1,00.LS	0.00	0 00 0	) 00.0	0,00 1000	00 10000.0	0 10000.00
		TOTAL Modify Exist Utility Runs		- 0			0 10,00	0 10,00	10
		TOTAL Structure Modifications	ş	- 0	· · · · · · · · · · · · · · · · · · ·		0 422,35	52 422,35	
C 01.03 . Allow	for Misc Enclosure Mods								
	L RSM SS <	> Allowance for misc modifications	1,00 15	0.00	0.00	0.00	),00 250( 0 25,0(	00 25000.0 00 25,00	0 25000.00
		TOTAL Allow for Mise Enclosure Mods			- 0	· · · · · · · · · · · · · · · · · · ·	0 25,00		10
		TOTAL Exist Engine Platform Enclosures	• • • • •				0.464,63	464,61	1 5~
LABOR ID: ICSNLR EQUIP ID:	EQNICS	Currency in DOLLARS				5	EW ID: ICS	SCRW UPB ID	₩386dA

Fri 29 Jun 2007 Eff. Date 06/28/07 DETALLED ESTIMATE	Tri-Service Automated Cost Engineeri NOCBPS: Permanent Enhancement of ICS - h	ng System (TRA New Orleans Hu	CES) rricane P	rot Proj				TIME 14:20:0
	C London Avenue Canal	ICS						, TEAST LINEAU
C02. New Engine Platform & Encl (N/A)	· ● 予义不过是 医外外层 化化化合物 医副子宫 医单子子 化化合物 化化合物 化化合物 化化合物 化合物 化合物 化合物 化合物 化合物	QUANTY .UOM	MANHRS	LABOR EC	ULPMNT MAT	ERIAL Of	ther TC	MAL COST UNIT CO
C02. New Engine Platform & Encl (N/A) Notes:								
New Engine Platforms with Enclosures a Station.	re not required at London Avenue Pump							
	TOTAL New Engine Platform & Encl (N/A)		0	0	0	0	0	0
C03. Phase 3 Pump Platform Enclosure Notes:								
1. Phase 3 Power Units are exposed to	hurricane wind blown debris.							
2. For purpose of cost development, est size and framing to London Ave. General	timate assumes enclosure similar in tor Platform.							
3. Quantities reflect total for one pl	latform.							
C. 03.01 Demolition								
C03.01 . 01. Chain Link Fencing								
L RSM SS <	> Site dml, chain link, remove	265.00 LF	0.00	0.00	0.00	0000	3.00 795	3.00 395 395
	TOTAL Chain Link Fencing	265.00 LF	- 0					
C03.01 . 02. Metal Roof-Siding Par	ក្នុន							
L RSM SS <	> Remove metal roof and metal	5150.00 SF	0.00	0.00	0.00	° 00 0	150	1.00 5,150 1.4
	TOTAL Metal Roof-Siding Panels	5150.00 SF	0	0	0	0 5,	150	5,150 1.1
C03.01 . 03. Misc Steel - Roof Pu	rlins							
L RSM SS <	> Remove metal purlins supporting	10750 LBS	0.00	0.00	0.00	0.00	0.25 .688	0.25 2,688 0.1
	TOTAL Misc Steel - Roof Purlins	IO750 LBS		- 0			. 688	2,688 0.1
	TOTAL Demolition	ξ -	0	0		8		8, 633
LABOR ID: ICSNLR EQUIP ID: EQNICS	Currency in DOLLARS					CREW ID:	LCSCRW	UPB ID; UP99EA

Fri 29 Jun 2007 Eff. Date 06/28/07	Tri-Service Automated Cost Engineerif NOCBPS: Permanent Enhancement of ICS - N	ng System (TRA New Orleans Hu	CES) rricane P	rot Proj				14:10:21
DETAILED ESTIMATE	C London Avenue Canal	ං ප 1					DETAIL P	AGE 53
C03. Phase 3 Pump Platform Enclosure	古世古古古古 医外外骨 医原丁烯苷 电复发 医多位 医原氨基 医弗德斯 医弗里耳氏 医马克尔氏 计分子 化分子	QUANTY DOM	MANHRS	LABOR EQ	UI PMNT MA	TERIAL Other	TOTAL COST L	NIT COST
C03.02 . Structure Modifications			nee and two two two two two two			1997 VAN NEW VAN AND AND AND AND AND AND AND AND AND A		
C03.02 . 01. Add Misc Steel Framir	55							
C03.02 . 01.01. Add Welded Str Note:	ructural Frame							
<ol> <li>Allow 5500 LF</li> <li>8 ea. x 5500</li> <li>3. 44,000 / 2000</li> <li>4. Cost based or handling.</li> </ol>	BS each Welded Frame (say 55 LF x 100 = 5 = 44,000 lbs. 0 = 22 tons n \$1.50/LB for material, labor, equip. incl	5500 lbs}. I dwelivery an	ਹ					
B MIL SS <	> Add Welded Steel Frame	11,00,10N	0.00	0 0	00'0 0	0.00 3000.00 0 33,000	3000,00	3000,00
	TOTAL Add Welded Structural Frame	4,00 EA	0	0		0 33,000	33,000	8250.00
C03.02 . 01.02. Add W10 Col's	at Eaves of Bldg							
B MIL SS <	> Add W10 Wide-Flange Columns at	NOT 96 0	0.00	0.00	00.0	0.00 2100.00 0 2,016	2100.00 2,016	2160.00
	TOTAL Add W10 Col's at Eaves of Bldg	1920,00 LB	0	0		0 2,016	2,016	1.05
C03.02 . 01.03. Add New Roof F	Purlins							
> SS TIN 8	> Add new purlins to support	21600 LB	0,00	0.00	0.00	0.00 1.10 0 23,760	1.10 23,760	1.10
	TOTAL Add New Roof Purlins	21600 LB	0	- 0		0 23,760	23,760	01.1
C03.02 . 01.04. Add MC6 Girts	at Bldg Perimeter							
B MIL 3S <	> Add new NC6x8.2 Girts btwn	11000 LB	0.00	0.00	0.00	0.00 33,000	3.00	3.00
	TOTAL Add MC6 Girts at Bldg Perimeter	11000 18	10			0 33,000	33,000	3.00
	TOTAL Add Misc Steel Framing	1	0		0	0 91,776	91,776	
C03.02 . 02. Add Precast Wall & Rc Note:	of Panels							
l. Estimates assumes (	6" +/- thick precast panels.							
LABOR ID: ICSNLR EQUIP ID: EQNICS	Currency in BOLLARS					CREW ID: ICSCR	a ups ID: C	4365J

Fri 29 Jun 2007 Eff. Date 06/28/07 DETATLED ESTMATE	PROJECT N	Tri-Service Automated Cost Engineerir OCBPS: Permanent Enhancement of ICS - N	ig System (TRA Vew Orleans Hv	(CES) rricane P	rot Froj				19 11 11 11 11 11 11 11 11 11 11 11 11 1	:10;21
		C London Avenue Canal							DETAIL PAG	ళ ప
C03. Phase 3 Pump Platform	Enclosure		QUANTY UOM	MANHRS	LABOR EQ	UIPMNT MATE	RIAL OF	her TOTA	T COST UNI	T COST
	<ol> <li>Cost incl materils, bldg.</li> </ol>	labor, equip, etc for installation onto $\epsilon$	sxisting					1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		4 9 9 9 9 9
	B MIL SS <	> Add new perimeter wall panels	7920.00 SF	0.00	0.00	0 00.0	0.00 10 10	. 00 200	10.00 79,200	10.00
		TOTAL Add Precast Wall & Roof Panels	7920.00 SF	- 0			·6L 0	200	79,200	10.00
c03.02 .	03. Add Overhead & Personn Notes:	el Doors								
	1. Allow (2)- commercia	l grade hollow metal doors at each enclos	iure.							
	2. Allow (1)-commercial at each enclosure. Assu	grade, sectional, steal, heavy duty, ove me 10-ft x 10-ft size.	erhead door							
	B MIL SS <	> Overhead coml, no frame, manual,	1.00 EA	0.00	0.00	00.0	0.00 1200 0 1,	200	200.00 1,200 1	200.00
	B MIL SS <	> Coml stl dr, fl, 3'-4" x 7'-0",	2.00 EA	0.00	0.00	0.00	0.00 500	000	500.00 1,000	500.00
		TOTAL Add Overhead & Personnel Doors	ŀ	- 0			0 2,	200	2,200	
C.03.02 .	04. Add Louvers & Ventilat Notes:	253								
	<ol> <li>Install louvers for and West enclosures</li> </ol>	air intake each side of enclosure. Provi	de at East							
	2. Assume (14) ea side	, at 4-ft x 4-ft size.								
	3. Total louver area = { SF. (SAY 1000 SF to	14 ea x 2 sides x 4 x 4   x 2 enclosures tal)	896							
	4. Provide a protective	aluminum shroud over top & sides of louve								
	5. Provide (2) - powered protection.	wall exhausters at ea enclosure; with shr	pao							
	B MIL JJ <	> Wall Louvers, aluminum, with	500.00 SF	0.00	0.00	0.00 0	0.00 40 0 20,	, 00 000	40.00 20,000	40.00
	B MIL JJ <	> Protective aluminum shroud over	28.00 EA	0.00	0.00	0.00	0.00 250 0 7,	.00	250.00 7,000	250.00
	8 AF 0년 <	> Fan, wall exhers, 1 HP, cntfg1,	2.00 EA	0.00	0.00	0.00	0.00 1500 0 3,	.00 000	500,00 3,000 1	500.00

Fri 29 Jun 2007 Eff. Date 06/28/07 Provates en 06/28/07	Tri-Service Automated Cost Engineering NOCBPS: Permanent Enhancement of ICS - Nev	System (TRAC Orleans Hur	ES) ricane Pi	rot Proj			111 144 147 147	14:10:23
LIGHT DO LOTTON	C London Avenue Canal	 හු					DETAIL 1	PAGE 55
C03. Phase 3 Pump Platform Enclosure		M WON: XINNU	ANARS	LABOR EQ	JI PMNT MATERIA	AL Other	TOTAL COST 1	NIT COST
	TOTAL Add Louvers & Ventilators		- 0			0 30,000	30,000	Pr 00 30 VM − 10 VM − 10
C03.02 . 05. Modify Exist Gen Exha Notes:	aust Vents							
I. Existing exhaust ve	ents pentrate the metal siding of the bldg.	·						
2. Vents need to be mo concrete panel system.	odified to function with the new exterior pu	ecast .						
<ol> <li>Includes adapting e concrte panels.</li> </ol>	exterior shrouds on vent penetration thru new	precast						
> NT TIW 8	> Allowance to modify exist	6.00 EA	0.00	0.00	0.00 0.0	0 500.00 0 3,000	500.00 3,000	500.00
	TOTAL Modify Exist Gen Exhaust Vents		10			0 3,000	3,000	
C03.02 . 06. Modify Exist Utility	Runs							
> DD TIM 8	> Allowance to modify utility runs	1.00 LS	0.00	0.00	0.00 0.0	0 5000.00 0 5,000	5000.00 5,000	5000.00
	TOTAL Modify Exist Utility Runs		- 0		0	0 2,000	2,000	
	TOTAL Structure Modifications					0 211,176	211,176	
C03.03 . Allow for Misc Enclosure Mods								
L RSM SS <	> Allowance for misc modifications	1.00 LS	0.00	0.00	0.00 0.0	0 25000 0 25,000	25000.00 25,000	25000.00
	TOTAL Allow for Misc Enclosure Mods		10	0		0 25,000	25,000	
	TOTAL Phase 3 Pump Platform Enclosure	i t	0	0	0	0 244,809	244,809	
LABOR ID: ICSNLR EQUIP ID: EQUICS	Currency in DOLLARS				CREW	ID: ICSCR	W UPB ID: C	P99EA

Eri 29 Jun 2007 Eff. Date 06/28/07	Tri-Service Automated Cost Engi ROJECT NOCBPS: Permanent Enhancement of J	ineering System (TR ICS - New Orleans H	ACES) urricane I	erot Proj			3HII	14:10:21
DETAILED ESTIMATE	C London Avenue	Canal ICS					I TIVLES	AGE 56
C	***************************************	QUANTY - UOM	MANHRS	LABOR EQ	NAT MA	TERIAL Other	TOTAL COST U	ISOD LIN
C								
<ol> <li>Allow for removal and disposal replacement with (13) roller gates</li> <li>Provide gates with rollers to during differential head condition for placement of gates.</li> </ol>	l of existing (13) needle gates, and es and associated framing. allow response to emergency closures ons, and need for quicker repsponse time							
<ol> <li>See "Item E_Capacity Modificat. additional pumping equipment and enhanced capacity.</li> </ol>	tions" for alternative of providing expanded facilities to accommodate							
C04. 01. Roller Gates and Guides								
C01. 01. Roller Gates								
L RSM SS	8 < >> Allowance for fabrication a	nd 151.00 TON	0,00	0.00	0.00	0.00 1700.00 0 256,700	1700,00 256,700	1700.00
I, RSM SS	5 < > Allowance for Corrosion	15000 SF	0.00	0.00	0.00	0.00 3.00 0 45,000	3,00 45,000	3.00
T, RSM SS	S < > > Allowance for installation	of 151.00 TON	00.0	0.00	0.00	0.00 1000.00 0 151,000	1000,00 151,000	1000.00
	TOTAL Roller Gates	13.00 EA	0		- 0	0 452,700	452,700	34823.08
C04. 01. 02. Gate Guide Colu	SUUT							
L RSM SS	5 < > > Allow for fab and delivery	of 56,00 TON	0.00	00.00	00'00	0.00 1700.00 0 95,200	1700,00 95,200	1700.00
L RSM SS	5 < > Allowance for Corrosion	7200.00 SF	0.00	0.00	0.00	0.00 3.00 0 21,600	3.00 21,600	3.00
L RSM SS	S < > Allowance for installation	of 56.00 TON	0.00	0.00	0.00	0.00 1000.00 0 56,000	1000.00 56,000	1000.00
	TOTAL Gate Guide Columns		0	0		0 172,800	172,800	
C04. 01. 03. Add Platform Ext	kpansion & Ladders							
L RSM SS	3 < > > Allowance for fabrication a	nd 12,00 TON	0.00	0.00	0.00	0.001700.00 0 20,400	1700.00 20,400	1700.00
L RSM SS	3 < > Allowance for installation	of 12,00 TON	0.00	0.00	0.00	0.00 1000.00 0 12,000	1000.00 12,000	1000.00
LABOR ID: ICSNLR EQUIP ID: EQNICS	Currency in DC					CREW ID: ICSCRW	UPB ID: U	<b>A</b> 3629

Fri 29 Jun 2007 Eff. Date 06/28/07	Tri-Service Automated Cost Engineerin NOCBPS: Permanent Enhancement of ICS - N	g System (TRAC ew Orleans Hur	ES) ricane P	rot Proj				T INIE	10:21
DELALTED BSTIMEE	C. London Avenue Canal	S)					20	TAIL PAGE	25
C		QUANTY UOM M	ANHRS	LABOR EQ	UI PMNT MATE	ERIAL Oth	er TOTAL	COST UNIT	. cost
			101 June Vall 144 July 144 Auto				<b>** **</b> ** ** **	9	
	TOTAL Add Platform Expansion & Ladders		0			0 32,4	00 32	400	
C04. 01. 04. Removal / Dispose of	Exist Gates								
L RSM SS <	> Allowance for gate removal from	51,00 TON	0,00	0.00	0°-00	0.00 1000. 0 51,0	00 100 00 51	0.00 IC	00.00
L RSM SS <	> Allowance for off-site removal	102000 IBS	0.00	0.00	0.00	0.00 0. 0 2,0	02 40 2	0,02	0.02
	TOTAL Removal / Dispose of Exist Gates	13.00 EA	0	- 0		0 53,0	40 53	1,040 4C	80.00
C04. 01. 05. Fill Vold of Needle C	Gære Seat								
1. Allow 12-ft / gate	x 13 gates = 156 LF								
l rsm ss <	> Fill void of Needle Gate Seats	136.00 LF	0.00	0.00	0.00	0.00 100. 0 15,6	00 00 10	0.00	00.00
	TOTAL Fill Void of Needle Gate Seat	13.00 EA			· · · · · · · · · · · · · · · · · · ·	0 15,6	00 15	, 600 12	00.00
C04. 01. 06. Install Gate Operator	r / Motor								
I. RSM SS <	> Instail gate operator; reuse	5.00 EA	0.00	0.00	0.00	0.00 2500. 0 12,5	00 250 00 12	0.00 ,500 25	00.00
	TOTAL Install Gate Operator / Motor	13.00 EA	0	- 0	0	0 12,5	00 12	, 500 9	61.54
	TOTAL Roller Gates and Guides		- 0	- 0	0	0 139,0	40 739	,040	
	TOTAL Gate Operations		0	0		0 139,0	139	, 040	

Fri 29 Jun 2007 Eff. Date 06/28/07	PROJECT N	Tri-Service Automated Cost Engineerir OCBPS: Permanent Enhancement of ICS - N	ng System (TKA New Orleans Hu	CES) rricane P	rot Proj				t anta	4:10:21
DELATED ESTIMATE		C London Avenue Canal	ICS						DETAIL PA	28 28 05
C05. Mechanical Systems			QUANTY UOM	MANHRS	LABOR EQ	TAM TUR	ERTAL OU	her TOT!	AL COST UN	IT COST
C05. Mechanical Syster	Su Su			10 000 04 min		na ana ang ang ang ang ang ang ang ang a		- int the last last and you you -	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	₩ ₽ ₽
C05. 01. Phase 1 Notes:	Pumps Sys Modifications									
l. Repl FSI type	sce existing Phase 1 pun	ps (12 ea) with new 350 cfs pumps (12 ea)	ł							
2. See "7 addition enhanced	ttem E_Capacity Modifica al pumping equipment and capacity.	tions" for alternative of providing expanded facilities to accommodate								
c05. 01. 01.	. Demo Exist Phase 1 Pur	87 Q4								
	L RSM JJ <	> Allowance for disconnect & prep	12.00 EA	0.00	0.00	0.00	0.00 7100 0 85,	.00	100.00 85,200	7100.00
	L RSM JJ <	> Allowance for removal and	12,00 EA	0.00	0.00	0.00	0.00 3750 0 45,	. 00	1750.00 45,000	3750.00
		TOTAL Demo Exist Phase 1 Pumps	12.00 EA				0 130,	200	.30,200 1	0850.00
c05. 01. 02	Demo Exist Hydraulic P	iping Sys								
C05. 01.	02.01. Install Valves	& drain Hyd Fluid								
	Z RSM JJ <	> Furchase (8)~3"gate valves1	8.00 EA	0.00	0.00	0.00	0.00 500 0 4,	.00	500.00 4,000	500.00
	L RSM JJ <	> Purchase (2)-1" gate valves1	2.00 EA	0.00	0.00	0.00	0.00 200	-00 400	200.00 400	200.00
	L RSM JJ <	> Allowance for installing valves	16320 LF	0.00	0°00 0	0.00	0.00 3 0.53,	.25 040	3.25 53,040	3.25
	L RSM JJ <	> Allowance for installing valves	4080.00 LF	0.00	0.00	0.00	0.00 3 0 13,	· 25 260	3.25 13,260	3.25
	L RSM JJ <	> Fluid Containment and Disposal	6160.00 GAL	0.00	0.00	0.00	0.00 10 0 61,	. 00	10.00 61,600	10,00
		TOTAL Install Valves & drain Hyd Fluid	3	0			0 132,	300	32,300	
c0s. 01.	02.02. Clean interior	of piping .								
	L RSM JJ <	> Allowance for flushing &	16320 LF	0.00	0.00	0.00	0.00 2 0 32,	.00	2.00 32,640	2.00
LABOR ID: ICSNLR EQUIP ID: EC	NICS	Currency in DOLLARS				Ū	CREW ID: IC	CSCRW U	PB ID: UP'	<b>A</b> 196

Eri 29 Jun 2007 Eff. Date 06/28/07	Tri-Service Automated Cost Engineeri NOCBPS: Permanent Enhancement of ICS -	ing System (TR New Orleans H	ACES) urricane l	rot Proj				233 Were Frid Çire	14:10:21
DETALIERO ESTIMATE	C London Avenue Canal							DETAIL E	AGE 59
C. 05. Mechanical Systems	· · · · · · · · · · · · · · · · · · ·	QUANTY UOM	MANHAS	I.ABOR EQ	JULPMNT MP	TERIAL	Other 5	FOTAL COST U	NLT COST
L RSM JJ <	> Allowance for flushing &		0.00	0°00	0.00	0.00	0.50	0.50	1 L 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
	TOTAL Clean interior of piping	2 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7					2,040 	2, U&U 	0.20
C05. 01. 02.03. Demo exist hyc	a fluid piping								
L RSM JJ <	> Demo existing 3" hydraulic	16320 .LF	0.00	0.00	0.00	0.00	10.50 71,360	10.50 171,360	10.50
L RSM JJ <	> Demo existing 1" hydraulic	4080.00 LF	0.00	0.00	0.00	00.0	7.50 30,600	7.50 30,600	7.50
	TOTAL Demo exist hyd fluid piping			0	0	0 2(	01,960	201,960	
	TOTAL Demo Exist Hydraulic Piping Sys	•	- 0	0	0	0	58,940	368,940	
C05. 01. 03. Demo Exist Power Unit	10								
1. RSM JJ <	> Allowance for disconnect & prep	: : 12,00.EA	0.00	0.00	00.0 0	0.00 3(	500.00 13,200	3600.00 43,200	3600.00
L RSM JJ <	> Allowance for removal and	12,00 EA	0.00	0.00	00.0	0.00 16	300.00 21,600	1800.00 21,600	1800.00
	TOTAL Demo Exist Power Units	12.00 EA		- 0	- 0	- 0	54,800	64,800	5400.00
C05. 01. 04. Miscellaneous Demo									
L RSM JJ <	> Allowance for Misc Pump Sys	1.00.15	0,00	0,00	00°0	0.00	50000 50,000	50000.00 50,000	50000.00
	TOTAL Miscellancous Demo					- 0	000,00	50,000	
C05. 01. 05. Modify Exist Pump Sup Nate:	ot Platforms								
1. Assumed steel frami similar to existing Pha	ing of existing pump platform deck and gra ase 1-17th Street pump platforms.	 Duşa							
LABOR ID: ICSNLR EQUIP ID: EQNICS	Currency in DOLLARS					CREW ID:	LCSCRW	0 : OI 840	839EA

Fri 29 Jun 2007 Eff, Date 06/28/07 Demotres Continented	Tri-Service Automated Cost Engineeri T NOCBPS: Permanent Enhancement of ICS -	ng System (TR) New Orleáns M	ACES) 1rricane	rot Proj				IN IN	14:10:21
ALANTAN GALINIA	C London Avenue Canal	S						DETAIL P	AGE 60
c		QUANTY UOM	MANHRS	LABOR EC	ZM TNM9 LUG	TERIAL C	Other 1	OTAL COST U	NIT COST
C05. 01. 05.01. Demo Exist S	tl & Grating (E-W)								)           
L RSM SS <	> Allowance for demo of exist	NOL. 00°ET	0.00	0,00	0.00	0.00 25	50,00 3,250	250.00 3,250	250.00
L RSM SS <	> Allowance for demo of exist	2640.00 SF	00.00	0.00	0,00	0.00	5.00 3,200	5.00 13,200	5.00
L RSM SS <	> Allowance for disposal of demo	35, 00 TON	0.00	0.00	0.00	0.00	50.00 1,750	50.00 1,756	50,00
	TOTAL Demo Exist Stl & Grating (E-W)			- 0			3,200	18,200	
C05. 01. 05.02. Install New 9	Stl & Grating (E-W)								
L RSM SS <	> Allow for fab and delivery of	13,00 TON	0.00	0.00	0.00	0.00 170	20.00 2,100	1700.00 22,100	1700.00
L RSM SS <	> Allowance for Corrosion	3300 00 SF	0.00	0,00	00.0 0	0.00	3.00 9,900	3.00 9,900	3.00
L RSM SS <	> Allowance for installation of	13.00 TON	0.00	0.00	00.0	0.00 100	20.00 3,000	1000.00 13,000	1000.00
L RSM SS <	> Allowance for new Grating	2640.00 SF	0.00	0.00	0.00	0.00 2 0.66	25.00 5,000	25.00 66,000	25,00
	TOTAL Install New Stl & Grating {E-W}				- 0	0 111	1,000	111,000	
	TOTAL Modify Exist Pump Supt Platforms					0 129		129,200	
C05. 01. 06. Install New Pumps w	/ Elec Driver								
L RSM JJ <	> New pump with electric driver	12.00 EA	0.00	0.00	0.00	0.00 170 02040	00000 1 00000 2	70000,00 0,400,000	170000
L RSM JJ <	> Install New pump with electric	12.00 EA	0.00	0.00	0.0 0	0.00 41 0.498	.5000 9000	415000.00 4,980,000 4	15000.00
	TOTAL Install New Pumps w/ Elec Driver	12.00 EA		0		02538	30000 2	5, 380, 000	2115000
C05. 01. 07. Install New Motor PC	ower Units								
L RSM JJ <	> Motors for New pumps, installed	12.00 EA	0.00	0.00	0.00	0.00 50 0 600	00000	500000,00 6,000,000 5	00000,000
	TOTAL Install New Motor Power Units	12.00 EA	0	- 0	0	009 0	00000	6,000,000 5	00000.00
LABOR ID: ICSWLR EQUIP ID: EQNICS	Currency in DOLLARS					CREW ID:	ICSCRW	UPB ID: U	699EA

DETAILED ESTIMATE	3: Permanent Enhancement of ICS - No	ew Orleans Hu	rricane P	rot Proj					*7:07:5
	C London Avenue Canal	rcs						DETAIL PI	6E 61
C.,05. Mechanical Systems		CUANTY UOM	MANHRS	LABOR EC	DULPMNT MA	TERIAL OU	ther TOT	AL COST UN	117 COST
C05. 01. 08. Replace Storage Tks w/ Dbl	Wall		900 um 101; ma Avi an an an	· · · · · · · · · · · · · · · · · · ·					
C05. 01. 08.01. Disconnect-Clean Exi Notes:	ist fuel Tank								
1. Assume tank 5% full 20,000 gal x .05 ~ 10	00 gal								
L RSM JJ <	> Disconnect existing fuel oil	ST 00 T	0.00	0.00	0.00	0,00 500 0	500 500	500.00 500	\$00.00
L RSM JJ <	> Transfer re-usable Fuel, incl	100.00 GAL	0.00	0.00	0.00	0.00	00	1.00 100	1.00
L RSM JJ <	> Clean and Flush tank prior to	1.00 1.5	0.00	0.00	00.0	0.00 500	- 00 500	500,00 500	500.00
TOT	FAL Disconnect-Clean Exist Fuel Tank	2.00 EA			0	0 1,	100	1,100	550.00
$c_{\perp}.05$ . 01, 08.02. Removal and Disposal	l of Exist Tk								
L RSM JJ <	> Removal and disposal of existing	2.00 EA	00.0	0.00	0.00	0.00 2000 0 4,	, 00 000	2000.00 4,000	2000.00
TOT	fAt Removal and Disposal of Exist Tk	2.00 EA	0		- 0		000	4,000	2000.00
C05. 01. 08.03. Install Double-Wall	Storage Tank								
I. RSM JJ <	> New Dbi Wall Storage Tank(s) ;	2.00 EA	0.00	0.00	0.00	0.00 22 0.45,	500 2: 000	2500.00 45,000 2	2500.00
L RSM JJ <	> Install new Dbl Wall Storage	2.00 EA	0.00	0.00	0.00	0.00 2000 0 4,	000	2000.00 4,000	2000.00
L RSM 37 <	> Reconnect fuel piping, allow	2.00 EA	0.00	0.00	0.00	0.00 1000 0 2,	• 000 000	1000.00 2,000	1000.00
TOT	tAL Install Double-Wall Storage Tank	2.00 58				0 51,	000	51,000 2	5500.00
TOT	AL Replace Storage Tks w/ Dbl Wall	- 2.00 EA	10		- 0	0 56,	100	56,100 2	8050.00
TOT	CAL Phase 1 Pumps Sys Modifications				10	032179	240 32,	179,240	
TOT	[AL Mechanical Systems		0	0		032179	240 32,	179,240	

Currency in DOLLARS

Eri 29 Jun 2007 Eff. Date 06/28/07 DETATIED ESTIMATE	Tri-Service Automated Cost Engineeri PROJECT NOCBPS: Fermanent Enhancement of ICS - 1	ig System (TRJ lew Orleans Hi	CES) (rricane P	tor Proj				e Wi F	4:10:21
	C London Avenue Canal	SOT						fa TIFLEO	62 62
C06. Electrical Systems		QUANTY UOM	MANHRS	LABOR EQ	UI PMNT NJ	TERIAL	Other 7	TOTAL COST BN	IT COST
C	siders that incremental SCADA (Supervisory Control And interface will be required in considerations of ICS								8 F F F 4
entancements. 2. Estimate provid to accommodate tra	as for upgrade of SCADA monitoring and control equipment nsition from a hydraulic driven system to a diesel driven								
system 3. Allowance includ with existing / new 4. Allowance based Total allowance of \$1000 - Pump Hou \$2000 - SCADA rou	<pre>des installation of conduit, wiring, devices, interface .     equipment and current SCADA monitoring system.     i on cost of SCADA upgrades per pump.     \$3000 as follows:     se SCADA upgradecost per pump     more a conte pump motors, etc</pre>								
dund red	ALLAN PACAL COLUMNER DESCRIPTION DESCRIPTION								
5. Estimate assume monitoring.	s existing SCADA system is adequate for all Phase 3								
C06. 01. Lightning	and Grounding System								
C06, 01, 01, 1	.ightning Frotection								
<pre>16000 0000 Electrical, Generally 16100 0000 Conductors &amp; Ground: 16180 0000 Grounding 16181 0010 Grounding device 16181 5999 Wire, laid in 16181 5999 Copper, barr</pre>	excludes crane services ing ss trench s stranded								
	MIL GG <16181 6010 > Grounding, laid in trench,	0.40 MLF	6.86 3	221.53 89	0.00	545,00 218	0.00	766.53	55 2997
<pre>16000 0000 Electrical, Generally 16900 0000 Special Systems 16801 0000 Special Systems 16840 0010 Lightning protec 16840 4000 Air terminals</pre>	excludes crane services tion								
	L MIL GG <16840 4040 > Lightning protection, air	22.00 EA	0,46 11	19.28 424	0.00	14.67 323	0.00	33.95 747	33,95
16840 0010 lightning protec 16840 4200 Air terminal t	ttion ases, copper								
	M MIL GG <16840 4220 > Lightning protection, air term	22,00 EA	0.89 20	35.72 786	0.00	21.50 473	0.00	57.22 1,259	57.22
	TOTAL Lightning Protection	t		1,299		L, 014		2,312	
LABOR ID: ICSNLR EQUIP ID: EQNI	CS Currency in DOLLARS					CREW ID:	ICSCRW	UPB ID: UP	4 2 9 9

Fri 29 Jun 2007 Eff. Date 06/28/07 DETAILED ESTIMATE C. Lor C Lor	ced Cost Engineering ancement of ICS - Ner ondon Avenue Canal	System (TR w Orleans H	icricane :	Prot				TIME . DETAIL PA	4:10:21 GE 63
C06. Electrical Systems		QUANTY UOM	MANHRS	LABOR EQ	W JNNA I M	ATERIAL.	Other	TOTAL COST U	III COST
C06. 01. 02. Grounding			- man one are too are the man one of		5 E F I I I I I I I I I I I I I I I I I I	-		 	197 TH 197 TH 197
16000 0000 Electrical, Generally excludes crane services 16100 0000 Conductors & Grounding 16180 0000 Grounding 16181 0010 Grounding devices 16181 0029 Rod									
MIL GG <16181 0100 > Grounding, rod,	, copper clad, 10'	16.00 EA	1.82 29	73.05 1,169	0.00	29.40 470	0.00	102.45 1,639	102.45
MIL GG <16181 6020 > Grounding, laid	d in treach,	1.00 MLF	9.43 643 69	304.40 305	0.00	1060.00 1,060	0.00	1364.60 1,365	1364,60
16191 0010 Grounding devices 16181 6299 Ground conductor bonding, cadweld									
MIL GG <16181 6350 > Grounding, gnd c	conductor bond,	16.00 EA	8 8 2 8 2	73.42 1,175	0.00	19,89 318	0.00	93.31 1,493	13.31
MIL GG <16181 6380 > Grounding, gnd c	conductor bond,	50.00 EA	2,08 104	84.12 4,206	0.00	17.29 865	0.00	101.41 5,071	101.41
TOTAL Grounding			1.2	6,854		2,713		9,567	
TOTAL Lightning and Gr	Srounding System		205	8,153		3,727		11,880	
C06. 02. Electrical Power									
C06. 02. 01. Power									
<pre>16000 0000 Electrical, Generally excludes crane services 16000 0000 Raceways, Generally excludes crane services 16016 0000 Conduits 16017 0010 Conduit, to 15', incl. terminations &amp; elbows 16017 9889 Rental, hydraulic bender</pre>									
L MIL GG <16018 0000 > Remove generator	or power and	1.00 LS	24.00 24	964,80 965	0'00 00'0	20 5 7 8 7 8	226564 26,564	227538.38 227,538.28	7538.38
<pre>16016 0000 Conduits 16018 0010 Conduit, to 15', includes couplings only 16018 0499 Steel, rigid galvanized (RGS)</pre>									
MIL GG <16018 0640 > Conduit to 15' E	B, 3" dia, incl	18000 LF	0.25	10.05 180,900	00.0	9.58 172,440	0.00	19.63 353,340	19.63
16000 0000 Electrical, Generally excludes crane services 16100 0000 Conductors & Grounding									
LABOR ID: ICSNLR EQUIP ID: EQNICS	irrency in DOLLARS					CREW ID	: ICSCRW	UPB ID: UI	4366

Fri 29 Jun 2007 Eff Date 06/28/67	Tri-Service Automated Cost Engineeri PROJECT NOCEPS: Permanent Enhancement of ICS - N	ig System (TR law Orleans H	ACES) urricane	8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7				1 ME	14:10:21
DETAILED ESTIMATE	C., London Avenue Canal	tcs						DETAIL E	AGE 64
C06. Electrical Systems		QUANTY UOM	MANHRS	LABOR E	A LUNAINOS	ATERIAL	Other	TOTAL COST (	TSOO TIN
16108 0000 Conductors 16115 0010 Shielded cable 16115 0039 Copper, XLP shield	ing, 5 KV				2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2				2 5 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
	M MIL GG <16115 0400 > Shielded cable, 5kV, 1/0, no	26.95 MLF	42.11 1,135	1691.79 45,594	0.00	2184.00 58,859	0.00	3875.79 104.453	3875.79
16108 0000 Conductors 1619 0010 Wire 16119 0919 600 volt, type THW 16119 0999 Copper, stranded									
	MIE GG <16119 1350 > Wire, 600 volt, type THWN-THHN,	8,00 MLF	32.31 98	494.52 3,956	0°-0	274.50 2,196	0.00	769.02 6,152	769,02
<pre>16000 0000 Electrical, Generally excl 16300 0000 Motors, Starters, Boards 16330 0000 Switches 16330 0010 Distribution section 16330 0100 Aluminum bus bars,</pre>	ides crane services & Switches not including breakers								
	B AF GG <16331 0000 > Medium voltyage soft start	12.00 EA	40.00 480	1615,20 19,382	0.00	9600.00 475,200	0.00	41215.20 494,582	41215,20
<pre>16000 0000 Electrical, Generally excl 16500 0000 Fower Systems &amp; Capacitos 16510 0000 Power Systems 16513 0010 Generator set 16513 0010 Generator set 16513 2000 Diesel engine</pre>	des crane services cs								
	M MIL GG <16513 3270 > Remove generator set	12.00 EA	177.78 2,133	6787.85 81,454	778.37 9,340	0.00	0.00	7566.22 90,795	7566.22
	B MIL GG <16513 3270 > Generator set, dsl eng, xfr	12.00 EA	250.00 3,000	9545,41 114,545	1094,58 13,135	350000 4200000	0.00	360640.00 4,327,680 3	60640.00
	TOTAL Power		11,371	446,796	22,475	4908704 2	26,564	5,604,540	
C06. 02. 03. Gate Þ	lotor Operators								
16000 0000 Electrical, Generally exclu 16300 0000 Motors, Starters, Boards 16350 0000 Motors	ides crane services & Switches								
	B MIL GG <16353 0000 > Gate motor operator	5.00 EA	0.00	76,53 383	0.00	5000.00 25,000	0.00	5076.53 25,383	5076.53
	TOTAL Gate Motor Operators		0	1.88		25,000		25,383	
LABOR ID: ICSNLR EQUIP ID: EQNICS	Currency in DOLLARS					CREW ID	: ICSCRW	UPB ID: U	¥366a

Fri 29 Jun 2007 Eff. Date 06/28/07	Tri-Service Automated Cost Engineering PROJECT NOCBPS: Permanent Enhancement of ICS - Ne	System (TRA « Orleans Hu	CES) rricane P	tor Proj				TIME 14:	10:21
DEIALLEU ENTIMATE	C London Avenue Canal						D D	ALL PAGE	ee ee
C	计外外子 医马克尔氏 医马尔氏 化二乙基 医马克尔氏 医马克尔氏 化化合物 化合物 化合物 化合物 医外周的 化合物	DUANTY DOM	MANHRS	LABOR EQ	M TNM4IUC	ATERIAL Oth	er TOTAL C	TINU TSOC	COST
C06, 02.	08. Control		ann ann an	re vera mer van van van van van	F F & + - + 4 4 4	<b>■ ■ ■ </b> →  →  →  →  →  →  →  →  →  →  →  →  →	er va av va ne va me	5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	NAN ANY ANY ANY
16000 0000 Electrical, Ger 16800 0000 Special Syste 16801 0000 Special Sys 16862 0010 Closed ci	erally excludes crane services ms tems rcuit TV system								
16862 6999 Micropi	ocessor, matrix switcher/controller								
	M CIV GG <16865 0000 > Scada control system for canal	12.00 EA	1,00	40.36 485	0.00	0.00 3000. 0 36,0	00 3040 00 36,	3.38 485 30	140.38
	TOTAL Control			1 1 1 1 1 1 1 1				1 50 1 66 1 97	
	TOTAL Electrical Power		11,383 4	47,663	22,475		64 5,666,	407	
	TOTAL Electrical Systems			् जित्त	22°, 4	4937431 262, 5	6.4 5.678,	り 1911日 1911 1911日 1911日 1911日 1911日 1911 19	
LABOR ID: ICSNLR EQUIP I	D: EQNICS					CREW ID: IC	SCRW UPB	eequ :di	EA

Fri 29 Jun 2007 Eff. Date 06/28/ DETAILED ESTIMATE	07 PROJECT	Tri-Service Automated Cost Engineering NOCBPS: Permanent Enhancement of ICS - Ne	: System (TR) w Orleans H	ACES) urricane P	rot Proj			L ME	14:10:21
		C London Avenue Canal	SOI					DETAIL P/	4GE 66
C07. Miscellane	Dus Items		QUANTY UOM	MANHKS	LABOR EQ	ULPMNT MATER	IAL Other	TOTAL COST UN	ILL COST
C07. Mí:	scellaneous Items		- 909 and man a		no no per une ven per une une .		1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -		
C07	. Di. Corrosion Protection Note:								
	<ol> <li>Provide costing on all majo</li> </ol>	or elements of the facility.							
	<ol> <li>Soil excavation and backfil structure supports in order to</li> </ol>	Il required at all platform columns and provided corrosion protection below grade.							
	<ol> <li>A cofferdam is required on t adequate depth to provide corro water line on Flood side.</li> </ol>	the flood side to enable drawdown of water t osion protection at a nominal depth below	0						
	<ol> <li>On Protected side, it is ase draw-down of canal for purpose nominal depth below water line</li> </ol>	sumed the pump station pumps can be used for of applying corrosion protection at a on Protected side.							
ο'	.07. 01. 01. Protective Coatings								
	C.,07. 01. 01.01. Soil Excavatio	on / Backfill							
	L MIL AA <	> Excav / Backfill around existing	1.00 LS	0.00	0.00	0.00	.00 51000 0 51,000	51000.00 51,000 5	1000.00
		TOTAL Soil Excavation / Backfill		1 0 1		· 0	0 51,000	51,000	
	C07. 01. 01.02. Construct Temp	p Cofferdam							
	L MIL AA <	> Construct Temp Cofferdam on	1,00 LS	0.00	0.00	0.00	.00 2100000 0 2100000	2100000.00 2,100,000	2100000
		TOTAL Construct Temp Cofferdam		- 0			0 210000	2,100,000	
	C.,07. 01. 01.03. Dewater Protec	tted Side							
	L MIL AA <	> Allowance for dewatering of	1.00 IS	0.00	0.00	0,00 0	.00 300000 0 300,000	300000.00 300,000 30	0000.00
		TOTAL Dewater Protected Side		0	0	0	0 300,000	300,000	
	C07. 01. 01.04. Apply Protecti	tve Coating							
	L MIL AA <	> Apply protective coating to	1.00 LS	0.00	0.00	0,00 0	.00 285000 0 285,000	285000.00 285,000 28	15000.00
		TOTAL Apply Protective Coating		0	0	D	0 285,000	285,000	
LABOR ID: ICSNLR	EQUIP ID: EQUICS	Currency in DOLLARS				CRE	W ID: 10:SOR	an :01 Hqu	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2

Fri 29 Jun 2007 Eff. Date 06/28/07	PROJECT	Tri-Service Automated Cost R NOCBPS: Permanent Enhancement C	Engineering S of ICS - New	ystem (TRA Orleans Hu	CES) rricane P	rot Proj			in the	1≰:10:21
DETAILED ESTIMATE		C London Aver	nue Canal IC	ب					77747.23C3	PAGE 67
C07. Miscellaneous Items			00 0	IANTY UOM	MANHRS	LABOR EC	UI PMNT MAI	TERIAL Other	TOTAL COST	UNIT COST
			via man dan man kan dan dan dan saka man dan saka saka	9 7 F E B 9 - 4 4 4 4						
		TOTAL Protective Coatings			0	0	0	0 2736000	2,736,000	
c07. 01. 02. Cathodi	ic Protection									
	L MIL AA <	> Allowance to install cat	thodic	1.00 LS	0.00	0.00	0.00	0.00 300000	30000,00	300000.00
		TOTAL Cathodic Protection		I		- 0	T ()	0 300,000	300,000	
		TOTAL Corrosion Protection		ł	- 0		0	0 3036000	3,036,000	
C07. 02. Fluid Storage Fac Note:	acility (On-Sit	(a)								
<ol> <li>The estimate SF area for stock storage and fluid</li> </ol>	te assumes The kpile of waste i changing of e	Fluid Storage Facility shall cont fluids, an 1800 Sf area for new f equipment.	tain a 200 fluid							
	L RSM SS <	> Allow for (1) - onsite st	сог & 150	0.00 SE	0.00	0°.0 0	0.00	0.00 725.00 0 1087500	725.00	725.00
		TOTAL Fluid Storage Facility (	(On-Site)	I				0 1087500	1,087,500	
C07. 03. Add 'l Fuel Farm Notes:	a Installed									
<ol> <li>Additional Fue facility. The add 1 &amp; OPTION 2 Conce</li> </ol>	lel Tanks are p dditional of th teptual Designs	provided to enhance fuel reserves lese tanks align reserve capacity s for New Pump Station Facilities.	at to ICS with OPTION							
<ol> <li>The added tanks replaced by double</li> </ol>	is are in addit e wall tanks a	cion to the existing single wall t ss shown elewhere in the estimate.	canks to be							
	L MIL AA <	> Install Fuel farm Tanks	ងំពុជ	3.00 EA	0.00 0	0.00	0.00	0.00 54000 0.162,000	54000.00 162,000	54000.00
		TOTAL Addt'l Fuel Farm Install	led	3.00 EA				0 162,000	162,000	54000.00
C07. 04. 96-in Butterfly V	Valves									
02000 0000 Site Work 02100 0000 Site Freparation & Excavati 02160 0000 Sheet Piling 02161 0009 Sheet piling 02161 3900 Wood, including wales	ion Support s, braces and	spacets spacets								

Fri 29 Jun 2007 Eff. Date 06/28/07	Tri-Service Automated Cost Engineeri PROJECT NOCBPS: Permanent Enhancement of ICS - 1	ig System (TR Jew Orleans H	ACES) urricane	Prot Proj					14:10:21
DETALLED ESTIMATE	C London Avenue Canal	ICS						DETAIL	PAGE 68
C 07 MSSCO11 structure trans.				- may bee may one was used and and				*********	
		QUANTI UUM	MANAKS	LABOR	TUMAINOS	AATERIAL	Other	TOTAL COST	UNIT COST
	L MIL AA <02200 0000 > Allowance for delivery of Valves	8 00 EA	0.00	0.00	0.00	0.00	1500.00 12,000	1500.00 12,000	1500.00
11000 0000 Equipment 11000 0000 Equipment									
	B MIL AA <11000 0001 > Allowance for modifying and	8, 00 EA	0.00	0.00	0.00	0.00	25000 200,000	25000.00 200,000	25000.00
15000 0000 Mechanical, Generally exc 15100 0000 Pipe & Fittings 15191 0000 Valves 15193 0010 Valves, bronze 15193 8350 Tempering water 15193 8550 Threaded connec	ludes crane services tions								
	B MIL AM <15194 0000 > 96" dia Butterfly Valve	8.00 EA	200.00 1,600	8238.90 65,911	2434.02 19,472	30000.00 640,000	0.00	90672.92 725,383	90672.92
	TOTAL 96-in Butterfly Valves	8,00 EA	1,600	65,911	19,472	640,000 2	212,000	937, 383	117172.92
	TOTAL Miscellaneous Items		1,600	65,911	19,472	640,000 <	1497500	5,222,883	
	TOTAL London Avenue Canal ICS		13,187	521,727	41,948	557743136	387770	44,528,876	
LABOR ID: ICSNLR EQUIP ID: EQUICS	Currency in DOLLARS					CREW IL	): ICSCRM	/ UPB ID: 1	AB99EA

Fri 29 Jun 2007 Eff. Date 06/28/07 DETAILED ESTIMATE	PROJECT	Tri-Service Automated Cost En NOCBPS: Permanent Enhancement of	ngineering Syn f ICS - New On	stem (TRAC) rleans Hur:	ES) ricane Pr	ot Proj			THE T	14:10:21
		D Maintenanc	ce Facility						d liAlgu	4GE 69
D01. Land Acquisition	e en van wee aan aan aan het ger yn skrij we de eerste aan aan ee e	***************************************	00W	MTY UOM M	ANHRS	LABOR EQU	JI PMNT MATERI	AL Other	TOTAL COST U	NIT COST
D Maintenance Facility Notes:										1 4 4 1 5 12 12 12 12 12 12 12 12 12 12 12 12 12
<ol> <li>The report proposes a common and warehouse space, including s parts storage; records storage, is for this facility to serve al ICS facilities.</li> </ol>	maintenance fac. torage space fo and a general m 1 three	ility, which includes office r make-up and waste oil; aintenance area. The intent								
<ol> <li>The report provides for a 25 pre-engineered rigeid frame buil</li> </ol>	,000 SF single : ding.	storage building, as a								
3. The foundation system to incl working floor level.	ude shallow foot	tings with a slab on grade								
4. Assume structure is NOT pile	: supported.									
5. Use \$725 / SF for constructi Station Bidg, OFTION 2 , New Orl	on costs as abst .eans Conceptual	tracted from the Pump Study.								
6. Alow For land acquisition of $\mathbb{D}_{\mathbb{Z}}^{+}.01$ . Land Acquisition	estimated 5 acr	re site.								
	> NO MSN 1	> Allowance for Land Acquis	sition	.00 TS	0.00	0.00	0.00 0	00 500000 0 5000000	5000000.00 5,000,000	500000
		TOTAL Land Acquisition			o	0	0	0 200000	5,000,000	

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/07 PROJ	Tri-Service Automated Cost Engineerin SCT NOCBPS: Permanent Enhancement of ICS - N	g System (TRU aw Orleans Hi	ACES) urricane [	rot Proj			3MI 3	4:10:21
DETAILED ESTIMATE	D Maintenance Facili	 А					DETAIL P.	KGE 70
D02. Maint & Stor Facility (Off-Site)		QUANTY UOM	MANHKS	LABOR EQUIF	WNT MATERI	AL Other	TOTAL COST U	AIT COST
D02. Maint & Stor Facility (Off-Site)								and and the set one set one set
L RSM SS <	> Allowance for (1)- 2,500 SF	25000 SF	0.00	0.00	0000	00 725.00 018125000	725.00 18,125,000	725.00
	TOTAL Maint & Stor Facility (Off-Site)		- 0	0	······································	018125000	18,125,000	
	TOTAL Maintenance Facility		- 0	0	······ 0	023125000	23,125,000	

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/07 Nemarres Permana	PROJECT	Tri-Service Automated Cost Engineerin NOCBPS: Permanent Enhancement of ICS - N	ng System (TRA New Orleans Hu	(CES) (rricane P	rot Proj			19 19 19	14:10:21
ATWING CO MANTA		E., Capacity Improveme	52 11 13					DETAIL	PAGE 71
E01. 17th Street Canal		,	QUANTY VOM	MANHRS	LABOR EQ	JI PMNT MATERI	AL Other	TOTAL COST 1	JNIT COST
E., Capacity Improvem E.,01, 17th Stree	ents t Canal						, 3 3 1 1 2 2 2 2 3 3 4 1 1 2 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		1 7 mm
E01. 01. N	ew Fump/Engine Platform & Enc tes:	11							
1. 9 W	A new expanded Engine Platf ) additional pumps and power mp8 x 500 SF = 4000	orm is required on the west side to house units each. Allocate approx 500 SF area p SF.	Se T						
8 C 0 •	Say platform dimensions are fferdam to be constructed in 500 /LF for for the cofferdam	<pre>40-ft x 100-ft 1g. A perimeter sheetpil t conjunction with the pump platform. Allow t</pre>	0						
. X - U U D D D	The estimate provides for a isting Engine Platform Struct evated concrete slab similar ructure to be framed with rig ecast concrete wall and roof	<pre>free-standing structure, adjacent to the ure, constructed upon a pile-supported to the existing structure. The new id welded frames, with a superstructure o panels.</pre>	<del>4.</del>						
. 4 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Overhead door and personnel d ventilation system appurten	. door access provided, in addition to louv ances.	ц Ф.						
υ. 	Cost per SF allows for misc sc mechanical appurtenances f	: eletrical (i.e., lighting, recepticles) a or new enclosed platform.	thd						
	l mil ra <	> Construct cofferdam around new	280.00 LF	0.00	0.00	0.00	00 2500.00 0 700,000	2500.00 700,000	2500.00
	L RSM SS <	> Allowance for (1) -4000 SF	4000.00 SF	0.00	0.00	0.00	00 785.00 0 3140000	785.00 3,140,000	785.00
		TOTAL New Pump/Engine Flatform & Encl	1.00 EA	0	0	0	0 3840000	3,840,000	3840000
E01. 02. M	echanical Systems								
ε, 01. 0	2. 01. Install New Pumps w/	Elec Driver							
	L RSM JJ <	> New pump with electric driver	8.00 24	0.00	0.00	0,00 0	00 1700000 013600000	1700000.00 13,600,000	1700000
	L RSM JJ <	> Install New pump with electric	- 8,00 EA	0.00	0.00	0.00	0 415000 0 3320000	415000.00 3,320,000 v	15000.00
		TOTAL Install New Pumps w/ Elec Driver	8.00 EA	0	0	0	016920000	16, 920, 000	2115000

Currency in DOLLARS

Eri 29 Jun 2007 Eff, Date 06/28/07 DETALLED ESTIMATE	FROJECT	Tri-Service Automated Cost Engineer: NOCBPS: Permanent Enhancement of ICS -	ing System (TR/ New Orleans H	ACES) Jrricane I	Prot Proj			T T T T T T T T T T T T T T T T T T T	14:10:21 75
		E Capacity Improver	nents					1 77747	177 (7
E. 01. 17th Street	canal		QUANTY UOM	MANHRS	LABOR EQ	DUTEMNT MA	TERIAL Other	TOTAL COST L	NIT COST
بي لي	01. 02. 02. Install New Motor Po	wer Units							
	L RSH J <	> Motors for New pumps, installed	8.00 EA	0.00	0.00	00 <b>°</b> 0.	0.00 500000 0 400000	\$00000,00 4,000,000 5	00000.00
		TOTAL Install New Motor Power Units	8.00 EA		0		0 400000	4,000,000 5	00000,00
ມ່	01. 02. 03. Install (2) New 9-ft Notes:	. Dia Pipes							
	1. Assumed pipes are ea	ach 200-ft in length from pump to dischar	. apr						
	2. Say pipe thickness	: is 3/4" thick plate at 30.6 PSF.							
	<ol> <li>5. Estimated weight of 345964 lbssay 350,0</li> </ol>	<pre>%f pipe = 28.265 SF / LF x 30.6 PSF x 200 000 lbs. = 175 tons.</pre>	IF x 2 ea =						
	4. Say pipe supports v each 200-ft length of (	weigh at estimated 500,000 lbs total (250) 9-ft dia. pipe. = 250 tons.	,000 lbs per						
	E01. 02. 03.01. 9-ft Dia Pipes	0							
	L RSM SS <	> Allow for fab and delivery of	175.00 TON	0.00	0.00	0.00	0.00 1700.00 0 297,500	1700.00 297,500	1700.00
	l RSM SS <	> Allowance for Corrosion	12000 SF	00.0	0.00	0.00	0.00 3.00 0 36,000	3.00 36,000	3.00
	L RSM SS <	> Allowance for installation of	175.00 TON	0.0	0.00	0.00	0.00 1000.00 0 175,000	1000.00	1000.00
		TOTAL 9-ft Dia Pipes	400.00 LF		0	10 1	0 508, 500	508,500	1271.25
	E01. 02. 03.02. Pipes Supports	s for 9-ft Dia Pipe							
	L RSM SS <	> Allow for fab and delivery of	250.00 TON	0.00	0.00	0 ° 00	0.00 1700.00 0 425,000	1700.00 425,000	1700.00
	L RGM SS <	> Allowance for Corrosion	5000,00 SF	00.0	0.00	0.00	0.00 3.00 0 15,000	3,00 15,000	3.00
	1. RSM SS <	> Allowance for installation of	250.00 TON	0.00	0.00	0,00	0.00 1000.00 0 250,000	1000.00 250,000	1000.00
		TOTAL Pipes Supports for 9-ft Dia Pipe	a 30.00 EA				0 000 000	690,000	23000.00
		TOTAL Install (2) New 9-ft Dia Pipes	400.00 LF	0			01198500	1,198,500	2996.25
LABOR ID: ICSNLR	EQUIP ID: EQNICS	Currency in DOLLARS					CREW ID: ICSCR	W UPB ID: U	8266d

Fri 29 Jun 2007 Eff. Date 06/28/07 DEFFITES SCREAMED	Tri-Service Automated Cost Engineeri PROJECT NOCBPS: Permanent Enhancement of ICS + 1	ng System (TRA New Orleans Hu	CES) rricane j	rot Proj				SWI F	4:10:21
STATES CONTAIN	E Capacity Improveme	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5						DETAIL PA	68 73
E. 01. 17th Street Canal		QUANTY UOM	MANHRS	LABOR EC	W LNMdIn	TERIAL	Other	TOTAL COST UN	UT COST
E01. 02. 04. 48" thick	Riprap at Pipe Disch	na una van van anno anno anno anno anno anno	- Mar	1 (m				A real role for and the part of the state of	
<i>α</i> .	SM AA < > Rip-rap, random, machine placed	125.00 CY	0.00	0.00	0°.0	0.00	75.00 9,375	75,00 9,375	75.00
	TOTAL 48" thick Riprap at Fipe Disch			- 0	0		9, 375	9,375	
	TOTAL Mechanical Systems			- 0		022		22,127,875	
E01. 03. Electrical Systems									
E01. 03. 01. Lightning	and Grounding System								
E01, 03, 01, 5, 11g	htning Protection								
<pre>16000 0000 Electrical, Generally excludes 16100 0000 Conductors &amp; Grounding 16180 0000 Grounding devices 16181 0010 Grounding devices 16181 5999 Wire, laid in trench 16181 5999 Copper, bare stranded</pre>	crane services								
W	IL GG <16181 6010 > Grounding, laid in trench,	0.40 MLF	9 9 9	221.53 89	0.00	545,00 218	0.00	766,53 307	55. 797 1
16000 0000 Electrical, Generally excludes 16800 0000 Special Systems 16801 0000 Special Systems 16840 0010 Lightning protection 16840 4000 Air terminals, copper	crane services								
M I	IL GG <16840 4040 > Lightning protection, air	29.00 23	0,48 14	19,28 559	0,00 0	14.67 425	0,00	33.95 984	33 <b>.</b> 95
16840 0010 Lightning protection 16840 4200 Air terminal bases, cop	H Q								
W W	IL GG <16840 4220 > Lightning protection, air term	29,00 EA	0,89 26	35.72 1,036	0°00	21.50 624	0.00	57.22 1,659	57.22
	TOTAL Lightning Protection		42	1,683		1,267		2,950	
E01. 03. 01.10. Grou	unding								
<pre>16000 0000 Electrical, Generally excludes ( 16100 0000 Conductors &amp; Grounding 16180 0000 Grounding 16181 0010 Grounding devices</pre>	crane services								
LABOR ID: ICSNLR EQUIP ID: EQNICS	Currency in DOLLARS					CREW ID	: ICSCRW	UPB ID: UR	99EA

Fri 29 Jun 2007 Eff. Date 06/28/07	Tri-Service Automated Cost Engineerin PROJECT NOCBPS: Permanent Enhancement of ICS - N	ng System (TR New Orleans H	ACES) Arricane	Prof Proi				IMI I	14:10:21
DETALLED ESTIMATE	E Capacity Improveme	ents						DETAIL I	AGE 74
E01. 17th Street Canal		QUANTY LUOM	MANHKS	LABOR EC	M INNAING	ATERIAL	Other 3	TOTAL COST (	NIT COST
16181 0029 Rod				ne mar and and and and and and and and and				n w m m m m	90 - 100 - 1
W	III GG <16181 0100 > Grounding, rod, copper clad, 10'	20.00 EA	1.82 36	73.05 1,461	0.00	29.40 588	0.00	102.45 2,049	102.45
W	ill GG <16181 6020 > Grounding, laid in trench,	J. OQ MLF	9,43 0	304.60 305	0.00	1060.00 1,060	0.00	1364.60 1,365	1364.60
16181 0010 Grounding devices 16181 6299 Ground conductor bondin	g, cadweld								
W	III. GG <16181 6350 > Grounding, gnd conductor bond,	20.00 EA	96 96 1	73.42 1,468	0.00	19,89 398	0,00 0	93.31 1,866	93.31
Σ.	HI. GG <16181 6380 > Grounding, gnd conductor bond,	50.00 EA	2,08 104	84.12 4,206	0.00	17.29 865	0.00	101.41	101,41
	TOTAL Grounding		186	7,440		2,910		10,350	
	TOTAL Lightning and Grounding System		229	9,123		4,177		13,301	
E01. 03. 02. Electrical	Power								
E. 01. 03. 02. 5. Pow	θĽ								
<pre>16000 0000 Electrical, Generally excludes 16000 0000 Raceways, Generally excludes 16016 0000 Conduits 16018 0010 Conduit, to 15', includes 16018 0499 Steel, rigid galvanized</pre>	crane services crane services couplings only (RGS)								
1911 1911	IL GG <16018 0640 > Conduit to 15' H, 3" dia, incl	9050.00 LF	0.25 2.63	10.05 90,953	0.00	9.58 86,699	0.00	19.63 177,652	19.63
16000 0000 Electrical, Generally excludes ( 16100 0000 Conductors & Grounding 16108 0000 Conductors 16115 0010 Shielded cable 16115 0039 Copper, XLP shielding, (	ctane services 5 KV								
W W	IL GG <16115 0400 > Shielded cable, 5kV, 1/0, no	14.50 MLF	119 *7*	1691.79 24,531	0.00 0	2184.00 31,668	0.00	3875.79 56,199	3875.79
16108 0000 Conductors 16119 0010 Wire 16119 0919 600 volt, type THWN-THH 16119 0999 Copper, stranded	z							1 4 - -	1 • •
W.	IL GG <16119 1350 > Wire, 600 volt, type THWN-THHN,	5.00 MLF	12.31 62	494、52 2,473	0.00	274.50 1,373	0.00	769.02 3,845	769.02
LABOR ID: ICSNLR EQUIP ID: EQNICS	Currency in DOLLARS					CREW ID	: ICSCRW	UPB ID: G	¥3664

Fri 29 Jun 2007 Eff. Date 06/28/07 DFTATLED ESTIMATE	Tri-Service Automated Cost Engineering ( PROJECT NOCBPS: Permanent Enhancement of ICS - New	System (TR2 Orleans Hu	CES) rricane	Prot Proj					14:10:21
	E Capacity Improvements	 0						DETALL	PAGE 75
E01. 17th Street Canal		UANTY UOM	MANHRS	LABOR	CULPMNT 0	ATERIAL	Other	TOTAL COST	UNIT COST
16000 0000 Electrical, Generally ( 16300 0000 Motors, Starters, Bo 16320 0000 Switches	excludes crane services ards & Switches								var oor me te de de de
16330 0010 Distribution sec 16330 0100 Distribution sec 16330 0100 Aluminum bus b	tion ars, not including breakers								
	B AF GG <16331 0000 > Medium voltyage soft start	8,00 EA	40,00 320	1615.20 12,922	0.00	39600.00 316,800	0.00	41215.20 329,722	41215.20
16000 0000 Electrical, Generally 16500 0000 Power Systems & Capa 16510 0000 Power Systems 16513 0010 Generator set 16513 0010 Generator set 16513 2000 Diesel engine	excludes crane services citors								
	B MIL GG <16513 3270 > Generator set, dsl eng, xfr	8.00 EA	250,00 2,000	9545.41 76,363	1094.58 8,757	350000 280000	0.00	360640.00 2,885,120	360640.00
	TOTAL Power	1	\$ 253	207,241	6, 757	3236540	+ 0	3,452,537	
	TOTAL Electrical Power	E	5,295	207,241	8,757	3236540		3,452,537	
	TOTAL Electrical Systems	E	5,483	216,364	8,757	3240717	- 0	3,465,838	
E01. 04. Communicat. Notes:	ion Systems								
1. The repo Data Acquis. enhancement	ort considers that incremental SCADA (Supervisory Control And ition) interface will be required in considerations of ICS s.								
2. Estimate to accommod system. Th previously :	provides for upgrade of SCADA monitoring and control equipment ate transition from a hydraulic driven system to a diesel driven is includes the replacement of all Phase I and Phase 2 installed.								
3. Allowance with existin	e includes installation of conduit, wiring, devices, interface ng / new equipment and current SCADA monitoring system.								
4. Allowan \$3000 as fo	ce based on cost of SCADA upgrades per pump. Total allowance of llows:								
\$1000 - P: \$2000 - S: 	ump House SCADA upgrade cost per pump CADA routing cost to remote pump motors, etc 								

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/0 DFTATLED ESTIMATE	)7 FROJECT NOCE	Tri-Service Automated Cost Engineerin 3PS: Permanent Enhancement of ICS - N	g System (TRAC	JES) rrìcane P:	for Proj				TAML	4 • • 10 • • 2
		E Capacíty Improveme	unts.						DETALE PL	16E 76
E01. 17th Street	. Canal	· · · · · · · · · · · · · · · · · · ·	CUANTY UOM	ANHRS	LABOR EQ	ULEMNT MA	(ERIAI, (	Other T	OTAL COST UN	TSOO TIP
	L RSM GG <	> Allowance for SCADA system	8,00 EA	0.00	0,00	0.00	0.00 77 00.0	85.00 6,280	785,00	785.00
	₽~4	OTAL Communication Systems	-		0		- 0	6, 280	6, 280	
Б., ОЗ.	05. Miscellaneous Items									
<sup>1</sup> 63	.01. 05. 01. Corrosion Protection Note:									
	1. Provide coating on all	major elements of the facility.								
	2. Soil excavation and bac structure supports in order	skfill required at all platform columns to provided corrosion protection belo	and w grade.							
	<ol> <li>A cofferdam is required adequate depth to provide c water line on Flood side.</li> </ol>	on the Flood side to enable drawdown o corrosion protection at a nominal depth	f water to below							
	4. On Protected side, it is draw-down of canal for purp nominal depth below water 1	s assumed the pump station pumps can be ose of applying corrosion protection a lue on Protected side.	t used for t a							
	E.01. 05. 01.01. Protective Coating	<u>81</u>								
	E01. 05. 01.01.01. Apply Prote Notes:	sctive Coating								
	I. Allow costs Improvements" a pump system at	of application of protective coatings : it 17th St. for 6 pump system = 75% of Phase 1 upgrade.	for "Capacity costs require	ad for 12						
	l MIL AA <	> Apply protective coating to	1.00 LS	0.00	0.00	0.00	0.00 32	20000	320000.00 320,000 32	0000.00
	£-4	WTAL Apply Protective Coating					0 32(	0,000	320,000	
	<u>Ere</u>	OTAL Protective Coatings	r F	0	0	0	0 320	0,000	320,000	
	E01. 05. 01.02. Cathodic Protectio									
	L MIL AA <	> Allowance to install cathodic	1.00 LS	0.00	0.00	0.00	0.00 32	20000	320000.00 320,000 32	0000.00
	Ere	OTAL Cathodic Protection	1				0 320	000010	320,000	
LABOR ID: ICSNLR	EQUIP ID: EQNICS	Currency in DOLLARS					CREW ID:	ICSCRW	UPB ID: UF	4366
Fri 29 Jun 2007 Eff. Date 06/28/07	Tr1-Service Automated Cost Engineering PROJECT NOCBPS: Permanent Enhancement of ICS - N	g System (TR) ew Orleans H	NCES) Prricane	Prot Pro				WILL'S	14:10:21	
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DETAILED ESTIMATE	E Conorders Tennerson							DETAIL	PAGE 17	
E01. 17th Street Canal		QUANTY UOM	MANHRS	LABOR	NULPANT N	ATERIAL	Other	TOTAL COST	UNIT COST	
		- 044 - 004 - 104			e m an 14 ac 14 ar	1 (FT 11) (FT 11)		- The set we we are set on the set		
	TOTAL Corrosion Protection					- 0	540,000	640,000		
E01. 05. 02.9	96-in Butterfly Valves									
02000 0900 Site Work 02100 0000 Site Preparation & E 02160 0000 Sheet Piling 02161 0009 Sheet piling 02161 3900 Wood, includin	Excavation Support 19 wales, braces and spacers									
	L MIL AA <02200 0000 > Allowance for delivery of Valves		0,09	0.00	0.00	0.00	1500,00	1500.00		
11000 0000 Equipment 11000 0000 Equipment		Z.00 EA	0	0	0	0	3, 000	3,000	1560.00	
	B MIL AA <11000 0001 > Allowance for modifying and	2.00 EA	0,00	0.00	0.00	0,00	25000 50,000	25000.00 50,000	25000.00	
<pre>15000 0000 Mechanical, Generally 15100 0000 Pipe &amp; Fittings 15191 0000 Valves 15193 0000 Valves, bronze 15193 0010 Valves, bronze 15193 8550 Tempering wate 15193 8550 Threaded con</pre>	excludes crane services st nections									
	B MIL AA <15194 0000 > 96" dia Butterfly Valve	2.00 EA	200.00	8238.90 16,478	2434,028 4,868	0000.00 160,000	0.00	90672.92 181,346	90672.92	
	TOTAL 96-in Butterfly Valves	2.00 EA	400	16,478	4,868	160,000	53,000	234,346	117172.92	
	TOTAL Miscellaneous Items	1.00 EA	400		4,868	160,000 6		874,346	874345.84	
	TOTAL 17th Street Canal		2, 883	200	13,625	340071726	5667155 	30,314,339		

Currency in DOLLARS

LABOR ID: ICSNER EQUIP ID: EQNICS

fri 29 Jun 2007 Eff. Date 06/28/07	PROJECT	Tri-Service Automated Cost NOCBPS: Permanent Enhancement	Engineering of ICS - Ne	System (TRA w Orleans Hu	CES) LTÍCANO PI	rot Proj			294) L	14:10:21
DETAILED SSTIMATE		E., Capacity	/ Improvemen	ವಾ ಸಿನ		I			DETAIL	PAGE 78
E.,02. Orleans Avenue Cana			90 24 001 100 000 000 000 000 000 000 000 00	QUANTY UOM	MANHRS	LABOR EQ	JI PANT MA	ERIAL Other	- TOTAL COST	UNIT COST
E02. Orleans Aver	nue Canal					111 '111' '00' '00' '00' '00' '00' and a		- Yee Yee and the set of the set	ner	
E_,02. 01. Nev Note	ø Pump/Engine Platform & Enc es:	1								
1 . (2) pure	A new expanded Engine Platf additional pumps and power p2 x 500 SF = 1000	orm is required on the west side units each. Allocate approx 500 SF.	e to house Sf area pe	ы						
2. cofi \$23(	Say platform dimensions are ferdam to be constructed in 00 /LF for for the cofferdam	a 40-ft x 25-ft lg. A perimeter i conjunction with the pump platf. a.	: sheetpile jorm. Allow							
3. exi: eie stri prec	The estimate provides for a sting Engine Platform Struct vated concrete slab similar ucture to be framed with rig cast concrete wall and roof	a free-standing structure, adjace. ure, constructed upon a pile-sup to the existing structure. The fid welded frames, with a supers- panels.	ant to the sported new structure of							
4. and	Overhead door and personnel ventilation system appurten	l door access provided, in additivances.	on to louve	Sund						
ъ. Міас	Cost per SF allows for misc c mechanical appurtenances f	: eletrical (i.e., lighting, recention new enclosed platform.	pticles) an	g						
	> VY TIM T	> Construct cofferdam ar	ound new	130,00 LF	0.00	0.00	0.00	0.00 2500.00 0 325,000	2500,00 325,000	2500.00
	L RSM SS <	> Allowance for (1) -1000	L SE	000,00 SF	0.00	0,00	0.00	0.00 785.00	785,000	785.00
		TOTAL New Pump/Engine Platform	m & Encl	1.00 EA			- 0	0 1110000	1,110,000	1110000
E02. 02. Mec	chanical Systems									
E02.02.	. 01. Install New Pumps w/	Elec Driver								
	L RSM JJ <	> New pump with electric (	driver	2.00 EA	0.00	0.00	0.00	0.00 1700000	170000.00 3,400,000	1700000
	L RSM JJ <	> Install New pump with e	lectric	2.00 EA	0.00	0.00	0.00	0.00 415000 0 830,000	415000.00	415000,00
		TOTAL Install New Fumps w/ El	.ec Driver	8,00 EA	0	0	0	0 4230000	4,230,000	528750.00

Currency in DOLLARS

LABOR ID: ICSNLR EQUIP ID: EQNICS

Fri 29 Jun 2007 Eff. Date 06/28/(	17 PROJECT	Tri-Service Automated Cost Engineeri ' NOCBPS: Permanent Enhancement of ICS - 1	ng System (TRA New Orleans Hu	CBS) rrícane F	tot Proj			IWI L	.14:10:21
DEFALLED ESTIMATE		E Capacity Improvem	e D t s					DETAIL	PAGE 79
E02, Orleans Ave	anue Canal.		QUANTY UOM	MANHRS	LABOR EQ	UIPMNT MATE	RIAL Other	TOTAL COST	UNIT COST
£3 <sup>4</sup>	.02. 02. 102. Install New Motor Pov	wer Units							3 3 2 É L F F F F F F F F
	L RSM JJ <	> Motors for New pumps, installed	2.00 EA	0.00	0.00	00.0	0.00 500000 0.1000000	500000,00 1,000,000	500000.00
		TOTAL Install New Motor Power Units	8.00 BA	0	- 0	- 0	0 100000	1,000,000	125000,00
ш'	.02. 02. 03. Install (1) New 9-ft Notes:	. Dia Pipe							
	1. Assumed pipe is each	th 200-ft in length from pump to discharge							
	2. Say pipe thickness	1 is 3/4" thick plate at 30.6 FSF.							
	3. Estimated weight of 172982 lbssay 175,	<pre>% f pipe ≈ 28.265 SF / LF x 30.6 PSF x 200 1 000 lbs. = 88 tons.</pre>	11 10 11 12 12 12 12 12 12 12 12 12 12 12 12						
	4. Say pipe supports v for 200-ft length of 9	weigh at estimated 250,000 lbs total .⊷ft dia. pipe. ≈ 125 tons.							
	E.,02. 02. 03.01. 9-ft Dia Pipe								
	r RSM SS <	> Allow for fab and delivery of	88,00 TON	0,00	0.00	00.0	0,00 1700.00 0 149,600	1700.00 149,600	1700.00
	L RSM SS <	> Allowance for Corrosion	48 00.0009	0.00	0.00	0.00	0.00 3.00 0 18,000	3.00 18,000	3.00
	l RSM SS <	> Allowance for installation of	88,00 TON	0.00	0.00	0.00	0.00 1000.00 0 88,000	1000.00 88,000	1000.00
		TOTAL 9-ft Dia Pipe	200.00 LF		- 0		0 255,600	255, 600	1278,00
	E02. 02. 03.02. Pipes Support:	s for 9-ft Dia Pipe							
	L RSM SS <	> Allow for fab and delivery of	125.00 TON	0.00	0.00	00.0	0.00 1700.00 0 212,500	1700.00 212,500	1700.00
	L RSM SS <	> Allowance for Corrosion	2500.00 SF	0.00	0.00	0.00 0	0.00 3.00 0 7,500	3,00	3.00
	L RSM SS <	> Allowance for installation of	125.00 TON	0.00	0.00	0.00	0.00 1000.00 0 125,000	1000,00 125,000	1000.00
		TOTAL Pipes Supports for 9-ft Dia Pipe	- 15.00 EA			·····	0 345,000	345,000	23000.00
		TOTAL Install (1) New 9-ft Dia Pipe	ř			·····	0 600, 600	600, 600	
LABOR ID: ICSNLR	EQUIP ID: EQNICS	Currency in DOLLARS	·			C	REW ID: ICSC	W UPB ID:	A3669U

Eri 29 Jun 2007 Eff. Date 06/28/07 Eff. Date 06/28/07	ering System (TI - New Orleans I	ACES] Murricane	ט כי פי גי				T BNI 3	4:10:21
DETAILED ESTIMATE E Capacity Impro-	venents	4	™1 3 4 4 2 2 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4				DETAIL PA	80 CE
E02. Orieans Avenue Canal.	QUANTY JOM	MANHKS	LABOR EQ	AM TWMGIU	TERIAL	Other T	OTAL COST UN	TT COST
E02. 02. 04. 48" thíck Riprap at Fipe Disch	a ran 100 feb da fa		11	na mje njel vroj na vroj na vroj na			977 - 28 JU - 19 10 - 19 10 - 20 10 -	1 1 1
B RSM AA < > RIP-rap, random, machine place	ed 75,00 CY	0.00	0.00	0,00	0.00	75.00 5,625	75.00 5,625	75.00
TOTAL 48" thick Riprap at Pipe Disc			- 0	- 0			5,625	
TOTAL Mechanical Systems		· · · · · · · · · · · · · · · · · · ·	0		0 28	36225	5,836,225	
E. 02. 03. Electrical Systems								
E02. 03. 01. Lightning and Grounding System								
E02. 03. 01. 5. Lightning Protection								
<pre>16000 0000 Electrical, Generally excludes crane services 16100 0000 Conductors &amp; Grounding 16180 0000 Grounding 16181 0010 Grounding devices 16181 5999 Wire, laid in trench 16181 5999 Copper, bare stranded</pre>								
MIL GG <16181 6010 > Grounding, laid in trench,	0.10 MLF	- 86 • 86	221.53 22	0.00	545.00 55	0.00	766.53	766.53
16000 0000 Electrical, Generally excludes crane services 16800 0000 Special Systems 16801 0000 Special Systems 16840 0010 Lightning protection 16840 4000 Air terminals, copper								
L MIL GG <16840 4040 > Lightning protection, air	7,00 EA	0.48	19.28 135	0.00	14.67 103	0.00	33.95 238	33.95
16840 0010 Lightning protection 16840 4200 Air terminal bases, copper								
M MiL GG <16840 4220 > Lightning protection, air terr	n 7.00 EA	0.89 6	35,72 250	0.00	21.50 151	0.00	57.22 401	57.22
TOTAL Lightning Protection		10	407		308	0	715	
E02. 03. 01.10. Grounding								
16000 0000 Electrical, Generally excludes crane services 16100 0000 Condectors & Grounding 16180 0000 Grounding 16181 0010 Grounding devices								
LABOR ID: ICSNER EQUIP ID: EQNICS	S S S S S S S S S S S S S S S S S S S				CREW ID:	: ICSCRW	an :di san	99EA

Fri 29 Jun 2007 Eff. Date 06/28/07	Tri-Service Automated Cost Engine PROJECT NOCBPS: Permanent Enhancement of ICS	ering System (T - New Orleans	RACES) Hurricane	Prot Proj				INIL	14:10:21
DETAILED ESTIMATE	E., Capacity Impro	venents	) 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	m 3 4 5 3 4 4				DETAIL F	AGE 81
E02. Orleans Avenue Canal	化化化合物 化化合物 化化合物 化化合物 化化合物 化化合物 化化合物 化化合	QUANTY UOM	MANHRS	LABOR EC	A TWMAIUC	ATERIAL	Other	TOTAL COST (	NIT COST
16181 0029 Rod	目	man man data data man yan yan yan yan yan yan yan yan yan y	and the state which many many many many many				100 MT 100 MT 100 MT 100 MT	, m ; , , , , , , , , , , , , , , , , ,	
	MIL GG <16181 0100 > Grounding, rod, copper clad,	10' 5.00 EA	1.82 92	73.05 365	0.00	29.40 147	0.00	102,45 512	102.45
	MIL GG <16181 6020 > Grounding, laid in trench,	0.25 MLF	9.43 2	304.60 76	0° 00	1060.00 265	0.00	1364,60 341	1364.60
16181 0010 Grounding devices 16181 6299 Ground conductor bo	nding, cadweld								
	MIL GG <16181 6350 > Grounding, and conductor bond	5.00 EA	1.82	73,42 367	00°0	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	0.00	93.31 467	93.31
	MIL GG <16181 6380 > Grounding, gnd condustor bond	, 12.00 BA	2.08 25	84.12 1,009	0'00	17.29 207	0.00	101.41	101.41
	TOTAL Grounding		46	1,818		616		2,537	
	TOTAL Lightning and Grounding Syste	ŭ	56	2,225	0	1,027	10	3, 252	
E02. 03. 02. Electr	ical Power								
£02, 03, 02, 5,	Power								
<pre>16000 0000 Electrical, Generally exclud 16000 0000 Raceways, Generally exclud 16016 0000 Conduits 16018 0010 Conduit, to 15', includ 16018 0010 Conduit, to 15', include 16018 0019 0499 Steel, rigid galvan.</pre>	des crane services des crane services udes couplings only ized (RGS)								
	MIL GG <16018 0640 > Conduit to 15' B, $3''$ dia, inc	1 2500.00 LF	0.25 625	10,05 25,125	0.00 0	9.58 23,950	0.00	19.63 49,075	19,63
<pre>16000 0000 Electrical, Generally exclud 16100 0000 Conductors &amp; Grounding 16108 0000 Conductors 16115 0010 Shielded cable 16115 0039 Copper, XLP shieldid</pre>	des crane services 19, 5 KV								
	M MIL GG <16115 0400 > Shielded cable, $5kV_{\rm e}$ 1/0, no	4.00 MLF	42,11 168	1691.79 6,767	0.00	2184.00 8,736	0.00	3875.79 15,503	3875.79
16108 0000 Conductors 16119 0010 Wire 16119 0919 600 volt, type THWN- 16119 0919 Copper, stranded									
	MIL GG <16119 1350 > Wire, 600 volt, type THWN-THH	N, I.50 MLF	12.31 18	494.52 742	0.00	274,50 412	0.0	769.02 1,154	769.02
LABOR ID: ICSNLR EQUIP ID: EQNICS	Currency in DOLL	ARS				CREW ID	: ICSCRW	018 ID: L	¥3664

Fri 29 Jun 2007 Eff. Date 06/28/07 DETEXIED SCUTMAND	Tri-Service Automated Cost Engineering PROJECT NOCBPS: Permanent Enhancement of ICS - New	ystem (TRA Orleans Hu	CES) rricane	Prot Proj				IWIL	14:10:21
SINGLES CATANIA	E Capacity Improvement.							DETAIL P	AGE 82
E.02. Orleans Avenue C	0 0	ANTY UOM	MANHRS	LABOR E	OUT PMNT M	ATERIAL	Other	TOTAL COST U	NIT COST
16000 0000 Electrical, 16300 0000 Motors, S: 16330 0000 Switche 16330 0010 Distr 16330 0010 Distr	Generally excludes crane services Larters, Boards & Switches s ibution section winum bus bars, not including breakers								
	B AF GG <16331 0000 > Medium voltyage soft start	2,00 EA	40.00 80	1615.20 3,230	0.00 3	9600.00 79,200	0.00	41215.20 82,430	41215.20
16000 0000 Electrical, 16500 0000 Power Sys: 16510 0000 Power S: 16513 0010 Gener: 16513 0010 Gener: 16513 2000 Die	Generally excludes crane services tems & Capacitors ystems ator set sel engine								
	B MIL GG <16513 3270 > Generator set, dsl eng, xfr	2,00 EA	250.00 500	9545.41 19,091	1094.58 2,189	350000 700,000	0.00	360640.00 721,280 3	(60640°00
	TOTAL Power	**	1,392	54,955	2,189	812,298		869,442	
	TOTAL Electrical Power	ł	1,392	54,955	2,189	812,298	- 0	869,442	
	TOTAL Electrical Systems		1,448	57,180	2,189	813, 324	- 0	872,694	
E02. 04.	Communication Systems Actes:								
	<ol> <li>The report considers that incremental SCADA (Supervisory Control And Data Acquisition) interface will be required in considerations of ICS anhancements.</li> </ol>								
	2. Estimate provides for upgrade of SCADA monitoring and control equipment to accommodate transition from a hydraulic driven system to a diesel driven system. This includes the replacement of all Phase 1 and Phase 2 previously installed.								
	3. Allowance includes installation of conduit, wiring, devices, interface with existing / new equipment and current SCADA monitoring system.								
	<ol> <li>Allowance based on cost of SCADA upgrades per pump. Total allowance of 53000 as follows:</li> </ol>								
	2000 - Pump House SCADA upgrade cost per pump 22000 - SCADA routing cost to remote pump motors, etc								
	53000 - Total estimated SCADA upgrade cost per pump								

Currency in DOLLARS

LABOR ID: ICSNLR EQUIP 1D: EQNICS

Eri 29 Jun 2007 Eff. Date 06/28/0 Deminitr containan	27 PROJECT	Tri-Service Automated Cost Engineer NOCBPS: Permanent Enhancement of ICS -	ing System (TRA New Orleans Ru	CES) Ericane P	rot Proj				TIME	14:10:21
en retar a total factor retariat		E Capacity Improve	nents.						DETAIL	AGE 83
E02. Orleans Ave	anue Canal		QUANTY UOM	MANHRS	LABOR EQ	UI PMNT MA	TERIAL	Other TC	JTAL COST (	NIT COST
	L RSM GG ≺	> Allowance for SCADA system	2.00 EA	0.00	0.00	00.0	. 00.0		785.00	785.00
		TOTAL Communication Systems				- 0	- 0	1,570	1,570	
E02.	. 05. Miscellaneous Items									
62 <sup>1</sup>	.02. 05. 01. Corrosion Protection Note:									
	1. Provide coating on	all major elements of the facility.								
	<ol> <li>Soil excavation and structure supports in c</li> </ol>	d backfill required at all platform column order to provided corrosion protection be	ns and low grade.							
	3. A cofferdam is requi adequate depth to provi water line on Flood sid	ired on the Flood side to enable drawdown ide corrosion protection at a nominal dep de.	of water to th below							
	4. On Protected side, i draw-down of canal for nominal depth below wat	it is assumed the pump station pumps can i purpose of applying corrosion protection ter line on Protected side.	be used for at a							
	E02. 05. 01.01. Protective Coa	atings								
	E02. 05. 01.01.01. Apply F Notes:	Protective Coating								
	1. Allow cc Improvement pump system	osts of application of protective coating. ts" at 17th St. for 6 pump system = 75% ( m at Phase 1 upgrade.	s for "Capacity of costs requir	ed for 12						
	> WY TIM T	> Apply protective coating to	1.00 LS	0.00	0.00	0.00	0.00	80000 80,000	80000,00 80,000	80000.00
		TOTAL Apply Protective Coating				-		80,000	80,000	
		TOTAL Protective Coatings		0	- 0	0	10	80,000	80,000	
	E02. 05. 01.02. Cathodic Prote	ection								
	l MIL AA <	> Allowance to install cathodic	1.00 LS	0.00	0.00	0.00	0.00	80000 80,000	80000.00 80,000	80000,00
		TOTAL Cathodic Protection						80,000	80,000	
LABOR ID: ICSNLR	EQUIP ID: EQNICS	Currency in DOLLAR					CREW ID:	: ICSCRW	UPB ID: U	P39EA

Fri 29 Jun 2007 Eff. Date 06/28/07 DETATIED ESTIMATE	Tri-Service Automated Cost Engineerin PROJECT NOCBPS: Permanent Enhancement of ICS - N	g System (TR) ew Orleans H	NCES) urrícane	Prot Proj				INT :	14:10:21
	E Capacity Improveme	ی دو ا						DETAIL	390E
E. 02. Orleans Avenue Canal	***************************************	QUANTY UOM	MANHKS	LABOR E	TUMA LUQI	MATERIAL	Other	TOTAL COST	JNIT COST
	化基化学 医血液 医牙子 医皮肤 医静力 化化化 化化化化化化化化化化化化化化化化化化化化化化化化化化化化化化化	,					AN AN AN IN NA		111 FR. VA. 110, 511 V. V. V.
	TOTAL Corrosion Protection		0	0	0	0	160,000	160,000	
E02. 05. 02. 96-in 1	Butterfly Valves								
02000 0000 Site Work 02100 0000 Site Preparation & Excava 02160 0000 Sheet Piling 02161 0009 Sheet piling 02161 3900 Wood, including wal	tion Support es, braces and spacers								
	L MIL AA <02209 0000 > Allowance for delivery of Valves	1,00 EA	0.00	0.00	0.00	00.0	1500.00 1,500	1500.00 1,500	1500.00
11000 0000 Equipment 11000 0000 Equipment									
	B MIL AA <11000 0001 > Allowance for modifying and	1.00 EA	00 <b>.</b> 0	0.00	0.00	0.00	25000 25,000	25000.00 25,000	25000,00
15000 0000 Mechanical, Generally exclud 15100 0000 Pipe & Fittings 15191 0000 Valves 15193 0010 Valves, bronze 15193 8350 Tempering water 15193 8650 Threaded connecti	des crane services ons								
	B MIL AA <15194 0000 > 96" dia Butterfly Valve	1.00 EA	200.00 200	8238,90 8,239	2434.02 2,434	80000.00 80,000	0,00	90672.92 90,673	90672.92
	TOTAL 96-in Butterfly Valves	1.00 EA	200	8,239	2,434	80,000	26, 500	117,173	117172.92
	TOTAL Miscellaneous Items	1.00 EA	200	8,239	2,434	80,000		277,173	277172.92
	TOTAL Orleans Avenue Canal		80 <del>7</del> 9 - 1	65,419	4,623		1 5 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5	8,097,662	

Fri 29 Jun 2007 Eff. Date 06/28/07	PROJECT	Tri-Service Automated Cost Engineerin NOCBPS: Permanent Enhancement of ICS - N	g System (TRAC ew Orleans Hui	JES) Pricane P	rot Proj			ANI I	14:10:21
DETALLEU ESTIMALE		E Capacity Improvemen	 Ф.					DETAIL	PAGE 85
E. 03. London Avenue C	·····································		QUANTY UOM	ANHRS	LABOR EQ	JIEMNT MATE	RIAL Other	TOTAL COST	UNIT COST
E. 03. London	Avenue Canal							man	100 VAR 101 FM 900 MM 100 MM 100
E03. 01	t. New Fump/Engine Platform & Enc Notes:	24							
	<ol> <li>A new expanded Engine Plati (6) additional pumps and power pump6 x 500 SF = 3000</li> </ol>	form is required on the west side to house units each. Allocate approx 500 SF area posr.							
	<ol> <li>Say platform dimensions are cofferdam to be constructed in \$2500 /LF for for the cofferdam</li> </ol>	<pre>3 40-ft x 75-ft 1g. A perimeter sheetpile 1 conjunction with the pump platform. Allow n.</pre>							
	3. The estimate provides for a existing Engine Platform Struct elevated concrete slab similar structure to be framed with rig precast concrete wall and roof	a free-standing structure, adjacent to the cure, constructed upon a pile-supported to the existing structure. The new jid welded frames, with a superstructure o. panels.	۰ الاستر						
	<ol> <li>Overhead door and personnel and ventilation system appurter</li> </ol>	i door access provided, in addition to louve hances.	ТФ						
	<ol> <li>Cost per SF allows for misc misc mechanical appurtenances</li> </ol>	; eletrical (i.e., lighting, recepticles) a for new enclosed platform.	р ц						
	L MIL AA <	> Construct cofferdam around new	230,00 LF	0.00	0.00	0.00	0.00 2500.00 0 575,000	2500.00 575,000	2500.00
	L RSM SS <	> Allowance for (1) -3000 SF	3000,00, SP	0.00	0.00	0.00	0.00 785.00 0 2355000	785.00 2,355,000	785.00
		TOTAL New Pump/Engine Platform & Encl	1,00 EA				0 2930000	2,930,000	2930000
E.03. 02	2. Mechanical Systems								
. EO	. 02. 01. Install New Pumps w/	Elec Driver							
	L RSM JJ <	> New pump with electric driver	6.00 EA	0,00	0.00	0 00 0	0.00 1700000 010200000	1700000.00 10,200,000	170000
	L RSM JJ <	> Install New pump with electric	6.00 24	0.00	0.00	0.0 0	0.00 415000 0 2490000	415000.00 2,490,000	415000.00
		TOTAL Install New Pumps w/ Elec Driver	8.00 EA	0	0	- 0	012690000	12,690,000	1586250
LABOR ID: ICSNLR EQ	UIP ID: EQNICS	Currency in DOLLARS				Ö	CSC1 - 01 - 1220	•01 840 MA	TPQQEA

Currency in DOLLARS

Fri 29 Jun 2007 Eff. Date 06/28/0		PROJECT	Tri-Service Automated Cost Engineeri NOCEPS: Permanent Enhancement of ICS -	ng System (TRZ New Orleans Hu	ces) uricane E	Prot Proj			INII	14:10:21
DETAILED ESTIMATE			E Capacity Improven	tents .					DETAIL	PAGE 86
E03. London Aven	ue Canal	τος την του ητα του	医甲状腺 化化化化化化化化化化化化化化化化化化化化化化化化化化化化化化化化化化化化	OUANTY UOM	MANHRS	LABOR EC	UI PMNT MATE	TRIAL Othe	r TOTAL COST	UNIT COST
ne ne ne no vo vo vo vo na na ne ne vo vo	~	바 아 아 봐 하 봐 봐 봐 나 나 나 수 수 수 가 다 다 다 더 더 더 아	· · · · · · · · · · · · · · · · · · ·	n an an an an an pu lan uu an un eu en en er				ar nov war ood max voo aan ook ook mak nak m	to the and and and any operation are not any for the day we	
E.	.03. 02. 02.	. Install New Motor Pow	er Units							
		L RSM JJ <	> Motors for New pumps, installed	6.00 EA	0,00	0.00	0,00	0.00 50000	0 50000.00 0 3,000,000	500000.00
			TOTAL Install New Motor Power Units	8.00 EA				0 30000		375000.00
ធរ	.03. 02. 03.	. Install (2) New 9-ft Notes:	Dia Pipes							
		l. Assumed pipes are ea	ch 200-ft in length from pump to dischar	.ge.						
	• *	2. Say pipe thickness	is 3/4" thick plate at 30.6 PSF.							
	\$ 7 \$Y	<ol> <li>Estimated weight of 345964 lbssay 350,0</li> </ol>	pipe = 28.265 SF / LF x 30.6 PSF x 200 00 lbs. = 175 tons.	LF X 2 ea =						
	v	1. Say pipe supports w each 200-ft length of 9	eigh at estimated 500,000 lbs total (250, ft dia. pipe. = 250 tons.	000 lbs per						
	E03. 02.	03.01. 9-ft Dia Fipes								
		L RSM SS <	> Allow for fab and delivery of	175.00 TON	0.00	0.00	0.00	0.00 1700.0 0 297,50	0 1700.00 0 297,500	1700.00
		L RSM SS <	> Allowance for Corrosion	12000 SF	0.00	0.00	0.00	0.00 3.( 0 36,0(	0 3.00 0 36,000	3.00
		L RSM 2S <	> Allowance for installation of	175.00 TON	0.00	0.00	0.00	0.00 1000.0 0 175,00	0 1000.00	1000.00
			TOTAL 9-ft Dia Pipes	400.00 LF	0			0 508,50	0 508,500	1271.25
	E03. 02.	03.02. Pipes Supports	for 9-ft Dia Pipe							
		L RSM SS <	> Allow for fab and delivery of	250.09 TON	0.00	0.00	0,00	0.00 1700.( 0 425,00	0 1700.00 0 425,000	1100.00
		L RSM SS <	> Allowance for Corrosion	5000.00 SF	0.00	0.00	0000	0.00 3.(	0 3.00 0 15,000	3.00
		L RSM SS <	> Allowance for installation of	250.00 TON	0.00	0.00	00.00	0.00 1000.0 0 250,00	0 1000.00 0 250,000	1000.00
			TOTAL Pipes Supports for 9-ft Dia Pipe	30,00 83				0 690,00	000,000	23000.00
			TOTAL Install (2) New 9-ft Dia Pipes	400.00 LF	- 0	0		0 119850		2996.25
LABOR ID: ICSNLR	RQUIP ID: EQ	DNTCS	Currency in DOLLARS				0	SREW ID: ICS	CRW UPB ID:	UP99EA

Eri 29 Jun 2007 Eff. Date 06/28/07 NewATTED FEATWARE	Tri-Service Automated Cost Engineerin CBPS: Permanent Enhancement of ICS - N	g System (TRAM lew Orleans Hu	125) tricane P	rot Proj				L THE WEAT	4:10:21
	E Capacity Improveme	nts .							- D 400
E.,03. London Avenue Canal	· · · · · · · · · · · · · · · · · · ·	QUANTY UOM 1	ANHRS	LABOR EQ	UIPMNT M	ATERIAL.	Other	TOTAL COST UP	ILT COST
E_,03. 02. 04. 48" thick Riprap at Pip	e Disch	a man over tim, took tim wat tim i out over took took took took	an an an an an an an an	191 June 1944 June 1911 June 2004 1	a car are not an and	a dea teo voo may na an		· · · · · · · · · · · · · · · · · · ·	744 AM /144 144 144 144 144 144 144 144
B RSM AA <	> Rip-rap, random, mạchine placed	125.00 CY	0.00	0.00	0.00	0.00	75.00 9,375	75,00 9,375	75,00
	TOTAL 48* thick Riprap at Pipe Disch		0	0				9,375	
	TOTAL Mechanical Systems	1		0	0	910	897875		
E.,03. 03. Electrical Systems									
E03. 03. 01. Lightning and Grounding	System								
E_03, 03, 01, 5. Lightning Protec	stion								
<pre>16000 0000 Electrical, Generally excludes crane service 16100 0000 Conductors &amp; Grounding 16180 0000 Grounding 16181 0010 Grounding devices 16181 5999 Wire, laid in trench 16181 5999 Copper, bare stranded</pre>	81								
MIL GG <16181	6010 > Grounding, laid in trench,	3.00 MLF	6.86 21	221.53 665	0.00	545,00 1,635	0.00	766.53 2,300	766.53
<pre>16000 0000 Electrical, Generally excludes crane service 16800 0000 Special Systems 16801 0000 Special Systems 16840 0010 Lightning protection 16840 4000 Air terminals, copper</pre>	83								
L MIL GG <16840	4040 > Lightning protection, air	22.00 EA	0.48 11	19.28 424	0.00	14.67 323	0.00	33.95 747	33.95
16840 0010 Lightning protection 16840 4200 Air terminal bases, copper									
M MIL GG <16840	4220 > Lightning protection, air term	22,00 EM	0,89 20	35.72 786	0.00	21.50 473	0,00 0	57.22 1,259	57.22
	TOTAL Lightning Protection			1,874		2,431		4,305	
E_,03, 03, 01,10. Grounding									
16000 0000 Electrical, Generally excludes crane service 16100 0000 Conductors & Grounding 16180 0000 Grounding 16181 0010 Grounding devices									
LABOR ID: ICSNLR EQUIP ID: EQNICS	Currency in DOLLARS					CREW ID	1 ICSCRW	UPB ID; U	99EA

Fri 29 Jun 2007 Eff. Date 06/28/07 DEFATIED ESFIMATE	Tri-Service Automated Cost Engineeri PROJECT NOCBPS: Permanent Enhancement of ICS - N	g System (TRA lew Orleans Mu	CES) rrícane	Prot Proj					14:10:21
JULY DIAL OF A LANCE &	E Capacity Improveme	90 90 90						2 ATV Faa	0 0 1 2
E.,03. London Avenue Canal		QUANTY UOM	MANHRS	LABOR EQ	M TNM IU	ATERIAL	Other T(	DTAL COST U	AIT COST
16181 0029 Rod									
	MIL GG <16181 0100 > Grounding, rod, copper clad, 10'	15.00 EA	1.82 27	73.05 1,096	0.00	29.40 441	0,00	102.45 1,537	102.45
	MIL GG <16181 6020 > Grounding, laid in trench,	atm 52.0	8 4 8	304.60 228	0.00	1060.00 795	0.00	1364.60 1,023	1364.60
16181 0010 Grounding devices 16181 6299 Ground conductor b	onding, cadweld								
	MIL GG <16181 6350 > Grounding, and conductor bond,	15.00 EA	2 N 80 1	73.42 1,101	0.00	19.89 298	0.00	93.31 1,400	93.31
	MIL GG <16181 6380 > Grounding, and conductor bond,	1.06 EA	2.08 2	84.12 89	0.00	17, 29 18	0.00	101.41 107	101.41
	TOTAL Grounding			2,515		1,553	0	4,067	
	TOTAL Lightning and Grounding System		। जन्म । न	4,389	- 0	3,983		8,373	
5_03.03.02. Elect	rical Power								
E03, 03, 02, 5	Power								
<pre>16000 0000 Electrical, Generally excl 16000 0000 Raceways, Generally excl 16016 0000 Conduits 16018 0010 Conduit, to 15', inc 16018 0010 Conduit, to 15', inc 16018 0499 Steel, rigid galva</pre>	udes crane services udes crane services ludes couplings only nized (RGS)								
	MIL GG <16018 0640 > Conduit to 15' H, 3" dia, incl	6800,00 LF	0.25 1,700	10,05 68,340	0.00	9.58 65,]44	00.0	19.63 133,484	19.63
<pre>16000 0000 Electrical, Generally excl 16100 0000 Conductors &amp; Grounding 16108 0000 Conductors 16115 0010 Shielded cable 16115 0010 Shielded cable 16115 0039 Copper, XLP shield</pre>	udes crane services ing, 5 KV								
	M MIL GG <16115 0400 > Shielded cable, 5kV, 1/0, no	10.88 MLF	42.11 458	1691.79 18,407	0.00 0	2184.00 23,762	0° 00	3875.79 42,169	3875.79
16108 0000 Conductors 16119 0010 Wire 16119 0919 600 volt, type THW 16119 0999 Copper, stranded	- T F F M								
	MIL GG <16119 1350 > Wire, 600 volt, type THWN-THAN,	4.00 MLF	12.31	494.52 1,978	0.00	274,50 1,098	0.00	769.02 3,076	769.02
LABOR ID: ICSNLR EQUIP ID: EQUICS	Currency in DOLLARS					CREW ID	: ICSCRW	UPB ID: U	P99EA

Fri 29 Jun 2007 Eff. Date 06/28/0	Tri-Service Automated Cost Engineerin PROJECT NOCBPS: Permanent Enhancement of ICS - N	g System (TR ew Orleans H	ACES) urricane	Proj					14:10:21
Nething Contract	E Capacity Improveme	80 को द						4 17890	n A D H
E03. London Aven	ue Canal 	QUANTY UOM	MANHRS	LABOR	UTPMNT UQ	ATERIAL	Other	TOTAL COST U	NIT COST
16000 0000 Electr 16300 0000 Moto 16330 0000 Sw 16330 0000 Sw	ical, Generally excludes crane services rs, Starters, Boards & Switches Atches								
16330 0100	Arsurioution section Aluminum bus bars, not including breakers								
	B AF GG <16331 0000 > Medium voltyage soft start	6.00 EA	40,00 240	1615.20 9,691	0.00	39600.00 237,600	0.00	41215.20 247,291	41215.20
16000 0000 Electr 16590 0000 Powe 16510 0000 Po 16513 0010 0 16513 0010 1 16513 2000	ical, Generally excludes crane services x Systems & Capacitors wer Systems Generator set Diesel engine								
	B MIL GG <16513 3270 > Generator set, dsl eng, xfr	6.00 EA	250.00 1,500	9545.41 57,272	1094.58 6,567	350000 2100000	0.00	360640.00 2,163,840 3	160640.00
	TOTAL POWER		3,947	155,688	6,567	2427604	- 0	2,589,860	
	TOTAL Electrical Power		3,947	155,688	6,567	2427604	-	2,589,860	
	TOTAL Electrical Systems		4,062		6,567	2431587	- 0	2,598,232	
в. 03.	04. Communication Systems Notes:								
	<ol> <li>The report considers that incremental SCADA (Supervisory Control And Data Acquisition) interface will be required in considerations of ICS enhancements.</li> </ol>								
	<ol> <li>Estimate provides for upgrade of SCADA monitoring and control equipmen to accommodate transition from a hydraulic driven system to a diesel driv system. This includes the replacement of all Phase 1 and Phase 2 previously installed.</li> </ol>	L Q L							
	3. Allowance includes installation of conduit, wiring, devices, interface with existing / new equipment and current SCADA monitoring system.								
	<ol> <li>Allowance based on cost of SCADA upgrades per pump. Total allowance \$3000 as follows:</li> </ol>	S.							
	\$1000 - Pump House SCADA upgrade cost per pump \$2000 - SCADA routing cost to remote pump motors, etc								
	\$3000 - Total estimated SCADA upgrade cost per pump								
LABOR ID: ICSNLR	EQUIP ID: EQNICS Currency in DOLLARS					CREW ID	: ICSCRW	UPB ID: C	AB99EA

JP99EA	UPB ID: U	D: ICSCRW	CREW I					D: EQNICS Currency in DOLLARS	SNLR EQUIP I	LABOR ID: IC
	240,000	240,000	0	0	0	0		TOTAL Cathodic Protection		
240000.00	24000.00 240,000 2	240000 240,000	0.00	0.00	0.00	0.00	1,00 15	L MIL AA < > > Allowance to install cathodic		
								05. 01.02. Cathodic Protection	Е, 03.	
	240,000	240,000		0	0	0		TOTAL Protective Coatings		
	240,000	240,000	0	0	0	0		TOTAL Apply Protective Coating		
240000.00	240000.00	240000 240,000	0.00	0.00	0.00	0.00	1,00 LS	L MIL AA < > Apply protective coating to		
					C)	ty åred for	. for "Capaci of costs requ	<ol> <li>Allow costs of application of protective coatings Improvements" at 17th St. for 6 pump system = 75% o pump system at Phase 1 upgrade.</li> </ol>		
								03. 05. 01.01.01. Apply Protective Coating Notes:	ы П	
								05. 01.01. Protective Coatings	Е03.	
							e used for at a	4. On Frotected side, it is assumed the pump station pumps can b draw-down of canal for purpose of applying corrosion protection nominal depth below water line on Protected side.		
						,	of water to A below	<ol> <li>A cofferdam is required on the Flood side to enable drawdown adequate depth to provide corrosion protection at a nominal depti water line on Flood side.</li> </ol>		
							is and ow grade.	<ol> <li>Soil excavation and backfill required at all platform column structure supports in order to provided corrosion protection belo</li> </ol>		
								1. Frovide coating on all major elements of the facility.		
								01. Corrosion Protection Note:	в03.05.	
								cellaneous Items	503. 05. Mis	
	4,710	4,710	0	0	0	0		TOTAL Communication Systems		
785.00	785.00	785,00	0.00	0.00	0.00	0.00	6.00 EA	L RSM GG < > Allowance for SCADA system		
LSOO LIN	TOTAL COST (	Other '	MATERIAL	EQUI PMNT	LABOR	MANHRS	MOU YTNIY		à Avenue Canal	E03. Londor
PAGE 90	DETATL			'n			9, 2, 0, 0,	E Capacity Improvem	IMATE	DETAILED EST
14:10:21	ANT.1			-f**^1	Prot Pro	RACES) Hurricane	ng System (T New Orleans	Tri-Service Automated Cost Engineeri PROJECT NOCBPS: Permanent Enhancement of ICS - 1	007 5/28/07	Fri 29 Jun 20 Eff. Date 06

Fri 29 Jun 2007 Eff. Date 06/28/07	Tri~Service Automated Cost Engineerin PROJECT NOCBPS: Permanent Enhancement of ICS - N	g System (TR ew Orleans H	ACES) urricane	Prot Pro,				IWI L	14:10:21
DETAILED ESTIMATE	E., Capacity Improveme							TFLEG	PAGE 91
E. 03. London Avenue Canal	***************************************	OITANTY INOM	MANHRS	T AROPA	JUNNE 21102				THE COLOR
2 1 2 1 2 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2	第三字 医月子子 医原因子 化化合金 医子子 医甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基	ter and						************	
	TOTAL Corrosion Protection		0	- 0	0		180,000	480,000	
E03, 05, 02, 96-in E	utterfly Valves								
02000 0000 Site Work 02100 0000 Site Preparation & Excavat 02160 0000 Sheet Piling	ion Support								
02161 0009 Sheet piling 02161 3900 Wood, including wale	s, braces and spacers								
	L MIL AA <02200 0000 > Allowance for delivery of Valves	2.00 EA	0.00	0.00	0.00	0.00	1500.00 3,000	1500.00 3,000	1500.00
11000 0000 Equipment 11000 0000 Equipment									
	B WIL AA <11000 0001 > Allowance for modifying and	2.00 EA	0.00	0.00 0	0 00'0	0.00	25000 50,000	25000.00 50,000	25000.00
<pre>15000 0000 Mechanical, Generally excluc 15100 0000 Pipe &amp; Fittings 15191 0000 Valves 15193 0010 Valves, bronze 15193 8350 Tempering water 15193 8650 Threaded connectio</pre>	es crane services Ds								
	B MIL AA <15194 0000 > 96" dia Butterfly Valve	2.00 EA	200.00 400	8238,90 16,478	2434.02 4,868	80000.00 160,000	0°0	90672,92 181,346	90672,92
	TOTAL 96-in Butterfly Valves	2.00 EA	400	16,478	4,868	160,000	53,000	234,346	117172.92
	TOTAL Miscellaneous Items	1.00 EA	400	16,478	4,868	160,000 5	533,000	714,346	714345.84
	TOTAL London Avenue Canal		29775	176,555	11,436	259158720	365585	23,145,163	
	TOTAL Capacity Improvements		11,993	474,817	29,683	688562854	167035	61,557,164	
	TOTAL Permanent Enhancement of ICS		52,558	2077063	152,893	24829602**	*   *   *   *	233, 579, 320	

LABOR ID: ICSNLR EQUIP ID: EQNICS

### Quantity Development

### NEW ORLEANS ICS PROJECT Demo of Platform Enclosures

# LONDON AVE / ORLEANS AVE. (SIMILAR) CANALS

GENEI	RATOR PL	ATFORM	ENCLOSI	URES	QTY PER BLDG	NO. OF BLDG'S	TOTALS
01 Der 01	nolition Chain Link	Fancina			Area (LF)	(EA)	742
* }		2			265	0	530 <b>530</b>
02	Metal Roof-	Siding Pan	els				
	a. Roof Pan	iels			QTY PER BLDG		
		Qty (ea)		Ž	Area (SF)		
		2	88	19.5	3432		
	b. Side Pan	els					
		Oty (ea)	_	>	Area (SF)		
		0	88	9	1056		
	c. End Pane	els					
		Qty (ea)	<b>i</b>	3	Area (SF)		
		3	38	Q	456		
		4	19	2.5	190		
					5134	N	10268 1 <b>0300</b>
03	Misc Steel -	- Roof Purli	ns				
	Qty (ea)	i	lbs/If		Total LBS		
	24	88	5		10560	€	21120 21500
<b>02 Stri</b> Note: St	ucture Modifi ee M. Vanek V	<b>cations</b> Norksheets	for quantitie	s of STRUC	TURE MODIFICATIONS		

## 03 Allowance for Misc Modifications

### NEW ORLEANS ICS PROJECT Demo of Platform Enclosures

17th Street Canal



### 02 Structure Modifications

Note: See M. Vanek Worksheets for quantities of STRUCTURE MODIFICATIONS

## 03 Allowance for Misc Modifications

New Orleans Hurricane Protection - ICS 41682.0100 London Ave Canal Orleans Ave Canal (Similar) Quantity Assessment for Roller Gates (Incl Steel Framing Members, Plates, Bracing, Connection PL's, Skin Plate) 1. Replacement Gate Leaf at 17th Street: USACE - Nashville Ctient : Project Name: Project No.: Location:

Computed By: Checked By:

January 8, 2007 L. Schieber

Date:

G. Hicks

Page 1 of 3

St.
17th
at
11
11
Gates
<u>Чо.</u>
<b>Witte</b>
ERS)
IEMB
N ON
2

					45 ngle Framing (say 1.0 ton per gate)
		<b>,</b>			Mise A
		Total	Paint	ц. 05	340.24
	Paint	% Area	2	paint	252 252 252 252 252 252 252 252 252 252
			AREA	S.F.A.F.	4,260
	f	•			
	ANGLE	TONS	4.Shapest	-	8
;	WT.	TONS .	Tees .		99 88 29
	Channel	TONS	C-Shapes		
	WF	TONS	W Shapes		
		Length			41.00 29.00 29.00
1		ibs/LF			45.00
		Unit	Guan		63 <del>4</del>
		No. of	Gates	-	
(S)		MEMBER	SIZE		WYTI SX45 LAXA
F FRAMING (MISC. STEEL FRAMING MEMBER		Description			Least Forming Member Witts Viet Framing Member Mileo: Angle Framing: (aay 1.0 ton pel galo)
01 LEA!		item	.01		್ರಕ್ರದ ಪ ಕ ಕ್ರಮ

0261

7.32

0.00 50.89

0.00

68.207

SUBTOTAL TONS =

02 SIEE	PLATE																			
1		ļ						Unit			TON	S OF PLATE	{BY THIC	(NESS)				6	AINT	
No.	seestitut a	SIZE	No. of Gates	Quan Quan	LBS/SF	Length	Width	Plate Area (SF)	1/16"	18.	3/6"	1(Z- 2/1	r. 3/4	8/2	5. 	1 1/4"	1 \$/2"	% Area to be	Total Paint	
42094-92	Leaf Skin Plate Protocatis Plate Protocatis Shin Plate of Carlo Leaf Protocatis Shin Plate of Carlo Leaf Top Plate. Flood Scie Carlon Plate. Vot Miss Plate. Vot Miss Plate. Joh Miss Plate. I.C. Flate Plate. I.C. Flate Plate. I.C.	8898888998		- = - =	99999999999999999999999999999999999999	27.000 1.755 1.17555 1.17555 1.17555 1.17555 1.175555 1.1755555 1.175555555555	1175 100 100 100 100 100 100 100 100 100 10	317.250 317.250 15.275 15.275 15.275 15.275 16.00 1.000 1.000 1.000 1.000 0.650			**************************************	1957.53 1959.55 1959.55	g					100% 100% 100% 100% 100% 100% 100% 100%	5.1. 6679.50 8679.50 8673.80 3353.80 3353.80 3553.80 3554.85 35554.85 355554.85 35555757575757575757575757575757575757	
						SUBTOTAL	TONS =	52.864	0:00	0.00	0.00	8.92 2.	1.6	0.00	0.00	0.00	0.80	XXX	10156.69	
																		SAY		

121.071 Plate + Framing 6 6.053545 allowance for roller, etc. 127.124 total tons 128 total tons 2%

12136.267 13000 SAY

SAΥ

ADD

Client : Project Name: Project No.: Location:

USACE - Nashville New Orleans Hurricane Protection - ICS Orleans Ave Canal (Similar) London Ave Canal 41682.0100

(Incl Steel Framing Members, Plates, Bracing, Connection PL's, Skin Plate) 1. Replacement Guide Columns at 17th Street: Quantity Assessment for Roller Gates

**ESTIMATE MU1-1** 

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تشب
03
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0
Z

lbs/LF

Quan

MEMBER SIZE

01 GATE GUIDE FRAMING (MISC. STEEL FRAMING MEMBERS)

Description

ltern No.

	L		ARE
	ANGLE	TONS	L-Shapes
n St.	WT	TONS	Tees
at 17th	Channel	TONS	C-Stapes
Ŧ	WF	TONS	W Shapes
		Length	
li va		Ibs/LF	

G. Hicks	L. Schieb
Computed By:	Checked By:

er.

January 8, 2007

Date:

690.00	
2.00	
0.00	
0.00	

0.00

6.05

0.00

350.00

100

840.5

Total Paint S.F.

% Area to be painted

3 1/2"

1 1/2"

1 1/4"

÷---

PAINT

51.271Plate + Framing42.5636allowance for misc53.835total tons55total tons 2% SAY

8592.000 SAY

ADD

36.432 4.435 48.00 12.00

W30×152 MC10×33.6 Guide Column Franting Vert Guide Column (tocate at each east guide column) (2) Horiz. Motor Operator Support between Guide Cols

శవ ళ ర

02 STEEL PLATE

**2**8

132.00 33.60

PLATE Description

81.80 30.60 **"**. \*\* Misuellaneous Plates Plate support for Motor Oper at ea pate Cont Plate across hottom of of stil at gates

# A

0.00 5.36 0.00 0.00 0.00 0.00 SUBTOTAL TOMS # 10.404

No.

Quan

1/8 1/16" 15.000 5.8 80 CW

TONS OF PLATE (BY THICKNESS 7/3 5.355 3/4 5/8 "Z/‡ 3/8... Unit Plate Area (SF) Width Length LBS / SF

Total Paint S.F. Paint % Area to paint AREA S.F.A.F. WT ANGLE TONS TONS Tees L-Shapes L-Shapes

4882.00 W/J0x132 1320.00 MC10x 33.6

100% 100%

8.500 5.000

6012 SF

0.00

36.43

4.44

0.00

40.867

SUBTOTAL TONS =

Page 1 of 3

No. Gates = 2. Replacement Guide Columns at London Ave: 02 GATE GUIDE FRAMING (MISC. STEEL FRAMING MEMBERS)

at Orleans Ave

W F Channel TONS TONS W Strupes C-Shapes

Length

**BASALF** 

Quar

MEMBER SIZE

Description

itern No.

				W30x132 MC10x 33.6	ц.
	Total	Paint	S,F,	2091.00 0.00	1602
Paint	% Area	5	staint	100% 100%	
		AREA	S.F.A.F.	8.500 5.000	
ANGLE	TONS	L-Shopes	(0-10 plf)		0.00
WT	TONS	Tees		16.236	16.24

0,000

818 83

132.00 33.60

• •

W30x152 MC10x 33.6

Guide Column Franing Vert Guide Column (locale at each oxist guide column) (c) Horiz Motor Operator Support between Guide Cole

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0.00

00.0

16.236

SUBTOTAL TONS =

ATE
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STEEL

02 STEI	EL PLATE																			
							Hun				TONS OF	PLATE (I	3Y THICK!	JESS)					PAINT	
No.	nescription	SIZE	Cuan	LBS/SF	Length		Plate Area (SF)	\$/16"	1/8"	3/8,-	1/2"	5/8"	3/4"		14 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	A" 11	12" 3.1	2" to be		ă î î
d d	Miscelaneous Plates Plate support los Mortos Ciper at es gate Cont Plate anose bottom of ei sill al gates	14- 1440	Ŧ	81.20 30.60	140.06 000	2.50	15.000 350.000					<b>.</b>		44	8			83		88
					SUBTOTAL	TONS =	10.404	0.00	0.00	0.00	0.00	0.00	5.36 6	00 5	0.6 1 0.0	00 00	0.0 1 00	0 2 00	680	9





					PAINT	sa Total Paint S.F.	2172.50 2350.00 2350.00 2350.00 2357.51 247.25	4857.58	5753.145 Knin	
			(gate)			* An		XXX	SAY SAY	c
			1.0 ton per			¢"   1/2		00.0		
			sming (say					00 00		
			15x45 c Angle Fr			*8		0 00		
		Total Paint	05.7 65.056 Mis Mis	695 SF	HICKNESS	3/4"	a construction of the second sec	0.77		
		Paint % Area to	Daint 855% 855%		ATE (BY 1	2/8	ja j	1.03		
		AREA	SF / F		JA OF PL	,211	15,180 1774 1774 1774 0775 0775 0775 0775 0775 0775 00000	23.44		
Ave		L		1	1 I	3/8		0.00	er, etc.	•
eans		ANGLE TONS L-Shapes	Ŗ	3.33		1/81		0.00	aming e for roll	ŝ
it Orl		W1 TONS Tess	27.675	27,68		1/16"		0.00	late + Fr Iowance	tal tons otal ton
ۍ م		Channel Tons C-Shapes		000	Unit	Plate Area (SF)	317,250 1,500 1,500 1,5275 1,5275 1,5275 1,5275 1,5275 1,5205 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,527 1,520 1,52	25.236	56.239 P 2.81196 a	59.051 to 60 to
	3	W F TONS W Stapes		0.00		Width	5257 8277 8277 8277 8277 8277 8277 8277	VL TONS =	۲ %	SAY
		Length	90 14 10 10	31.003		Length	27,00 1,00 1,10 1,10 1,10 1,10 1,10 2,11 1,00 1,10 1,00 1,100	SUBTOT/	ADD	
les II		lbs/LF	45.00	TONS =		LBS / SF	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$			
No. Ga		Unit Quan	0.4	SUBTOTAL		Unit Quan	-8-855-0			
		No. of Gates	<b>90</b> -43			No. of Gates	មិន១មិនសិទ្ធិភូទិត្			
s Ave :	(Ş	MEMBER	WT15445			PLATE SIZE	201 201 201 201 201 201 201 201 201 201			
piacement Gate Leaf at Orlean	FRAMING (MISC. STEEL FRAMING MEMBER	Description	Laaf Feaning Viti S Vat Faaning Mentee Misc. Angle Franking (say 1.0 ten per gala)	4		Description	Leart Same Taree Protocoid Sube State Faraye Pran. Frood State Faraye Pran. Frood State Clampe Parter, 144 Bottom Prante, 144 Misc Prante, 344 Misc Prante, 344 Misc Prante, 142 Prante prane at Top, Flood State Flampe prane at Top, Flood State			
2. Re	02 LEAF	ltern No,	ಕ್ಷಿಯೆ ರ ರ ಕ	02 STEE		No.	42078-92-44 -			

Client :	USACE - Nashvílle	
Project Name:	New Orleans Hurricane Protection - ICS	Date:
Project No.:	41682.0100	Computed By;
Location:	London Ave Canaf	Checked By:
	Orleans Ave Canal (Similar)	
Quantity Assessment for Roller Gat	(GS	Page 1 of 3
(Incl Steel Framing Members, Plates, Bracing,	Connection PL's, Skin Plate)	v

January 8, 2007 G. Hicks L. Schieber

0	F4	
13	ΥF	7 QNS W Stapes
	:	mgnal
tes =		17sdi
No. Ga	2	Quan
		No. of Gates
n Ave : <sup>RS)</sup>	0104010	SIZE
placement Gate Leaf at Londo FRAMING (MISC. STEEL FRAMING MEMBE	Para referêçên ev	06%515%20
1. Rel 01 LEAF	-	No.

e
AV.
ondon
at L
13

			VT15x45 Msc. Angle Framing (say 1.0 ton per gate)	H.
Γ	Total Peint	ц, so		2328
Paint	% Area to	paint	200 200 200	
	AREA	S.F.A.F.	1 400	
L	L			
3LE]	NS apes	Γ		22
ANC	0 T			8.6
WT	TONS Tees		5 5	71.96
Channel	TONS C-Shupes			0.00
WF	TONS W Strapes			0.00
	Length	L	41 00	80.608
	1hs/LF		12.80	TONS #
	Unit Quan	[	<b>2</b> ) #	subrotal
	No. of Gates		22	
	MEMBER		WT15x45	
	Oescription		Avis Franking Miss, Angle Franking, (say, 1.0 toi) per gate) Miss, Angle Franking, (say, 1.0 toi) per gate)	

ತೆದೆ ಕ

01 STEI	1. PLATE																			
								Unit			101	NS OF PLAT	E (BY TH	CKNESS)			-		PAINT	Г
No.	Description	PLATE SIZE	No. of Gates	Quan	LBS / SF	Langth	Width	Plate Area (SF)	1/16"	1/8"	3/8"	1/2"	5/8" 3.	·4" 7/8	÷	1/4"	1 1/2"	% Area to be	Total Paint	1
ಕರು ಇಕಳ ಥರ	Lead Static Balan Phate of Gate Land Persenseried Static State Phate of Gate Land Flags Place. Flood State Devolvangen Patasa Devolvangen Patasa Detom Patas. Art Mac Patasa Art Mac Patasa Art Mac Patasa Top, Flood State Flags plate at Top, Flood State	azaasaa	2222222222		\$\$\$\$\$\$\$\$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$ \$\$ \$\$ \$ \$ \$	26 26 26 26 27 27 26 27 26 27 27 26 27 26 26 27 26 26 26 26 26 26 26 26 26 26 26 26 26	<u>*************************************</u>	208.350 1.1.000 1.5.210 1.5.210 1.5.210 1.6.00 1.000 1.2000 1.20000 1.20000 1.20000 1.20000 1.20000 1.20000 1.20000000000				200500 2017 2017 2017 2017 2017 2017 2017 20	2 1					<u> </u>	1122 1122 1122 1122 1122 1122 1122 112	

	12133.93	14451.510 15000
	XXX	say Say
	0.00	
	0.00	
	0,00	
	0.00	
	1,99	
1974930	2.67	
	58.42	
	0:00	er, etc.
	0.00 {	raming te for roll s
	0.00	Plate + F allowand total ton total ton
	63.079	143.687 7.184356 150.871
	SUBTOTAL TONS =	ADD 5% SAY

USACE - Nashville New Orleans Hurricane Protection - ICS 41682.0100 London Ave Canal Orleans Ave Canal (Similar) Client : Project Name: Project No.: Location:

January 8, 2007 G. Hicks L. Schieber

Date: Computed By: Checked By:

Page 1 of 3

Quantity Assessment for Roller Gates (Incl Steel Framing Members, Plates, Bracing, Connection PL's, Skin Plate)

1. Replacement Guide Columns at London Ave:

13 at London Ave No. Gates =

					W30x132 MC10x 33.6	SP SP
		Total	Paint	ц s	4879.00	5439
	Paint	% Area	9	pairt	000 1000	
			AREA	S.F.A.F.	8 8 00 0 00 00 0 00 00	
	L	J		i		
	NGLE	IONS	-Shapes	-10 p(f)		0,00
	NT A	ONS	Fees L	0	1986	7.88
1	neł	9 1 1 1 1 1	580	Opt()	-3	
	Chan	LON	C-Shap	(101-30	5.24	2.2
	WF	TONS	W Shapes			0:00
		Length			41.00 12.00	43.120
		Ibs/LF		-	112 00 33 80	
		Quan		_	2.8	I THIOIRO
_				_	ø	
EMBERS		MEMBER	SIZE		W30X13	
TE GUIDE FRAMING (MISC. STEEL FRAMING N		Description			Gude Column Framma Vet Gude Column Framma Vet Gude Column forste at each exist galar column (2) Heart, Mata Operator Support between Guide Cols (2) Heart, Mata Operator Support between Guide Cols	
01 GAT		(tern	N0.		4200	

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2

PAINT	Totxi Paint	820.00 350.00	287.60
	% Area to be	100%	Contraction of the local distance of the loc
	3 1/2"		00.0
	\$ 1/2"		
	1 1/4"		0.60
	÷	5.048	\$ 05
CKNESS)			0.00
(BY THE	3/4"	10 10 10 10	5.35
OF PLATE	5/8		000
TONS	1/2"		000
	- 8/E		8-00
	** <b>8</b> /1		0.00
	1/16"		6.00
Cont	Plate Area (SF)	15,000	10.404
	Width	#3 N	VL TONS =
	Length	\$0.0 00.0	SUBTOT/
	LBS / SF	81 20 20 50	
	Quan	÷	
	PLATE	4- *	
	Description	Miscellanieous Plates Miscellanieous Plates Date support for Motor Solar at ea plate Cont Plate avroas boltom of of sill at gates	
	No.	4.0	

53.530Plate + Framing5%2.6765allowance for misc5%2.6506total fonsY56total fons SAY ADD



SAY

### **NEW ORLEANS ICS PROJECT** 05\_01.01 - Demo Exist Pumps (applies to Ph1 and Ph2 pumps)

### LONDON AVE / ORLEANS AVE. / 17th Street

### LONDON



### ORLEANS 01 Demoi

Demolition 18 MWI pumps		
EAST SIDE -	Ph1 EA	
	10	
WEST SIDE -	Ph2	
	10	TOTAL

### **17th STREET**



BLACK & VEATCH NEW ORLEANS ICS PROJECT 05\_01.01 - Demo Existing Pumps LONDON AVE / ORLEANS AVE. / 17th Street

SHEET 1 OF 2

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Labor;	Base Hr Rate	Fringes	other	TOTAL
Laborers, Serni Skilled, Foreman	\$18,52	\$4.51	\$0.00	\$23.03
Laborers, Semi Skilled	\$17.52	\$4.51	80,00	\$22.03
Plumber / Pipe fitter	\$23,52	\$6,68	\$0.00	\$30.20
Equipment Oper, Medium	\$20.25	\$7.80	\$0.00	\$28.05
Truck Drivers, Heavy	\$17.35	\$7.80	\$0.00	\$25.15
	n conce			Estimated
	II UNIGAN ONDZ	LUUB KEGION II	Esc to 2007	2007 Region II
General Equipment:	Base Daily Rate	Base Hourty Rate	(esc. by 1.05 factor)	Base Hourly Rate
Fruck, Hwy,	\$699.28	\$87.41	1.10	\$96.15
Misc Equip, total (incl compressor, winches, hand tools, etc.)				\$25.00
Crane, wheel mounted,				\$135.00

## 1. Disconnect Existing Pump; prep for removal

		LABOR		EQUIP		
nr, item		2007 Davis-Bacon		Estimated		
		Hr. Rate		2007 Region II		
		(incl Fringes)		Base Hourly Rate		
1 Laborers, Semi Skilled, Foreman		\$23.03				
1 Laborers, Semi Skilled		\$22.03				
4 Plumber / Pipe fitter		\$120.80				
<ol> <li>Misc Equip,total (incl corripressor, winches, hand tools, etc.)</li> </ol>				\$25.00		
1 Equipment Oper, Medium		\$28.05				
<ol> <li>Crane, wheel mounted,</li> </ol>				\$135.00		
TOTAL		\$193.91		\$160.00	_	
	No. of Pumps	No. of days	hr/dav			
Productivity:	1	N	2	0.05	tanks per hr	
					_	
Cost per UOM:	Tank	\$3,878.20		\$3,200.00	\$7,078.20	/ Tk Tota
				SAY	\$7,100	TOTAL

/ Tk Total Labor + Equip.



EQUIP	Estimated	2007 Region II	Base Hourly Rate				\$25.00		\$135 00	2	\$96,15	\$256.15	hriday 10 <b>6.010</b> Tranks per hr
LABOR	2007 Davis-Bacon	Hr. Rate	(incl Fringes)	\$23.03	\$22.03	\$0.00		\$28.05		\$25.15		\$98.26	No. of days
	Item			lled, Foreman	lied		tol compressor, winches, hand tools, etc.)	tedium	ited,	Ay.		FOTAL =	No. of Pumps
	hr.			1 Laborers, Semi Sk	1 Laborers, Semi Ski	4 Plumber / Pipe fitte	<ol> <li>Misc Equip total (ii</li> </ol>	1 Equipment Oper, N	<ol> <li>Crane, wheel mourt</li> </ol>	<ol> <li>Truck Drivers, Hea</li> </ol>	1 Truck, Hwy,		Productivity:

Cost per UOM:

Tank

/ Tk Total Labor + Equip. TOTAL \$3,544.11 \$3,750 \$2,561.51 SAΥ \$982.60

2 2 0F SHEET

## 05\_01.02 - Demo of Hydraulic Fluid System

17th STREET 1 Hydrautic Fluid Piping (Phase 1 System)

		nominal	Avg Length		270
			No. of Pipes	EA	24
	80 Stl Piping	1	Pipes /row	Qty (ea)	ষ
Demolition	01 3" dia Sch	EAST SIDE	Rows	Qty (ea)	Q
2					

LGTH OF PIPING LF

6480

nomínal	Avg Length		225	
	No. of Pipes	ĒA	24	
Ш	Pipes /row	Qty (ea)	ষ	
WEST SID	Rows	Oty (ea)	9	

			TOTAL LF =
Avg Length		225	
No. of Pipes	EA	24	
/row	ty (ea)	4	

	5% Add for
<u>الل</u>	5400
	<u>الل</u>

 3" dia piping	12474	Tot Ph 1 & Ph 2	
5% Add for Ph 2	594	Phase 2	
5400	11880	Phase 1	

Stl Piping		Alone More
Sch 80	SIDE -	Div
1" dia	EAST	0,000
02		

EAST SID	щ Ч		nominal
Rows	Pipes /row	No. of Pipes	Avg Length
Qty (ea)	Qty (ea)	EA	) l
9	÷	9	270
WEST SIL	ы. Эн.		nominal
Rows	Pipes /row	No. of Pipes	Avg Length
Qty (ea)	Oty (ea)	EА	ł
9	<del></del>	9	225

Phase 1 LGTH OF PIPING LF 1620

Phase 1 Piping Volume	LF Gals	1 4361.148	121.144
- piping -	Gals / I	0.367	0.041
l to drain fron NG	CF Vol / LF	0.05	0.0055
Volume of Fluid LGTH OF PIPI	Ľ	3" 11880	1" 2970
02		Ph1	Ph1

hase 2 Piping Volume	Gals	218.0574	6.057
e - prinți	Gals / LF	0.3671	0.041
I to drain from NG	CF Vol / LF	0.05	0.0055
Volume of Fluid LGTH OF PIPII	LF	3" 594	1" 149
03		Ph1	РН

	Phase 1	3" dia piping 1" dia piping TOTAL	
Volume	Gals	4361.15 121.14 4482.29	

Tot Ph 1 & Ph 2

Phase 2

Phase 1

1" dia piping 3119

5% Add for Ph 2 149

LF 1350 **2970** 

TOTAL LF =

LGTH OF PIPING

	Volume	Gals	2/18.06 6.06 224.44	
--	--------	------	---------------------------	--

	Phase 1	3" dia piping	1" dia piping	TOTAL
me	80	96	6	

	.,	•	H
Gals	218.06	8.06	224.11
	No.5	1920	100

### 05\_01.02 - Demo of Hydraulic Fluid System **NEW ORLEANS ICS PROJECT**

## 17th Street (Units at the Gate Closure Structure) 1 Hydraulic Fluid Piping 01 Demolition 01 3" dia Sch 80 Stl Piping

nominal	Avg Length		25
	No. of Pipes	EA	56
	Pipes /row	Qty (ea)	4
	Rows	Qty (ea)	14



LGTH OF PIPING

Ŀ



### 02 1" dia Sch 80 Stl Piping

nominal	Avg Length	<b>ا</b> سہ	25	
	No. of Pipes	EA	14	
	Pipes /row	Qty (ea)	***	
	Rows	Oty (ea)	14	





## 02 Volume of Fluid to drain from piping - 3" dia Sch 80 Stl Piping LGTH OF PIPING Volume

		'n	***	5
Volume	Gals	613.94	14.28	628.22

" dia piping " dia piping DTAL

### 05\_01.02 - Demo of Hydraulic Fluid System **NEW ORLEANS ICS PROJECT**

## LONDON AVE / ORLEANS AVE. / 17th Street

### LONDON

	TOTAL LF =		TOTAL LF =
n) nominal Avg Length L 300	nominal Avg Length L 380	nominal Avg Length L 300	nominal Avg Length L 380
ise 1 System No. of Pipes 24	No. of Pipes EA 24	No. of Pipes EA 6	No. of Pipes EA 6
draulic Fluid Piping (Pha Demolition 01 3" dia Sch 80 Stl Piping EAST SIDE - Rows Pipes /row Qty (ea) Qty (ea) 6 4	<b>WEST SIDE</b> - Rows Pipes /row Qty (ea) Qty (ea) 6 4	02 1" dia Sch 80 Stl Piping EAST SIDE - Rows Pipes /row Oty (ea) Oty (ea) 6 1	<b>WEST SIDE -</b> Rows Pipes /row Qty (ea) Qty (ea) 6 1
4 H 2 10 2 12			

3" dia piping

LGTH OF PIPING

느

LGTH OF PIPING

7200

щ

Phase 1

Phase 1 LGTH OF PIPING

1800

щ

02 Volume of Fluid to drain from piping - 3" dia Sch 80 Stl Piping Volume Gals 5991.072 166.421 Gals / LF 0.3671 CF Vol / LF LGTH OF PIPING LF CF

	3" dia piping	1" dia piping	TOTAL	
Volume Gals	5991.07	166.42	6157.49	Phase 1

0.041

0.05

**3"** 16320 **1"** 4080

1" dia piping

LGTH OF PIPING

لد. ....آ

## 05\_01.02 - Demo of Hydraulic Fluid System

	LGTH OF PIPING LF 6500	LGTH OF PIPING LF 6100 12600 Phase 1	Phase 1 LGTH OF PIPING LF 1625	LGTH OF PIPING LF 1525 3160 Phase 1
		TOTAL LF =		TOTAL LF =
<b>n)</b> nominal	Avg Length L 325	nominal Avg Length L 305	nominal Avg Length L 325	nominal Avg Length L 305
ise 1 Systen	No. of Pipes EA 20	No. of Pipes EA 20	No. of Pipes EA 5	No. of Pipes EA 5
ORLEANS 1 Hydraulic Fluid Piping (Pha 01 Demolition 01 3" dia Sch 80 Stl Piping EAST SIDE -	Rows Pipes /row Qty (ea) Qty (ea) 5 4	WEST SIDE - Rows Pipes /row Qty (ea) Qty (ea) 5 4	02 1" dia Sch 80 Stl Piping EAST SIDE - Rows Pipes /row Qty (ea) Qty (ea) 5 1	<b>WEST SIDE</b> - Rows Pipes /row Qty (ea) Qty (ea) 5 1

3" dia piping

dia Sch 80 Stl Piping Volume	Gals	4625.46	128.487
piping - 3"	Gals / LF	0.3671	0.041
to drain from	CF Vol / LF	0.05	0.0055
Volume of Fluid LGTH OF PIPIN	LF	3" 12600	1" 3150
02			

	3" dia piping 1" dia piping TOTAL
Volume Gals	4625.46 128.49 4753.95 Phase 1

1" dia piping

BLACK & VEATCH NEW ORLEANS ICS PROJECT 05\_01.02 - Demo of Hydraulic Fluid System LONDON AVE / ORLEANS AVE. / 17th Street

SHEET 1 OF 4

CREW DEVELOPMENT:				
Labor:	Base Hr Rate	Fringes	other	TOTAL
Laborers, Semi Skilled, Foreman	\$18.52	\$4,51	\$0,00	\$23.03
Laborers, Semi Skilled	\$17.52	\$4.51	\$0.00	\$22.03
Plumber / Plpe fitter	\$23.52	\$5.68	\$0.00	\$30,20
Equipment Oper, Medium	\$20.25	\$7.80	\$0.00	\$28.05
Truck Drivers, Heavy	\$17.35	\$7.80	\$0.00	\$25,15
				Estimated
	2006 Region II	2006 Region II	Esc to 2007	2007 Region II
veneral Equipment:	Base Daily Rate	Base Hourly Rate	(esc. by 1.05 factor)	Base Hourly Rate
Truck, Off-Hwy, Rear Dump, 367, 23-29CY	\$699.28	\$87.41	1.10	\$96,15
Misc Equip,total (incl compressor, winches, hand tools, etc.)				\$25,00

## 1. Install Valves and Drain Hydraulic Piping

	l				
		LABOR		EQUIP	
hr. Item		2007 Davis-Bacon		Estimated	
		Hr. Rate		2007 Region II	
		(incl Fringes)		Base Hourly Rate	
1 Laborers, Semi Skilled, Foreman		\$23.03			
1 Laborers, Semi Skilled		\$22.03			
4 Plumber / Pipe fitter		\$120.80			
1 Misc Equip,total (incl compressor, winches, hand tools, etc.)				\$25.00	
TOTAL =		\$165.86		\$25.00	
	LF for		•		
	(4)-pipe run	No. of days	hriday		
Productivity:	1200	7	10	60	LF per hr
	L				
Cost per UOM:	5	\$2.76		\$0.42	\$3.18 / LF Total Labor + Equip.
				SAY	\$3.25 TOTAL





### 3. Demo Exist Hydraulic Fluid Piping

		LABOR		EQUIP	
hr. Item		2007 Davis-Bacon		Estimated	
		Hr. Rate	-	2007 Region II	
		(incl Fringes)		Base Hourly Rate	
1 Laborers, Semi Skilled, Foreman		\$23.03			
1 Laborers, Serni Skilled		\$22.03			
4 Plumber / Pipe fitter		\$120.80			
<ol> <li>Misc Equip,total (incl compressor, winches, hand tools, etc.)</li> </ol>				\$25 DD	
1 Equipment Oper, Medium		\$28.05			
1 Truck, Off-Hwy, Rear Dump, 36T, 23-29CY				\$96 15	
TOTAL =		\$193.91		\$12115	
	LF for			•	
	(4)-pipe run	No. of days	hr/day		
Productivity: (allow 30-ft per hour)	1200	4	. <del>0</del>	L	F per hr
Cast per UOM:	Ľ.	\$6.46	8000000	\$4.04	\$10.50 / LF Total Labor + Equip.
			, I		
				SAY	\$10.50 TOTAL

05\_01.03 - Demo Existing Power Units **NEW ORLEANS ICS PROJECT BLACK & VEATCH** 

## LONDON AVE / ORLEANS AVE. / 17th Street

2 -5 SHEET

<b>PMENT</b> :	
DEVELC	icya
CREW	

Labor:	Base Hr Rate	Fringes	other	TOTAL	
Laborers, Semi Skilled, Foreman	\$18.52	\$4,51	\$0.00	\$23.03	
Laborers, Semì Skilled	\$17.52	\$4.51	20.00	\$22.03	
Plumber / Pipe fitter	\$23.52	\$6.68	\$0.00	\$30,20	
Equipment Oper, Medium	\$20.25	\$7,80	\$0.00	\$28.05	
Truck Drivers, Heavy	\$17.35	\$7,80	\$0.00	\$25.15	
	2008 Device II	2006 Boolog B		Estimated	
	ii linifay way	n mongan avor	ESC 10 2001	ZUU/ Region II	
ceneral cquipment:	Base Daily Rate	Base Hourly Rate	(esc. by 1.05 factor)	Base Hourly Rate	
Truck, Hwy.	\$699.28	\$87.41	1.10	\$96.15	
Misc Equip,total (incl compressor, winches, hand tools, etc.)				\$25.00	
Crane, wheel mounted,				\$135.00	
		A REAL PROPERTY AND A REAL PROPERTY OF A REAL PROPERTY AND A REAL			

			LABOR		EQUIP	
	ltern		2007 Davis-Bacon		Estimated	
			Hr, Rate		2007 Region II	
			(Inci Fringes)		Base Hourly Rate	
<ol> <li>Laborers, Semi Skilled, F</li> </ol>	oreman		\$23.03			
1 Laborers, Semi Skilled			\$22.03			
4 Plumber / Pipe fitter			\$120.80			
<ol> <li>Misc Equip,total (incl col</li> </ol>	mpressor, winches, hand tools, etc.)		•		00 222 .	
<ol> <li>Equipment Oper, Mediun</li> </ol>			\$28.05			
<ol> <li>Crane, wheel mounted,</li> </ol>					\$135.00	
					<b>)</b>	
	TOTAL =		\$193.91		\$160.00	
		No. of Pumos	No. of days	hridav		
Productivity:		1	-	10	0.10 Itani	ks per hr
Cant and Dit.		Ľ.	04 040 40			

\$1,600.00 \$3,539.10 / Tk Total Labor + Equip.

TOTAL \$3,600 SAY

\$1,939.10

Tank

Cost per UOM:

1. Disconnect Existing Pump; prep for removal

05\_01.03 - Demo Existing Power Units (con't)

~ 2 OF SHEET

		L	LABOR	EQUIP	
hr.	Item		2007 Davis-Bacon	Estimated	
			Hr. Rate	2007 Region II	
and the second			(inci Fringes)	Base Hourly Rate	
ŗ	Laborers, Semi Skilled, Foreman		\$23.03		<b>.</b>
*~	Laborers, Semi Skilled		\$22 CB		
ৰ	Plumber / Pipe fitter		SO OO		
*	Misc Equip,total (incl compressor, winches, hand tools, etc.)			\$35 M	
***	Equipment Oper, Medium		\$38.05		
***	Crare, wheel mounted,				
<b>4</b> 04	Truck Drivers, Heavy		\$25.15	\$120'00	
***	Truck, Hwy,				
	TOTAL =		\$98.26	\$256.15	-
		NO. OI PUMPS	NO. OT DAYS N//D	A	
	r todacuvity:	F	0.5	10 0.20	tanks per hr
	Cost war ION.		OC POT O		
			DC. D+0	91,280.76	11.16
				SAY	\$1.8

🗾 / Tk Total Labor + Equip.

\$1,772.06

TOTAL

\$1,800

Client : USACE - Nashville Project Name: New Orleans Hurricane Protection - ICS Project No.: 41682.0100 Location: Canal (Similar) Quantity Assessment for Modification of Existing Pump Platforms

1. 17th Street: (Abstracted from Phase 1 17th St Dwg #137....area / wt of steel impacted by 12 pumps)

01 PLATFORM DECK FRAMING (MISC. STEEL FRAMING MEMBERS)

No. of Platforms = 1 ea side

from	Townships of	all and a second		:	1		WF	Channel	ΜŢ	ANGLE	LI	
No.	Lexertipieox	3215	Platforms	Wembers	Ibad	Length	TONS W Shapes	C-Shaders	YONS	TONS	L	ARFA
											~~~	5 E B E
WEST	PUMP PLATFORM										L	
	West Deck Framing										1	
e.	Misc Sheel WF Framing	W12 X 45		\$	425.00	13.76	4 %UU					1.600
à		W10x33	-	9	33.00	8.83	1.748					4 3201
ā		W8x10	**	6	10.00	2,10	0.063					2.60
ਚਂ		W8×10	~	w	10.00	4.40	0.132					2 80
್												
vi	Misc Steet Bracing	WT5X10.5	~	8	10.50	7.60			0.798			2.20
EAST F	PUMP PLATFORM (same as West Pum	p Platform)										
64	East Deck Framing								-	Ī		
त्रं	Misc Steel WF Franking	W12 X 40	•~	ç	40.00	13.75	3.300					4 600
.c		W10x33	~	12	33.00	8.83	1.748					4 320
ن		W8X10	•	φ	10.00	5.10	0.063					2.80
5		W8X10	**	~	10.00	4,40	0.132					2.60
a.`								_			,	
á	Misc Steel Bracing	WT5x10.5	•	2	10.50	7 60			0.798			2.20
	SUBTOTAL TONS =			517		12 0.64	91.46	0.00	1 20	0.00	L	
						16.000	121-123	0,40	6	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		

759.00 W12 X 40 467 75 W15x3 32.76 W6x10 68.64 W8x10

100% 100% 100%

334.40 WT5×10.5 3306 SF

100%

753 00 W12 X 40 457 75 W10x33 32.76 W8x10 88.64 W8x10

100% 100% 100% 100%

Totai Paint S.F. Paint % Area to paint 394.40 WTSx10.5 0.00

DD 5% 0.604134 12.687 SAY
---------------------------------

e tor misc	_	Š
allowanc	total tons	total ton
0.004134	12.687	13
×		

		Total Paint	<u>رو ۲</u>	2640.00			2640.00	·····
	PAIN	% Area to be	painted	₹ş			xxx	SAY
		3 1/2"	-				0'00 -	
		1 1/2					0.00	
		1 1/4"	Ť				0.00	
		in.	-				9.60	
	58)	1.					0.00	
	THICKNE	7/8"					0.00	
	NTE (BY	3/4"					0.00	
	VS OF PL	5/8.					0.00	
	TOI	1/2	Ţ	çono			0.00	
		.318.					0.00	
		1/8"		1	ſ		0.00	
		1/15"	-				0.00	
	Unit	Plate Area (SF)		120011900		1300 DV0	2640.00	
		Width		13.75		92 ST	= sho	
	_	ųtibua		90		8.0	UBTOTAL TI	
			-	6	-		in .	
		Ouan		-		+		
	1	Gates	***			****		
		SUZE			111 W 44004 Advantation (			
C GRATING	() The second se		UMP PLATFORM	West Granting Residences Cathor	JMP PLATFORM	East Crating Representation (Stabits		
02 51EE		-ON	WEST P	5 A B B	EAST P	4 14		

Date; Computed By: Checked By:

Page 1 of 3

January 8, 2047 G. Hicks L. Schieber

5945.094 6000

SAY
# **NEW ORLEANS ICS PROJECT** 05\_01.08 - Replace Exist Fuel Stor Tank with Double-Wall Tank

# LONDON AVE / ORLEANS AVE. / 17th Street

# LONDON



# ORLEANS

01 Demolition



2 TOTAL

# **17th STREET**



02 Remove Existing fuel supply piping to Phase 2 pumps (to be removed)

2

TOTAL

05\_01.08 - Replace Storage Tanks (w/ Dbl Wall Tank) **NEW ORLEANS ICS PROJECT BLACK & VEATCH** 

LONDON AVE / ORLEANS AVE. / 17th Street

1 OF 1 SHEET

CREW DEVELOPMENT:				
Labor:	Base Hr Rate	Fringes	other	TOTAL
Laborers, Serni Skilled, Foreman	\$18.52	\$4,51	\$0.00	\$23.03
Laborers, Semi Skilled	\$17.52	\$4.51	\$0.00	\$22.03
Plumber / Pipe fitter	\$23.52	\$6.68	\$0.00	\$30.20
Equipment Oper, Medium	\$20.25	\$7,80	\$0,00	\$28.05
Truck Drivers, Heavy	\$17.35	\$7,80	\$0,00	\$25.15
				Estimated
	2006 Region II	2006 Region II	Esc to 2007	2007 Region II
General Equipment:	Base Daily Rate	Base Hourly Rate	(esc. by 1.05 factor)	Base Hourly Rate
Truck, Hwy,	\$699,28	\$87.41	1.10	\$96.15
Misc Equip,total (incl compressor, winches, hand tools, etc.)				\$10.00
Crane, wheel mounted,				\$135.00

# 1. Removal and disposal of tank(s)

		LABOR		EQUIP
hr. Item		2007 Davis-Bacon		Estimated
		Hr. Rate		2007 Region II
		(incl Fringes)		Base Hourly Rate
1 Laborers, Semi Skilled, Foreman		\$23.03		المعادلية والمعادية
1 Laborers, Semi Skilled		\$22.03		
2 Plumber / Pipe fitter		\$60.40		
<ol> <li>Misc Equip, total (incl compressor, winches, hand tools, etc.)</li> </ol>				\$10.00
1 Equipment Oper, Medium		\$28.05		
1 Crane, wheel mounted,				\$135.00
1 Thick Drivers, Heavy		\$25.15		\$96.15
1 Truck, Hwy,				
T01AL =		\$158.66		\$241.15
	No of The	Alc of device but	, dow	
Productivity:	-	0.5	10	0.2 [ta

Cost per UOM:

\$1,205.76 \$793.30

Tank

/ Tk Total Labor + Equip. TOTAL \$1,999.06

\$2,000 SAY

							ទ ០៣ ជនកេរន	s on canaf	s on canal	s on canal	canal side of	canal side of				al water	er water	er water		ទទ សេនវិចាប	er water canal side of	canal side of	erene al al al a a a a a a a a a a a a a a a	Cellar and al	canal side of	canal side of	ar water canal side of	br water ⊶⊷⊷ ≂i4⊙ n€	CORDON SALAN OF	ಪಡೆಗಿತ್ತು ಶ್ವೇಧಕ್ಕಾಗಿ	or water sr water v	af Wattaf		
G.M. Akers 6/11/2007 of			Desucrateer tive	1000	nane nane	none	none however platform i side of fevee	none however platform # side of levee	none however platform i: side of levea	none however platform is side of levee	none however pipe is on levee	nane nane however pipe is an	levee	none	nore	none nuwevel lack is UV	hone however rack is ov none	none however x's are ov	RORe Invier retail	none however rack is over	none however rack is ov none however pipe is on	levee hore however pipe is on	levee Proce housings make is an	liore coveyer reckies on	frone however rack is on levee	none however rack is on levee	none however rack is on none however rack is on	none however rack is over	(10/15 tluerover reun to vir (87466 meno himmorier eile in on v	ILUTE FURED TO THE PROPERTY PROVIDED TO THE PR	none however rack is ow none however rack is ow none however rack is ow	Fidee suveres reun is or house canat	lower canal	lower canal
			Cost	\$20.248.15			\$20,248.15												\$1,270.37											\$952.78			\$1,587.96	\$623.84
		lackfill	Estimated Cost per CY	\$25.00			\$25.00												\$25.00											\$25.00			\$25,00	\$25.00
	*****	Soil Excavation / E	Volume (CY)	808.9			808.9												50.8									Ţ		38.1			63.5	24.95
Computed Date Date Date Page	化苯基并中毒素 手手 计自己存储器 化氯化氯化		Soli removal / replacement Area	emove /replace 142'x44'x3.5'd with 16' verhead clear	ione tone	1008 emove freelace	errove replace 142'x44'x3.5'd with 11' overhead clear	0000	10ne	10116	9006	1023 <del>0</del>	1078 1078	ນດາອ ເວກອ	1017 <del>8</del>	008	1011& 1011&	ione emove /replace	"x7'x3.5' d tone	one	101.0	1016	lane	tone	sone	ione	sone .	auo	ióne emove treplace	x7x3.5 d	SOTIE SOTIE SOTIE	Miller DTHB	emove /replace 40'x3.5'x3.5' d	emove /replace (5'x3.5'x3.5' d
			nstalled Sost	\$11,070	\$462	\$47	\$7,647	\$462	\$29	\$47 c	\$6.037	000	\$1,093 51,093	\$903 r	\$2,995 r <1 854 r	\$798	\$1,160 r	\$911 1	\$5,052 7 \$3,550 r	\$676	\$26.1	\$8,257 r	\$777	\$565 r	\$310	\$1,997 r		\$145	\$334 F	\$1,994	\$95 r \$95 r \$224 r	\$2,991	\$21,742	\$698 \$698
z	1983년 1983년 1984년 1983년 19 1983년 1983년 198 1983년 1983년 198	เมเษ	كoating, surface olerant epoxy 10-11 ft in 2 coats, labor & <sub>11</sub> natt (@ 1.28 \$/ft <sup>2</sup> ) <sup>2</sup> = 0	200'5\$	\$13	\$21	\$3,459	\$209	\$13	\$21	\$2,730	407°0¢	5494 5494	\$409 \$298	\$1,355 \$830	\$361	2228	S412	\$2,285 \$1,606	\$306	\$118	\$3, 739	\$361	\$265	\$140	\$903	5046 0509	\$05	\$150	\$902 *149	\$43 \$43	\$1,353	\$28'834	\$315 \$545
SURESTORATIO	a 載人 19 番号 从 拍散 29 就派派提供	on-overflow struct	tuface Prep, C SPC-SP6, tr abor & mat1 c @1.55 \$/ft <sup>3</sup> n	\$6,063	\$263 \$16	\$26	\$4,188	\$253	\$16	\$26	\$3,306 89,306		1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	6360 6360	\$1,641 \$1,016	\$437	\$635 \$635	\$499	\$2,767 \$1,944	\$370	9419 19	\$2°0'98	\$425	\$309	\$170	\$1,094	00 <del>1</del> 0 8702	\$80	\$182	\$1,092 \$728	\$123	\$1,638	\$11,908	\$381 \$670
NGINEERS JENCY PL/ JE No. 5 RUCTURE	医怀林分林囊的复数	t below at n	teel S Luface Is rea (ft²) ((	3912	163 10	17	2702	163	40	11	2133	9 0 7	388	233	1058 655	282	10	322	1785 1254	239	78 000	1747	274	200	109	706		2	117	705	34	1057	7683	246
DRPS OF E VNS EMER( ) FI OSURE STIMATE	20 12 13 14 14 14 14 14 14 14 14 14 14 14 14 14	ixcept 6 fee	s S A A	99	** **	œ	99	۴	***	60	24	r (	မက်	8 X	10 C	50 F	2 <b>7</b> :	<del></del>	ල ර	83	1	44	¢	20	<del>1</del> 6	ଦେଝ	, r	Q	4	αç	, a 4	12	412.5	35 7
S ARMY CO EW ORLEV 41669 0310 41689 0310 011NG E		water line e	∋eaift ereach q	16.17	178.03 16.5	ග	11.17	178.03	16.5	¢	97 187	i c	187 187 187	. 4	9 2 2 2 2 2	ಳುಳ	17.565	1,555	31.67 29.67	5.17	0.00 127 P26	000.701	132.835	4.75	¥	92 X	) 43 	ŝ	17.565	16.67 7	3.33 3.33	12.5	12.5	5) 41 5) 141
JZGEO	前與新聞時間的情報	elow grada or	surface lif area per ft p	3.665	0.916 0.622	0.344	3.865	0.916	0.622	0.344	0.916 0.916		0.344	1.710	2.100 2.100	1.710	1.667	1.043.1	7.046 7.048	2.100	0.20.1 0.010	2	0,344	2.100	1.710	2.100 2.100	1.710	1.710	1.667	7.046 2.100	2.100	7.046	1,49	1.49 3.067
Owner: Project: Title:	annan an a	jessor of 3 feet t	Material of Construction	14" dia pipe	oli 3" pipe oli 2" pipe	oll 1" pipe	14" dia pipe	oit 3" pipe	oil 2" pipe	oil 1" pipe	3" pipe De 3" pipe		alo 1" pipe sin 1" pipe ink C10/16.3	ck C8x11.5	kgr C10x15.3 kgr C10x15.3	ck C8X11.5 ck C8X11.5	K's L5x5x3/8"	" 5 LOXOXO/G"	die HP 14x73 die HP 14x73	ck C10x15.3 ck CRv4 2	an unaura	ndod o	an 1" pipe	ck C10x15.3	ck C8x11.5	gr C10x15.3 ar C10x15.3	ck C8x11.5	ck C8x11.5	≮'s L5x5x3/8"	ile HP 14x73 ck C10x15.3	ck C10x15.3 ck C6x6.2	HP 14x73	rol PZ27	ali PZ27 ng C15x33.9
ULACK & VEATCH	17TH STREET C	Coating is to the	Structure	Engine Platform (East)	fuel	fuel	Engine Platform (West)	fuel -	fuel	fuel:	Pipe Rack (East) Pipe Rack (East) hydraulic pli	1 222	case dr. case dr. ennine naef ra	engine platf ra	pipe rack strr pipe rack stm	er edid	pipe rack	Dipe rack.	pipe rack p pipe rack p	pump platf ra	Hydraulic Pipe & Pine Rack Mast		case dr	engine platf ra	engine platf ra	pipe rack stm pipe rack stm	eu acid	pipe ra	pipe rack	pipe rack p pump platf ra	pump platf ra pump platf ra	Pump Platform (East)	flow conti	retaining w frami

G.M. Akers 6/11/2007 of				Uewater by none however framimo is over water	none however framing is over water	none however framing is over water	riorie riowever framimg is over water norie however frammg is over water	none however framimg is over water	see non-overflow structure	nore, pipe interior none, pipe interior	lower canal Inwar canal			see non-overflow structure	see non-overliow structure	see non-overflow structure see non-overflow structure	iower canai		lower canel	none however framimg is over water	none however framing is over water	Dorid Nowever (raming is over water more bowever framing is over water	none however framing is over water	hone however framing is over water	none however trammng is over water see non-overflow stoucture.	none, pipe interior	none, pipe interior	IOWEE COSTAN IOWEE COSTAN	see non-overflow structure	see non-overflaw structure see non-overflaw structure	see non-overflow structure	Rood side & protected side by 150' Joint coffer dam	cilman lantate dilan	none Rood side & southerstad side for secon	iloud side a protested side by 100 long caffer dam	None		101 B	anore	าอตะ	torre however is over water
				COST								¢3 703 46		\$2,540.74	\$952.78				\$1,587.96													\$1 BOO DO		\$880.56		\$170.14	00000000000000000000000000000000000000	00.000.000	\$660.56	\$680.56	\$59,581
	*****	Backfilf	Estimated	L'OST DEL L'Y								00 SC\$		\$25.00	\$25.00				\$25.00													\$25.00		\$25.00		\$25.00	00 363	00.026	\$25.00	\$25.00	Áes
		Soil Excavation /		Volume (LT)								C G		101.6	38.1				63.52													22		27.2		6.81	60 60 60	00-00-0	27.2	27.2	
Computed Date Date Date Page			Soil removal /	replacement Area	anone	none	NORS	anone	10/16 10/16	tone	10ne Jone	emove /replace 7'v7'v3 5' d	emove /replace	7'x7'x3.5' d remove trenlace	7'x7'x3.5' d	10708 10719	10Ne	emove /replace	140'X3.5'X3.5' C	anor	euor	Jone	ານາຣ	none	10ne	tone	Tone	tone	ອບບ	10/16 10/16	Jone	icou skie rench s protected side tranch sach 27' x 6' x 6' d	emove /replace	\$0'x3.5'x3.5' d	Jone	ernove /reprace 15'x3.5'x3.5' d 2004 clida trooch a	orotected side trench soch 50' v 8' v 8' v	emove /replace	30'x3.5'x3.5' d amove freedere	entove rreptede 30'x3,5'x3,5' d	10rte
			Talled	\$3,986 1	\$2,180	\$3,522]r	\$1,192	594	\$44,718[5	\$3,558	\$745 r \$2.123 r	\$1304	6	\$1,490	\$579	\$2,711 r \$374 r	\$2,991	1	/a 521,742	\$1,224 r	\$3,986 1	\$3,522 r	\$1.974	\$1,192	\$38,118 r	\$2,013	\$3,558[0	\$1,082	\$1,117 s	\$2.711 0	\$374 1	28,878 \$8,979		\$1,154[6	\$9,979 r	\$1,386	1 11 11 11 11 11 11 11 11 11 11 11 11 11		\$14,334 6	\$11,464	\$317,919
z	计存储分词存储 的复数小型的小型 医	ອນກ	20ating, surface blerart epoxy 10-11 ff in 2 coats, labor & h	\$1,803	9998	\$1,593 *803	\$539	\$43	\$20,226 \$911	\$1,609	\$337 \$960	\$590		\$674	\$262	\$1,226	\$1,353		420,044 12	\$553	\$1,803	\$1,593	\$883	\$539 649	\$17.243	\$911	\$1,609 \$437	\$480	\$505	\$1,226	\$169	\$4,513		\$522	\$4,513	\$627	\$2.105		\$6,483	\$5,185	\$253
\$ 4N RESTORATIO 12.3121.1251	椎针杆浆体纤维体的	ton-overflow struct	Surface Prep, ( SSPC-SP6, tr abor & math en tx cm <sup>2</sup> )	\$2,183	51,194	\$1,929 \$1,021	\$653	\$52	\$24,49Z	\$1,949	\$408 \$1,163	\$714		\$816	\$317	\$1,485	\$1,638	\$44 000	ತಾಗ್ರಆಗರ ಚಿತಿ ತಾಗ್ರಆಗರ	\$670	62,183 64,104	\$1,929	\$1,081	8653 ***	\$20,877	\$1,103	\$1,849 \$1,122	\$581	\$612	\$1,485	\$205	\$5,485		70.04	\$5,465	\$759	\$2.549		\$7,851	\$6,279	\$307
NGINEERS SENCY PLJ Je No. 5 RUCTURE		t below at r	itace Inface as (#2)	1409	270	597	421	en e	112	1267	263	461		970	205	132	1057	7604	с 22 8	432	1409	1244	697	421	13469	711	724	375	305	958	132	3526		204	3526	490	1645		5065	4051	112339
ORPS OF E ANS EMER ANS EMER P P OSURE ST STIMATE		xcept 6 fee	r ⊗ ⊗ P	3	r⊷ (	2 Q	18	ø	ୟ ମ	e7)	89 (Y	Å	9	16	¢,	м	12	3 7 7 8	10 13 13 14 14 14 14 14 14 14 14 14 14 14 14 14	• سغ	en r	ф	42	5 C	6 CN	න අ	5 G	÷	<u> </u>	2	r×	112.870	207 202	no+'/c	112.870	30.000	100.720		338.010	317.340	¢.
JS ARMY C VEW ORLE 041609.031 041609.031 MTERIM CL DOATING E		r water line e	ineal ft serearch	36	22.5	13.75	0	2.13	zre: 430 15,096	26.677	4.67 4.84	4.67		4.0/	4.84	16.5	12.5	404	с 10 10	141	88 C 9	22.5	13.75	2 13 8	238.188	15.096	4.67	4.84	4.67	11.33	16.5	22	ü	ń	22	11.5	11.5	6 1	5 2 2	11.00	ත
		iow grade ol	surface    area per th	4.891	4.891	4.227	2.600	2.800	15.208	15.708	7.046	7.046	2000	04M1.1	7.046	4.000	7.046	1 40	1.49	3.067	4.891	4.609	4.227	2.600	28.274	15.708	7.048	7.046	2,040	7.046	4.000	1.42		78.7	1.42	1.42	1,42			1.11	3.865
RLACK & VEATCAS Project No. Title:	17TH STREET CANAL	Coating is to the lessor of 3 feet be	Material of Structure Construction	framing W14x43	framing W14x43 framion M13040	framing W10x33 framing W10x33	framing W6x10	framing W8x10	discharge i.d. 5 dis pipe	discharge Ld. 5' dia pipe	discharge support HP 14x73 discharge support HP 14x73	discharge support HP 14x73	CF144 (11 Monthly Constraints	orxer an nodane afransin	discharge support HP 14x73	discharge support TS14x10x5/8" Birmo Platform	(West) HP 14x73	flow cootrol 9797	retaining wall PZ27	transing C15x33.9	framing VV14X43 framino VV14X43	framing W12x40	franting W10x33	framing vvsxiu framing VV8x10	discharge i.d. 9' dia pipe	discharge i.d. 5' dia pipe discharge i.d. 5' dia pipe	discharge run o ura pipe discharge support HP 14x73	discharge support HP 14x73	discharge support HP 14x73 discharoe support HP 14x73	discharge support HP 14x73	discharge support TS14x10x5/8"	Non-Overflow Structure (East) PZ35	8736	Non-Overflow	Structure (West) PZ35	522d	aux cell PZ35	flowed through the	C. 1224 Readout	floodwali PS27.5 Gate Closure	<u>Monoith IWateri</u> 14" dia pipe <u>Totals</u>

<sup>1</sup>Includes multiplier for complex structure and adherent mill scale <sup>2</sup>Includes multiplier for complex structure



G.M. Akers 6/12/2007 of	į		Desvated by		11 norre	110Te Pode	าเฉคย		1.1 §102119 NOMB	10778 2020	none however pipe is on canal side of	(evee none	none however pipe is on canal side of	60 VOTA	1000 B	37 none	none however pite is on canal side of 37 lievee	lower carval	riane nowever prove is officianal side of levee	none however pipe is on canal side of	levee none	nore	a none	riture rowever pile is un tana side of Revee	ILIVARI LERISSI	lower canal	see non-creative sectors none, pipe interior	none, pipe interior	iower canal see nor-overflow structure	lower ran of	see non-overflow structure	rune, pipe interior	score, pape intence lower canal	see non-overflow structure	flood side by 180' long coffer dam & D protected side by lower canal	flaod side by 180' long coffer dam & Dermaniad wide by lower name	And a second s		
			Cost		\$18,336.			6000 607 8	0201010							\$1,270.5	\$1,111,						\$962.7	\$1,111.											\$4,000.6	34 000 5		\$49,	
	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	Backfill	Estimated Cost per C)		\$25.00			00 20 20 20	20.034							\$25.00	\$25.00						\$25.00	\$25.00											\$25.00	\$25.00			
	加加和能力的 化化化物 化化化物	Soil Excavation /	Volume (CY)		733.4			4 084	1.55							50.8	44.5						38.1	44.5											160	160			
Computed Date Checked Date Page	(2) (2) (2) (2) (2) (2) (2) (2) (2) (2)		Soil removal / replacement Area	remove /replace 138'x41'x3.5'd with 11'	45 overhead clear	86 none 82 none	49 none remove /rentace	138'x411'x3.5'd with	96 hone	82 none 49 none		at none 90 none	87 0000	79 nore	70 none remove frenlace	14 7'x7'x3.5' d	remove /replace 75 7'x7'x3,5' d	53 none	17 nane 76 none		30 none 74 none	70 none remove /replace	36 7'x7'x3.5' d remove irenlace	75 7'x7'x3.5' d 53 none		36 none 35 none	34 none	29 NDN8 36 DDD8	39 nane	36 none	35 none	34 none 20 acos	sé none	39 V fhaad eide treach &	protected side trench protected side trench 10 each 120' x 6' x 6' d	protected side french 0 each 120' x 6' x 6' d		9.2	
	****		Installed Cost		0 \$15,1 4	4 0 1 1 2 1 2	19 21	4 4 4 4	4 22	8 8 8		9 \$10,21 9 \$8,21	7 201	220	4 \$1,0	6 \$1,9	8 \$1,6	4 \$2,10	1 \$10.2 #7.1	ž	4 10 1	4 \$1,0	\$1,45	8 \$1.61 \$2.11		8 \$1,4	2 \$5.6	7 \$6.2	83	9 81.4	5 \$22,76	2 \$5,00 48.00	0 7 7 7 7 7 7	53 0	0 \$26,3°	526.31		\$212,21	
NOL	******	ucture	Coating, surface olerant epoxy 10-11 dt in 2 coats, labor i matil (@ 1.28 \$/n <sup>2</sup> )²		\$9`9\$ ***		8	90 AA	2 CT 69	() U	e	84,00 83,74	CV3	\$35	848	\$86	\$75	\$97	\$4,62 23,02	4 ) }	\$43 \$30	545 5	504	\$75 \$97		\$64 \$10.20	\$2,56	\$2,81 \$74		\$64	\$10,29	55 20 5 8 2 8 2	564	610	\$11.90	\$11.90		29	
s AN RESTORA1 2.3121.1251	非非非非常可能能能能	ion-overflow str	Suface Prep, ( SSPC-SP6, t abor & met) o @1.55 \$/ft <sup>1</sup> , r		\$8,295 #442	\$34	\$81	48 705	\$162	\$34 \$81	000	\$4,540	\$630	\$426	\$586	\$1,048	\$917	\$1,179	\$5,596 \$3,596	200°0	\$528 \$389 ****	0002	\$786	\$917 \$1,179		\$12 468	\$3,102	\$7.472 \$7.88	\$218	\$786	\$12,468	53,102	\$786	91.7\$	\$14,410	\$14,410	-	7.4	
ENGINEERS GENCY PL GENOY PL GENOY PL GENO FLOCTURE	******	et below at n	Steel Steel 5 Surface Is Vrea (tr <sup>2</sup> ) (		5352	52	200 20	5353	105	53	0000	2829	340	275	378	676	592	761	3610		339 238 238	2) Q	502	592		507 8044	2001	202	141	507	8044	2201	507	4	9287	9297		75012	~
CORPS OF : EANS EMER 10 F LOSURE SI ESTIMATE	****	except 6 fe	quantity /		68 -	~ ~ 1	£	89	*	τ" IΩ	ç	30	ыC	i urs	23	85	٢	σ,	88	1	မက်နှ	3	Φ	~ 6		(V 64	(V )	က္	4	12	CN (	NICO	ф. Г	4	360,698	380.698		ii	f actails
US ARMY ( NEW ORLE 041669.03 INTERIM C COATING I	121212111112121	or water line	lineal ft per each		11.17	49.98 99.98	81.8	15 17	114.32	35.5 30.5	3 801	159.84	198.5	159.84	9.865833	12	51	12	197 138 34		19/ 138.34 0.666833	000000.0	12	6 <u>5</u>	¢	142.250	63.708	40.105	វេះ	S	142.250	46.708	দ ম	à	22	22			ind to share the
		below grade	surface area per ft		7.046 0.916	0.622	U.344	7.046	0.916	0.622	0.040	0.916	0.344	0.344	1.667	7.048	7.046	7.046	0.918 0.916	č	0.344	7001	7.046	7.046	1	6.040 28.274	15,708	7.046	7.046	7.046	28.274	15.708	7.046	2,445,11.1	1.11	1. 11. 11.			tructure and a
Owner. Project. Project No. Title:	IE CANAL	ssor of 3 féet	Material of Construction		HP 14x73 3" rine	states States	edici . I.	HP 14x73	3" pipe	Z" pipe 1" pipe	2ª nino	3" pipe	1° pipe	1° pipe	: L5x5x3/8"	HP 14x73	HP 14x73	HF 14X73	3" pipe 3" pipe		1 pipe 1 kvsv2/8"	LUAVAUNU	HP 14x73	HP 14x73 HP 14x73	111) A 470	HF 14X/3 9' dia pipe	5 dia pipe E dia pipe	HP 14x73	HP 14x73	HP 14x73	S' dia pipe E dia pipe	o wa pipe 5' dia pipe	HP 14x73 HD 14x73	°°''*1'.⊡⊡	PS27.5	PS27.5	anto.	u N	for complex s
RLACK & VRATCH	ORLEANS AVENU	Coating is to the le	Structure	Equipment	Plattom (East) fuel of	nen Ineloi	10 JGN	Equipment Platform (West)	inel of	fuel of	Hydrautic Pipe & Pine Rank (Each	hydraulic pip.	case drait	case drait	equip platf raci	pipe rack pik	pipe rack pik	pipe rack plik Hydraulic Pipe &	Pipe Rack (West) hydraulic pipe	a series of the	case drair case drair erruin ruatf rack	and mind discha	pipe radi	pipe raci	Fump Platform	ucesu discharge i.d.	discharge i.d.	discharge support	discharge support Pump Platform	(West)	discharge i.d.	discharge Ld.	discharge support	undaha nijipuwan	Non-Overflow Structure (East)	Non-Overflow Structure (West)	<u>Serth ClOsure</u> Monolith IN/star)	Totals	<sup>1</sup> Includes multiplier

 $^{\rm t}$  includes multiplier for complex structure and adherent mill scale  $^{\rm 2}$  includes multiplier for complex structure



G. M. Akers 6/11/2007 of			Converter thu	n bio na manana ang kanana na manana ang kanana na mang kanana na manana kanana na kanana na kanana na kanana n	thorte	110194 10190	norte		none	100% Dove	none however pipe is on canal side of	10.400 Tione	nors however pipe is on canal side of	10478 TUGTA	RGR&	nonta transmission office in our control with offi-	HUNE SAVEVES PARE IS UN LOUIS SUUE OF	lower canai none however pipe is an canal side of	lavee none	none however pipe is on canal side of levee	0070 80000		none however pile is on canal side of	BVBB Anwer ranat	and the second se	owwr canar see non-overfiow structure	none, pipe interior	100465 CBIRA	see non-overflaw structure	lower canal	see non-overflow structure neos nitys interior	normer proper interior	see non-overflow structure	flood side by 150° long coffer dam & protected side by lower canal		nood side by 150 king coffer dam & protected side by lower canel	
			Cost		\$20,462.04			\$30 AR3 04								\$952.78	\$793.98					87 CADS	5 - 47.64	\$793.98										\$3,000.00	••••••	\$3,000.00	\$50,418 \$51,000
	tet fil		Estimated Cost per CY		\$25.00			825,00								\$25.00	\$25.00					\$25.00	64-01-MG	\$25.00										\$25.00		\$25.00	say
e e	and Fychamion ( Pr		Volume (CY)		318.5			А 131 Б.								38.1	31.8					3.8		31.8										120		. 120	
Computed Date Checked Date Page			ated Soil removal / replacement Area	remove /replace 16.4'v41'v3 P.d. with 17'	\$17,150 overhead clear	202 none 202 none	\$1/5 none remove freplace	154'x41'x3.5'd with 11' \$17 150 overhead clear	\$325 none	\$62 none \$178 none		\$6,427 DODE	\$1.085 none	\$791 none	&1,443 none remove /replace	\$837 7'x7'x3.5' d remove /replace	\$1,196 7×7×3.5 d	20°208 60018	\$10,851 none \$9,289 none	\$1,019 none	\$872 none \$1.443 none	remove /replace \$837_7'x3_5' d	remove /replace	\$1,196 7'x7'x3.5' d \$3,589 none	\$1675 none	\$23,006 none	55,496 none 36,229 none	\$1,595 none	\$399 none	\$1,675 none	\$6,4%5 none	\$8,229 none \$1.595 none	× 6665	flood side french & protected side french \$19,796 each 90' x 6' x 6' d	flood side trench & mittertent side trench	\$19,796 each 90' x 6' x 6' d	\$0 215.840
ATION	stratuces are represented and	Continue acceleration	<pre>Coamp, surace tolerant epoxy 10-11 off in 2 coats, labor &amp; inst mat1 (@ 1.28 \$/ft<sup>3</sup>)<sup>2</sup> Cos</pre>		191,757	9 9 9 9 9 9 9 9 9		157 73	\$147	\$28 \$81	¢6 736	\$3,811	5491	8358	7534	6263	\$541 51 620	C70'I &	\$4,908 \$4,201	5461	\$335 \$652	\$379		\$541 \$1,623	\$758	\$10,405	50,643 50,817	1225	\$180	\$758 \$40 A05	\$3,843	\$2,817 \$721	\$180	58,954		\$8,954	C.
IS AN RESTORA 52.3121.1251	not-overflow s	Cufford Dura	SSPC-SP6, Isbor & mat1 (@1.55 \$/# <sup>3</sup> ) <sup>1</sup>		\$9,393	0 10 10 - 10 - 10 - 10 - 10 - 10 - 10 -	10 A A A	\$9.393	\$178	470A	\$R 3.77	\$4,615	\$594	4049	7210	848	\$665 *1 046	000e'i #	\$5,943 \$5,087	\$558	\$478 \$790	\$459		\$655 \$1,966	\$917	\$12,600	59,442 53,412	\$874	0173	\$917 \$12 600	\$4,653	\$3,412 \$374	\$218	\$10,842		\$10,842	80
S OF ENGINEER MERGENCY PI File No. RE STRUCTURE	sussessment t 6 feet below at		Steel Surface Y Area (ft²)		77 6060		2	77 6060	115	6 63	24 4085	24 2978	6 383	6 280	10	6 2560	5 423	11/1 <b>1</b> /1	24 3834 24 3282	6 360	6 308 31 510	6 296	1	5 423 12 1268	14 582	2 8129	3 3002 3 201	20 564	4	14 592 2 A170	3 3002	3 2201 20 564	4 145	150 6995		6995	76269
S ARMY CORPS EW ORLEANS E 1669-0310 TERIM CLOSUI	refer ine excep		eal ft r each quanti		11.17 196 30	2000 2000 2000	0.00	11,17	125.32	30.5 30.5	185.61	135.4	185.61	135.4 0.006		p.,	17 17 17	2	174.36 149.25	174.36	149.25 9.866	7	4	15	ø	143.755	46.708	4	ð	6 143 755	63.708	46.708	លា	22 286.		22 286.	
ĭĭ8⊻ŏ	elow grade or l	>	surface lin area per ft pe		7.046	0.622	100	7.046	0.916	0.344	0.916	0.916	0.344	0.344		7.046	7.046		0.916 0.916	0.344	0.344 1.867	7.046	47 4 A	7.046	7.046	28.274	15.708	7.048	0101	7.046 28.274	15.708	15.708 7.046	7.046	5. 1		њ. њ	
Owner: Stack & Vearch Project No. BLACK & Vearch This: This:	LONDON AVENUE CANAL Coating is to the lessor of 3 feet b		Material of Structure Construction	Equipment	Platform (East) HP 14x73 fund oil 3" oine	tuel of 2" pipe fusion 1" since	added a tio cana	Equipment Platform (West) HP 14x73	fuel oil 3" pipe	fuel oil 1" pipe	Hydraulic Pipe & Pipe Rack (East) 3" pipe	hydrautic pipe 3" pipe	case drain 1" pipe	case drain 1" pipe ando dat rack 1 5×5×3/9"		pipe rack pile HP 14x73	pipe reck pite HP 14x73 bibe reck pite HP 14x73	Hydraulic Pipe &	<u>ripe Rack (West)</u> 3" pipe hydraulic pipe 3" pipe	case drain 1° pipe	case grain 1° pipe equip platt rack L5x5x3/8°	pipe rack HP 14x73	miene os als sills a silves	pupe rack HP 14x73	runp Platform (East) HP 14x73	discharge i.d. 9' dia pipe	discharge i.d. 5' dia pipe	discharge support HP 14x73 discharge support HP 14v73	Pump Platform	(West) HP 14x73 discharpe Ld. 9' dia pipe	discharge i.d. 5' dia pipe	discharge I.d. 5' dia pipe discharge support HP 14x73	discharge support HP 14x73	Nor-Overtiow. Structure (East) PS27.5	Nan- <u>Overflow</u>	Structure (West) PS27.5 Sate Closure	Mornolith <u>[Nater]</u> n/a Fotals

<sup>1</sup> includes multiplier for complex structure and adherent mill scale <sup>2</sup> includes multiplier for complex structure



RLACK & VEATCH	Owner: Project: Title:		US ARMY C NEW ORLE 041669.031 INTERIM C CATHODIC	CORPS OI ANS EME 0 LOSURE PROTEC	F ENGINEI ERGENCY File No. STRUCTU	ERS PLAN RES 52.3121.1 EE MATE	TORATION 252	_	Computed Date Checked Date Page	F. (J.) Yang 6/11/2007 of
17th Street Canal						a data taka matu taka matu taka matu	- the set and the put was the total	14 MINA AND 1844 - MAN 2004 - MAN 444	really need when your man you man you	A man and man have the same the same and the same
All protected structure	in encoated ca	∠ mAvπ rbon ste	in soll and 4 el.	t mart in	water.					
			Sheet							
Ctra tota ao	Material of	Pipe	Piling Wall		Depth of	Burial	Immersion	Immersion	Required	
Endine Platform	CONSULUCION		Lengur (TT)	Quantity	puriai (π)	Area (tt.)	Depth (ft)	Area (ft')	Current (A)	
(East)	Pipe	14		99	70	16.925			34	
Engine Platform	•				•				)	
(West)	Pipe	14		66	20	16,925			34	
Pump Platform (East)	PZ 22		100.16		41	7 515	σ	1 650	55	
Pump Platform	PZ 27		212		4	19 427	ο	4 264	1 U 1 U	
Pump Platform	PZ 35		55		4	4 803	ο	1.554	) 7	
Pumo Platform	HP1473		)	C S		4000	р с		<u>t</u>	
Conduit Sunnort	HD1473			3	- •	0,117 2,04E	ກເ	3,003 200	40	
				t o	- t	0,810	ימ	202	ת	
Pump Platform				Q			ю	1130.4	S	
(Mast)	D7 77		10016		۲ ۲		¢		ć	
Dumn Diatform	D7 97		242			010'/	ה מ	1,000	77	
			717		4	13,421	5)	4,204	202	
Fump Hattorm	PZ 35		55		4	4,803	თ	1,054	14	
Platform Piles	HP14x73			80	4	22,370	ດ	4,910	64	
Conduit Support	HP14x73			Q	43	1,760			4	
Pump Bell				Q			9	1130.4	5	
Interim Closure									ł	
<u>Structure</u>	PS 27.5		1375		29	66391.88			133	
Aux End Cell	PZ 35		128		56	15267.84			31	
	Pipe	24		18	124	14,017			28	
West End Cell	PZ 40		171		56	23556.96		173	48	
	Pipe	30		14	124	13,628			27	
East End Cell	PZ 40		171		56	23556.96		173	48	

	Owner:		US ARMY C	SORPS OI	F ENGINEE	RS			Computed	F. (J.) Yang
	Project: Project No		NEW ORLE	ANS EME	ERGENCY I	PLAN RES	TORATION		Date	6/11/2007
	Title:		INTERIM C	u LOSURE	STRUCTUR	02.3121.12 3E	707		Unecked Date	
			CATHODIC	PROTEC	TION ESTI	MATE			Page	of
17th Street Canal			wan han saal ann man man han saa saa				er vole sond date and date with the g	anno varan mano anga vara mano kana vara uning ma		AN ANNO 1997 YANG AND
Cathodic protection ci	urrent density is	s 2 mA/ft <sup>2</sup>	in soil and	4 mA/ft <sup>2</sup> in	water.					
All protected structure	e is uncoated ca	arbon ste	el.							
			Sheet							
	Material of	Pipe	Piling Wall		Depth of	Burial	Immersion	Immersion	Required	
Structure	Construction	Dia (in)	Length (ft)	Quantity	Burial (ft)	Area (ft²)	Depth (ft)	Area (ft²)	Current (A)	
	Pipe	30		14	124	13,628		and and the summary law out a summary l	27	
Cofferdam	1 PZ 35		345		54	39681.9			79	
	Pipe	30		80	0 7	57,148	10	13,904	170	
	W 24x84							1,008	4	
	W21×101							721	ო	
SUM	u					409,035		41,138	983	
Reauired Current (A)	983									
	)									
Number of Anode Beds (@60 A/bed)	11									
Total Cost	\$425,000									
(@\$25,000 /bed)										

RPS OF ENGINEERS VS EMERGENCY PLAN RESTORATION File No. 52.3121.1252 SURE STRUCTURE ROTECTION ESTIMATE ROTECTION ESTIMATE Computed 6/11/2007 Date Date Page of	hA/ft² in water.	Depth of Burial Immersion Immersion Required uantity Burial (ft) Area (ft <sup>2</sup> ) Depth (ft) Area (ft <sup>2</sup> ) Current (A)	68 70 32,463 65	68 70 32.463 . 65	12 60 4,910 10 818 13	23 60 9,412 10 1,569 25 2	5 6 942 4 28 45 8,593 10 1,910 25	12 60 4.910 10 818 13	24 60 9,821 10 1,637 26	28 45 8,593 10 1,910 25		50         15900.8         32           63         58         12460.1         25	46 14628.7 4 764 32	63 50 10741.5 21 50 2334.0 5	4 50 682.0 1	50         15900.8         32           63         58         12460.1         25	46 14628.7 4 764 32	
RMY CORPS OF ENC ORLEANS EMERGE 39.0310 File I RIM CLOSURE STRL 10DIC PROTECTION	l and 4 mA/ft <sup>2</sup> in wate	Wall Dept h (ft) Quantity Buria	68 7	68	12 6	23 6	ح 28 28	12 6	24 6	28 0		91 63 63	91	в 63 8	4	91 63 5	16	
t No. 04166 INTEF	ensity is 2 mA/ft <sup>2</sup> in soi bated carbon steel. Sheet	al of Pipe Piling uction Dia (in) Lengt	(73	(73	(73	673	:73	73	(73	73		5 1( 73	5 16	5	73	5 16 73	5 16	
Owner Project Title:	Avenue Canal protection current de cted structure is unco	Materia Constr	HP14x	HP14x	ation (East) HP14x	Induit Support HP14x	Pipe Support HP14x ation (Mest)	HP14X	Induit Support HP14x	Pipe Support HP14x	<u>Slosure</u>	HP14x	Circular Cell 2 PS 27	West Arc Cell PS 27	HP14X	Circular Cell 1 PS 27	Circular Cell 2 PS 27.	

	Owner:	US ARMY (	CORPS OI		ERS	,		Computed	F. (J.) Yang
	Project:	NEW ORLI	EANS EME	ERGENCY	PLAN RES	TORATION		Date	6/11/2007
BLACK & VEATCH	Project No.	041669.03	0	File No.	52.3121.1	252		Checked	
	Title:	INTERIM C	LOSURE	STRUCTUI	ш			Date	
		CATHODIC	: PROTEC	TION ESTI	IMATE			Page	of
Orleans Avenue Ca	nal	the state what your allow made have been able the state over the two the two the state over the	the same while basis have been along while a same and a		n dang mang mang mang dina dina dina tang mang nang nang nang nang nang nang n	in in in the set of the set of the set	na oon oon maa maa laga maa jama saya gin yey		Mi yanh ang aliy tuyo ciya ulan tan tan aliy ang din s
Cathodic protection o	current density is	s 2 mA/ft <sup>2</sup> in soil and	4 mA/ft <sup>2</sup> in	water.					
All protected structur	e is uncoated ca	arbon steel.							
		Sheet							
	Material of	Pipe Piling Wall		Depth of	Burial	Immersion	Immersion	Required	
Structure	Construction	Dia (in) Length (ft)	Quantity	Burial (ft)	Area (ft²)	Depth (ft)	Area (ft²)	Current (A)	
	HP14x73		63	50	10741.5			21	1
East Arc Ce	ell PS 27.5	28		50	2331.0			5	
	HP14x73		4	50	682.0			¥m.	
Gate S	iii PZ 27	230		4	20085.9	2	690	43	
Gate guid	e		9	15			669.87	ო	
Pile Fram	e	24	18	107	24190.6			48	
		30	18			10	2826	<del>ا</del>	
		18					94	0	
SUM	I				268930.6		16353.3	603	
Reauired Current (A)	603								
Number of Anode	T T								
Beds (@60 A/bed)									
1otal Cost (@\$25.000 /bed)	\$275,000								

RLACK & VEATCH	Owner: Project: Project No. Title:	US ARMY NEW ORI 041669.03 INTERIM CATHOD	CORPS O LEANS EME 310 CLOSURE CLOSURE	F ENGINEI ERGENCY File No. STRUCTU :TION EST	ERS PLAN RES 52.3121.1 RE IMATE	TORATION 252		Computed Date Checked Date Page	F. (J.) Yang 6/11/2007 of
London Avenue Ca	mał	na anno anno 7000 2000 2000 2000 2000 2000 2000 200			- war war san war and the same same	a mark more from when have not mark the table		want want have been been here have ment	The party works made your party that work your your them
Cathodic protection	current density is	s 2 mA/ft² in soil an	d 4 mA/ft² ir	water.					
All protected structu	re is uncoated ca	arbon steel.							
		Sheet			Ĭ				
Structure	Material of Construction	Pipe Piling Wa Dia (in) Length (ft	ll Quantity	Depth of Burial (ft)	Bunal Area (ft²)	Immersion Depth (ft)	Immersion Area (ft²)	Required Current (A)	
Engine Platform									
( <u>East)</u> Engine Platform	HP14x73		68	20	32,463			65	
(West)	HP14x73		68	70	32,463			65 0	
Dumn Station (Eact)	HD14v73			en	£ 700	Ç	055	⊃ <i>4</i>	
			<u>t</u>	00	0,163	2	200	2	
Conduit Suppo	ort HP14X73		23	60	9,412	10	477	21	
Pump B	ell		9			ဖ	1130.4	ۍ	
Pipe Suppo	ort HP14x73		26	45	7,979	10	1,773	23	
Pump Station (East)	HP14x73		14	60	5,729	10	955	15	
Conduit Suppo	ort HP14x73		1 <u>0</u>	60	7,775	10	477	17	
Pump B	<b>ell</b>		9			Q	1130.4	ъ	
Pipe Suppo	ort HP14x73		28	45	8,593	10	1,910	25	
Interim Closure									
Structure	PS 27.5	164		50	13653.0			27	
	HP14x73		63	58	12460.1			25	
West Circular Cell	2 PS 27.5	164		46	12560.8	4	656	28	
	HP14x73		63	50	10741.5			21	
West Arc Ci	ell PS 27.5	28		50	2331.0			ۍ	
	HP14x73		4	50	682.0			<del></del>	
East Circular Cell	1 PS 27.5	164		50	13653.0			27	
	HP14x73		63	58	12460.1			25	
East Circular Cell	2 PS 27.5	164		46	12560.8	4	656	28	
	HP14x73		63	50	10741.5			21	

	Owner:	5	IS ARMY C	<b>ORPSOI</b>	F ENGINEE	ERS			Computed	F. (J.) Yang
đ	<b>Project</b> :	Z	<b>IEW ORLE</b>	ANS EME	ERGENCY	PLAN RES	TORATION		Date	6/11/2007
BLACK & VEATON	Project No.	0	41669.031	0	File No.	52.3121.1	252		Checked	
	Title:	<u></u>	<b>VTERIM CI</b>	OSURE	STRUCTUI	Ш М			Date	
		0	ATHODIC	PROTEC	TION ESTI	MATE			Page	of
London Avenue Car				NAL YARA SHALL NALE WAS AND WATE OVER NO		n and the same and the same the same and			NANG MENAN ANNA MENAN	an man, man man man ann ann ann man man man man
Cathorlic protection c	irrent density i	s 2 m∆/f <del>i</del> ² i	/ pue lios u	1 m / H <sup>2</sup> in	unter.					
					watel.					
All protected structur	e ís uncoated c	arbon steel	,							
		S	heet							
	Material of	Pipe P	iling Wall		Depth of	Burial	Immersion	Immersion	Required	
Structure	Construction	Dia (in) L	ength (ft)	Quantity	Burial (ft)	Area $(ft^2)$	Depth (ft)	Area (ft²)	Current (A)	
East Arc Ce	II PS 27.5		28		50	2331.0			5	
	HP14x73			4	50	682.0			<del></del>	
									0	
Gate Sill Foundatio	n PZ 27		510		41	44538.3	2	1530	95	
Gate guide	0)			12	30			2679.48	<del>,</del>	
Pile Fram	٥	24		42	100	52752.0			106	
		30		42			10	6594	26	
		18						210	<b>4</b>	
SUM						312290		21133	209	
	100									
Kequired Current (A)	607									
Number of Anode	ر د									
Beds (@60 A/bed)	4									
Total Cost	\$300 000									
(@\$25,000 /bed)	\$000°									

Computed B.P. Louque Date 6/14/2007 Checked Date	Page of
US ARMY CORPS OF ENGINEERS NEW ORLEANS EMERGENCY PLAN RESTORATION 041669.0310 File No. 52.3121.1253 INTERIM CLOSURE STRUCTURE	PROTECTIVE COATING O&M COST ESTIMATE
Owner: Project Title:	
ELACK & VEATCH	

# 17th Street Canal

# Maintenance Painting Sequence

Work         Cost           0n         Year         t           0n         Year         t           1         0         \$2.2           0         12         \$1.1           nce         16         \$1.1
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

O&M Cost and Work Intervals Calculated per SSPC-Painting Manual, Volume 1, Good Painting Practice,

Practical System Life (P) = 12 Years

Touch Up Costs = 40 % of Intitial Painting Costs

Maintenance Repaint Costs = 70 % of Initial Painting Costs

Full Repaint Costs = 135% of Initial Painting Costs

# Total Painting Costs for 60 Year Structure Life, Field Application

	Original							
Painting	Painting		Maint	F.		Maint.	Full	
Operation	Cost	Touch-Up	Repaint	Repaint	Touch-Up	Repaint	Repaint	Totals
Year	0	12	16	22	24	38	44	
Cost in								
Current	\$2.83	\$1.13	\$1.98	\$3.82	\$1.13	\$1.98	\$3.82	\$13.87
Dollars								
NFV Costs								
@ 2.5 %	\$2.83	\$1.52	\$2.94	\$6.58	\$2.05	\$5.06	\$11,32	\$29.47
Inflation								
NPV Costs								
%6 <b>@</b>	\$2.83	\$0.54	\$0.74	\$0.99	\$0.26	\$0.19	\$0.26	\$2.98
Interest								

# Total Surface Area Requiring Painting

Estimated 112339 ft2 Surface Area

O&M Net Present Value

ent \$334,261 NPV Costs @ 9% Internest Times Surface Area

Computed B.P. Louque Date 6/14/2007 Chacked Date Date of Page of	;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
US ARMY CORPS OF ENGINEERS NEW ORLEANS EMERGENCY PLAN RESTORATION 041669.0310 File No. 52.3121.1253 INTERIM CLOSURE STRUCTURE PROTECTIVE COATING O&M COST ESTIMATE	ᆣᅮᆣᆤᆤᆤᆤᆤᆤᆤᅸᆊᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸᅸ
Owner: Project: Title:	
elack a veator	

# Orleans Avenue

# Maintenance Painting Sequence

O&M Cost and Work Intervals Calculated per SSPC-Painting Manual, Volume 1, Good Painting Practice.

Practical System Life (P) = 12 Years

Touch Up Costs = 40 % of Intitial Painting Costs

Maintenance Repaint Costs = 70 % of Initial Painting Costs

Full Repaint Costs = 135% of Initial Painting Costs

# Total Painting Costs for 50 Year Structure Life, Field Application

		have been a second s	Contraction of the second s			and the second se		
	Original							
Painting	Painting		Maint	Ful		Maint.	Full	
Operation	Cost	Touch-Up	Repaint	Repaint	Touch-Up	Repaint	Repaint	Totals
Year	0	12	16	22	24	38	44	
Cost in								21020000000000000000000000000000000000
Current	\$2.83	\$1.13	\$1.98	\$3.82	\$1.13	\$1.98	\$3.82	\$13.87
Dollars								
NFV Costs								
@ 2.5 %	\$2.83	\$1.52	\$2.94	\$6.58	\$2.05	\$5.06	\$11.32	\$29.47
Inflation								
NPV Costs								
%6 @	\$2.83	\$0.54	\$0.74	\$0.99	\$0.26	\$0.19	\$0.26	\$2.98
interest							-	

# **Total Surface Area Requiring Painting**

Estimated 75012 ft2 Surface Area

O&M Net Present Value

ent \$223,196 NPV Costs @ 9% Internest Times Surface Area

	Owner:	US ARMY CORPS OF ENGINEERS	Computed	B.P. Louque
The Advert	Project:	NEW ORLEANS EMERGENCY PLAN RESTORATION	Date	6/14/2007
17. S.	Project No.	041669.0310 File No. 52.3121.1253	Checked	
BLACK & VEATCH	Title:	INTERIM CLOSURE STRUCTURE	Date	
		PROTECTIVE COATING 08M COST ESTIMATE	Page	, jo

# London Avenue

# Maintenance Painting Sequence

Painting Operation	Work Occurs in Year	Cost per ft2
Initial Painting	0	\$2.83
Touch-Up	12	\$1.13
Maintenance Repaint	16	\$1.98
Full Repaint	52	\$3.82

O&M Cost and Work Intervals Calculated per SSPC-Painting Manual, Volume 1, Good Painting Practice.

Practical System Life (P) = 12 Years

Touch Up Costs = 40 % of Intitial Painting Costs

Maintenance Repaint Costs = 70 % of Initial Painting Costs

Full Repaint Costs = 135% of Initial Painting Costs

# Total Painting Costs for 50 Year Structure Life, Field Application

	The second secon								*
Painting	Painting		Maint	Full		Maint.	Full		
Operation	Cost	Touch-Up	Repaint	Repaint	Touch-Up	Repaint	Repaint	Totals	
Year	0	12	16	22	24	38	44		
Cost in									-
Current	\$2.83	\$1.13	\$1.98	\$3.82	\$1.13	\$1,98	\$3.82	\$13.87	
Dollars						,			
NFV Costs									
@ 2.5 %	\$2.83	\$1.52	\$2.94	\$6.58	\$2.05	\$5.06	\$11.32	\$29.47	·
Inflation							_		
NPV Costs									
%6 @	\$2.83	\$0.54	\$0.74	\$0.99	\$0.26	\$0.19	\$0.26	\$2.98	
Interest									

# **Total Surface Area Requiring Painting**

Estimated 75269 ft2 Surface Area

O&M Net Present Value

It \$226,936 NPV Costs @ 9% Internest Times Surface Area

# Life Cycle Costs

## Life Cycle Cost (LCC) Detail New Orleans 17th Street, London & Orleans Canals

INPUT DATA	A	IIF= 0.98					
	Study Period, yrs	50					
	Lifecycle cost analysis formula per ETL-1110-2-361	PV=C*(IIF)^n					
	Total Flow	26,250	CFS				
					 _	 -	

				17th St.	London Ave	Orleans Ave.	Total
Pumping Units				37	26	12	75
Pumping Station Capacity (CFS)				12,950	9,100	4,200	26,250
INITIAL CAPITAL COSTS							
Item Description				\$	\$	\$	\$
Pump Station Construction	1	LS	-	\$181,228,079	\$125,502,194	\$83,503,428	\$390,233,701
Maintenance Building Construction	1	LS	\$41,556,365	\$20,501,140	\$14,406,207	\$6,649,018	\$41,556,365
50 YR LCC OPERATING			Unit Labor	PV \$	PV \$	PV \$	PV \$
Item Description	Qty	Unit	Cost (\$/unit)	Cost	Cost	Cost	Cost
Operations and Maintenance Chief (Prorated to each pump station)	1	EA	\$2,544,204	\$1,255,141	\$881,991	\$407,073	\$2,544,204
Electrical Foreman (Prorated to each pump station)	1	EA	\$2,149,275	\$1,060,309	\$745,082	\$343,884	\$2,149,275
Mechanical Foreman (Prorated to each pump station)	1	EA	\$2,250,624	\$1,110,308	\$780,216	\$360,100	\$2,250,624
Pump Station Operator (One per pump station)	3	EA	\$1,913,021	\$1,913,021	\$1,913,021	\$1,913,021	\$5,739,064
Electrical Trade Laborer (One per pump station)	3	EA	\$1,557,784	\$1,557,784	\$1,557,784	\$1,557,784	\$4,673,353
Mechanical Trade Laborer (One per pump station)	3	EA	\$1,868,936	\$1,868,936	\$1,868,936	\$1,868,936	\$5,606,808
50 YR LCC MAINTENANCE							
Item Description	Qtv	Unit	Unit Cost				
			(\$/unit)				
Level I and Level II Engine PM Subtotals	1	EA	\$98,071	\$3,628,626	\$2,549,845	\$1,176,852	\$7,355,323
Engine 25 Year Overhaul Subtotals	1	EA	\$33,191	\$1,228,051	\$862,955	\$398,287	\$2,489,292
Drive-Pump 25 Year Overhaul Subtotals	1	EA	\$205,178	\$7,591,586	\$5,334,628	\$2,462,136	\$15,388,351
Cathodic Protection System Energy	1	EA	-	\$632,897	\$630,229	\$515,284	\$1,778,410
Cathodic Protection System Inspection	1	LS	\$140,201	\$140,201	\$140,201	\$140,201	\$420,602
Cathodic Protection System Replace Anodes (Once @ 25 yr)	1	LS	-	\$256,473	\$181,039	\$165,953	\$603,465
Coatings and Finishes	1	LS	-	\$702,918	\$491,114	\$495,289	\$1,689,321
SUB TOTAL LIFE CYCLE COSTS				\$224,675,470	\$157,845,443	\$101,957,245	\$484,478,158
Historical Operatioins and Maintenance Costs from Sewer & Water Board	1	000 CFS	\$500,000	\$6,475,000	\$4,550,000	\$2,100,000	\$13,125,000

\$231,150,470 \$162,395,443 \$104,057,245 \$497,603,158

## O&M Cost Detail New Orleans 17th Street, Orleans & London Canals

INPUT DATA Study Period, yrs Lifecycle cost analysis formula per ETL-1110-2-361 PV=C\*(IIF)n 50 IIF= 0.98

## OPERATION COSTS

Item Description	Qty	Unit	Unit Labor Cost	Total Labor Cost	Unit Equipment Cost	Total Equipment Cost	Unit Material Cost	То	otal Material Cost	Total Cost ( C )	Notes
			(\$/unit)	(\$/unit)	(\$/unit)	(\$/unit)	(\$/unit)		(\$/unit)	(\$)	
Operators											
Operation & Maintenance Chief	1	ea	\$81,661	\$81,661	\$0	:	50	\$0	\$0		\$81,661 SAC Yearly Salary w/Benefits
Canal Operator	1	ea	\$61,402	\$61,402	\$0	:	50	\$0	\$0		\$61,402 SAC Yearly Salary w/Benefits
Maintenance Staff											
Operation & Maintenance Chief	0	ea	\$81,661	\$0	\$0	:	50	\$0	\$0		\$0 SAC Priced above
Electrical Foreman	1	ea	\$68,985	\$68,985	\$0	:	50	\$0	\$0		\$68,985 SAC Yearly Salary w/Benefits
Mechanical Foreman	1	ea	\$72,238	\$72,238	\$0	:	50	\$0	\$0		\$72,238 SAC Yearly Salary w/Benefits
Electrical Trade Laborers	1	ea	\$50,000	\$50,000	\$0	:	50	\$0	\$0		\$50,000 SAC Yearly Salary w/Benefits
Mechanical Trade Laborers	1	ea	\$59,987	\$59,987	\$0	:	50	\$0	\$0		\$59,987 SAC Yearly Salary w/Benefits
	Total			\$394,273		:	50		\$0		\$394,273
Operation and Maintenance Labor Costs											Ratio CFS per site

Operation and Maintenance Labor Costs

# 50 Year Present Value Calculations for Salaries

Period (n)	Operation & Maintenance Chief	Electrical Foreman	Mechanical Foreman	Canal Operator	Electrical Trade Laborers	Mechanical Trade Laborers
1	\$80,028	\$67,605	\$70,793	\$60,174	\$49,000	\$58,787
2	\$78,427	\$66,253	\$69,377	\$58,970	\$48,020	\$57,612
3	\$76,859	\$64,928	\$67,990	\$57,791	\$47,060	\$56,459
4	\$75,322	\$63,630	\$66,630	\$56,635	\$46,118	\$55,330
5	\$73,815	\$62,357	\$65,297	\$55,503	\$45,196	\$54,223
6	\$72,339	\$61,110	\$63,991	\$54,392	\$44,292	\$53,139
7	\$70,892	\$59,888	\$62,712	\$53,305	\$43,406	\$52,076
8	\$69,474	\$58,690	\$61,457	\$52,239	\$42,538	\$51,035
9	\$68,085	\$57,516	\$60,228	\$51,194	\$41,687	\$50,014
10	\$66,723	\$56,366	\$59,024	\$50,170	\$40,854	\$49,014
11	\$65,389	\$55,238	\$57,843	\$49,167	\$40,037	\$48,033
12	\$64,081	\$54,134	\$56,686	\$48,183	\$39,236	\$47,073
13	\$62,799	\$53,051	\$55,553	\$47,220	\$38,451	\$46,131
14	\$61,543	\$51,990	\$54,442	\$46,275	\$37,682	\$45,209
15	\$60,312	\$50,950	\$53,353	\$45,350	\$36,928	\$44,305
16	\$59,106	\$49,931	\$52,286	\$44,443	\$36,190	\$43,418
17	\$57,924	\$48,933	\$51,240	\$43,554	\$35,466	\$42,550
18	\$56,765	\$47,954	\$50,215	\$42,683	\$34,757	\$41,699
19	\$55,630	\$46,995	\$49,211	\$41,829	\$34,062	\$40,865
20	\$54.518	\$46.055	\$48.227	\$40,992	\$33.380	\$40.048
21	\$53,427	\$45,134	\$47,262	\$40,173	\$32,713	\$39,247
22	\$52.359	\$44.231	\$46.317	\$39,369	\$32.059	\$38,462
23	\$51,311	\$43.347	\$45.391	\$38,582	\$31,417	\$37.693
24	\$50,285	\$42,480	\$44,483	\$37,810	\$30,789	\$36,939
25	\$49.280	\$41.630	\$43,593	\$37.054	\$30,173	\$36,200
26	\$48,294	\$40,797	\$42,721	\$36,313	\$29,570	\$35.476
27	\$47.328	\$39,981	\$41.867	\$35.587	\$28,978	\$34.767
28	\$46.382	\$39,182	\$41,029	\$34,875	\$28,399	\$34.071
29	\$45.454	\$38,398	\$40.209	\$34,177	\$27.831	\$33.390
30	\$44.545	\$37,630	\$39,405	\$33,494	\$27,274	\$32,722
31	\$43.654	\$36.878	\$38,617	\$32,824	\$26,729	\$32.068
32	\$42 781	\$36 140	\$37 844	\$32 167	\$26 194	\$31.426
33	\$41,925	\$35,417	\$37.087	\$31,524	\$25,670	\$30,798
34	\$41,087	\$34,709	\$36,346	\$30,894	\$25,157	\$30,182
35	\$40,265	\$34.015	\$35,619	\$30,276	\$24,654	\$29 578
36	\$39.460	\$33,334	\$34 906	\$29,670	\$24 161	\$28,987
37	\$38,670	\$32,668	\$34,208	\$29,077	\$23,677	\$28,407
38	\$37,897	\$32.014	\$33 524	\$28,495	\$23,204	\$27,839
39	\$37 139	\$31 374	\$32 854	\$27,925	\$22 740	\$27,282
40	\$36,396	\$30 747	\$32,197	\$27,367	\$22,285	\$26,736
11	\$35,668	\$30,132	\$31 553	\$26,820	\$21,839	\$26,202
42	\$34,055	\$20,520	\$30 922	\$26,020	\$21,000	\$25,677
13	\$34,256	\$28,025	\$30,303	\$25,255	\$20.974	\$25,617
-5	\$22 571	\$29,350	\$20,607	\$25,750	\$20,574	\$24,661
44	\$33,371	\$20,300	\$25,057	\$23,242	\$20,555	\$24,001
45	\$32,099	\$27,793 \$27,227	\$29,103	\$24,730	\$20,144	\$24,107
40	\$32,241	\$27,237	\$20,521	\$24,243	\$19,741	\$23,004
47	əə 1,597 1,597	⇒∠0,692	⊋∠7,951 ¢27,951	ə∠3,/58 €22.292	\$ 19,340 \$19,050	\$23,210 \$22,746
48	\$30,965 \$20,245	\$∠5,158 \$25,625	\$27,392	\$23,283	\$18,959	\$22,746
49	\$30,345 \$00,700	\$∠5,635	\$26,844	\$22,817	\$18,580	\$22,291
50	\$29,738	\$25,122	\$26,307	\$22,361	\$18,208	\$21,845
Total	\$2,544,204	\$2,149,275	\$2,250,624	\$1,913,021	\$1,557,784	\$1,868,936

7/20/2007

			Unit Labor	Total Labor	Unit Equipment	Total Equipment	Unit Material	I otal Material	Present value	
Item Description	Qty	Unit	Cost	Cost	Cost	Cost	Cost	Cost	Cost	
Maintenance Tasks	Per	Engine								
Pump Rebuild		1 EA								
Pump Rebuild Task Total		Rebuild cost 20	1% of new pump or	ost of \$17,000,000			\$340,000.00	\$340,000	\$205,178	
Engine Complete Overhaul Level I & Level II Engine Maintenance		1 LS				950+2300=	\$3,250.00	\$3,250.00		Louisiana Machinery Quotations Aerual Level I Impectors: 5920 (at 6 months)
Engine Complete Overhaul Task Total							\$55.000.00	\$55.000	\$33,191	Annual Level II PM: \$2300 (at 12 months) - Does not include a load bank test which is recommended - If you include that you can add approximately \$3200
										Top End Overhaul: \$22,000 - \$28,000 - 8,000 to 10,000 hours

Major Overhaul: \$49,000 - \$55,000 - 16,000 to 20,000 hours

### 50 Year Present Value Calculations for Corrosion Protection

### Canal Square Footage for Coatings Cathodic Protection Power

	CP Power 17th CP	Power C	P Power orleans CP Po	ower CF	Power london	CP Power	CP Inspec	CP Inspect	17th st CP Replace	orleans	CP Replace	london	CP Replace Coatings and Finishes 17th	112339		Coatings and Finishes Orleans	75012	0	oatings and Finishes London	76269	Level 18	II Engine Inspecti	on
Period (n)	Durrent Value	0	urrent Value	CL	irrent Value		Current Value																
1	\$20,314.00	\$19,907.72	\$16,539.00	\$16,208.22	\$17,592.00	\$17,240.16	\$4,500.00	\$4,410.00	\$0.00	\$0.00		\$0.00		\$0.00 0	\$0.00	\$0.00	0	\$0.00	\$0.00	0	\$0.00		
2	\$20,314.00	\$19,509.57	\$16,539.00	\$15,884.06	\$20,314.00	\$19,509.57	\$4,500.00	\$4,321.80	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$3,121.30
3	\$20,314.00	\$19,119.37	\$16,539.00	\$15,566.37	\$20,314.00	\$19,119.37	\$4,500.00	\$4,235.36	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$3,058.87
4	\$20,314.00	\$18,736.99	\$16,539.00	\$15,255.05	\$20,314.00	\$18,736.99	\$4,500.00	\$4,150.66	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$2,997.70
5	\$20,314.00	\$18,362.25	\$16,539.00	\$14,949.95	\$20,314.00	\$18,362.25	\$4,500.00	\$4,067.64	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$2,937.74
6	\$20,314.00	\$17,995.00	\$16,539.00	\$14,650.95	\$20,314.00	\$17,995.00	\$4,500.00	\$3,986.29	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$2,878.99
7	\$20,314.00	\$17,635.10	\$16,539.00	\$14,357.93	\$20,314.00	\$17,635.10	\$4,500.00	\$3,906.56	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$2,821.41
8	\$20,314.00	\$17,282.40	\$16,539.00	\$14,070.77	\$20,314.00	\$17,282.40	\$4,500.00	\$3,828.43	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$2,764.98
9	\$20,314.00	\$16,936.75	\$16,539.00	\$13,789.35	\$20,314.00	\$16,936.75	\$4,500.00	\$3,751.86	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$2,709.68
10	\$20,314.00	\$16,598.02	\$16,539.00	\$13,513.57	\$20,314.00	\$16,598.02	\$4,500.00	\$3,676.83	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$2,655.49
11	\$20,314.00	\$16,266.06	\$16,539.00	\$13,243.30	\$20,314.00	\$16,266.06	\$4,500.00	\$3,603.29	50.00	\$0.00		\$0.00		\$0.00	****	50.00	04703.00	*** *** **	\$0.00			\$3,250.00	\$2,602.38
12	\$20,314.00	\$15,940.74	\$16,539.00	\$12,978.45	\$20,514.00	\$15,540.74	\$4,500.00	\$3,551.25	50.00	\$0.00		\$0.00		\$1.13 120343.07	\$33,614.33	\$1.13	04/03.00	\$00,515.36	\$1.13 00	103.97 \$0	,630.00	\$3,250.00	\$2,550.33
13	\$20,314.00	\$15,621.92	\$16,539.00	\$12,710.00	\$20,514.00	\$15,621.92	\$4,500.00	\$3,460.60	50.00	\$0.00		\$0.00		\$0.00		50.00			30.00			\$3,250.00	52,499.32
15	\$20,314.00	\$15,303,46	\$16,539.00	\$12,404.40	\$20,314.00	\$15,303.46	\$4,500.00	\$3,391.39	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$2,449.34
16	\$20,214.00	\$14 702 22	\$16,533.00	\$11 070 99	\$20,214.00	\$14 702 22	\$4,500.00	\$2,257.00	\$0.00	\$0.00		\$0.00		\$1.00 222421.22	\$160.005.21	\$1.09	14952276	\$107 501 16	\$1.02.151	012.62 \$10	202 50	\$2,250.00	\$2,252.24
17	\$20,214.00	\$14,100.10	\$16,533.00	\$11,370.03	\$20,214.00	\$14,100.15	\$4,500.00	\$2 101 05	\$0.00	\$0.00		\$0.00		\$0.00	\$100,333.21	\$0.00	140323.10	\$107,501.10	\$0.00	012.02 <b>910</b>	,	\$2,250.00	\$2,205,20
18	\$20,314.00	\$14,120,98	\$16,539.00	\$11,496,84	\$20,314.00	\$14,120.98	\$4,500.00	\$3,128,11	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$2 259 19
19	\$20,314,00	\$13,838,56	\$16,539,00	\$11 266 91	\$20 314 00	\$13,838,56	\$4,500.00	\$3,065,55	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250,00	\$2 214 01
20	\$20,314,00	\$13 561 79	\$16,539,00	\$11.041.57	\$20 314 00	\$13 561 79	\$4,500.00	\$3,004,24	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250,00	\$2 169 73
21	\$20.314.00	\$13,290,55	\$16,539.00	\$10,820,74	\$20.314.00	\$13,290,55	\$4,500.00	\$2,944,15	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$2,126,33
22	\$20.314.00	\$13,024,74	\$16,539.00	\$10,604,32	\$20.314.00	\$13,024,74	\$4,500.00	\$2,885.27	\$0.00	\$0.00		\$0.00		\$3.82 429134.98	\$275,148,77	\$3.82	286545.84	\$183,724,80	\$3.82 291	347.58 \$18	5.803.53	\$3,250.00	\$2,083,80
23	\$20,314.00	\$12,764.25	\$16,539.00	\$10,392.24	\$20,314.00	\$12,764.25	\$4,500.00	\$2,827.56	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$2,042.13
24	\$20,314.00	\$12,508.96	\$16,539.00	\$10,184.39	\$20,314.00	\$12,508.96	\$4,500.00	\$2,771.01	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$2,001.29
25	\$20,314.00	\$12,258.78	\$16,539.00	\$9,980.70	\$20,314.00	\$12,258.78	\$4,500.00	\$2,715.59	\$425,000.00 \$256,472.51 \$	275,000.00	\$165,952.80 \$30	00.000,00	\$181,039.42	\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,961.26
26	\$20,314.00	\$12,013.61	\$16,539.00	\$9,781.09	\$20,314.00	\$12,013.61	\$4,500.00	\$2,661.28	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,922.04
27	\$20,314.00	\$11,773.33	\$16,539.00	\$9,585.47	\$20,314.00	\$11,773.33	\$4,500.00	\$2,608.05	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,883.59
28	\$20,314.00	\$11,537.87	\$16,539.00	\$9,393.76	\$20,314.00	\$11,537.87	\$4,500.00	\$2,555.89	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,845.92
29	\$20,314.00	\$11,307.11	\$16,539.00	\$9,205.88	\$20,314.00	\$11,307.11	\$4,500.00	\$2,504.77	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,809.00
30	\$20,314.00	\$11,080.97	\$16,539.00	\$9,021.77	\$20,314.00	\$11,080.97	\$4,500.00	\$2,454.68	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,772.82
31	\$20,314.00	\$10,859.35	\$16,539.00	\$8,841.33	\$20,314.00	\$10,859.35	\$4,500.00	\$2,405.59	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,737.37
32	\$20,314.00	\$10,642.16	\$16,539.00	\$8,664.50	\$20,314.00	\$10,642.16	\$4,500.00	\$2,357.47	50.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,702.62
33	\$20,314.00	\$10,429.32	\$16,539.00	\$0,491.21	\$20,514.00	\$10,429.32	\$4,500.00	\$2,310.32	50.00	\$0.00		\$0.00		\$0.00	f co oco oo	50.00	04700.00	£ 40 C 47 74	50.00			\$3,250.00	\$1,000.07
34	\$20,314.00	\$10,220.73	\$16,539.00	\$0,321.39	\$20,314.00	\$10,220.73	\$4,500.00	\$2,204.12	\$0.00	\$0.00		\$0.00		\$0.00	\$63,669.60	\$1.13	04/03.00	342,047.71	\$1.13 00	103.97 \$4	5,362.36	\$3,250.00	\$1,635.20
36	\$20,214.00	\$9,915,99	\$16,533.00	\$7 001 95	\$20,214.00	\$0.915.00	\$4,500.00	\$2,174.46	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$2,250.00	\$1,502.45
37	\$20,314.00	\$9,619,67	\$16,539.00	\$7,832.02	\$20,314.00	\$9,619,67	\$4,500.00	\$2 130 97	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1 539 03
38	\$20,314,00	\$9,427,28	\$16,539,00	\$7 675 38	\$20 314 00	\$9 427 28	\$4,500.00	\$2 088 35	\$0.00	\$0.00		\$0.00		\$1.98 222431.22	\$103 225 41	\$198	148523.76	\$68 926 59	\$1.98.151	012.62 \$7	0.081.62	\$3,250,00	\$1 508 25
39	\$20,314,00	\$9 238 73	\$16,539,00	\$7 521 88	\$20 314 00	\$9 238 73	\$4,500.00	\$2,046,58	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250,00	\$1,478,09
40	\$20.314.00	\$9.053.96	\$16,539.00	\$7,371,44	\$20.314.00	\$9,053,96	\$4,500.00	\$2,005.65	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,448.53
41	\$20.314.00	\$8.872.88	\$16,539.00	\$7,224,01	\$20.314.00	\$8,872,88	\$4,500.00	\$1,965.54	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,419,56
42	\$20.314.00	\$8,695,42	\$16,539.00	\$7,079,53	\$20.314.00	\$8,695,42	\$4,500.00	\$1,926,23	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,391,16
43	\$20,314.00	\$8,521.51	\$16,539.00	\$6,937.94	\$20,314.00	\$8,521.51	\$4,500.00	\$1,887.70	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,363.34
44	\$20,314.00	\$8,351.08	\$16,539.00	\$6,799.18	\$20,314.00	\$8,351.08	\$4,500.00	\$1,849.95	\$0.00	\$0.00		\$0.00		\$3.82 156.62	\$64.39	\$3.82	63178.98	\$25,972.87	\$3.82 338	94.397 \$1	3,933.98	\$3,250.00	\$1,336.07
45	\$20,314.00	\$8,184.06	\$16,539.00	\$6,663.20	\$20,314.00	\$8,184.06	\$4,500.00	\$1,812.95	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,309.35
46	\$20,314.00	\$8,020.38	\$16,539.00	\$6,529.93	\$20,314.00	\$8,020.38	\$4,500.00	\$1,776.69	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,283.17
47	\$20,314.00	\$7,859.97	\$16,539.00	\$6,399.33	\$20,314.00	\$7,859.97	\$4,500.00	\$1,741.16	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,257.50
48	\$20,314.00	\$7,702.77	\$16,539.00	\$6,271.35	\$20,314.00	\$7,702.77	\$4,500.00	\$1,706.33	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,232.35
49	\$20,314.00	\$7,548.72	\$16,539.00	\$6,145.92	\$20,314.00	\$7,548.72	\$4,500.00	\$1,672.21	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,207.71
50	\$20,314.00	\$7,397.74	\$16,539.00	\$6,023.00	\$20,314.00	\$7,397.74	\$4,500.00	\$1,638.76	\$0.00	\$0.00		\$0.00		\$0.00		\$0.00			\$0.00			\$3,250.00	\$1,183.55
	10120	\$632,897 Ti	otai	\$615,284 To	ca:	\$630,229		\$140,200.59	\$256,472.51		\$165,952.80		\$181,039.42		\$702,917.93			\$495,288.52		5	491,114		\$98,071

7/20/2003

ELACK & VEATCH	Owner: Project: Project No. Title:	US ARMY C NEW ORLEA 041669.0310 INTERIM CL CATHODIC	ORPS OF ENO ANS EMERGEI ) OSURE STRU PROTECTION	3INEERS NCY PLAN RE File No. ICTURE O AND M EST	STORATION 52.3121.1253 FIMATE	Computed Date Checked Date Page	G.M. Akers 6/14/2007 of
17th Street Canal			=========				
	ENERGY						
Cathodic protection	current provid	led at 30 V thr	ough 80% effic	ient rectifiers.			
Energy Cost based	on Entergy Ne	ew Orleans Ind	c. schedule MN	IR-17			
Future value levels b	based on 2.5%	6 inflation and	9% interest rat	tes.			
Required Current	983	from F. (J.) Y	ang estimate				
Assumed Voltage (V)	30						
Power (kW)	29.49						
Rectifier Power	36.86						
Rectifier Annual Power (kWh)	322,916	26,910	kWh per month				
Annual Energy Cost							
Per Schedule	MMNR-17						
Demand Charge	\$10,548						
Energy Charge	\$9,765	_					
Total	\$20,313.20	3					
	Current Cost	t					
Annual CP Energy Cost	\$20,314						

# **CP MONITORING**

Cathodic protection monitoring consists of bi-monthly cp site inspections and an annual cp current survey.

	Current Cost
Annual CP	¢4 500
Monitoring Cost	<b>Φ</b> 4,500

CP REPLACEMENT Cathodic protection deep well anode beds required replacement in 25 years.

-	
	Current Cost (Capitol)
CP Replacemnt Cost	\$425,000

BLACK & VEATCH	Owner: Project: Project No. Title:	US ARMY C NEW ORLEA 041669.0310 INTERIM CL CATHODIC	ORPS OF ENO ANS EMERGEI ) OSURE STRU PROTECTION	3INEERS NCY PLAN RE File No. ICTURE O AND M EST	STORATION 52.3121.1253 IMATE	Computed Date Checked Date Page	G.M. Akers 6/14/2007 of
Orleans Avenue Ca	anal						
	ENERGY						
Cathodic protection	current provid	led at 30 V thr	ough 80% effic	ient rectifiers.			
Energy Cost based	on Entergy Ne	ew Orleans Inc	c. schedule MN	IR-17			
Future value levels l	based on 2.5%	6 inflation and	9% interest rat	tes.			
Required Current	603	from F. (J.) Y	ang estimate				
Assumed Voltage (V)	30						
Power (kW)	18.09						
Rectifier Power	22.61						
Rectifier Annual Power (kWh)	198,086	16,507	kWh per month				
Annual Energy Cost	:						
Per Schedule	MMNR-17						
Demand Charge	\$10,548						
Energy Charge	\$5,990						
Total	\$16,538.35	_					
	Current Cos	t					
Annual CP Energy Cost	\$16,539						

# **CP MONITORING**

Cathodic protection monitoring consists of bi-monthly cp site inspections and an annual cp current survey.

	Current Cost
Annual CP	¢4 500
Monitoring Cost	<b>Φ</b> 4,500

CP REPLACEMENT Cathodic protection deep well anode beds required replacement in 25 years.

	Current Cost (Capitol)
CP Replacemnt Cost	\$275,000

_	Owner:	US ARMY C	ORPS OF EN	GINEERS		Computed	G.M. Akers
₽.	Project:	NEW ORLE/	ANS EMERGE		ESTORATION	Date	6/14/2007
BLACK & VEATCH	Project No.	041669.0310	)	File No.	52.3121.1253	Checked	
	Title:	INTERIM CL	OSURE STR	UCTURE		Date	
		CATHODIC		N O AND M ES	STIMATE 	Page	of 
London Avenue Ca	anal						
	ENERGY						
Cathodic protection	current provid	led at 30 V thr	ough 80% effi	icient rectifiers			
Energy Cost based	on Entergy Ne	ew Orleans Ind	c. schedule M	NR-17			
Future value levels	based on 2.5%	6 inflation and	9% interest ra	ates.			
Required Current	709	from F. (J.) ነ	'ang estimate				
Assumed Voltage (V)	30						
Power (kW)	21.27						
Rectifier Power	26.59						
Rectifier Annual Power (kWh)	232,907	19,409	kWh per month				
Annual Energy Cost	t						
Per Schedule	MMNR-17						
Demand Charge	\$10,548						
Energy Charge	\$7,043						
Total	\$17,591.33	_					
	Current Cos	t					
Annual CP Energy Cost	\$17,592						

CP MONITORING Cathodic protection monitoring consists of bi-monthly cp site inspections and an annual cp current survey.

	Current Cost
Annual CP	¢4 500
Monitoring Cost	φ4,500

CP REPLACEMENT

Cathodic protection deep well anode beds required replacement in 25 years.

	Current Cost (Capitol)
CP Replacemnt Cost	\$300,000

	Owner:	US ARMY CORPS (	OF ENGIN	EERS	Computed	B.P. Louque
	Project:	NEW ORLEANS EMERGENCY PLAN RESTORATION				6/14/2007
₽.	Project No.	041669.0310	File No.	52.3121.1253	Checked	
BLACK & VEATCH	Title:	INTERIM CLOSURE	E STRUCT	URE	Date	
		PROTECTIVE COA	TING O&N	I COST ESTIMATE	Page	of

## 17th Street Canal

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# Maintenance Painting Sequence

Painting Operation	Work Occurs in Year	Cost per ft2
Initial Painting	0	\$2.83
Touch-Up	12	\$1.13
Maintenanc e Repaint	16	\$1.98
Full Repaint	22	\$3.82

O&M Cost and Work Intervals Calculated per SSPC-Painting Manual, Volume 1, Good Painting Practice. Practical System Life (P) = 12 Years Touch Up Costs = 40 % of Initial Painting Costs Maintenance Repaint Costs = 70 % of Initial Painting Costs

Full Repaint Costs = 135% of Initial Painting Costs

# Total Painting Costs for 50 Year Structure Life, Field Application

	Original							
Painting	Painting		Maint	Full	Touch-	Maint.	Full	
Operation	Cost	Touch-Up	Repaint	Repaint	Up	Repaint	Repaint	Totals
Year	0	12	16	22	34	38	44	
Cost in								
Current	\$2.83	\$1.13	\$1.98	\$3.82	\$1.13	\$1.98	\$3.82	\$13.87
Dollars								

# **Total Surface Area Requiring Painting**

Estimated Surface 112339 ft2 Area

	Owner:	US ARMY CORPS (	OF ENGIN	EERS	Computed	B.P. Louque
	Project:	NEW ORLEANS EM	Date	6/14/2007		
₽.	Project No.	041669.0310	File No.	52.3121.1253	Checked	
BLACK & VEATCH	Title:	INTERIM CLOSURE	E STRUCT	URE	Date	
		PROTECTIVE COA	TING O&N	I COST ESTIMATE	Page	of

## **Orleans Avenue**

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Maintenance Painting Sequence

Painting Operation	Work Occurs in Year	Cost per ft2
Initial Painting	0	\$2.83
Touch-Up	12	\$1.13
Maintenanc e Repaint	16	\$1.98
Full Repaint	22	\$3.82

O&M Cost and Work Intervals Calculated per SSPC-Painting Manual, Volume 1, Good Painting Practice. Practical System Life (P) = 12 Years Touch Up Costs = 40 % of Initial Painting Costs Maintenance Repaint Costs = 70 % of Initial Painting Costs

Full Repaint Costs = 135% of Initial Painting Costs

# Total Painting Costs for 50 Year Structure Life, Field Application

	Original							
Painting	Painting		Maint	Full	Touch-	Maint.	Full	
Operation	Cost	Touch-Up	Repaint	Repaint	Up	Repaint	Repaint	Totals
Year	0	12	16	22	34	38	44	
Cost in								
Current	\$2.83	\$1.13	\$1.98	\$3.82	\$1.13	\$1.98	\$3.82	\$13.87
Dollars								

# **Total Surface Area Requiring Painting**

Estimated Surface 75012 ft2 Area

	Owner:	US ARMY CORPS (	OF ENGIN	EERS	Computed	B.P. Louque
	Project:	NEW ORLEANS EM	Date	6/14/2007		
₽.	Project No.	041669.0310	File No.	52.3121.1253	Checked	
BLACK & VEATCH	Title:	INTERIM CLOSURE	E STRUCT	URE	Date	
		PROTECTIVE COA	TING O&N	I COST ESTIMATE	Page	of

## London Avenue

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Maintenance Painting Sequence

Painting Operation	Work Occurs in Year	Cost per ft2
Initial Painting	0	\$2.83
Touch-Up	12	\$1.13
Maintenanc e Repaint	16	\$1.98
Full Repaint	22	\$3.82

O&M Cost and Work Intervals Calculated per SSPC-Painting Manual, Volume 1, Good Painting Practice. Practical System Life (P) = 12 Years Touch Up Costs = 40 % of Initial Painting Costs Maintenance Repaint Costs = 70 % of Initial Painting Costs

Full Repaint Costs = 135% of Initial Painting Costs

# Total Painting Costs for 50 Year Structure Life, Field Application

	Original							
Painting	Painting		Maint	Full	Touch-	Maint.	Full	
Operation	Cost	Touch-Up	Repaint	Repaint	Up	Repaint	Repaint	Totals
Year	0	12	16	22	34	38	44	
Cost in								
Current	\$2.83	\$1.13	\$1.98	\$3.82	\$1.13	\$1.98	\$3.82	\$13.87
Dollars								

# **Total Surface Area Requiring Painting**

Estimated Surface 76269 ft2 Area