TECHNICAL MEMORANDUM

Index Number 180-45 – Southwest – 6217 Wilson Blvd – Class III/IV Pump Station Upgrades – Project Definition

PREPARED FOR: JEA Capital Budget Planning

PREPARED BY: Anand Mody, PE Brown and Caldwell

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DATE: February 10, 2016

Introduction & Background

The Big Wilson Pump Station (PS), located at 6217 Wilson Blvd, Jacksonville FL 32210 was constructed in 1980/81 (reference: As Built Drawings provided by JEA). According to the As Built drawing, treatment units of an existing wastewater treatment facility – Cedar Hills Sewerage Treatment Plant – were demolished and the Big Wilson PS (5.6 MGD capacity) was constructed as a part of the improvements.

Two 18-inch gravity sewer lines manifold together into a 24-inch DIP that enters the Big Wilson PS site on the east side of the PS building. The PS building has two levels. The upper level of the building houses an influent screen room, generator room, motor and control room, storage room, and a restroom. The lower level of the building houses a pump room (dry-pit) and a wet well (wet-pit).

Upon entering the PS, the wastewater flow is immediately split into two separate 3-ft wide channels. Each channel used to have a sluice gate to isolate the channel and a mechanical bar screen to collect floatables from the influent wastewater entering the PS. Per JEA's operation staff, the sluice gates are frozen in-place and the southern mechanical bar screen was removed and a manual bar screen installed in-place. During the site visit, the northern bar screen was also not in operation and per JEA's operation staff, this screen needs to be removed as well as a part of this project. The sluice gates at each channel will also be required to be replaced.

Following the screens, the flow from each channel combines and enters the wet well area of the PS. There are three (3) 50 HP pumps (two (2) duty and one (1) standby) in the dry-pit area that pump the wastewater from the wet well into a 16-inch DIP force main that runs towards Wilson Blvd. and ultimately to the Southwest Water Reclamation Facility. Each pump is rated for pumping 1,950 gpm at approximately 52-ft with total PS capacity of 3,900 gpm (~5.6 MGD).

The electrical service for Big Wilson PS is a 480V, three phase service composed of 3# 500KCM & 1#2 Neutral. The utility is provided by an overhead transformer serving the main disconnect located in the Motor Control Center (400A, three phase). The standby power is supplied by a Caterpillar generator (155KW, 480V, three phase) located inside the station building. The generator is fed from a 1,000 gallon above ground diesel fuel tank located outside. The standby feeder runs from the generator control panel main breaker to the automatic transfer switch located in the MCC.

Big Wilson PS – Northeast Part of the Building

Big Wilson PS – North Part of the Building

Justification

JEA utilizes a percentage scoring system for evaluating their PSs. A percentage score of greater than 50% identifies the PS as requiring attention (needing improvements). The Big Wilson PS scored 57% during JEA's recent inspection and observations. The existing pumps, motors, and many components at this PS were installed in 1980/81. JEA indicated that these have reached the end of their useful life and or need improvements to handle additional future flows to meet the current industry standards. JEA also desires to upgrade the electrical and instrumentation equipment as it is antiquated and needs improvements to bring to current industry standards. For these reasons, JEA desires to rehabilitate this existing PS.

The purpose of this document is to serve as the project definition (PD) for the Big Wilson PS evaluation. This project definition provides, background and justification, defines the project scope, provides a preliminary evaluation of the PS, provides a schedule for design and construction and estimates the anticipated capital costs for the work.

Scope

JEA tasked Brown and Caldwell (BC) to evaluate the PS with respect to the following disciplines – civil, mechanical, electrical, instrumentation and structural. As a part of JEA's PS inspection, JEA has identified the following issues with the Big Wilson PS:

- Water draining down the stairwell into the wet well area
- Only one ventilation fan is working.
- Lighting in the wet well area is poor.
- Potable wash down water piping in wet well area requires replacement.
- Sluice gates and actuators require replacement.
- Bolts in stairwell to wet well need replacement.
- Blower requires replacement.
- 1970s vintage electrical requires evaluation.

These items were evaluated and confirmed as part of Brown and Caldwell's overall assessment of the facility. The following are the functional improvements identified in the multi discipline assessment.

Functional Improvements

The following functional improvements are recommended:

1. Rain pouring down the stairwell into the wet well area – This area was identified by JEA and BC observed the area for leaks. The threshold of the doorway into the wet well area is clearly not sealed and would allow the deck slab to drain directly into the inside of the building down a corridor to the wet well stair. BC recommends that a replacement door and threshold be installed. For this work, FRP doors and frames should be utilized. Replace other doors beyond their useful life as required. See photos 1 and 2 in Appendix A.

2. Ventilation fan – The existing non-working ventilation fan will be replaced with a new in-kind ventilation fan to provide adequate ventilation in the motor and control room. See photo no. 3 in Appendix A.

   The ventilation system needs to be evaluated per Sections 7 and 13 of NFPA 820, 2016 and also meet JEA airflow Standard of 30 air changes per hour (ACH) for dry pit areas and 60 ACH for the wet well areas. Per the JEA operational staff, the existing ventilation system does not meet these requirements. Hence, the ventilation system will need to be upsized.

3. Poor lighting in wet well area – During the site visit, it was observed that a number of light fixtures were not working; most likely due to corrosion (see photo 4 & 5 in Appendix A). Per JEA operation staff, JEA prefers the LED lighting as manufactured by RAB Lighting, Inc.

   As both the screen room and the wet well area are classified as Class 1, Division 1, it is recommended that all lights and conduits in this area be replaced with appropriate fixtures while also adding additional lighting in the wet well area.

   It is recommended that the lighting on the building exterior and throughout the interior should be updated and replaced with high efficiency LED type along with the respective raceway, wiring, and devices for the lighting. This also applies to emergency lighting and exit signs.

4. Potable water connection in wet well area – During the discussions with JEA operational staff, there is no potable water connections in the wet well area. BC recommends that a new potable water pipe along with a backflow preventer be installed in the wet well area with at least two connections.

5. Sluice gates – During the site visit it was observed that both the sluice gates located in the wet well area were frozen in-place. The actuators located in the upper level screen room were also frozen (see photo 6 & 7 in Appendix A). It is recommended that these gates be replaced with new 30-inch sluice gates with new actuators and disconnects that are appropriate under Class 1 Division 1 environment conditions per JEA Standards.

6. Stair Bolts – It was observed that the bolts in the stair well to the wet well area were all corroded. These bolts can be replaced with new corrosion resistant bolts of 316SS or duplex stainless steel. However, with entry into the confined space, the designer of the improvements should evaluate if a full replacement with FRP stairs should be included and if the replacement of the entire guardrail system within the confined space area should be included. See photo 8 in Appendix A.

7. Blower replacement – During the site visit, JEA operational staff indicated that the non-functioning blower was recently replaced under the maintenance program. It will have to be confirmed that adequate ventilation is provided per NFPA 820, 2016 and then determine if any additional ventilation is required.

8. Replace reduced voltage autotransformers for each pump to meet the requirements as included in JEA's Master Lift Station Standards and Section 433 Submersible Wastewater Pumping Stations. The existing Motor Control Center should be replaced due to age, corrosion, and the increase in motor horsepower to include VFD's. The drives will need to meet JEA standards including and not limited to having heat sinks, profibus communication cards, and DV/DT output filter (if required per JEA standard). The new main disconnect, ATS and MCC will need updated ARC flash analysis and labeling.

9. Replace controls for each pump to meet the requirements as specified by JEA's Master Lift Station Standards and Section 433 Submersible Wastewater Pumping Stations. The existing electrical control panel appears to be in good condition considering there are unsealed entry and exit points. The PLC is a Siemens S7-300 with a Weidmuller radio. Despite the condition of the existing control panel, BC recommends replacing it with one that includes Profibus communications to the new pump motor starters and meets the current JEA Master Lift Station Standards and Section 433 Submersible Wastewater Pumping Stations.

10. Replace electrical panels and cabling in the pump room to meet the requirements as specified by JEA's Master Lift Station Standards and Section 433 Submersible Wastewater Pumping Stations - including pump manual safety switches, sump pump control panel, water seal pump disconnects, and flush water pump disconnect.

11. Mechanical Bar Screen – There is one non-functioning mechanical bar screen at the PS. Recommended Standards for Wastewater Facilities, 2014 Section 42.322 requires bar screens on pump station with greater than 30-inch sewers and since the sewer to this PS is 24-inches, a bar screen is not required.

    During the site visit, JEA's operational staff indicated that there is no concern in regards to rags, plastics or other floatables entering the PS and hence screening (mechanical or manual) is not required as a part of the improvements. As part of improvement project, the existing non-functioning mechanical bar screen will be removed. Since this will leave an unprotected opening and the embeds supporting the remaining grating in this area are corroded, BC recommends that an FRP grating system with integral top plate be installed throughout the screen room as well in the channel.

12. Paint in the screen room and wet well areas – Due to the highly corrosive environment due to the biogenic sulfide corrosion in these areas, a blended amine cured epoxy paint system recommended that would be suitable under the biogenic sulfide corrosion conditions. The existing painting will be stripped and the concrete will be prepared per the paint system requirements prior to the new paint system being applied per JEA Standard Section 447 – Water Wastewater Protective Coatings. See photos 9 & 10 in Appendix A.

13. BC had limited sight lines into the influent channels but noticed that there is degradation of concrete. The designer of the improvements should review these conditions within the confined space and recommend repairs/resurfacing of the influent channels. See photo 11 in Appendix A. It will have to be confirmed that adequate ventilation is provided per NFPA 820, 2016 and then determine if any additional ventilation is required.

14. Modify existing concrete bases under pumps as required for new pumps installation.

15. BC observed that the main hatches on the exterior deck over the wet well did not have spring assists or fall prevention devices currently in use at many installations. BC recommends that the hatch plate be upgraded with stiffeners and spring assist/hold-open arms and that a fall prevention net or grate be retrofitted as part of the improvement project.

16. BC noted that guardrails are required on all platforms that are greater than 24-inches above adjacent grade. Stairways should also have a third handrail that is not currently in place. JEA Staff indicated that they started to work on adding these but BC should include that as a part of the proposed improvements. BC recommends that guardrail and handrail be provided throughout the pump station. Minor repairs at anchor bolts should also be included in the improvement project.

17. Pumps – JEA provided the future flow and head conditions for the PS as 4,383 gpm (6.3 MGD) at 75-ft head. The current pump will not be able to meet these requirements and hence the pumps will need to be replaced. The low and high system curve for this pump station was not readily available from JEA, hence a detailed hydraulic evaluation for the pump selection was not performed to ensure that the recommended pump operated within the Preferred Operating Range (POR). A detailed hydraulic analysis for the pump selection is recommended during the design phase. The new pumps will meet the requirements as specified in Section 433 Submersible Wastewater Pumping Stations.

    Replace all three existing dry-pit submersible pumps as follows:

    a. Per JEA's Standards Manual Part AS – 603, Flow Serve (pump model MSX), EMU and KSB pumps are approved pump manufacturers. The existing pumps at the Big Wilson PS are the vertical shaft dry pit solids handling type and per JEA, the replacement pumps shall be of similar type. Per the conversations with Flow Serve's pump representative, the MSX pump does not come in the extended shaft version and recommended the pump model MFV which is a vertical shaft dry pit solids handling type pump.

       The preliminary pump selected that meets these requirements as manufactured by Flow Serve is pump model MFV. New vertical shaft dry pit solids handling pumps and appurtenances would include three 60-HP pumps each rated at 2,192 gpm at 75 ft of head. Two pumps will be duty and one pump will be standby. The pumps design flow and head conditions were developed by JEA System Planning. A pump curve for this pump is included in Appendix A. Shaft guards and upper level motor guards at the base of the motor are recommended by BC.

18. Existing valves and piping downstream of the discharge head can remain. Recommend adding a JEA Standard strap-on effluent flowmeter to totalize and record flow in the PLC via 4-20mA signal from the flowmeter. We also recommend adding a discharge pressure transmitter and monitoring the signal with the PLC via 4-20mA signal to alarm in event of high discharge conditions. Each of these would be monitored and trended in SCADA.

19. NFPA 820, 2016 Standards for Fire Protection in Wastewater Treatment and OSHA, 29 CFR 1910.146, Confined Spaces Permit Requirements both recommends combustible gas detection in pump station wet wells. It is recommended to install a new combustible gas detection system capable of monitoring for combustible gas such as Methane. Other gases such as Hydrogen Sulfide and Oxygen can be monitored as desired; this is at JEA's discretion.

20. Generator – Replace existing generator with one sized to handle the increased electrical load and meets current JEA standards. Using conservative estimate, a 300 KW generator is recommended. Calculations are needed to determine accurately the proposed generator sizing that will meet the requirement with the increased pump motor horsepower. Current standards require engine-generator unit to be capable of interfacing with JEA SCADA equipment and having an automatic exerciser to test the unit on a weekly basis to name a couple. The Automatic Transfer Switch (ATS) will also need replacement in addition to all wiring and raceways between the ATS and genset.

21. Diesel Fuel Tank – The existing above ground tank appears to be in good physical condition and has UL 2085 listing. Many of the gauges on the fuel tank were unreadable. Recommend replacing all gauges and instrumentation on the fuel tank including and not limited to fuel level gauge, 4-20mA data converter and leak detection to meet JEA standards. JEA standards require 60 hour capacity at 100% at full load above 151KW gensets. Calculations are needed to determine if the existing 1,000 gallon fuel tank will meet this requirement with the increased pump motor horsepower. If the existing fuel tank meets the standards requirements then we recommend the fuel tank to remain. Current day tank should be replaced.

22. Grounding – With the entire electrical system being replaced to accommodate the increased pump HP, it is recommended that the grounding system be upgraded/replacement as well.

23. Bubbler System – A new bubbler system has replaced the submersible pressure transducer. Bubbler systems tend to have issues with moisture/ condensation and require a lot of maintenance. We

recommend a hydrostatic, or radar level transmitter. We also recommend backup relay logic using floats or the bubbler to back up the PLC but also the level transmitter/bubbler.

24. JEA staff had indicated that they would like to have a hoist for lifting the pumps in the dry pit area. Given the complexity of the piping, shafts and other hangers within the space, this would have to become a system other than a hoist and monorail system discussed. The designer of the improvement project should install steel framing that would accommodate eye bolts and hoist locations to assist with removal based on discussions with JEA staff and the methods currently used to pull pieces of pipe, valves, pumps and motors. Most likely this could also include the purchase of A-Frames in addition to the pick points.

25. During the site visit, JEA operational staff indicated that odor was not an issue at this PS and hence no odor control system is recommended. Odor sampling can be performed as a part of the design project to confirm that no foul odor is present at this pump station.

26. BC's final recommendation is to recoat the dry pit and electrical room since the existing coating is peeling in locations and repairs have been made without the final coating being accomplished. All coatings shall be applied per JEA Standard Section 447 – Water Wastewater Protective Coatings.

Expansion and Phasing

Engineering design for this project will be completed by the end of FY17. Procurement, construction and close out for the improvements project will be completed by FY19.

Materials of Construction

Materials of construction will conform to the latest edition of JEA *Water & Sewer Standards Manual* and *Master Lift Station Standards*.

Location, Site Planning Considerations

Land Ownership/Acquisition Issues

The project will be constructed entirely within the Big Wilson PS property. No additional property is expected to be needed.

Existing As-builts

As-builts of existing construction are available.

Site Constraints

The project is constrained by the existing layout of the structures and facilities, most notably the wet well area and the screen room. The wet well area is a confined space entry and improvements in this area will require confined space permit. Additionally, the screen room due to the exposure from the wet well area is a Class 1 Division 1 area. During the design phase, the determination will be made in regards to additional construction requirements in these areas.

Demolition of Existing Facilities

New construction will be take place on or in existing facilities. Demolition of existing facilities is expected as listed in the functional improvements section of this project definition document.

Stormwater Management

Because there will be no additional impervious area constructed, no additional stormwater treatment is expected to be required.

Fencing

There is adequate existing fencing around the Big Wilson PS site.

Regulatory and Permitting Requirements

No FDEP or City of Jacksonville permits are expected to be required as the improvements being recommended are generally replacements.

Implementation Schedule

The major activities involved in the project are as follows:

- Request for Design Proposal and Review
- 30%, 60%, 90%, and 100% Design
- Construction Contractor Procurement
- Construction
- Project Closeout

Big Wilson Class III/IV Pump Station Upgrades	**FY 2017**			**FY 2018**				**FY 2019**				**FY 2020**
	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st
Request for Design Proposal & Review = 204 Days												
Engineering – Design Duration = 251 Days												
Procurement – Bid Duration = 133 Days												
Construction Duration = 310 Days												
Closeout Duration = 54 Days												

Project Management & Delivery

Stage	**Project Definition**	**10% Schematic Design**	**30% Conceptual Design**	**90% Detail Design**	**100% Final Design**	**Bid**	**Construction**
To Project Delivery	PEC	PEC	PEC	PEC	PEC	PEC	PEC
		OPB Established		Trend		Trend	Trend

Cost Opinion and Expenditure Forecast

A Class 4 Engineer's Opinion of Probable Construction Cost (EOPCC) was prepared in accordance with the Association for the Advancement of Cost Engineering International (AACE) criteria for the improvements recommended for the Big Wilson PS (Appendix B). A Class 4 estimate is defined as a Planning Level/Design Technical Feasibility Estimate. Typically, engineering is from 1 to 15 percent complete. Class 4 estimates are used to prepare planning level cost scopes and form the base work for the Class 3 Project Budget or Funding Estimate. Expected accuracy for Class 4 estimates typically range from -30 to +50 percent, depending on the technological complexity of the project, appropriate reference information and inclusion of an appropriate contingency determination. In unusual circumstances, ranges could exceed those shown.

The construction for this project is not expected to start until FY-2018 and will last for about 12 months. For this project, the anticipated rate of escalation is 3% per annum. The mid-point of contruction is approximately 25.7 months from the date of this EOPCC. Hence, a 6.62 % escalation to midpoint is included in the EOPCC.

An undesigned/undeveloped contingency of 30% is included in the EOPCC. This contingency factor covers unforeseen conditions, area economic factors, and general project complexity. This contingency is used to account for those factors that cannot be addressed in each of the labor and/or material installation costs. Based on industry standards, completeness of the project documents, project complexity, the current design stage and area factors, construction contingency can range from 10 to 50 percent.

The estimate of probable cost below includes construction permits, contingency, contractor's overhead, profit, and mobilization, and bonds and insurance. In addition, engineering services, start-up services, and JEA General and Administrative costs, JEA Cost and Scheduling, and JEA Project Management are included.

ACTIVITY/DESCRIPTION	SUB-TOTAL	TOTAL
Contractor Direct Cost	$1,823,669	$1,823,669
Contractor Indirect Cost		$843,088
Overhead & Profit	$119,942	
Miscellaneous-General/Special Conditions	$165,631	
Engineering Undefined Contingency – 30%	$557,515	
JEA Cost & Engineering		$666,689
Engineering (10%)	$266,676	
Project Management (4%)	$106,670	
Engineer's Services During Construction (5%)	$133,338	
JEA Inspector (6%)	$160,005	
TOTAL PROJECT COST	**$3,333,446**	**$3,333,446**

PROJECTED EXPENDITURE FORECAST BY FISCAL YEAR		
ACTIVITY	**FY 2018**	**TOTAL**

QUARTER	1st	2nd	3rd	4th	
JEA Cost & Engineering 10%	$26,668				**$26,668**
JEA Cost & Engineering 30%	$53,335				**$53,335**
JEA Cost & Engineering Final		$93,337	$93,336		**$186,673**
Construction				$26,668	**$26,668**
TOTAL	**$80,003**	**$93,337**	**$93,336**	**$26,668**	**$293,344**

PROJECTED EXPENDITURE FORECAST BY FISCAL YEAR						
ACTIVITY	**FY 2019**				**FY 2020**	**TOTAL**
QUARTER	**1st**	**2nd**	**3rd**	**4th**	**1st**	
JEA Cost & Engineering 10%						
JEA Cost & Engineering 30%						
JEA Cost & Engineering Final						
Construction	$850,000	$800,000	$800,000	$500,000	$90,102	**$3,040,102**
TOTAL	**$850,000**	**$800,000**	**$800,000**	**$500,000**	**$90,102**	**$3,040,102**

FY 2018 TOTAL	**$293,344**
FY 2019 TOTAL	**$2,950,000**
FY 2020 TOTAL	**$90,102**
PROJECT GRAND TOTAL	**$3,333,446**

Risks

- If this infrastructure is not replaced JEA will continue incurring long term maintenance expense.
- Higher wastewater flow and head conditions at the PS are anticipated thereby requiring the existing pumps, which have reached their useful life and are failing, to be replaced.
- Electrical and I/C components at this station are antiquated and will require replacement due to the following reasons:
    - New pumps are significantly larger size (50 HP existing pumps vs. 75 HP proposed pumps each)
    - Vintage electrical components are showing signs of wear and failure
    - JEA desires to have the electrical and I/C components be bought up to current industry and JEA Standards
- Replacement of non-functioning door as it creates slippery conditions due to rain seeping in and poor lighting in the screen and wet well areas.
- Other miscellaneous, though important, improvements as mentioned in functional improvements are necessary for daily functions to be performed at this station.

Revision History

Name	Date	Version	Revision Notes
Brian Phillips	5/6/16	01	Revised dates

CP: Revision #:

Date:

Scope Approval –The signatures below represent approval for this project. The groups represented must approve in writing changes to the scope, cost, or schedule, prior to implementing those changes.

Corporate Planning	Date	O&M	Date
Outreach	Date	Environmental	Date
Others Signature	Date	Others Signature	Date

Rev 1 Description:

Schedule Effect:
Cost Effect:
Approvals:

Corporate Planning	Date	O&M	Date
Outreach	Date	Environmental	Date
Others Signature	Date	Others Signature	Date

Rev 2 Description:

Schedule Effect:
Cost Effect:
Approvals:

Corporate Planning	Date	O&M	Date
Outreach	Date	Environmental	Date
Others Signature	Date	Others Signature	Date

APPENDIX A

Photos 1 and 2 – Door threshold and corroded latch/lock set at the Screen Room

Photo 3 – Ventilation Fan to be replaced in-kind

Photo 4 – Non-working Light Fixture

Photo 5 – Non-working Light Fixture

Photo 6 & 7 – Frozen Sluice Gates and Actuators

Photo 8 – Corroded Stairwell Bolts

Photos 9 and 10 – Paint peeling from the Screen Room Walls

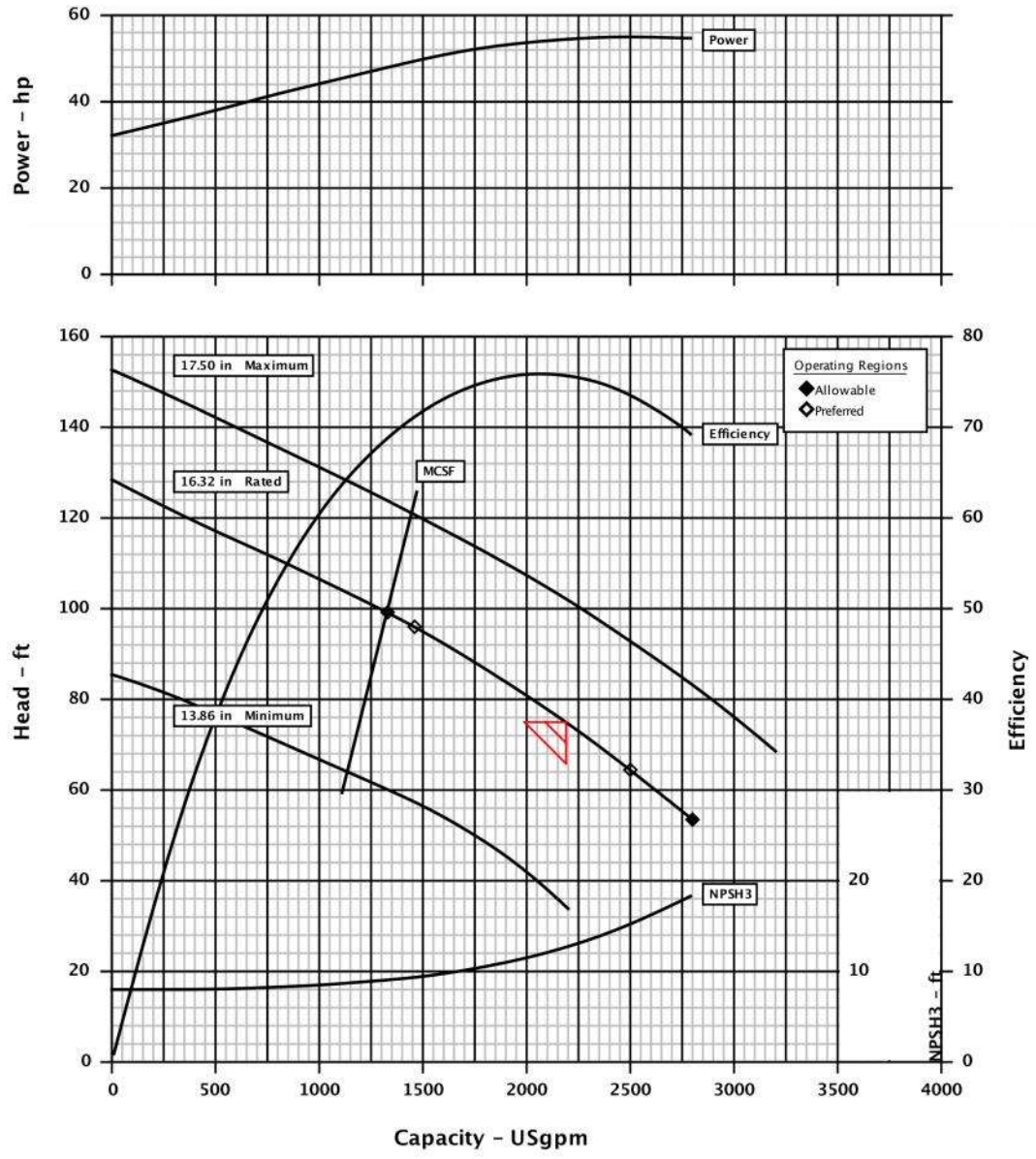
Photo 11 – Degraded concrete in the influent channel as seen from exterior concrete box.

FLOWSERVE

Pump size & type	: 6MF18A FR6A
Based on curve no.	: 89116446
Number of stages	: 1

Customer	: Dave Hartwig	Capacity	: 2192.0 USgpm
Item number	: JEA Big Wilson PS	Head	: 75.00 ft
Service	: Pump Station	Specific gravity	: 1.000
Flowserve reference	: 507861317	Pump speed	: 1180 rpm
Date	: February 9, 2016	Test tolerance	: Hydraulic Institute Level B

CURVES ARE APPROXIMATE. PUMP IS GUARANTEED FOR ONE SET OF CONDITIONS: CAPACITY, HEAD, AND EFFICIENCY.



Affinity v1.5.2

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FLOWSERVE

Hydraulic Datasheet

Customer	: Dave Hartwig	Pump / Stages	: 6MF18A FR6A	/ 1
Customer reference	:	Based on curve no.	: 89116446	
Item number	: JEA Big Wilson PS	Flowserve reference	: 507861317	
Service	: Pump Station	Date	: February 9, 2016	

Operating Conditions

Capacity	: 2192.0 USgpm
Water capacity (CQ=1.00)	: -
Normal capacity	: -
Total developed head	: 75.00 ft
Water head (CH=1.00)	: -
NPSH available (NPSHa)	: Ample
NPSHa less NPSH margin	: -
Maximum suction pressure	: 0.0 psig

Liquid

Liquid type	: Other	
Temperature / Spec. Gravity	: 60 °F	/ 1.000
Solid Size - Actual / Limit	: -	/ 3.00 in
Viscosity / Vapor pressure	: 1.00 cSt	/ -

Materials / Specification

Material column code	: CI
Pump specification	: -

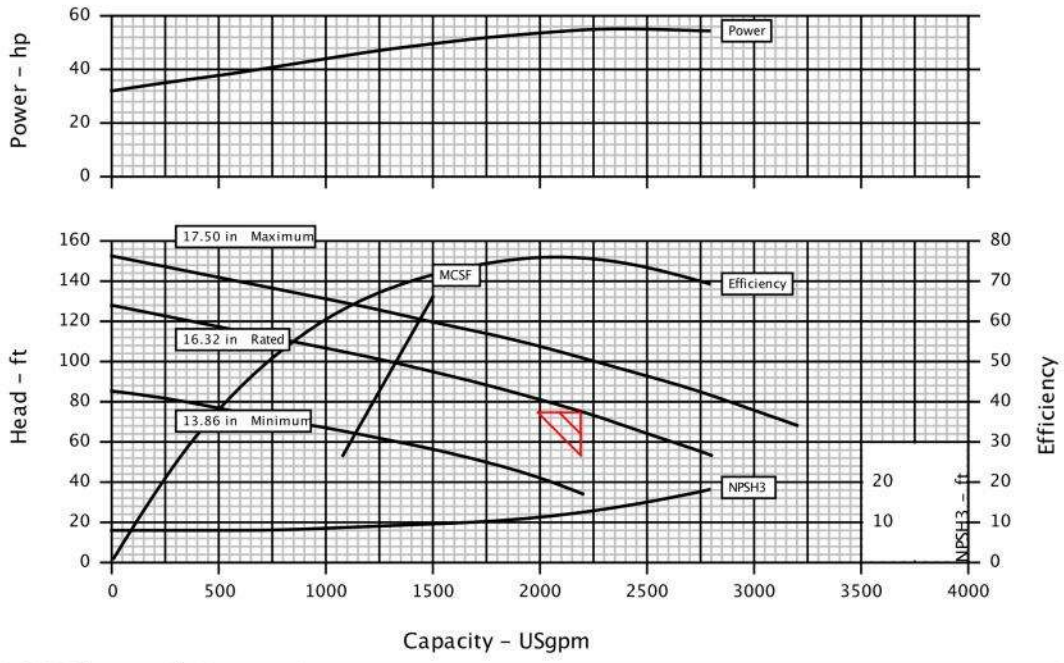
Other Requirements

Hydraulic selection : No specification
Construction : No specification
Test tolerance : Hydraulic Institute Level B
Driver Sizing : Max Power(MCSF to EOC) not using SF

Performance

Hydraulic power	: 41.5 hp	Impeller diameter	
Pump speed	: 1180 rpm	Rated	: 16.32 in
Pump overall efficiency (CE=1.00)	: 75.9 %	Maximum	: 17.50 in
		Minimum	: 13.86 in
NPSH required (NPSH3)	: 12.6 ft	Suction specific speed	: 8310 (US units)
Rated power	: 54.7 hp	Minimum continuous flow	: 1333.3 USgpm
Maximum power	: 55.0 hp	Maximum head @ rated dia	: 128.40 ft
Driver power	: 60.0 hp / 44.7 kW	Flow at BEP	: 2081.8 USgpm
Casing working pressure	: 55.6 psig	Flow as % of BEP	: 105.3 %
(based on shut off @ cut dia/rated SG)		Efficiency at normal flow	: -
Maximum allowable	: 200.0 psig	Impeller dia ratio (rated/max)	: 93.3 %
Hydrostatic test pressure	: 250.0 psig	Head rise to shut off	: 71.2 %
Est. rated seal chamb. press.	: -	Total head ratio (rated/max)	: 73.5 %

CURVES ARE APPROXIMATE, PUMP IS GUARANTEED FOR ONE SET OF CONDITIONS; CAPACITY, HEAD, AND EFFICIENCY.



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FLOWSERVE

Construction Datasheet

Customer	: Dave Hartwig	Pump / Stages	: 6MF18A FR6A / 1
Customer reference	:	Based on curve no.	: 89116446
Item number	: JEA Big Wilson PS	Flowserve reference	: 507861317
Service	: Pump Station	Date	: February 9, 2016

Construction

Nozzles	Size	Rating	Face	Pos'n
Suction	8.00 in	-	-	-
Discharge	6.00 in	-	-	-

Casing mounting	: -
Casing split	: -
Impeller type	: -
Bearing type (radial)	: -
Bearing number (radial)	: -
Bearing type (thrust)	: -
Bearing number (thrust)	: -
Bearing lubrication	: -
Rotation (view from cplg)	: -

Materials

Casing	: -
Impeller	: -
Case wear ring	: -
Impeller wear ring	: -
Inducer	: -
Shaft	: -
Sleeve	: -

Baseplate, Coupling and Guard

Baseplate type	: -
Baseplate material	: -
Coupling manufacturer	: -
Coupling size	: -
Coupling / Shaft guard	: -

Weights (Approx.)

Bareshaft pump(nett)	: -
Baseplate(nett)	: -
Driver(nett)	: -
Shipping gross weight/vol.	: - / -

Testing

Hydrostatic test	: -
Performance test	: -
NPSH test	: -

Paint and Package

Pump paint	: -
Base grout surface prep	: -
Shipment type	: -

Driver Information

Manufacturer	: -
Power	: 60.0 hp / 44.7 kW
Service factor (req'st / act)	: 1.15 / -
Speed	: 1200 rpm
Orientation / Mounting	: Horizontal / -
Driver Type	: -
Frame-size / material	: 404VP / -
Enclosure	: -
Hazardous area class	: -
Explosion 'T' rating	: -
Volts / Phase / Hz	: 460 V / - / 60 Hz
Amps-full load/locked rotor	: - / -
Motor starting	: Direct on line (DOL)
Insulation	: -
Temperature rise	: -
Bearings	: -
Lubrication	: -
Motor mounted by	: -

Sound Pressure (dBA @ 1.0 m)

Driver, expected	: -
Pump & driver, estimated	: -

Seal Information

Arrangement	: -
Size	: -
Manufacturer / Type	: - / -
Material code (Man'f/API)	: - / -
Internal neck bushing	: -

Gland

Gland material	: -
Flush	: -
Vent	: -
Drain	: -
Auxiliary seal device	: -

Piping

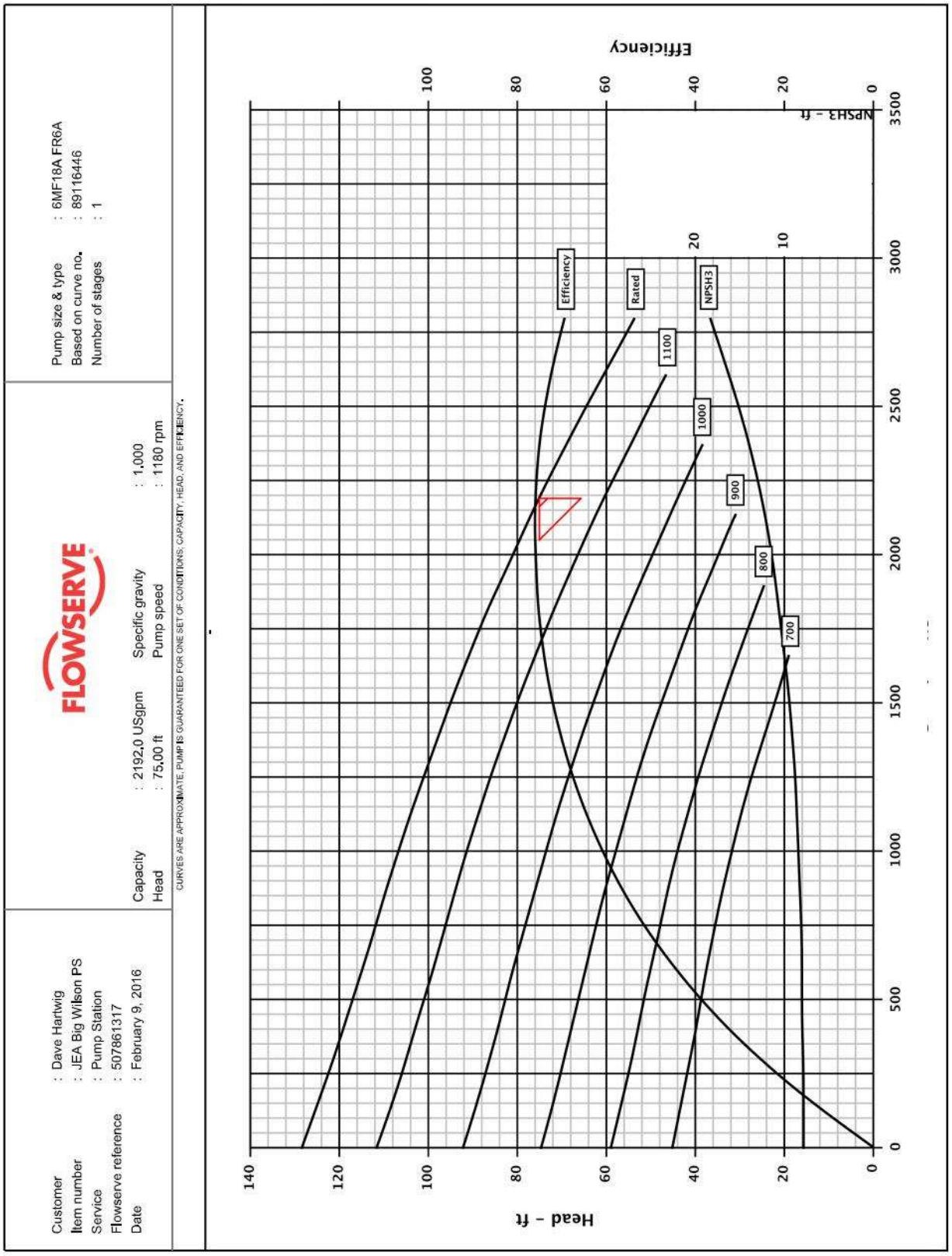
Seal flush plan	: -
Seal flush construction	: -
Seal flush material	: -
Aux seal flush plan	: -
Aux seal flush construction	: -
Aux seal flush material	: -

Notes

-
-
-
-
-
-

Affinity v1.5.2

3 of 5


Customer : Dave Hartwig
Item number : JEA Big Wilson PS
Service : Pump Station
Flowserve reference : 507861317
Date : February 9, 2016
FLOWSERVE
Capacity : 2192,0 USgpm
Head : 75,00 ft
Specific gravity : 1,000
Pump speed : 1180 rpm
CURVES ARE APPROXIMATE. PUMP IS GUARANTEED FOR ONE SET OF CONDITIONS: CAPACITY, HEAD, AND EFFICIENCY.
Pump size & type : 6MF18A FR6A
Based on curve no. : 89116446
Number of stages : 1
Head - ft
Efficiency
NPSH3 - ft
Efficiency
Rated
NPSH3
1100
1000
900
800
700
Affinity v1.5.2
5 of 5
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APPENDIX B

ENGINEERS OPINION OF PROBABLE CONSTRUCTION COST (EOPCC)

Brown AND Caldwell

Memorandum

Date: February 10, 2016

To: Anand Mody, Tampa

From: Doug Gabbard, Cincinnati

Reviewed by: Sergio Bazarevitsch

Project No.: 148757.300.02

Subject: Big Wilson Pump Station
5-Percent Design Completion
Basis of Estimate of Probable Construction Cost

The Basis of Estimate Report and supporting estimate reports for the subject project are attached. Please call me if you have questions or need additional information.

Enclosures (3):

1. Basis of Estimate Report
2. Summary Estimate
3. Detailed Estimate

Basis of Estimate Report

Big Wilson Pump Station

Introduction

Brown and Caldwell (BC) is pleased to present this opinion of probable construction cost (estimate) prepared for the Big Wilson Pump Station, Jacksonville, FL.

Summary

This Basis of Estimate contains the following information:

- Scope of work
- Background of this estimate
- Class of estimate
- Estimating methodology
- Direct cost development
- Indirect cost development
- Bidding assumptions
- Estimating assumptions
- Estimating exclusions
- Allowances for known but undefined work
- Contractor and other estimate markups

Scope of Work

Upgrade the existing pump station which includes, new pumps, controls, lighting, Electrical and instrumentation upgrades, cleaning and recoating the wet well and removing the existing mechanical bar screens.

Background of this Estimate

There have not been any previous estimates for this project.

The attached estimate of probable construction cost is based on the technical memorandum dated 2/10/16, received by the ESG. These documents are described as a Class 4 estimate based on the current project progression, additional or updated scope and/or quantities, and ongoing discussions with the project team. Further information can be found in the detailed estimate reports.

Class 4: 1 to 15 Percent

In accordance with the Association for the Advancement of Cost Engineering International (AACE) criteria, this is a Class 4 estimate. A Class 4 estimate is defined as a Planning Level or Design Technical Feasibility Estimate. Typically, engineering is from 1 to 15 percent complete. Class 4 estimates are used to prepare planning level cost scopes or to evaluate alternatives in design conditions and form the base work for the Class 3 Project Budget or Funding Estimate.

Expected accuracy for Class 4 estimates typically range from -30 to +50 percent, depending on the technological complexity of the project, appropriate reference information and the inclusion of an appropriate contingency determination. In unusual circumstances, ranges could exceed those shown.

Estimating Methodology

This estimate was prepared using quantity take-offs, vendor quotes and equipment pricing furnished either by the project team or by the estimator. The estimate includes direct labor costs and anticipated productivity adjustments to labor, and equipment. Where possible, estimates for work anticipated to be performed by specialty subcontractors have been identified.

Construction labor crew and equipment hours were calculated from production rates contained in documents and electronic databases published by R.S. Means, Mechanical Contractors Association (MCA), National Electrical Contractors Association (NECA), and Rental Rate Blue Book for Construction Equipment (Blue Book).

This estimate was prepared using BC's estimating system, which consists of a Windows-based commercial estimating software engine using BC's material and labor database, historical project data, the latest vendor and material cost information, and other costs specific to the project locale.

Direct Cost Development

Costs associated with the General Provisions and the Special Provisions of the construction documents, which are collectively referred to as Contractor General Conditions (CGC), were based on the estimator's interpretation of the contract documents. The estimates for CGCs are divided into two groups: a time-related group (e.g., field personnel), and non-time-related group (e.g., bonds and insurance). Labor burdens such as health and welfare, vacation, union benefits, payroll taxes, and workers compensation insurance are included in the labor rates. No trade discounts were considered.

Indirect Cost Development

Local sales tax has been applied to material and equipment rentals. A percentage allowance for contractor's home office expense has been included in the overall rate markups. The rate is standard for this type of heavy construction and is based on typical percentages outlined in Means Heavy Construction Cost Data.

The contractor's cost for builders risk, general liability and vehicle insurance has been included in this estimate. Based on historical data, this is typically two to four percent of the overall construction contract amount. These indirect costs have been included in this estimate as a percentage of the gross cost, and are added after the net markups have been applied to the appropriate items.

Bidding Assumptions

The following bidding assumptions were considered in the development of this estimate.

1. Bidders must hold a valid, current Contractor's credentials, applicable to the type of project.
2. Bidders will develop estimates with a competitive approach to material pricing and labor productivity, and will not include allowances for changes, extra work, unforeseen conditions or any other unplanned costs.
3. Estimated costs are based on a minimum of four bidders. Actual bid prices may increase for fewer bidders or decrease for a greater number of bidders.
4. Bidders will account for General Provisions and Special Provisions of the contract documents and will perform all work except that which will be performed by traditional specialty subcontractors as identified here:
   - Electrical
   - HVAC systems

Estimating Assumptions

As the design progresses through different completion stages, it is customary for the estimator to make assumptions to account for details that may not be evident from the documents. The following assumptions were used in the development of this estimate.

1. Contractor performs the work during normal daylight hours, nominally 7 a.m. to 5 p.m., Monday through Friday, in an 8-hour shift. No allowance has been made for additional shift work or weekend work.
2. Contractor has complete access for lay-down areas and mobile equipment.
3. Equipment rental rates are based on verifiable pricing from the local project area rental yards. Blue Book rates and/or rates contained in the estimating database.
4. Contractor markup is based on conventionally accepted values that have been adjusted for project-area economic factors.
5. Major equipment costs are based on both vendor supplied price quotes obtained by the project design team and/or estimators, and on historical pricing of like equipment.
6. Process equipment vendor training using vendors' standard Operations and Maintenance (O&M) material, is included in the purchase price of major equipment items where so stated in that quotation.
7. Bulk material quantities are based on manual quantity take-offs.
8. There is sufficient electrical power to feed the specified equipment. The local power company will supply power and transformers suitable for this facility.
9. Soils are of adequate nature to support the structures. No piles have been included in this estimate.
10. Flow of on channel will be shut down for a period of 1 month.

Estimating Exclusions

The following estimating exclusions were assumed in the development of this estimate.

1. Hazardous materials remediation and/or disposal.
2. O&M costs for the project with the exception of the vendor supplied O&M manuals.
3. Utility agency costs for incoming power modifications

4. Permits beyond those normally needed for the type of project and project conditions.
5. By pass pumping.
6. Repairs to existing Pavements.

Allowances for Known but Undefined Work

The following allowances were made in the development of this estimate.

1. Electric and Instrumentation

Contractor and Other Estimate Markups

Contractor markup is based on conventionally accepted values which have been adjusted for project-area economic factors. Estimate markups are shown in Table 1.

Table 1. Estimate Markups

Item	Rate (%)
Net Cost Markups	
Labor (employer payroll burden)	10
Materials and process equipment	8
Equipment (construction-related)	8
Subcontractor	5
Sales Tax (State and local for materials, process equipment and construction equipment rentals, etc.)	0
Material Shipping and Handling	2
Gross Cost Markups	
General Conditions	10
Start-up, Training and O&M	2
Construction Contingency	30
Builders Risk, Liability and Auto Insurance	2
Performance and Payment Bonds	1.5
Escalation to Midpoint of Construction	3

Labor Markup

The labor rates used in the estimate were derived chiefly from the latest published State Prevailing Wage Rates. These include base rate paid to the laborer plus fringes. A labor burden factor is applied to these such that the final rates include all employer paid taxes. These taxes are FICA (which covers social security plus Medicare), Workers Comp (which varies based on state, employer experience and history) and unemployment insurance. The result is fully loaded labor rates. In addition to the fully loaded labor rate, an overhead and profit markup is applied at the back end of the estimate. This covers payroll and accounting, estimator's wages, home office rent, advertising and owner profit.

Materials and Process Equipment Markup

This markup consists of the additional cost to the contractor beyond the raw dollar amount for material and process equipment. This includes shop drawing preparation, submittal and/or re-submittal cost, purchasing and scheduling materials and equipment, accounting charges including invoicing and payment, inspection of received goods, receiving, storage, overhead and profit.

Equipment (Construction) Markup

This markup consists of the costs associated with operating the construction equipment used in the project. Most GCs will rent rather than own the equipment and then charge each project for its equipment cost. The equipment rental cost does not include fuel, delivery and pick-up charges, additional insurance requirements on rental equipment, accounting costs related to home office receiving invoices and payment. However, the crew rates used in the estimate do account for the equipment rental cost. Occasionally, larger contractors will have some or all of the equipment needed for the job, but in order to recoup their initial purchasing cost they will charge the project an internal rate for equipment use which is similar to the rental cost of equipment. The GC will apply an overhead and profit percentage to each individual piece of equipment whether rented or owned.

Subcontractor Markup

This markup consists of the GC's costs for subcontractors who perform work on the site. This includes costs associated with shop drawings, review of subcontractor's submittals, scheduling of subcontractor work, inspections, processing of payment requests, home office accounting, and overhead and profit on subcontracts.

Sales Tax (Materials, Process Equipment and Construction Equipment)

This is the tax that the contractor must pay according to state and local tax laws. The percentage is applied to both the material and equipment the GC purchases as well as the cost for rental equipment. The percentage is based on the local rates in place at the time the estimate was prepared.

Contractor Startup, Training, and O&M Manuals

This cost markup is often confused with either vendor startup or owner startup. It is the cost the GC incurs on the project beyond the vendor startup and owner startup costs. The GC generally will have project personnel assigned to facilitate the installation, testing, startup and O&M Manual preparation for equipment that is put into operation by either the vendor or owner. These project personnel often include an electrician, pipe fitter or millwright, and/or I&E technician. These personnel are not included in the basic crew makeup to install the equipment but are there to assist and trouble shoot the startup and proper running of the equipment. The GC also incurs a cost for startup for such things as consumables (oil, fuel, filters, etc.), startup drawings and schedules, startup meetings and coordination with the plant personnel in other areas of the plant operation.

Builders Risk, Liability, and Vehicle Insurance

This percentage comprises all three items. There are many factors which make up this percentage, including the contractor's track record for claims in each of the categories. Another factor affecting insurance rates has been a dramatic price increase across the country over the past several years due to domestic and foreign influences. Consequently, in the construction industry we have observed a range of 0.5 to 1 percent for Builders Risk Insurance, 1 to 1.25 percent for General Liability Insurance, and 0.85 to 1 percent for Vehicle Insurance. Many factors affect each area of insurance, including project complexity

and contractor's requirements and history. Instead of using numbers from a select few contractors, we believe it is more prudent to use a combined 2 percent to better reflect the general costs across the country. Consequently, the actual cost could be higher or lower based on the bidder, region, insurance climate, and on the contractor's insurability at the time the project is bid.

Material Shipping and Handling

This can range from 2 to 6 percent, and is based on the type of project, material makeup of the project, and the region and location of the project. Material shipping and handling covers delivery costs from vendors, unloading costs (and in some instances loading and shipment back to vendors for rebuilt equipment), site paper work, and inspection of materials prior to unloading at the project site. BC typically adjusts this percentage by the amount of materials and whether vendors have included shipping costs in the quotes that were used to prepare the estimate. This cost also includes the GC's cost to obtain local supplies; e.g., oil, gaskets and bolts that may be missing from the equipment or materials shipped.

Escalation to Midpoint for Labor, Materials and Subcontractors

In addition to contingency, it is customary for projects that will be built over several years to include an escalation to midpoint of anticipated construction to account for the future escalation of labor, material and equipment costs beyond values at the time the estimate is prepared. For this project, the anticipated rate of escalation is 3 percent per annum.

The estimated construction time for this project is 12 months, exclusive of unusual weather or site conditions delays. Construction is anticipated to start 10/01/17 and complete 09/30/18.. The escalation factors used in this estimate are calculated from the date the estimate is finalized to the anticipated midpoint of construction at approximately 25.7 months from the date of this estimate.

Undesigned/undeveloped Contingency

The contingency factor covers unforeseen conditions, area economic factors, and general project complexity. This contingency is used to account for those factors that cannot be addressed in each of the labor and/or material installation costs. Based on industry standards, completeness of the project documents, project complexity, the current design stage and area factors, construction contingency can range from 10 to 50 percent.

Performance and Payment Bonds

Based on historical and industry data, this can range from 0.75 to 3 percent of the project total. There are several contributing factors including such items as size of the project, regional costs, and contractor's historical record on similar projects, complexity and current bonding limits. BC uses 1.5 percent for bonds, which we have determined to be reasonable for most heavy construction projects.

Brown AND Caldwell

Estimate Summary Report

2/10/2016 7:03 AM

Project Number:	148757.300.002
Estimate Issue Number:	1
Bid Date:	2/23/2016
Estimator:	Doug Gabbard

Big Wilson Pump Station Upgrade

City Of Jacksonville, FL
Big Wilson Pump Station Upgrade
Class 4 Estimate

Estimator	Doug Gabbard
BC Project Manager	Anand Mody
BC Office	Tampa
Estimate Issue No.	1
QA/QC Reviewer	Sergio Bazarevitsch
QA/QC Review Date	01/29/16
BC Estimate Number	148757.300.002

Notes

PROCESS LOCATION/AREA INDEX

01 Replace Entry Doors
02 Replace venilation Fan
03 Replace Lighting
04 Extend Potable water line to Wet Well
05 Replace Sluice gates
06 Remove and replace stair bolts
07 Replace Bower System
08 Replace electric moters and control center
09 Replace pump controls
11 Demo bar screens and replace grating
12 Clean, scrape and paint wet well
14 Modify concrete pump bases
15 Modify spring loaded hatches
16 Replace handrails
17 Replace pumps
18 Install flow meter
19 Gas Detection System
26 Paint Dry Pit and Electric Room
27 By-Pass Pumpimg

Brown AND Caldwell

Estimate Summary Report

2/10/2016 7:03 AM

Project Number: 148757.300.002
Estimate Issue Number: 1
Bid Date: 2/23/2016
Estimator: Doug Gabbard

Big Wilson Pump Station Upgrade

Estimate Breakdown	Takeoff Quantity	Grand Total Unit Price	Gross Total Cost w/Markups
01 Totals			
01 Replace metal Entry Doors	1.00 LS	17,622.57 /LS	17,623
02 Replace ventilation Fan	1.00 EA	7,968.27 /EA	7,968
03 Replace Lighting and Emergency Lighting	1.00 LS	71,552.31 /LS	71,552
04 Potable Water Conections in Wet Well	60.00 LF	189.12 /LF	11,347
05 Replace sluice Gates	2.00 EA	65,317.98 /EA	130,636
06 Remove and Replace Existing Stairs & Railing	1.00 LS	23,477.25 /LS	23,477
07 Blower Replacement	1.00 LS	121,036.68 /LS	121,037
08 Electrical, Motor control Center	1.00 LS	897,303.70 /LS	897,304
09 Replace pump controls	1.00 LS	364,069.28 /LS	364,069
11 Demo bar screen and replace grating	2.00 EA	3,149.19 /EA	6,298
12 Clean, scrap and Paint Wet Well area	3,962.00 SF	5.96 /SF	23,630
13 Influent Channel and Wet Well Concrete Repair	1.00 LS	134,742.31 /LS	134,742
14 Modify Concrete Pump bases	3.00 EA	1,224.72 /EA	3,674
15 Modify spring loaded hatches	1.00 LS	914.75 /LS	915
16 Replace hand rails	88.00 LF	273.44 /LF	24,063
17 Replace Pumps	3.00 EA	237,852.28 /EA	713,557
18 Install Flow Meter	1.00 EA	40,880.56 /EA	40,881
19 Gas Detection System	1.00	26,258.47	26,258
26 Clean PaintPaint Dry pit, Electrical Room	1.00 LS	13,797.83 /LS	13,798
27 Close one Channel Flow	1.00 LS	33,927.35 /LS	33,927
01 Totals	1.00 LS	2,666,757.27 /LS	2,666,757

Brown AND Caldwell

Estimate Detail Report

Big Wilson Pump Station Upgrade

2/10/2016 7:00 AM

Project Number:	148767.300.002
Estimate Issue:	1
Due Date:	2/23/2016
Estimator:	Doug Gabbard

City Of Jacksonville, FL
Big Wilson Pump Station Upgrade
Class 4 Estimate

Estimator	Doug Gabbard
BC Project Manager	Anand Mody
BC Office	Tampa
Estimate Issue No.	1
QA/QC Reviewer	Sergio Bazarevitsch
QA/QC Review Date	01/29/16

Notes

PROCESS LOCATION/AREA INDEX

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09 Replace pump controls
11 Demo bar screens and replace grating
12 Clean, scrape and paint wet well
14 Modify concrete pump bases
15 Modify spring loaded hatches
16 Replace handrails
17 Replace pumps
18 Install flow meter
19 Gas Detection System
26 Paint Dry Pit and Electric Room
27 By-Pass Pumpimg

Page 1

Brown AND Caldwell

Estimate Detail Report

Big Wilson Pump Station Upgrade

2/10/2016 7:00 AM

Project Number: 148767.300.002
Estimate Issue: 1
Due Date: 2/23/2016
Estimator: Doug Gabbard

Phase	Estimate Breakdown	Item	Quantity	Labor Cost/Unit	Material Cost/Unit	Sub Cost/Unit	Equip Cost/Unit	Other Cost/Unit	Total Cost/Unit	Total Net Amount
01 Totals										
01 Replace metal Entry Doors										
02999 FRP Doors & Frames										
08-13-13.13	Doors, hollow FRP, commercial, fiberglass, flush, full panel, hollow core, 1-3/8" thick, 20 ga., 3'-0" x 7'-0"	0100	3.0 ea	40.08	350.64	-	-	-	390.72 /ea	1,172
	FRP Doors & Frames		3.0 EA	40.08	350.64				390.72 /EA	1,172
08100 FRP Doors										
08-13-13.15	Doors, fire, flush, "A" label, 3 hour, composite, 18 ga., 3'-0" x 7'-0"	0680	6.0 ea	45.43	720.76	-	-	-	766.19 /ea	4,597
08-13-13.15	FRP doors, rated, receive, sort and spread, per manhour	5000	6.0 mh	36.54	-	-	-	-	36.54 /mh	219
	FRP Doors		6.0 leaf	81.96	720.76				802.72 /leaf	4,816
08115 FRP Door Frame										
08-12-13.25	Door frames, FRP channels with anchors and bar stops, 6" channel@ 4.2lb/LF, 3' x 7' door, weighs 100 lb	0100	9.0 ea	141.10	232.79	-	11.44	-	385.32 /ea	3,468
	FRP Door Frame		9.0 ea	141.10	232.79		11.44		385.32 /ea	3,468
	01 Replace metal Entry Doors		1.0 LS	1,881.89	7,471.55		102.99		9,456.43 /LS	9,456
02 Replace ventilation Fan										
23999 Remove and replace Fan										
23-05-05.10	Fans, 1-1/2 thru 10 H.P. or 20,000 CFM, selective demolition	2124	1.0 ea	156.95	-	-	-	-	156.95 /ea	157
23-34-16.10	Fans, industrial exhauster, 2000 CFM, 3 H.P.	5540	1.0 ea	517.63	3,500.00	-	-	-	4,017.63 /ea	4,018
23-37-13.30	Grille, aluminum, air supply, adjustable, single deflection, 30" x 30"	0500	1.0 ea	31.64	61.00	-	-	-	92.64 /ea	93
	Remove and replace Fan		1.0 EA	706.22	3,561.00				4,267.22 /EA	4,267
	02 Replace ventilation Fan		1.0 EA	706.22	3,561.00				4,267.22 /EA	4,267
03 Replace Lighting and Emergency Lighting										
26005 Remove and replaceLighting										
26-05-05.20	Wiring duct, plastic, 3" wide, electrical demolition, remove	5810	200.0 lf	1.34	-	-	-	-	1.34 /lf	268
26-05-05.50	Metal light pole, 20' high, electrical demolition, remove, excl concrete bases	3030	10.0 ea	125.53	-	-	16.14	-	141.67 /ea	1,417
26-51-13.55	Interior LED fixtures, high bay, surface mounted, 8 bars, 656 watt	4070	15.0 ea	576.91	1,862.25	-	-	-	2,439.16 /ea	36,587
26-52-13.10	Emergency lighting units, additional remote mount, sealed beam, 25 W 6 V	0780	5.0 ea	16.56	27.70	-	-	-	44.26 /ea	221
	Remove and replaceLighting		1.0 ls	10,259.64	28,072.26		161.44		38,493.34 /ls	38,493
	03 Replace Lighting and Emergency Lighting		1.0 LS	10,259.64	28,072.26		161.44		38,493.34 /LS	38,493
04 Potable Water Conections in Wet Well										
22113 Stainless Steel Pipe										
21-11-19.50	Hose Connections	9120	2.0 ea	410.35	999.00	-	-	-	1,409.35 /ea	2,819
22-05-29.10	Pipe hanger / support, rods, stainless steel, both ends machine threaded, 1" thread size x 18" long, type 304	2810	10.0 ea	2.02	15.09	-	-	-	17.11 /ea	171
22-11-13.64	Pipe, stainless steel, butt weld, 1-1/2" diameter, schedule 5, type 304, includes weld joint and clevis type hangers 10' OC	0580	60.0 lf	10.48	18.60	-	0.69	-	29.77 /lf	1,786

Brown AND Caldwell

Estimate Detail Report

Big Wilson Pump Station Upgrade

2/10/2016 7:00 AM
Project Number: 148757.000.002
Estimate Issue: 1
Due Date: 2/23/2016
Estimator: Doug Gabbard

Phase	Estimate Breakdown	Item	Quantity	Labor Cost/Unit	Material Cost/Unit	Sub Cost/Unit	Equip Cost/Unit	Other Cost/Unit	Total Cost/Unit	Total Net Amount
22113 Stainless Steel Pipe										
22-11-13.66	Tee, stainless steel, straight, butt weld, 1-1/2", schedule 5, type 304, includes the weld machine	1170	2.0 ea	127.24	49.50	-	8.41	-	185.15 /ea	370
33-11-13.35	Backflow preventer, ball valves, reduced press,threaded,1-1/2" pipe	0090	1.0 ea	48.49	917.76	-	-	-	966.25 /ea	966
	Stainless Steel Pipe		**60.0 lf**	**29.54**	**71.36**		**0.97**		**101.88 /lf**	**6,113**
	04 Potable Water Conections in Wet Well		**60.0 LF**	**29.54**	**71.36**		**0.97**		**101.88 /LF**	**6,113**
05 Replace sluice Gates										
33999 Remove and install sluice gates										
11-05-05.10	Hydraulic gate, canal, flap, knife, slide or sluice, 19" to 36" diameter, selective demolition	2852	2.0 ea	418.51	-	-	101.90	-	520.41 /ea	1,041
35-20-16.26	Hydraulic sluice gates, hydraulic structures, plastic, heavy duty, self contained w/Actuator, 24" x 24", AWWA C501	0160	2.0 ea	5,145.11	27,861.60	-	1,528.48	-	34,536.18 /ea	69,072
	Remove and install sluice gates		**2.0 EA**	**5,564.62**	**27,861.60**		**1,630.38**		**35,056.80 /EA**	**70,113**
	05 Replace sluice Gates		**2.0 EA**	**5,564.62**	**27,861.60**		**1,630.38**		**35,056.80 /EA**	**70,113**
06 Remove and Replace Existing Stairs & Railing										
06999 Fiberglass steps										
02-41-19.19	Selective demolition,rubbish handling,0 - 50'haul,load,haul,dump and return,hand carried,including 11 - 21 riser stairs,cost added demolition cost	2150	20.0 cy	46.08	-	-	-	-	46.08 /cy	922
05-52-13.50	Railing, pipe, Fiberglass, wall rail, 1-1/2" diam., shop fabricated	0965	20.0 lf	19.68	212.00	-	1.39	-	233.07 /lf	4,661
11-91-13.10	Stair equipment,, fiberglass, steps, 20 tread count	0160	1.0 ea	1,268.50	5,725.00	-	-	-	7,013.50 /ea	7,014
	Fiberglass steps		**1.0 LS**	**2,603.57**	**9,965.00**		**27.81**		**12,596.38 /LS**	**12,596**
	06 Remove and Replace Existing Stairs & Railing		**1.0 LS**	**2,603.57**	**9,965.00**		**27.81**		**12,596.38 /LS**	**12,596**
07 Blower Replacement										
11999 Blower Replacement										
46-06-00.00	Blowers, positive displacement, complete w/ motor, 500 cfm	BC-0446	1.0 ea	15,000.00	50,000.00	-	-	-	65,000.00 /ea	65,000
	Blower Replacement		**1.0 LS**	**15,000.00**	**50,000.00**				**65,000.00 /LS**	**65,000**
	07 Blower Replacement		**1.0 LS**	**15,000.00**	**50,000.00**				**65,000.00 /LS**	**65,000**
08 Electrical, Motor control Center										
26024 Electrical Fitout, Conceptual										
26-05-33.05	Branch power, to 3/4" EMT w/ conductors, avg. $/sf, fitout	6015	2,600.0 sf	1.00	0.40	-	-	-	1.40 /sf	3,630
26-05-80.10	Motor connections, flexible conduit and fittings, 3 phase, 230 volt, 25 HP motor	0200	3.0 ea	163.76	27.70	-	-	-	191.45 /ea	574
26-22-13.10	Transformer, dry-type, low operating temperature (80 Deg. C), single phase 480 V primary 120/240 V secondary, 25 kVA	2250	3.0 ea	884.29	4,011.00	-	-	-	4,895.29 /ea	14,686
26-24-13.30	Distribution switchboards,120/208v or 277/480v, avg cost per amp	2000	120.0 amp	9.67	8.60	-	-	-	18.27 /amp	2,192
26-24-13.30	Emerg distribution boards,120/208v or 277/480v, avg cost per amp	2010	1,200.0 amp	9.67	8.60	-	-	-	18.27 /amp	21,920
26-24-16.30	Panelboards, 3 phase 4 wire, main lugs, 120/208 V, 225 amp, 42 circuits, NQOD, incl 20 A 1 pole plug-in breakers	1000	1.0 ea	1,300.43	1,313.13	-	-	-	2,613.56 /ea	2,614
26-24-19.40	Motor starter, combination, with fused switch, size 1, 10 HP, NEMA 1	1600	3.0 ea	340.11	620.75	-	-	-	960.86 /ea	2,883

Brown AND Caldwell

Estimate Detail Report

Big Wilson Pump Station Upgrade

2/10/2016 7:00 AM

Project Number: 148787.300.002
Estimate Issue: 1
Due Date: 2/23/2016
Estimator: Doug Gebbard

Phase	Estimate Breakdown	Item	Quantity	Labor Cost/Unit	Material Cost/Unit	Sub Cost/Unit	Equip Cost/Unit	Other Cost/Unit	Total Cost/Unit	Total Net Amount
26024 Electrical Fitout, Conceptual										
26-24-19.40	Motor starter, magnetic, 1 or 2 pole, 240 volt, .75 HP motor	6000	3.0 ea	20,184.52	106,113.12	-	-	-	126,297.64 /ea	378,893
26-32-13.16	Generator set, dsl eng,incl btry, chgr,muf,auto xfr sw&day tank,300 kW	2900	1.0 ea	4,964.13	46,890.50	-	638.44	-	52,493.07 /ea	52,493
27-54-13.50	Fire/Life safety system, complete, avg. cost per sf, fitout	0070	2,600.0 sf	-	-	0.40	-	-	0.40 /sf	1,040
	Electrical Fitout, Conceptual		2,600.0 sf	33.21	151.12	0.40	0.25		184.97 /sf	480,925
	08 Electrical, Motor control Center		1.0 LS	86,336.17	392,909.66	1,040.00	638.44		480,924.59 /LS	480,925
09 Replace pump controls										
27202 Instrumentation and PLC Programming										
27-20-02.00	2" 316 SS, Pressure Gauge, 0-300 psi	BC-0001	6.0 ea	58.82	38.20	-	-	-	97.02 /ea	582
27-20-02.00	Weatherproof Pressure Switch	BC-0016	6.0 ea	110.54	312.29	-	-	-	422.82 /ea	2,537
27-20-02.00	Pressure Transmitters	BC-0026	6.0 ea	221.07	1,206.40	-	-	-	1,427.48 /ea	8,565
27-20-02.00	Explosion-proof Pressure Transmitters	BC-0031	6.0 ea	110.54	859.50	-	-	-	970.04 /ea	5,820
27-20-05.00	Pressure switches	BC-0001	6.0 ea	110.54	723.84	-	-	-	834.38 /ea	5,006
27-20-05.00	Temperature Switches, NEMA 4X	BC-0021	6.0 ea	110.54	249.26	-	-	-	359.79 /ea	2,159
27-20-05.00	Float level switch	BC-0036	3.0 ea	442.15	7,527.96	-	-	-	7,970.11 /ea	23,910
27-20-14.00	Loop Checking	BC-0001	10.0 ea	221.07	-	-	-	-	221.07 /ea	2,211
27-20-15.00	Instrumention, control systems, software, hardware complete	BC-0006	1.0 ls	30,000.00	30,000.00	30,000.00	30,000.00	30,000.00	150,000.00 /ls	150,000
27-20-15.00	Programming Using I/O Count	BC-0016	30.0 ea	33.32		-	-	-	33.32 /ea	1,000
	Instrumentation and PLC Programming		1.0 LS	38,869.06	72,920.79	30,000.00	30,000.00	30,000.00	201,789.85 /LS	201,790
	09 Replace pump controls		1.0 LS	38,869.06	72,920.79	30,000.00	30,000.00	30,000.00	201,789.85 /LS	201,790
11 Demo bar screen and replace grating										
02999 Demo bar screen										
02-22-04.50	Site demolition, equipment removal, mechanical bar screen	BC-0006	2.0 ea	912.83	-	-	-	-	912.83 /ea	1,826
	Demo bar screen		2.0 EEA	912.83					912.83 /EEA	1,826
05999 Fiberglass Grating										
06-52-10.30	Fiberglass grating, molded, orange (for highly corrosive environment), 2" square mesh, 2" thick	1200	36.0 sf	5.22	39.48	-	-	-	44.70 /sf	1,609
	Fiberglass Grating		1.0 LS	187.80	1,421.40				1,609.20 /LS	1,609
	11 Demo bar screen and replace grating		2.0 EA	1,006.73	710.70				1,717.43 /EA	3,435
12 Clean, scrap and Paint Wet Well area										
09900 Painting & Wallcovering Wet well										
09-91-13.90	Paints & coatings, walls, concrete masonry units (CMU), porous, first coat, waterproof sealer, spray	0600	3,962.0 sf	0.16	0.26	-	-	-	0.42 /sf	1,655
09-97-13.23	Paints and protective coatings, epoxy primer, sprayed	6610	3,962.0 sf	0.27	0.30	-	-	-	0.58 /sf	2,287
09-97-13.23	Paints and protective coatings, epoxy topcoat, sprayed	6630	3,962.0 sf	0.29	0.27	-	-	-	0.57 /sf	2,242
	Painting & Wallcovering Wet well		3,962.0 sf	0.73	0.84				1.56 /sf	6,185
09900 Painting & Wallcovering Screen Room										
09-91-23.72	Paints & coatings, walls & ceilings, interior, concrete, drywall or plaster, glaze coating, 2 coats, spray	1640	2,432.0 sf	0.29	1.04	-	-	-	1.33 /sf	3,231
	Painting & Wallcovering Screen Room		1.0 sf	714.24	2,517.12				3,231.36 /sf	3,231
09999 Misc. Finishes										

Brown AND Caldwell

Estimate Detail Report

Big Wilson Pump Station Upgrade

2/10/2016 7:00 AM
Project Number: 148757.300.002
Estimate Issue: 1
Due Date: 2/23/2016
Estimator: Doug Gabbard

Phase	Estimate Breakdown	Item	Quantity	Labor Cost/Unit	Material Cost/Unit	Sub Cost/Unit	Equip Cost/Unit	Other Cost/Unit	Total Cost/Unit	Total Net Amount
09999 Misc. Finishes										
01-54-23.70	Scaffolding, steel tubular, heavy duty shoring, frame, buy, 6' high x 4' wide	0935	20.0 ea	-	107.69	-	-	-	107.69 /ea	2,154
	Misc. Finishes		1.0 LS		2,153.84				2,153.84 /LS	2,154
09999 Cleaning walls and floor										
05-01-10.51	Concrete cleaning, steel surface treatment, 5000 psi pressure washing, 5000 -/day	6215	4,000.0 sf	0.30	-	-	-	-	0.30 /sf	1,199
	Cleaning walls and floor		1.0 LS	1,199.26					1,199.26 /LS	1,199
	12 Clean, scrap and Paint Wet Well area		3,962.0 SF	1.21	2.02				3.22 /SF	12,769
13 Influent Channel and Wet Well Concrete Repair										
03999 Influent channel repair										
03-99-99.99	Influent channel and wet well concrete repair	MISC	1.0 LS	30,000.00	30,000.00		15,000.00	-	75,000.00 /LS	75,000
	Influent channel repair		1.0 LS	30,000.00	30,000.00		15,000.00		75,000.00 /LS	75,000
	13 Influent Channel and Wet Well Concrete Repair		1.0 LS	30,000.00	30,000.00		15,000.00		75,000.00 /LS	75,000
14 Modify Concrete Pump bases										
03900 Patching Concrete										
03-01-30.62	Patching concrete, walls, epoxy grout, 1/2" deep, including chipping, cleaning and epoxy grout	2150	48.0 sf	7.47	14.14	-	-	-	21.61 /sf	1,037
03-01-30.62	Portland cement underlayment; self-leveling 4100 psi, pumped, 1/2"	2520	48.0 sf	0.13	2.85	-	0.04	-	3.02 /sf	145
03-01-30.62	Portland cement topping; self-level/dry 6100 psi, pumped, to 1-1/2"	2670	48.0 sf	0.17	12.48	-	0.05	-	12.69 /sf	609
03-05-13.30	Cement, portland, type I/II, 94 lb. Bags, less than truckload or less than carload lots, includes material only	0250	8.0 bag	-	10.13	-	-	-	10.13 /bag	81
03-11-13.55	C.I.P. concrete forms, mat foundation, plywood, 4 use, includes erecting, bracing, stripping and cleaning	0120	16.0 sfca	5.62	0.72	-	-	-	6.34 /sfca	101
	Patching Concrete		144.0 sf	3.21	10.46		0.03		13.71 /sf	1,974
	14 Modify Concrete Pump bases		3.0 EA	154.21	502.27		1.40		657.88 /EA	1,974
15 Modify spring loaded hatches										
11999 Hinges										
23-82-29.10	Hydronic htg,2 pipe multi fin convector,for hinged access door,add	2245	10.0 ea	13.73	35.50	-	-	-	49.23 /ea	492
	Hinges		1.0 LS	137.27	355.00				492.27 /LS	492
	15 Modify spring loaded hatches		1.0 LS	137.27	355.00				492.27 /LS	492
16 Replace hand rails										
05999 Handrails										
09-69-13.10	Access floors, handrails, aluminum, 2 rail	1500	88.0 lf	26.07	120.45	-	-	-	146.51 /lf	12,893
	Handrails		88.0 LF	26.07	120.45				146.51 /LF	12,893
	16 Replace hand rails		88.0 LF	26.07	120.45				146.51 /LF	12,893
17 Replace Pumps										
33999 Replace Pumps										
02-22-04.52	Equipment dismantling/demolition, deliver existing pumps and motors to owner	BC-0246	3.0 ea	600.00	-	-	-	-	600.00 /ea	1,800
33-99-99.99	Pump micellaneous, valves and Appurtenances	MISC	1.0 LS	37,500.00	37,500.00		-	-	75,000.00 /LS	75,000
46-06-16.00	Pumps, gen util, Wmot, mtd on base, sgl stage, 60 HP w/VFD's	BC-0061	3.0 ea	12,499.99	90,000.00	-		-	102,499.99 /ea	307,500

Brown AND Caldwell

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Project Number: 148757.300.002
Estimate Issue: 1
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Phase	Estimate Breakdown	Item	Quantity	Labor Cost/Unit	Material Cost/Unit	Sub Cost/Unit	Equip Cost/Unit	Other Cost/Unit	Total Cost/Unit	Total Net Amount
	Replace Pumps		3.0 LS	25,599.99	102,500.00				128,099.99 /LS	384,300
	17 Replace Pumps		3.0 EA	25,599.99	102,500.00				128,099.99 /EA	384,300
18 Install Flow Meter										
33999 Install Flow Meter										
22-05-23.30	Valves, iron body, butterfly, lug type, pneumatic operator, 12"	0620	2.0 ea	459.72	1,923.08	-	-	-	2,382.80 /ea	4,766
27-20-03.00	12" strap on flowmeters	BC-0016	1.0 ea	3,000.03	12,000.00	-	-	-	15,000.03 /ea	15,000
40-05-19.10	Fitting Flanged & Bolted-Cast Iron-Reducer 1 Dia-Cls 125 16 Inch (600mm)	A242416 006100	2.0 ea	-	1,117.32	-	-	-	1,117.32 /ea	2,235
	Install Flow Meter		1.0 EA	3,919.47	18,080.78				22,000.25 /EA	22,000
	18 Install Flow Meter		1.0 EA	3,919.47	18,080.78				22,000.25 /EA	22,000
19 Gas Detection System										
33999 Gas Deection System										
33-99-99.99	Gas Dtection System	MISC	1.0 LS	-	-	15,000.00	-	-	15,000.00 /LS	15,000
	Gas Deection System		1.0 LS			15,000.00			15,000.00 /LS	15,000
	19 Gas Detection System		1.0			15,000.00			15,000.00	15,000
26 Clean PaintPaint Dry pit, Electrical Room										
09900 Painting & Wallcovering (Including Acoustic Wall Panels)										
01-54-07.50	Scaffolding assembly and disassembly, OPEN	BC-0001	7,500.0 sqft	0.25		-		-	0.25 /sqft	1,876
04-01-30.20	Cleaning masonry, light restoration, light soil, by chemical, low pressure wash, brush and rinse, excludes scaffolding	0260	7,500.0 sf	0.13	0.02	-	-	-	0.15 /sf	1,125
09-91-23.72	Paints & coatings, walls & ceilings, interior, concrete, drywall or plaster, glaze coating, 2 coats, multicolor, spray	1640	7,500.0 sf	0.13	0.47	-	-	-	0.60 /sf	4,500
	Painting & Wallcovering (Including Acoustic Wall Panels)		1.0 sf	3,847.56	3,653.18				7,500.74 /sf	7,501
	26 Clean PaintPaint Dry pit, Electrical Room		1.0 LS	3,847.56	3,653.18				7,500.74 /LS	7,501
27 Close one Channel Flow										
02999 By Pass Pumping										
46-06-00.00	Influent channel stop logs, complete w/ frames	BC-0086	1.0 ea	2,792.18	419.33	-	-	-	3,211.51 /ea	3,212
46-06-18.00	Pump, cntfgl, horiz mtd, horiz split, sgl stg,4000GPM,200HP,10"D 1 Month renta with attedent 4Hrs day	BC-0171	1.0 ea	1,214.71	13,785.29	-		-	15,000.00 /ea	15,000
	By Pass Pumping		1.0 LS	4,006.89	14,204.62				18,211.51 /LS	18,212
	27 Close one Channel Flow		1.0 LS	4,006.89	14,204.62				18,211.51 /LS	18,212
	01 Totals		1.0 LS	296,825.55	1,020,299.54	46,040.00	49,254.00	30,000.00	1,442,329.09 /LS	1,442,329

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Estimate Detail Report

Big Wilson Pump Station Upgrade

2/10/2016 7:00 AM
Project Number: 148757.000.002
Estimate Issue: 1
Due Date: 2/23/2016
Estimator: Doug Gabbard

Estimate Totals

Description	Rate	Hours	Amount	Totals
Labor		3,570 hrs	296,826	
Material			1,020,210	
Subcontract			46,040	
Equipment		7,776 hrs	49,254	
Other			30,000	
			1,442,329	1,442,329
Labor Mark-up	10.000 %		29,683	
Material Mark-up	8.000 %		81,617	
Subcontractor Mark-up	5.000 %		2,302	
Construction Equipment Mark-up	8.000 %		3,940	
Other - Process Equip Mark-up	8.000 %		2,400	
			119,942	1,562,271
Material Shipping & Handling	2.000 %		20,404	
Material Sales Tax	8.000 %		73,638	
Net Markups			94,042	1,656,313
				1,656,313
Contractor General Conditions	10.000 %		165,631	
			165,631	1,821,944
Start-Up, Training, O&M	2.000 %		36,439	
			36,439	1,858,383
Undesign/Undevelop Contingency	30.000 %		557,515	
			557,515	2,415,898
Bldg Risk, Liability Auto Ins	2.000 %		48,318	
			48,318	2,464,216
Contractor Bonds & Insurance	1.500 %		36,963	
			36,963	2,501,179
Escalation to Midpoint (ALL)	6.620 %		165,578	
Gross Markups			165,578	2,666,757
Total				**2,666,757**