TM No.9
Oso WRP Phase 2
Cost/Benefit Evaluation

Oso Water Reclamation Plant
Nutrient Removal Project (Ammonia)

City Project No.E09007
LNV Project No.100140.00

Submitted to:

City of Corpus Christi
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April 15, 2013

Oso Water Reclamation Plant
Nutrient Removal Project (Ammonia)
City Project No. E09007
LNV Project No. 101040.00

TECHNICAL MEMORANDUM NO. 9

Date: April 15, 2013

To: Dan Biles, P.E. - Director of Engineering

From: Logan Burton, P.E.

Subject: Oso WRP Phase 2 Cost/Benefit Evaluation

Copies To: Bill Green, P.E., Foster Crowell, Joe Trejo, P.E.

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1 Executive Summary

The City of Corpus Christi owns and operates six (6) wastewater treatment plants, which currently serve approximately 310,000 customers. This memorandum focuses on the Oso Water Reclamation Plant (WRP) and the Laguna Madre Wastewater Treatment Plant (WWTP), and will provide some related discussion on the Greenwood Wastewater Treatment Plant (GWWTP) as well. The Oso WRP is the largest of the six treatment plants in the City of Corpus Christi and is located at the corner of Ennis Joslin Road and Nile Drive, adjacent to the Texas A&M University-Corpus Christi Athletic Facility. The plant currently serves the large, growing service area on the City's Southside, which includes approximately 24,143 acres and over 50% of the City's population.

All treatment plants in the State of Texas are required to operate under a Texas Pollution Discharge Elimination System (TPDES) permit, which is authorized and monitored by the Texas Commission on Environmental Quality (TCEQ). The TCEQ has recently adopted more stringent restrictions on ammonia levels intended to protect sea grasses in the bay systems. On April 29, 2011, the TCEQ issued a renewal of the plant's TPDES permit which included new effluent ammonia limits on 30-day average, 7-day average and daily maximum of 4 mg/L, 6 mg/L and 10 mg/L, respectively, along with a milestone compliance date on or before October 29, 2013. To attain compliance by October 29, 2013, the City adopted a strategy of implementing near-term (Phase 1) and long-term (Phase 2) improvements at the Oso WRP.

Phase 1 improvements are considered near-term improvements as a result of the increased O&M costs and added complexity to the operation of the plant. These improvements will not meet the cost/benefit requirements of a long-term solution. The Phase 2 facility upgrades are necessary for the plant to meet additional anticipated regulatory requirements, to provide additional treatment capacity to meet projected increased plant flows, to ensure continued plant reliability, and to replace the temporary Phase 1 improvements. The proposed Oso WRP Phase 2 work addresses the following mission elements:

- Mission Element #2 – Treat Wastewater
    - Goal – Operate and upgrade wastewater treatment plant facilities to meet regulatory requirements.
        - Strategy 1 - Meet or exceed TCEQ & EPA regulated effluent quality limits
        - Strategy 3 - Implement effective plant asset management strategies

- Mission Element #4 – Plan and develop expansion to the wastewater utility
        - Strategy 2 - Improvements and anticipated regulatory requirements for plant re-rating

The goal of this study was to develop life-cycle cost estimates with as much confidence as possible given the state of the conceptual design. Life cycle costs represent the total cost incurred over the life span of a project, including design, construction, and operation and maintenance (O&M) costs. All cost estimates in this study are shown in 2013 dollars and are broken into multiple components such as

capital construction, construction contingency, administrative items, engineering design, and O&M costs.

Due to the additional permitting requirements anticipated in upcoming TPDES renewals, the growth in the Southside, and the age of the plant, there is not a realistic, viable "do nothing" option. As a result, this memo discusses the consequences of not moving forward with the Phase 2 improvements and describes the necessary projects that would be necessary in lieu thereof.

The capital construction costs for Oso WRP Phase 2 Improvements, including decommissioning of the Laguna Madre WWTP, is $80,969,000 with a total project cost including administration estimated at $99,439,000. The total construction costs associated with not implementing Phase 2 are $105,030,000 with a total project cost including administration of $128,990,000 which includes Laguna Madre WWTP and Greenwood WWTP upgrades.

The Wastewater Department has adopted a budget for the operation of Oso WRP for the current fiscal year (2012-2013). This memorandum illustrates the estimated O&M costs for the "do nothing" approach, along with the O&M costs for the plant once the Phase 2 improvements are implemented. The improvements will result in a less complex, more efficient biological nutrient removal process along with more reliable treatment equipment. The chart below and table on the following page summarize the total present values of both alternatives and demonstrates how the Phase 2 Improvements will save the City approximately $106 million over the next 20 years.

Figure 1: Present Value Cost Summary

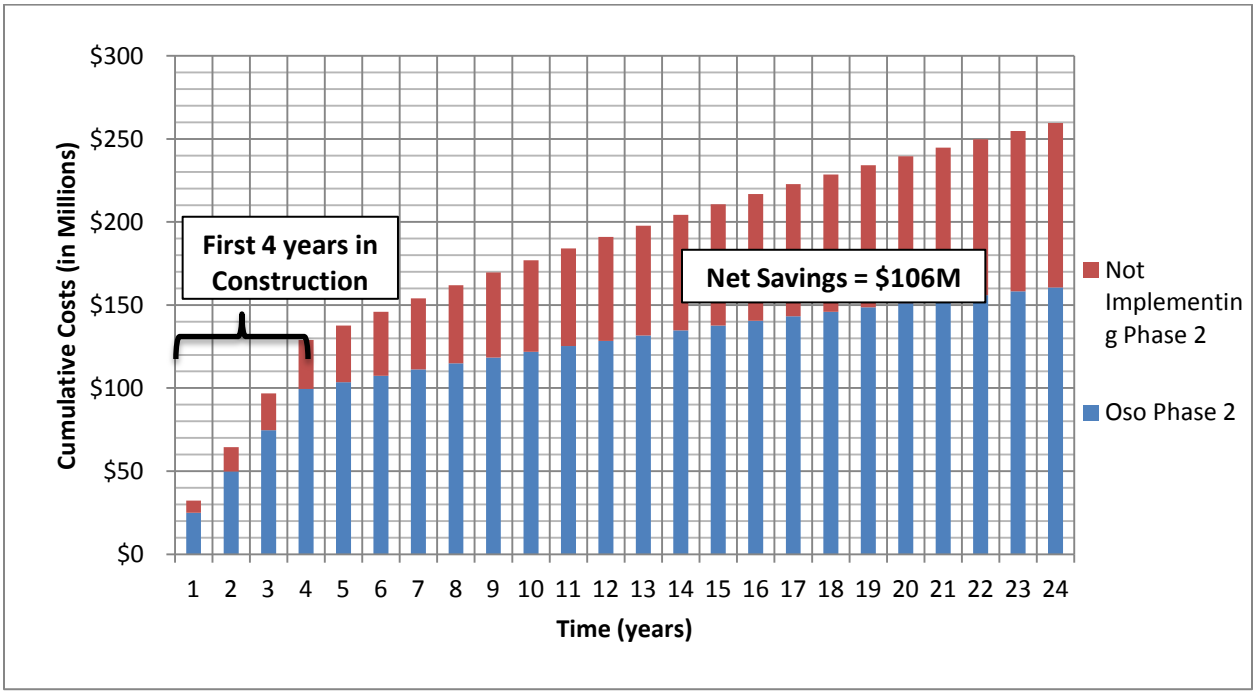


Table 1-1: Present Value Cost Summary

ALTERNATIVE	PROJECT COSTS	O&M COSTS (Present Value)	LIFECYCLE COSTS (20 Years)
Phase 2 Improvements	$99,439,000	$66,440,000	**$165,879,000**
Not Implementing Phase 2 Improvements	$128,990,000	$143,160,000	**$272,150,000**
PRESENT VALUE SAVINGS	**$29,551,000**	**$76,720,000**	**$106,271,000**

The purpose of this memorandum was to provide background information of the Oso WRP Nutrient Removal (Ammonia) project, summarize its advantages and disadvantages, and show the economic financial impacts of implementing these improvements. If the recommendations identified in this memo are executed, the estimated savings to the City is $106 million over the next 20 years.

2 Introduction

2.1 Purpose

The purpose of this memorandum is to provide the background information on the drivers of the Oso WRP Nutrient Removal (Ammonia) project, as currently identified in the City's Capital Improvement Program, and to present the results of a cost/benefit evaluation of the project improvements. Ultimately, this memo intends to show the economic benefits of implementing these improvements. The basis for the cost evaluation will be the estimated capital and incremental operational and maintenance (O&M) costs associated with the project. The results of this memo will provide an understanding of the cost impacts and will aid the City in making an informed decision regarding the future direction of the plant.

2.2 Background Information

2.2.1 City of Corpus Christi Wastewater Treatment

The City of Corpus Christi owns and operates six (6) wastewater treatment plants which currently serve approximately 310,000 customers. This memorandum focuses on two (2) of the six plants; Oso Water Reclamation Plant (WRP) and the Laguna Madre Wastewater Treatment Plant (WWTP) and will provide some related discussion on the Greenwood Wastewater Treatment Plant (GWWTP) as well. Additional information related to each of these plants is provided in subsections below.

All treatment plants in the State of Texas are required to operate under a Texas Pollution Discharge Elimination System (TPDES) permit which are authorized and monitored by the Texas Commission on Environmental Quality (TCEQ). TPDES permits describe the minimum water quality based effluent

limitations and monitoring requirements which must be met to maintain permit compliance. TPDES permits are typically issued for five (5) year durations and must be renewed prior to expiration.

Upon each permit renewal, the TCEQ and United States Environmental Protection Agency (USEPA) have the authority to include more stringent requirements in the permit. Over the past 10 years, these regulatory agencies have focused their attention on adopting nutrient (ammonia, nitrogen and phosphorus) limits, especially for those plants which discharge effluent into or near certain impaired waters. To date, the Greenwood WWTP, which discharges into Oso Creek, has the only permit containing an ammonia limit (3 mg/L) while the Oso WRP permit only requires that ammonia concentrations be monitored and reported on a weekly basis.

2.2.2 Oso Water Reclamation Plant (Oso WRP)

The Oso Water Reclamation Plant (Oso WRP) is the largest of the six treatment plants in the City of Corpus Christi and is located at the corner of Ennis Joslin Road and Nile Drive, adjacent to the TAMU-CC Athletic Facility. The plant currently serves the large and growing service area on the City's Southside which consists of approximately 24,143 acres and over 50% of the City's population. Refer to Exhibit 1 – Service Area Map for a graphical depiction of the service area. The Oso WRP discharges into Oso Bay (Cayo del Oso) which is on the USEPA's list of impaired water bodies and is currently operating under a 20 mg/L BOD_5 and 20mg/L TSS permit. The plant is operated with a current allocation of 16 staff members and produces an effluent quality that is in compliance with TCEQ's Type II Reclaimed Water (§210.32) regulations.

The Oso WRP was originally constructed in 1941 and several expansion projects have occurred over the years. The most recent major upgrade to the Oso WRP was completed in 1982. The project consisted of converting the plant's activated sludge process to a contact stabilization process and upgrading the plant's treatment capacity to accommodate average daily flows (ADF) of 16.2 million gallons per day (MGD) and peak 2-hour flows up to 98.0 MGD. The Oso WRP is currently configured as two parallel treatment trains; each rated at 8.1 MGD average daily flow. The Oso WRP currently treats about 11.3 MGD which represents approximately 70% of the plant's ADF design capacity and based on growth projections, this is expected to increase to approximately 15.2 MGD once the service area is completely developed. Per TCEQ regulations, design for increased capacity must be underway when flows reach 75% of design capacity.

As mentioned above, the TCEQ has recently adopted more stringent restrictions on ammonia levels intended to protect sea grasses in the bay systems. On April 29, 2011, the TCEQ issued a renewal of the plant's TPDES permit which included new effluent ammonia limits on 30-day average, 7-day average and daily maximum of 4 mg/L, 6 mg/L and 10 mg/L, respectively, along with a milestone compliance date on or before October 29, 2013. Prior to this renewal, the Oso WRP permit had not contained an ammonia limitation. The purpose of the compliance schedule was to provide sufficient time for the City to design, construct, and commission the necessary improvements to meet this ammonia limit in the near-term. The existing contact stabilization configuration of the Oso WRP was designed to remove BOD efficiently, but is not well-suited for ammonia removal nor is it allowed by TCEQ to be used as a nitrifying process to remove ammonia. As a result, major facility upgrades at the Oso WRP are necessary to comply with this

new ammonia limit. It should also be noted there are indications from the regulators that Total Nitrogen (TN) and Total Phosphorus (TP) limits are likely to be imposed upon the Oso WRP within the next several permit renewal cycles.

To attain compliance by October 29, 2013, the City adopted a strategy of implementing near-term (Phase 1) and long-term (Phase 2) improvements at the Oso WRP. This strategy allows the City to implement cost effective improvements as a temporary means of meeting the new effluent ammonia requirements in the near-term while planning, designing, and implementing the permanent long-term Phase 2 facility improvements following completion of other on-going major capital projects such as the New Broadway WWTP.

Phase 1 improvements included the temporary Breakpoint Chlorination Facility (BPC) and Step Feed modifications which are currently under construction and are scheduled for completion in September 2013. Phase 1 will achieve compliance with the ammonia limitations in the City's discharge permit within the mandated timeframe. However, as a result of the increased O&M costs and added complexity to the operation of the plant, these improvements will not meet the cost/benefit requirements of a long-term solution.

The Phase 2 facility upgrades are necessary for the plant to meet additional anticipated regulatory requirements, provide additional treatment capacity to meet projected increased plant flows, to ensure continued plant reliability, and to replace the temporary Phase 1 improvements. Technical Memorandum No. 6 – Regulatory Compliance and Implementation Plan describes the major capital improvements necessary to meet the current and anticipated (future) effluent regulations.

2.2.3 Laguna Madre Wastewater Treatment Plant (LMWWTP)

The Laguna Madre Wastewater Treatment Plant (LMWWTP) serves the entire Flour Bluff peninsula (approximately 7,335 acres) with the exception of the Naval Air Station. Refer to Exhibit 1 – Service Area Map for a graphical depiction of the service area. It is one of the smaller plants operated by the City and is located on the east end of Jester Street, adjacent to the Philip Dimitt Municipal Fishing Pier. The LMWWTP has a current allocation of 8 staff, operates as an activated sludge process and discharges into the Laguna Madre. The plant is currently treating an ADF of 2.1 MGD and although it is permitted for 20 mg/L BOD_5 and 20 mg/L TSS, it consistently achieves effluent quality of 3 mg/L and 5mg/L, respectively. This ADF flow represents approximately 70% of the plant's ADF design capacity and ADF flows are anticipated to peak out at approximately 7.5 MGD as the service area approaches full build-out.

The plant was originally constructed in 1971 and was expanded to its current 3.0 MGD average daily and 9.0 MGD peak 2-hour capacities in 1986. The LMWWTP produces an effluent quality that is in compliance with TCEQ's Type II Reclaimed Water (§210.32) regulations and 300,000 to 500,000 gallons are pumped to the Naval Air Station each day for irrigation of their golf course.

2.2.4 Greenwood Wastewater Treatment Plant (GWWTP)

The Greenwood Wastewater Treatment Plant (GWWTP) is located at the intersection of Saratoga Boulevard and Greenwood Drive and serves approximately 6,000 acres on the City's Westside, including

the International Airport. Refer to Exhibit 1 – Service Area Map for a graphical depiction of the service area.

The plant was originally constructed in 1959 and was most recently expanded in 2000 to provide increased ADF capacity of 8.0 MGD. The plant is a conventional activated sludge process with anaerobic digestion. The GWWTP discharges effluent into Oso Creek and currently operates on the most stringent permit of all plants owned by the City. The plant is currently treating an ADF of 5.8 MGD and is permitted for 10 mg/L BOD_5, 15 mg/L TSS, and 3 mg/L Ammonia. This ADF flow represents approximately 73% of the plant's ADF design capacity.

2.3 Wastewater Department Business Plan

The Wastewater Department's Business Plan for FY 2012-2013 was approved on August 1, 2012. The plan outlines the department's mission elements, goals, strategies, and individual tasks for the current fiscal year while also laying out a management framework for the next 3 to 5 years. When considering the viability of a potential project, it is imperative that the project scope and intent are aligned with the goals and strategies of the adopted business plan. The proposed Oso WRP Phase 2 work addresses the following mission elements:

- Mission Element #2 – Treat Wastewater
    - Goal – Operate and upgrade wastewater treatment plant facilities to meet regulatory requirements.
        - Strategy 1 – Meet or exceed TCEQ & EPA regulated effluent quality limits
        - Strategy 3 - Implement effective plant asset management strategies

- Mission Element #4 – Plan and develop expansion to the wastewater utility
        - Strategy 2 – Improvements and anticipated regulatory requirements for plant re-rating

3 Evaluated Alternatives

The alternatives considered in this cost/benefit evaluation are described in detail below.

3.1 Oso WRP Phase 2 Improvements

The team conducted a workshop with City staff to identify the goals and objectives of the Oso WRP Phase 2 improvements. These goals were based on the City's current operation experience and issues and considered the current regulatory climate with impending more stringent permitting implications. The goals and objectives are shown below:

- Maintain regulatory compliance
- Provide for biological ammonia and total nitrogen removal
- Provide accommodations for implementing future phosphorus removal
- Provide for Coliform and Enterococci removal and/or inactivation
- Re-rate the average daily flow capacity to meet anticipated future flows

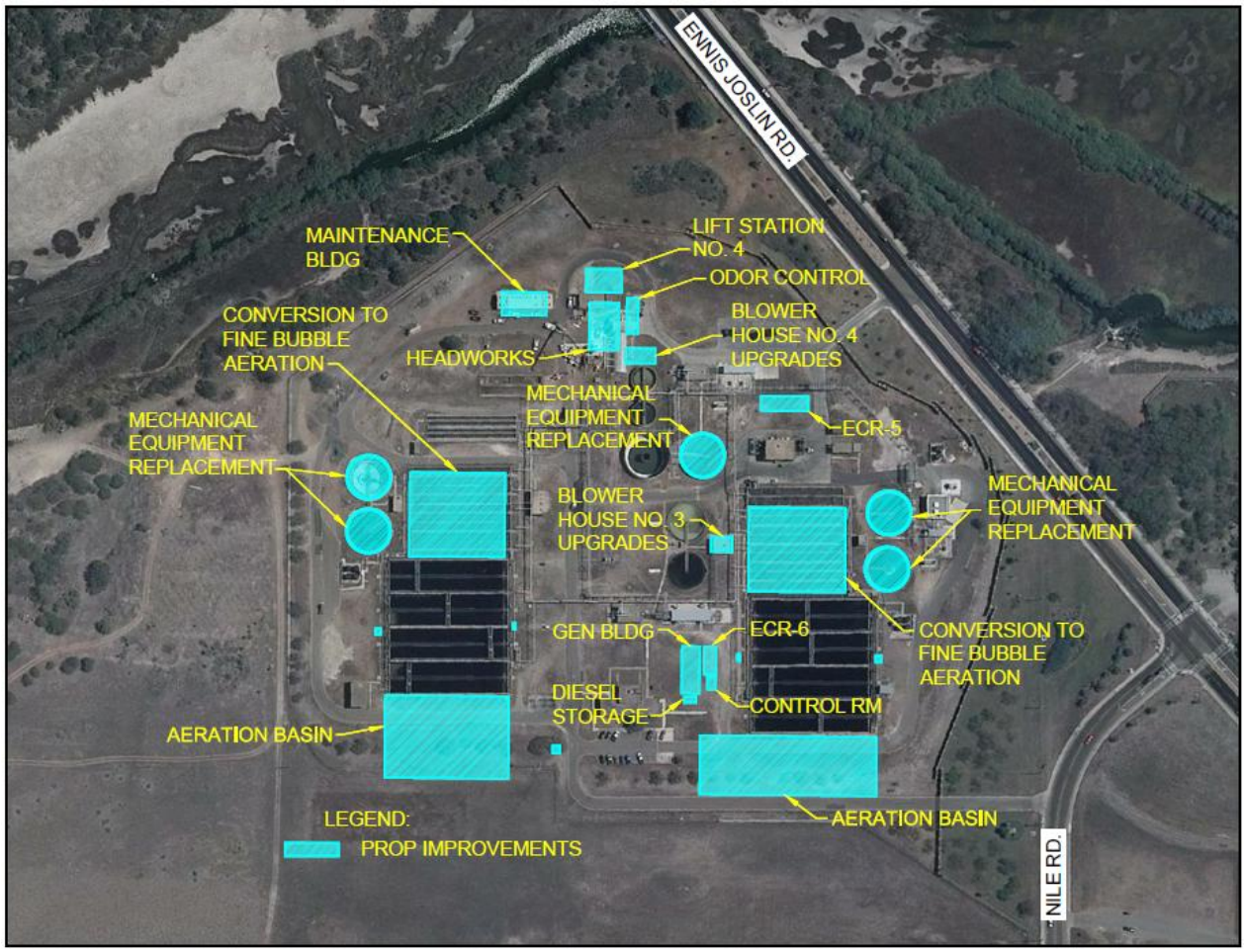
- Maintain peak hour flow capacity of 98 MGD
- Improve process automation and monitoring
- Reduce process and maintenance costs
- Reduce process odors
- Provide operational and maintenance flexibility

The Phase 2 improvements proposed to meet the goals and objectives described above are described in detail in TM-6 and consist of the following elements as shown in Figure 1:

- Site Development & Yard Piping – additional cut/fill as needed for the final plant layout, paving, grading, access roadways, and drainage improvements. Includes site landscaping, on-site miscellaneous yard piping, interconnecting process piping, tie-ins to existing and proposed treatment facilities and coordination with Oso WRP's existing hydraulic profile
- New Influent Pump Station –80 MGD capacity, depending upon the results of the evaluation to either eliminate Lift Station No. 1 or consolidate Lift Stations No. 1 and No. 2 into a single submersible style station with dual wet wells; the influent pump station will include a building, flow measurement, pump hoisting system, and automated controls
- New Headworks – mechanical bar screens with associated washers/compactors for the screenings, vortex grit removal with grit pumps and classifiers, and flow splitting
- New Odor Control System – odor control system to serve both the new influent pump station and headworks
- New Process Train No. 3 Aeration Basin – approximately 3 MG volume, anoxic and aerobic (oxic) zones, provisions to biologically remove phosphorus in the future, anoxic zone submersible mixers, fine bubble diffused aeration system, internal basin mixed liquor return (MLR) pumps and piping, return activated sludge piping, upgrades to the process air system (blowers & piping), and flow splitter structure
- New Process Train No. 4 Aeration Basin – approximately 3 MG volume, anoxic and aerobic (oxic) zones, provisions to biologically remove phosphorus in the future, anoxic zone submersible mixers, fine bubble diffused aeration system, MLR pumps and piping, return activated sludge piping, upgrades to the process air system (blowers & piping), and flow splitter structure
- Reconfigure Existing Process Train No. 1 & No. 2 (East and West) Aeration Basins – install new baffle walls to create anoxic zones, submersible mixers, fine bubble diffused aeration, diffused air piping, upgrades to the process air system, mixed liquor return (MLR) pumps and piping, walkways/catwalks, and return activated sludge piping
- Upgrade Disinfection System – new chlorine solution pumping system, baffles, mixing, chlorine contact chamber mechanical internals
- Electrical System Upgrades – overall site electrical for new process facilities, instrumentation and controls, two new electrical control rooms (ECR), four (4) new standby electrical generators, relocation of two (2) existing generators, and area lighting
- SCADA System – new plant-wide supervisory control and data acquisition (SCADA) system to monitor and control all new plant processes

- Site and Civil Design – new yard piping to connect new process units, paving and grading, and landscape architectural elements
- Maintenance Building – new facility with maintenance bays, shop, parts storage, storage, offices, restrooms, locker rooms, and training room
- Condition Assessment of Existing Facilities – evaluate the condition, capacity, and treatment reliability of the existing facilities that will remain in service after the Phase 2 improvements are complete. Any additional design tasks associated with items identified in the condition assessment to be rehabilitated or replaced are not included in this scope and fee proposal, including the effluent outfall facilities, administration building, belt press building, digesters, and clarifiers.
- Laguna Madre WWTP Decommissioning & Transfer Station –overall decommissioning and demolition of the entire treatment plant, 17.5 MGD lift station and force main to transfer wastewater flows from the LMWWTP service area to the Oso WRP, and effluent force main to transfer effluent from the Oso WRP back to the LMWWTP effluent line supplying the NASCC. <u>THE LMWWTP IMPROVEMENTS ARE NOT CURRENTLY INCLUDED IN TM-6.</u>

Figure 2: Phase 2 Improvements



3.2 Not Implementing Phase 2 Improvements

Due to the additional permitting requirements anticipated in upcoming TPDES renewals, the growth in the Southside, and the age of the plant, there is not a realistic, viable "do nothing" option. As a result, this option is intended to show the consequences of not moving forward with the Phase 2 improvements and describes other projects that would be necessary in lieu thereof.

A significant portion of the existing Oso plant and its associated treatment equipment is 30 to 60 years old and has exceeded its intended/useful service life. Although normal maintenance has kept the plant in operation, the condition of certain treatment equipment is at a high risk for potential failure and must be replaced. Any failures in the plant equipment or process can result in unauthorized discharges (upstream or downstream of the plant) which can potentially create a health/safety concern and are subject to enforcement action by the Texas Commission on Environmental Quality (TCEQ). This equipment must be budgeted for replacement or repair since they represent significant capital expenditures. These expenditures obviously impact the City's budget so the cost estimates for this option will include this rehabilitation/replacement work. Depending on the size/scope of the replacement project, some of the equipment and treatment unit replacement will be shown as a capital cost and some will be included in the operational and maintenance (O&M) budget for the plant.

Based on proposed growth trends in the Oso WRP basin, the City will need to increase treatment capacity in the very near term at either Oso WRP or GWWTP. Both service areas share a common boundary. If Phase 2 upgrades are not implemented at Oso WRP, the City will have to begin construction on a Greenwood WWTP expansion project to increase its capacity by at least 4 MGD within the next 5-10 years. This project will allow flows from the Oso service area to be diverted to the Greenwood plant which will provide sufficient capacity buffer in accordance with TCEQ's 75/90 rule. This also provides the secondary benefit of allowing the City to temporarily take a single train out of service for greatly needed aeration basin maintenance such as grit removal and air system rehabilitation.

One last consideration is that the plant will be incapable of producing effluent in compliance with any future permits containing a limit on Total Nitrogen (TN). As described in TM-6, it is anticipated that TCEQ will include a new TN limit in the next 1-2 renewals (2 – 7 years). Although very difficult to accurately predict, any enforcement action resulting from non-compliance will include significant monetary fines/penalties typically ranging from $1,000 to $10,000 per day per violation.

4 Summary of Advantages/Disadvantages

ALTERNATIVE	ADVANTAGES	DISADVANTAGES
Phase 2 Improvements	• Reduced nutrient transport into Oso Bay • Significant reduction in chemical costs • Significant reduction in electrical costs with higher efficiency air system • Typical staffing requirements • Provides redundant treatment trains for operations &maintenance flexibility • Increased ADF capacity to 24 MGD • Delays need for GWWTP Expansion • Eliminated need for LMWWTP Upgrades • Less complex treatment process with less operational risk • Increased influent pumping capacity resulting in decreased SSOs. Standby pumps no longer needed. • Replaces vintage equipment exceeding design life • Improved automation and monitoring system • Improved odor control • Provides accommodations for implementing future Total Phosphorus removal • Improved neighbor to TAMU-CC Athletic complex & surrounding community with new facility • Reduces permitting risk for City by eliminating a treatment facility (LMWWTP)	• Significant capital investment required • Requires considerable coordination effort during construction with plant operations
Not Implementing Phase 2 Improvements	• Temporarily delays major capital costs at GWWTP & LMWWTP	• Increased chemical costs • Complex treatment process with increased operational risks • Existing process not approved by TCEQ for nutrient removal • Potentially positions City “behind the curve” in regards to impending new permit requirements • Requires major facility upgrades at Greenwood WWTP which operates on most stringent permit • Provides no flexibility for maintaining aeration basins at Oso WRP • Inefficient air system with high energy costs • Continued high maintenance required on vintage equipment

5 Project Cost Estimates

The goal of this study was to develop life-cycle cost estimates with as much confidence as possible given the state of the conceptual design. Life cycle costs represent the total cost incurred over the life span of a project, including design, construction, and operation and maintenance costs. All cost estimates in this study are shown in 2013 dollars and are broken into multiple components such as capital construction, construction contingency, administrative items, engineering design, and O&M costs.

2013 Dollars are the values as they are observed in the market at the time these estimates were prepared. Capital Construction Costs are the expenditures required to construct an infrastructure project. All capital construction costs are developed based on recent and historical data on wastewater construction projects in the region. Each construction sub-total includes a 30% construction contingency. The contingency is the amount added to a cost estimate to cover costs associated with unknowns, unforeseen circumstances, or unanticipated conditions which are impossible to evaluate due to the limited amount of information available at the time the estimate is prepared. Each construction estimate includes an allowance for administrative costs including engineering design, topographic survey, contract administration, in-house engineering services, construction inspection, testing, bonds and insurance, and miscellaneous printing.

Operation and maintenance (O&M) costs are post-construction and begin at the end of the projects first year in service. O&M costs comprise all expenditures necessary to ensure continued operation and effectiveness of the facility and include normal maintenance or repairs, labor, electricity, chemicals, replacement of parts, and regular preventative maintenance. O&M costs are estimated on an annual basis over the design life of a project (20 years for this evaluation).

In order to accurately quantify anticipated future costs, it is critical that all expenses be converted to their present value. Present value represents the amount of money, which, if invested in the current year, would be sufficient to cover all the costs over time associated with a project. The present value of a future cost is calculated using an assumed discount rate. The discount rate is the assumed interest rate used in calculating the present value of expected future costs and in this study is assumed to be 5%. Inflation was estimated at 3% per year.

5.1 Capital Construction & Project Costs

The detailed capital construction cost estimates are provided in Appendix A. The capital construction costs for Oso WRP Phase 2 Improvements, including decommissioning of the Laguna Madre WWTP, is $80,969,000 with a total project cost estimated at $99,439,000. These costs are summarized in Table 4-1.

Table 4-1: Construction Cost Summary Table

Item	Capital Construction Cost	Project Cost (Includes Admin)
East Plant Retrofit	$5,585,000	$6,865,000
West Plant Retrofit	$5,585,000	$6,865,000
New East Process Train No. 3 Aeration Basins	$11,245,000	$13,815,000
New West Process Train No. 4 Aeration Basins	$10,545,000	$12,955,000
Influent Pump Station	$9,910,000	$12,180,000
Headworks	$9,734,000	$11,964,000
Maintenance Bldg	$1,158,000	$1,428,000
Disinfection Sys. & Chlorine Basins Equip Replacement	$1,300,000	$1,570,000
Digester Mech Equip Replacement	$975,000	$1,175,000
LMWWTP Decommissioning & Transfer	$24,932,000	$30,622,000
TOTAL	**$80,969,000**	**$99,439,000**

The total construction costs associated with not implementing Phase 2 are $105,030,000 and have a total project cost of $128,990,000. Table 4-2 summarizes these costs.

Table 4-2: Not Implementing Phase 2 Construction Cost Summary Table

Item	Capital Construction Cost	Project Cost (Includes Admin)
Greenwood WWTP Expansion to 12 MGD (Req 5-10 Yrs)	$41,600,000	$51,090,000
Disinfection Sys. Mod.& Chlorine Basin Mech Equip. Replacement	$1,300,000	$1,600,000
Digester No 2,3 & 4 Mech Equip Replacement	$980,000	$1,210,000
Aeration Basin Rehabilitation including grit removal & diffuser replacement	$14,530,000	$17,850,000
Influent Lift Station	$9,910,000	$12,170,000
Headworks	$9,730,000	$11,950,000
Laguna Madre WWTP Upgrades (Req 10 Yrs)	$27,000,000	$33,160,000
TOTAL	**$105,030,000**	**$128,990,000**

5.2 O&M Costs

The evaluation of O&M costs involves a number of assumptions as shown in Table 4-3.

Table 4-3: Operation & Maintenance Cost Assumptions

PARAMETER	VALUE
Labor Cost per employee per year (includes overhead)	$65,000
Electrical Cost ($/KWH)	$0.08
Sodium Hypochlorite ($/gal)	$0.60
Sodium Hydroxide ($/gal)	$0.20
Sodium Bisulfite ($/gal)	$3.84
Increased Maintenance/Repair Costs @ Oso on Vintage Equipment if not Replaced (as a % of Existing)	50% $150,000
Evaluation Period (Years)	20
Assumed Discount Rate	5%
Assumed Inflation Rate	3%

The Wastewater Department's adopted budget for the operation of Oso WRP for the current fiscal year (2012-2013) is shown in column 2 of Table 4-4. The budget must be increased approximately 30% this coming year (shown in column 3) as the Breakpoint Chlorination facility is placed in service. The BPC process is very complex and will require substantial monitoring while in service. It has been assumed that the City will need to add five (5) additional staff to monitor and operate the facility. The step feed pumps will be in operation 24/7 and will increase power usage at the plant. The BPC process involves removing all ammonia by the addition of chemical (sodium hypochlorite). As a result, the sodium hypochlorite usage will increase approximately 800% (approximately $1.9M per year). It was noted in previous memos that the BPC reaction occurs most efficiently within a desired pH range. This range will be controlled by dosing sodium hydroxide and is estimated to cost about $50,000 per year.

The fourth column illustrates the estimated O&M costs for the plant once the Phase 2 improvements are implemented and are the result of a less complex, more efficient biological nutrient removal process along with more reliable treatment equipment. The Phase 2 improvements are expected to reduce O&M approximately $3.7 million per year which has a present value of $59.4 million.

Table 4-4: Oso WRP O&M Costs Summary

COMPONENT	2012-2013 CURRENT BUDGET ANNUAL COSTS	PHASE 1 IMPROVEMENTS ESTIMATED ANNUAL COSTS	PHASE 2 IMPROVEMENTS ESTIMATED ANNUAL COSTS	REDUCED O&M COSTS (PH1 to PH2)
Labor	$995,000	$1,320,000	$995,000	$325,000
Electrical/Power	$1,685,000	$1,770,000	$926,750	$843,250
Chemicals	$700,000	$2,700,000	$450,000	$2,250,000
Maintenance & Repairs	$300,000	$450,000	$150,000	$300,000
All Other Items	$1,563,885	$1,563,885	$1,563,885	$0
TOTAL ANNUAL O&M COSTS	**$5,243,885**	**$7,803,885**	**$4,085,635**	**$3,718,250**
Present Value of O&M (20 Years)	**-**	**$124,590,000**	**$65,230,000**	**$59,360,000**

Table 4-5 shows the Wastewater Department's adopted budget for the Laguna Madre WWTP for the current fiscal year (2012-2013) along with how the O&M costs are impacted once Phase 2 is implemented and the LMWWTP is decommissioned. Although the plant will no longer be in service, it is being replaced by a lift station planned for 7.5 MGD average and 17.5 MGD peak flows with 135HP pumps. Once the LMWWTP is decommissioned, the O&M will be reduced approximately $1.1 million per year which has a present value of $17.4 million.

Table 4-5: Laguna Madre WWTP O&M Costs Summary

COMPONENT	2012-2013 CURRENT BUDGET ANNUAL COSTS	PHASE 2 IMPROVEMENTS ESTIMATED ANNUAL COSTS	REDUCED O&M COSTS
Labor	$422,000	$0	$422,000
Electrical/Power	$175,000	$70,578	$104,422
Chemicals	$117,000	$0	$117,000
Maintenance & Repairs	$75,000	$5,000	$70,000
All Other Items	$373,880	$0	$373,880
TOTAL ANNUAL O&M COSTS	**$1,162,880**	**$75,578**	**$1,087,302**
Present Value of O&M (20 Years)	**$18,570,000**	**$1,210,000**	**$17,360,000**

5.3 Other Costs

It is understood that without the Phase 2 Improvements, the Oso WRP is incapable of meeting the TN requirement anticipated to be adopted by TCEQ in future permits. Although very difficult to accurately estimate the legal fees and regulatory fines associated with permit non-compliance, it is likely that TCEQ will levy heavy fines ranging from $1,000 to $10,000 per day per violation. Table 4-6 represents a theoretical scenario of one violation per day at $3,000 per violation which represents an annual cost of $1.1 million (present value of $17.5 million). This cost component is not currently factored into the

present value costs for either alternative but is provided to show the potential magnitude of fines for non-compliance.

Table 4-6: Estimated Regulatory Fines

COMPONENT	ESTIMATED ANNUAL COST
Possible Regulatory Fines (Range from $1-10K per day per violation, Assume $3K/day)	$1,095,000
Present Value (20 Years)	**$17,490,000**

5.4 Total Present Value Costs

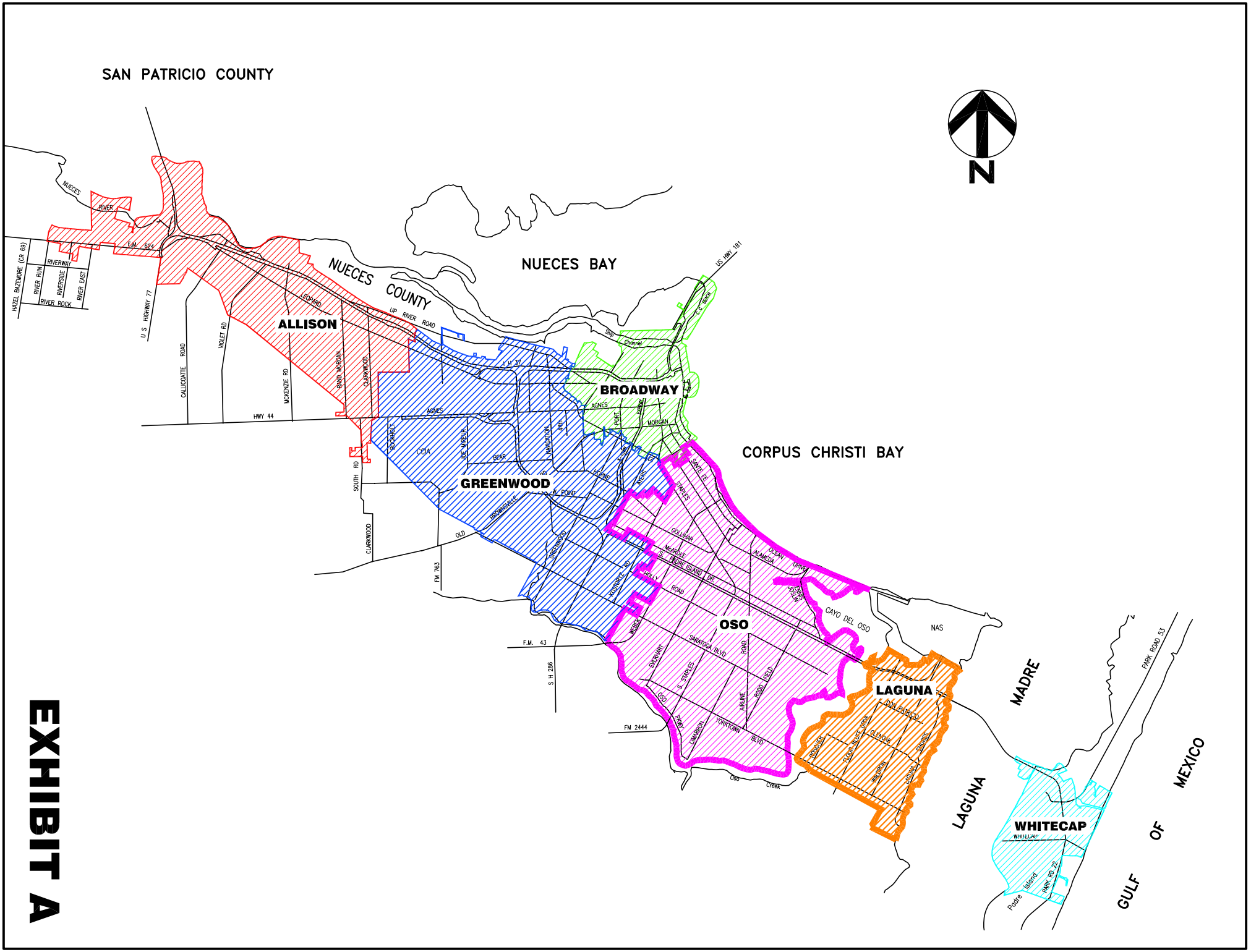
Table 4-7 summarizes the total present values of both alternatives and shows that the Phase 2 Improvements save the City approximately $106 million over the next 20 years.

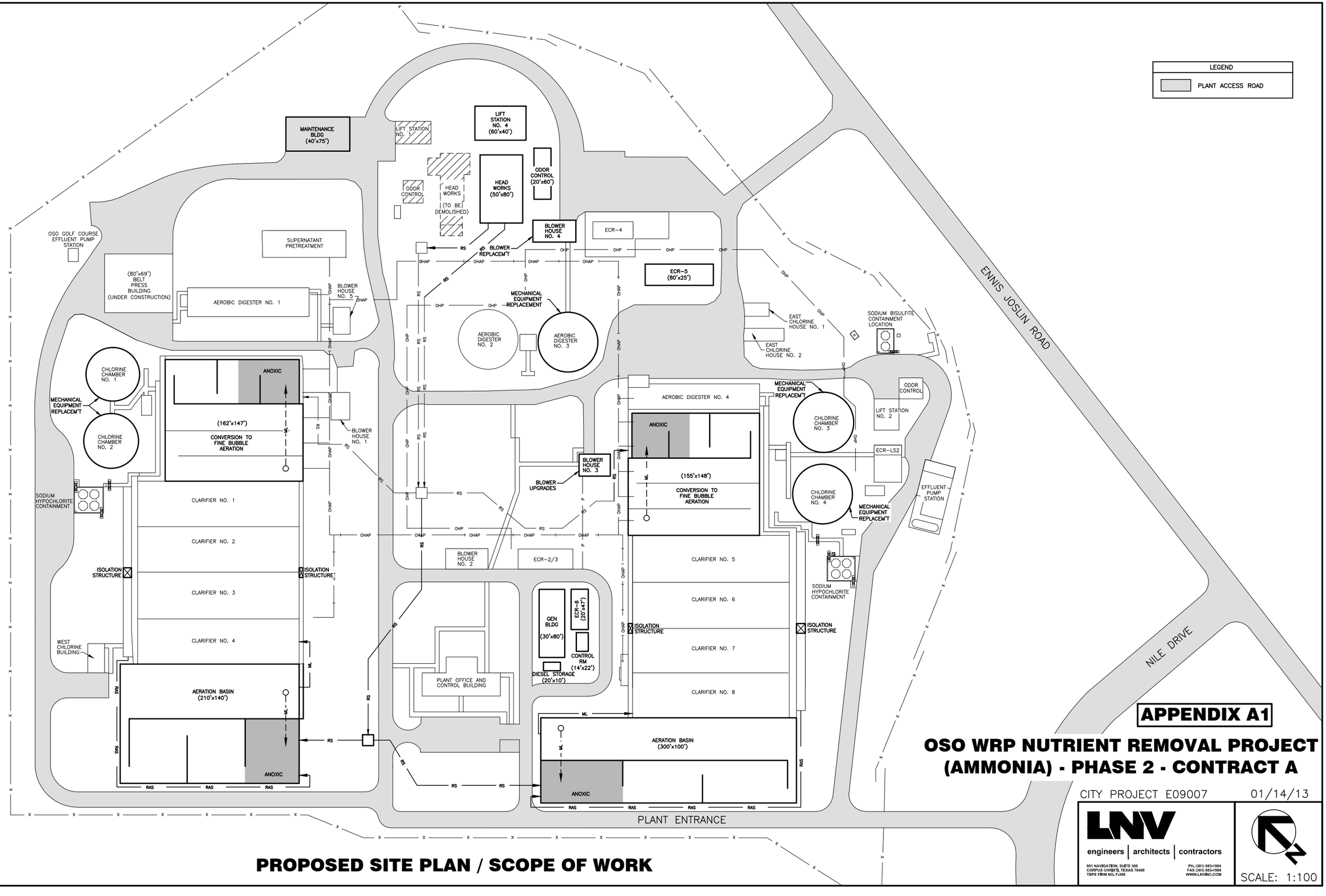
Table 4-7: Present Value Cost Summary

ALTERNATIVE	PROJECT COSTS	O&M COSTS (Present Value)	LIFECYCLE COSTS (20 Years)
Phase 2 Improvements	$99,439,000	$66,440,000	**$165,879,000**
Not Implementing Phase 2 Improvements	$128,990,000	$143,160,000	**$272,150,000**
PRESENT VALUE SAVINGS	**$29,551,000**	**$76,720,000**	**$106,271,000**

6 Conclusion

The purpose of this memorandum was to provide background information of the Oso WRP Nutrient Removal (Ammonia) project, summarize its advantages and disadvantages, and show the economic financial impacts of implementing these improvements. Ultimately, with the impending additional permitting requirements in upcoming TPDES renewals, the growth in the Southside, and the age of the plant, there is not a realistic "do nothing" option. Major facility upgrades will be required involving significant capital investment. If the recommendations identified in this memo are executed, the estimated savings to the City is $106 million over the next 20 years.


SAN PATRICIO COUNTY
NUECES COUNTY
NUECES BAY
CORPUS CHRISTI BAY
ALLISON
BROADWAY
GREENWOOD
OSO
LAGUNA
WHITECAP
LAGUNA MADRE
GULF OF MEXICO
N
EXHIBIT A



PROPOSED SITE PLAN / SCOPE OF WORK

APPENDIX A1

OSO WRP NUTRIENT REMOVAL PROJECT (AMMONIA) - PHASE 2 - CONTRACT A

CITY PROJECT E09007

01/14/13

LNV
engineers | architects | contractors
801 NAVIGATION, SUITE 300
CORPUS CHRISTI, TEXAS 78408
TBPE FIRM NO. F-366
PH. (361) 883-1984
FAX (361) 883-1986
WWW.LNVINC.COM

SCALE: 1:100

ALAMEDA ST

OCEAN DR

TERMINATE WASTEWATER FORCEMAIN AT NEW HEADWORKS

TAMU–CC

CORPUS CHRISTI BAY

PRELIMINARY PREFERRED ROUTE (35,750 LF)DUAL 20ò WASTEWATER FORCEMAIN FROM LAGUNA MADRE WWTP 12ò EFFLUENT FORCEMAIN FROM OSO WRP

OSO WRP

TIE–IN PROPOSED EFFLUENT FORCEMAIN AT EXISTING EFFLUENT PUMP STATION

ENNIS JOSLIN RD

OSO BAY

NAVAL AIR STATION

SOUTH PADRE ISLAND DR

FLOUR BLUFF DR

N.A.S. DR

LAGUNA MADRE

TIE–IN PROPOSED EFFLUENT FORCEMAIN FROM OSO WRP

DECOMMISSION EXISTING LAGUNA MADRE WASTEWATER TREATMENT PLANT

PROPOSED 17.5 MGD LIFT STATION

N

0 2000' 4000'

LEGEND:

- PRELIMINARY PREFERRED ROUTE
- ALTERNATE ROUTES
- PROP 17.5 MGD LIFT STATION

APPENDIX A2

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801 NAVIGATION, SUITE 300
CORPUS CHRISTI, TEXAS 78408
TBPE FIRM NO. F-366

PH. (361) 883-1984
FAX (361) 883-1986
WWW.LNVINC.COM

CITY OF CORPUS CHRISTI, TEXAS

LAGUNA MADRE WWTP DECOMMISSIONING & TRANSFERS TO OSO WRP
PRELIMINARY ALTERNATIVE ROUTES
PHASE 2 - CONTRACT B

U:\Corpus Christi\100140.00 Oso Water Reclamation Plant Nutrient Removal (Ammonia)\005\Drawings\Exhibits - Imagery\Laguna Madre Oso Transfer Prelim Alter Routes.dwg
Monday, April 01, 2013, 4:28pm

engineers | architects | contractors

In association with:
Jacobs Engineering Group
Joshua Brown, P.E.

DATE: March 20, 2013
BY: JB & LB & JH

PROJECT: Oso WRP Nutrient Removal Project (Ammonia) - Phase 2 Improvements
PROJECT NO: E09007

PRELIMINARY ESTIMATE OF PROBABLE CONSTRUCTION COST

Item	Description	Qty	Unit	Unit Price	Total Price
1	East Plant Retrofit	1	LS	$ 5,585,000	$ 5,585,000
2	West Plant Retrofit	1	LS	$ 5,585,000	$ 5,585,000
3	New East Process Train No. 3	1	LS	$ 11,245,000	$ 11,245,000
4	New West Process Train No. 4	1	LS	$ 10,545,000	$ 10,545,000
5	Influent Pump Station	1	LS	$ 9,910,000	$ 9,910,000
6	Headworks	1	LS	$ 9,734,000	$ 9,734,000
7	Maintenance Building	1	LS	$ 1,158,000	$ 1,158,000
8	Disinfection System Modifications & Chlorine Contact Basin Mech Equip. Replacement	4	EA	$ 325,000	$ 1,300,000
9	Digester No 2,3 & 4 Mech Equip Replacement	3	EA	$ 325,000	$ 975,000
10	LMWWTP Decommissioning & Transfers	1	LS	$ 24,932,000	$ 24,932,000
				SUB TOTAL	**$ 80,969,000**
				CONSTRUCTION SUB TOTAL (2013 $)	**$ 80,969,000**
	DESIGN - BASIC SERVICE (8.0%)				$ 6,478,000
	ENGINEERING - ADDITIONAL SERVICES (2.0%)				$ 1,620,000
	TOPOGRAPHIC SURVEY (0.3%)				$ 243,000
	CONTRACT ADMINISTRATION (3.0%)				$ 2,430,000
	ENGINEERING SERVICES (3.5%)				$ 2,834,000
	CONSTRUCTION INSPECTION (3.5%)				$ 2,834,000
	TESTING (1.0%)				$ 810,000
	BOND INSURANCE (1.0%)				$ 810,000
	MISC. (PRINTING, ETC) (0.5%)				$ 405,000
				ADMINISTRATIVE SUB TOTAL	**$ 18,470,000**
				PROJECT TOTAL (2013 $)	**$ 99,439,000**

CONSTRUCTION TOTAL (2016 $)[Note 1] **$88,478,000**

PROJECT TOTAL (2016 $)[Note 1] **$106,948,000**

NOTES:

1. Preliminary construction prices are based on recent and historical data on local projects in Corpus Christi and costs should be escalated 3% per yr to the midpoint of construction in 2013 dollars.
2. Items not included in the estimate are any structures or equipment identified during the condition assessment as requiring upgrades, rehabilitation, or replacement including but not limited to the outfall facilities, administration building, belt press building, digesters, clarifiers and/or yard piping.

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In association with:
Jacobs Engineering Group
Joshua Brown, P.E.

DATE: March 20, 2013
BY: JB & LB & JH

PROJECT: Oso WRP Nutrient Removal Project (Ammonia) - Phase 2 Improvements
PROJECT NO: E09007
DESCRIPTION: East Plant Aeration Basin Retrofit

PRELIMINARY ESTIMATE OF PROBABLE CONSTRUCTION COST

Item	Description	Qty	Unit	Unit Price	Total Price
1	Mobilization	1	LS	$ 210,000	$ 210,000
2	Sludge removal & disposal	1	LS	$ 250,000	$ 250,000
3	Utilty relocation (RS piping)	1	LS	$ 160,000	$ 160,000
4	Demolition (160' baffle wall)	1	LS	$ 100,000	$ 100,000
5	New baffle walls	1	LS	$ 250,000	$ 250,000
6	Yard piping modifications	1	LS	$ 500,000	$ 500,000
7	Mixers, MLR pump & pipe, WAS pump & pipe	1	LS	$ 750,000	$ 750,000
8	New fine bubble diffusers	1	LS	$ 525,000	$ 525,000
9	Upgrades to air piping (automated valves)	1	LS	$ 450,000	$ 450,000
10	Walkway retrofit due to new air pipe	1	LS	$ 250,000	$ 250,000
11	Electrical and Instrumentation	1	LS	$ 850,000	$ 850,000
				SUB TOTAL	**$ 4,295,000**
				CONTINGENCIES (30%)	**$ 1,290,000**
				CONSTRUCTION SUB TOTAL (2013 $)	**$ 5,585,000**
	DESIGN - BASIC SERVICE (8.0%)				$ 447,000
	ENGINEERING - ADDITIONAL SERVICES (2.0%)				$ 112,000
	TOPOGRAPHIC SURVEY (0.3%)				$ 17,000
	CONTRACT ADMINISTRATION (3.0%)				$ 168,000
	ENGINEERING SERVICES (3.5%)				$ 196,000
	CONSTRUCTION INSPECTION (3.5%)				$ 196,000
	TESTING (1.0%)				$ 56,000
	BOND INSURANCE (1.0%)				$ 56,000
	MISC. (PRINTING, ETC) (0.5%)				$ 28,000
				ADMINISTRATIVE SUB TOTAL	**$ 1,280,000**
				PROJECT TOTAL (2013 $)	**$ 6,865,000**

NOTES:

1. Preliminary construction prices are based on recent and historical data on local projects in Corpus Christi and costs should be escalated 3% per yr to the midpoint of construction in 2013 dollars.

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In association with:
Jacobs Engineering Group
Joshua Brown, P.E.

DATE: March 20, 2013
BY: JB & LB & JH

PROJECT: Oso WRP Nutrient Removal Project (Ammonia) - Phase 2 Improvements
PROJECT NO: E09007
DESCRIPTION: West Plant Aeration Basin Retrofit

PRELIMINARY ESTIMATE OF PROBABLE CONSTRUCTION COST

Item	Description	Qty	Unit	Unit Price	Total Price
1	Mobilization	1	LS	$ 210,000	$ 210,000
2	Sludge removal & disposal	1	LS	$ 250,000	$ 250,000
3	Utilty relocation (RS piping)	1	LS	$ 160,000	$ 160,000
4	Demolition (160' baffle wall)	1	LS	$ 100,000	$ 100,000
5	New baffle walls	1	LS	$ 250,000	$ 250,000
6	Yard piping modifications	1	LS	$ 500,000	$ 500,000
7	Mixers, MLR pump & pipe, WAS pump & pipe	1	LS	$ 750,000	$ 750,000
8	New fine bubble diffusers	1	LS	$ 525,000	$ 525,000
9	Upgrades to air piping (automated valves)	1	LS	$ 450,000	$ 450,000
10	Walkway retrofit due to new air pipe	1	LS	$ 250,000	$ 250,000
11	Electrical and Instrumentation	1	LS	$ 850,000	$ 850,000
				SUB TOTAL	**$ 4,295,000**
				CONTINGENCIES (30%)	**$ 1,290,000**
				CONSTRUCTION SUB TOTAL (2013 $)	**$ 5,585,000**
	DESIGN - BASIC SERVICE (8.0%)				$ 447,000
	ENGINEERING - ADDITIONAL SERVICES (2.0%)				$ 112,000
	TOPOGRAPHIC SURVEY (0.3%)				$ 17,000
	CONTRACT ADMINISTRATION (3.0%)				$ 168,000
	ENGINEERING SERVICES (3.5%)				$ 196,000
	CONSTRUCTION INSPECTION (3.5%)				$ 196,000
	TESTING (1.0%)				$ 56,000
	BOND INSURANCE (1.0%)				$ 56,000
	MISC. (PRINTING, ETC) (0.5%)				$ 28,000
				ADMINISTRATIVE SUB TOTAL	**$ 1,280,000**
				PROJECT TOTAL (2013 $)	**$ 6,865,000**

NOTES:

1. Preliminary construction prices are based on recent and historical data on local projects in Corpus Christi and costs should be escalated 3% per yr to the midpoint of construction in 2013 dollars.

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In association with:
Jacobs Engineering Group
Joshua Brown, P.E.

DATE: March 20, 2013
BY: WLB & BHE & JH

PROJECT: Oso WRP Nutrient Removal Project (Ammonia) - Phase 2 Improvements
PROJECT NO: E09007
DESCRIPTION: Proposed East Aeration Basin (Train 3)

PRELIMINARY ESTIMATE OF PROBABLE CONSTRUCTION COST

Item	Description	Qty	Unit	Unit Price	Total Price
1	Mobilization	1	LS	$ 420,000	$ 420,000
2	Utility relocation	1	LS	$ 200,000	$ 200,000
3	New splitter box with gates	1	LS	$ 350,000	$ 350,000
4	Isolation Structures (Clarifier & RAS)	2	EA	$ 100,000	$ 200,000
5	Excavation/ fill/ disposal	20000	CY	$ 30	$ 600,000
6	Dewatering	1	LS	$ 250,000	$ 250,000
7	New aeration basin concrete structure	1	LS	$ 1,600,000	$ 1,600,000
8	Yard & Air piping modifications	1	LS	$ 1,100,000	$ 1,100,000
9	Mixers, MLR pump, WAS pump	1	LS	$ 700,000	$ 700,000
10	Diffusers	1	LS	$ 525,000	$ 525,000
11	Air piping (automated valves)	1	LS	$ 450,000	$ 450,000
12	Blower Upgrades & Replacement	1	LS	$ 750,000	$ 750,000
13	Walkways, Safety Rails	1	LS	$ 250,000	$ 250,000
14	Electrical and Instrumentation	1	LS	$ 1,250,000	$ 1,250,000
				SUB TOTAL	**$ 8,645,000**
				CONTINGENCIES (30%)	**$ 2,600,000**
				CONSTRUCTION SUB TOTAL (2013 $)	**$ 11,245,000**
	DESIGN - BASIC SERVICE (8.0%)				$ 900,000
	ENGINEERING - ADDITIONAL SERVICES (2.0%)				$ 225,000
	TOPOGRAPHIC SURVEY (0.3%)				$ 34,000
	CONTRACT ADMINISTRATION (3.0%)				$ 338,000
	ENGINEERING SERVICES (3.5%)				$ 394,000
	CONSTRUCTION INSPECTION (3.5%)				$ 394,000
	TESTING (1.0%)				$ 113,000
	BOND INSURANCE (1.0%)				$ 113,000
	MISC. (PRINTING, ETC) (0.5%)				$ 57,000
				ADMINISTRATIVE SUB TOTAL	**$ 2,570,000**
				PROJECT TOTAL (2013 $)	**$ 13,815,000**

NOTES:

1. Preliminary construction prices are based on recent and historical data on local projects in Corpus Christi and costs should be escalated 3% per yr to the midpoint of construction in 2013 dollars.

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Joshua Brown, P.E.

DATE: March 20, 2013
BY: WLB & BHE & JH

PROJECT: Oso WRP Nutrient Removal Project (Ammonia) - Phase 2 Improvements
PROJECT NO: E09007
DESCRIPTION: Proposed West Aeration Basin (Train 4)

PRELIMINARY ESTIMATE OF PROBABLE CONSTRUCTION COST

Item	Description	Qty	Unit	Unit Price	Total Price
1	Mobilization	1	LS	$ 330,000	$ 330,000
2	Utility relocation	1	LS	$ 200,000	$ 200,000
3	Isolation Structures (Clarifier & RAS)	2	EA	$ 100,000	$ 200,000
4	Excavation/ fill /disposal	20000	CY	$ 30	$ 600,000
5	Dewatering	1	LS	$ 250,000	$ 250,000
6	New aeration basin concrete structure	1	LS	$ 1,600,000	$ 1,600,000
7	Yard & Air piping modifications	1	LS	$ 900,000	$ 900,000
8	Mixers, MLR pump, WAS pump	1	LS	$ 700,000	$ 700,000
9	Diffusers	1	LS	$ 525,000	$ 525,000
10	Air piping (automated valves)	1	LS	$ 450,000	$ 450,000
11	Blower Upgrades & Replacement	1	LS	$ 750,000	$ 750,000
12	Walkways & Safety Rails	1	LS	$ 250,000	$ 250,000
14	Electrical and Instrumentation	1	LS	$ 1,350,000	$ 1,350,000
				SUB TOTAL	**$ 8,105,000**
				CONTINGENCIES (30%)	**$ 2,440,000**
				CONSTRUCTION SUB TOTAL (2013 $)	**$ 10,545,000**
	DESIGN - BASIC SERVICE (8.0%)				$ 844,000
	ENGINEERING - ADDITIONAL SERVICES (2.0%)				$ 211,000
	TOPOGRAPHIC SURVEY (0.3%)				$ 32,000
	CONTRACT ADMINISTRATION (3.0%)				$ 317,000
	ENGINEERING SERVICES (3.5%)				$ 370,000
	CONSTRUCTION INSPECTION (3.5%)				$ 370,000
	TESTING (1.0%)				$ 106,000
	BOND INSURANCE (1.0%)				$ 106,000
	MISC. (PRINTING, ETC) (0.5%)				$ 53,000
				ADMINISTRATIVE SUB TOTAL	**$ 2,410,000**
				PROJECT TOTAL (2013 $)	**$ 12,955,000**

NOTES:

1. Preliminary construction prices are based on recent and historical data on local projects in Corpus Christi and costs should be escalated 3% per yr to the midpoint of construction in 2013 dollars.

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In association with:
Jacobs Engineering Group
Joshua Brown, P.E.

DATE: March 20, 2013
BY: WLB & BHE & JH

PROJECT: Oso WRP Nutrient Removal Project (Ammonia) - Phase 2 Improvements
PROJECT NO: E09007
DESCRIPTION: Proposed Influent Lift Station

PRELIMINARY ESTIMATE OF PROBABLE CONSTRUCTION COST

Item	Description	Qty	Unit	Unit Price	Total Price
1	Mobilization	1	LS	$ 370,000	$ 370,000
2	Utility Relocation Allowance	1	LS	$ 300,000	$ 300,000
3	Excavation	1	LS	$ 500,000	$ 500,000
4	Dewatering	1	LS	$ 150,000	$ 150,000
5	New 60" Inlet Piping	500	LF	$ 1,000	$ 500,000
6	Lift Station Dual Wet Well	1	LS	$ 750,000	$ 750,000
7	Submersible Influent Pumps	8	EA	$ 150,000	$ 1,200,000
8	Lift Station Building	1500	SF	$ 300	$ 450,000
9	Yard piping & Fittings	1	LS	$ 500,000	$ 500,000
10	Flow Metering	1	EA	$ 200,000	$ 200,000
11	Pump Hoist & Lifting System	1	LS	$ 150,000	$ 150,000
12	Demolition & Decommissioning of LS1 & LS2	1	LS	$ 150,000	$ 150,000
13	Electrical, Instrumentation & Programming	1	LS	$ 2,400,000	$ 2,400,000
				SUB TOTAL	**$ 7,620,000**
				CONTINGENCIES (30%)	**$ 2,290,000**
				CONSTRUCTION SUB TOTAL (2013 $)	**$ 9,910,000**

	DESIGN - BASIC SERVICE (8.0%)	$ 793,000
	ENGINEERING - ADDITIONAL SERVICES (2.0%)	$ 199,000
	TOPOGRAPHIC SURVEY (0.3%)	$ 30,000
	CONTRACT ADMINISTRATION (3.0%)	$ 298,000
	ENGINEERING SERVICES (3.5%)	$ 347,000
	CONSTRUCTION INSPECTION (3.5%)	$ 347,000
	TESTING (1.0%)	$ 100,000
	BOND INSURANCE (1.0%)	$ 100,000
	MISC. (PRINTING, ETC) (0.5%)	$ 50,000
	ADMINISTRATIVE SUB TOTAL	**$ 2,270,000**
	PROJECT TOTAL (2013 $)	**$ 12,180,000**

NOTES:

1. Preliminary construction prices are based on recent and historical data on local projects in Corpus Christi and costs should be escalated 3% per yr to the midpoint of construction in 2013 dollars.

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In association with:
Jacobs Engineering Group
Joshua Brown, P.E.

DATE: March 20, 2013
BY: WLB & BHE & JH

PROJECT: Oso WRP Nutrient Removal Project (Ammonia) - Phase 2 Improvements
PROJECT NO: E09007
DESCRIPTION: Proposed Headworks Structure

PRELIMINARY ESTIMATE OF PROBABLE CONSTRUCTION COST

Item	Description	Qty	Unit	Unit Price	Total Price
1	Mobilization	1	LS	$ 360,000	$ 360,000
2	Sludge removal and disposal	1	LS	$ 150,000	$ 150,000
3	Demolition (Removal of buried post thickeners and Existing Headworks facility)	1	LS	$ 350,000	$ 350,000
4	Pier Foundation - (54) 36" dia piers @ 50' Depth)	2700	VF	$ 120	$ 324,000
5	Utility Relocation	1	LS	$ 100,000	$ 100,000
6	Excavation	1	LS	$ 50,000	$ 50,000
7	Modifications to Existing Lift Station Force Mains	500	LF	$ 500	$ 250,000
8	Bar Screen Channel Concrete Structure	1	LS	$ 500,000	$ 500,000
9	Grit Basin Concrete Structure	1	LS	$ 750,000	$ 750,000
10	Bar screens, Compactors, Gates	1	LS	$ 1,500,000	$ 1,500,000
11	Vortex Grit Equipment	4	EA	$ 400,000	$ 1,600,000
12	Miscellaneous Piping	1	LS	$ 300,000	$ 300,000
13	Electrical and Instrumentation	1	LS	$ 500,000	$ 500,000
14	Odor Control Facility Improvements	1	LS	$ 750,000	$ 750,000
				SUB TOTAL	**$ 7,484,000**
				CONTINGENCIES (30%)	**$ 2,250,000**
				CONSTRUCTION SUB TOTAL (2013 $)	**$ 9,734,000**

	DESIGN - BASIC SERVICE (8.0%)	$ 779,000
	ENGINEERING - ADDITIONAL SERVICES (2.0%)	$ 195,000
	TOPOGRAPHIC SURVEY (0.3%)	$ 30,000
	CONTRACT ADMINISTRATION (3.0%)	$ 293,000
	ENGINEERING SERVICES (3.5%)	$ 341,000
	CONSTRUCTION INSPECTION (3.5%)	$ 341,000
	TESTING (1.0%)	$ 98,000
	BOND INSURANCE (1.0%)	$ 98,000
	MISC. (PRINTING, ETC) (0.5%)	$ 49,000
	ADMINISTRATIVE SUB TOTAL	**$ 2,230,000**
	PROJECT TOTAL (2013 $)	**$ 11,964,000**

NOTES:

1. Preliminary construction prices are based on recent and historical data on local projects in Corpus Christi and costs should be escalated 3% per yr to the midpoint of construction in 2013 dollars.

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In association with:
Jacobs Engineering Group
Joshua Brown, P.E.

DATE: March 20, 2013
BY: WLB & BHE & JH

PROJECT: Oso WRP Nutrient Removal Project (Ammonia) - Phase 2 Improvements
PROJECT NO: E09007
DESCRIPTION: Maintenance Building

PRELIMINARY ESTIMATE OF PROBABLE CONSTRUCTION COST

Item	Description	Qty	Unit	Unit Price	Total Price
1	Mobilization	1	LS	$ 43,000	$ 43,000
2	Site Clearing & Preparation	1	LS	$ 20,000	$ 20,000
3	Metal Building & Foundation (3000 SF)	3000	SF	$ 200	$ 600,000
4	Utility Relocation	1	LS	$ 25,000	$ 25,000
5	Plumbing & HVAC	1	LS	$ 150,000	$ 150,000
6	Electrical Improvements	1	LS	$ 50,000	$ 50,000
				SUB TOTAL	**$ 888,000**
				CONTINGENCIES (30%)	**$ 270,000**
				CONSTRUCTION SUB TOTAL (2013 $)	**$ 1,158,000**
	DESIGN - BASIC SERVICE (8.0%)				$ 93,000
	ENGINEERING - ADDITIONAL SERVICES (2.0%)				$ 24,000
	TOPOGRAPHIC SURVEY (0.3%)				$ 4,000
	CONTRACT ADMINISTRATION (3.0%)				$ 35,000
	ENGINEERING SERVICES (3.5%)				$ 41,000
	CONSTRUCTION INSPECTION (3.5%)				$ 41,000
	TESTING (1.0%)				$ 12,000
	BOND INSURANCE (1.0%)				$ 12,000
	MISC. (PRINTING, ETC) (0.5%)				$ 6,000
				ADMINISTRATIVE SUB TOTAL	**$ 270,000**
				PROJECT TOTAL (2013 $)	**$ 1,428,000**

NOTES:

1. Preliminary construction prices are based on recent and historical data on local projects in Corpus Christi and costs should be escalated 3% per yr to the midpoint of construction in 2013 dollars.

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DATE: March 20, 2013
BY: WLB

PROJECT: Oso WRP Nutrient Removal Project (Ammonia) - Phase 2 Improvements
PROJECT NO: E09007
DESCRIPTION: Laguna Madre WWTP Decommissiong, Transfer Lift Station & Wastewater/Effluent Force Mains

PRELIMINARY ESTIMATE OF PROBABLE CONSTRUCTION COST

Item	Description	Qty	Unit	Unit Price	Total Price
1	Mobilization	1	LS	$ 920,000	$ 920,000
2	Utility Relocation Allowance	1	LS	$ 300,000	$ 300,000
3	Excavation for Wet Well	1	LS	$ 35,000	$ 35,000
4	Dewatering for Wet Well	1	LS	$ 40,000	$ 40,000
5	New 36" Inlet Piping	100	LF	$ 350	$ 35,000
6	Dual Concrete Wet Well	1	LS	$ 150,000	$ 150,000
7	135 HP Submersible Influent Pumps	6	EA	$ 80,000	$ 480,000
8	Lift Station Building	1000	SF	$ 300	$ 300,000
9	LS Yard piping Modifications	1	LS	$ 50,000	$ 50,000
10	Flow Metering	1	EA	$ 125,000	$ 125,000
11	Pump Hoist & Lifting System	1	LS	$ 125,000	$ 125,000
12	Demolition & Decommissioning of LMWWTP	1	LS	$ 750,000	$ 750,000
13	Electrical, Instrumentation & Programming	1	LS	$ 1,000,000	$ 1,000,000
14	Dual 20-in Wastewater Force Main to Oso WRP	29300	LF	$ 250	$ 7,325,000
15	Dual 20-in Wastewater FM Installed across Oso Bay via HDD	4750	LF	$ 490	$ 2,327,500
16	Dual 20-in Wastewater FM across Shoreline Bridge	1700	LF	$ 300	$ 510,000
17	12-in Effluent Force Main to LMWWTP	29300	LF	$ 85	$ 2,490,500
18	12-in Effluent FM installed across Oso Bay via HDD	4750	LF	$ 170	$ 807,500
19	12-in Effluent FM across Shoreline Bridge	1700	LF	$ 100	$ 170,000
21	Dewatering by Well Pointing for both FMs	29300	LF	$ 25	$ 732,500
22	HMACP Pavement Repair (3300 LF)	2567	SY	$ 60	$ 154,000
23	Air Release Valve Manholes & Assembly	20	EA	$ 9,000	$ 180,000
24	Gate Valves @ 4000' Spacing	30	EA	$ 5,500	$ 165,000
				SUB TOTAL	**$ 19,172,000**
				CONTINGENCIES (30%)	**$ 5,760,000**
				CONSTRUCTION SUB TOTAL (2013 $)	**$ 24,932,000**
	DESIGN - BASIC SERVICE (8.0%)				$ 1,995,000
	ENGINEERING - ADDITIONAL SERVICES (2.0%)				$ 499,000
	TOPOGRAPHIC SURVEY (0.3%)				$ 75,000
	CONTRACT ADMINISTRATION (3.0%)				$ 748,000
	ENGINEERING SERVICES (3.5%)				$ 873,000
	CONSTRUCTION INSPECTION (3.5%)				$ 873,000
	TESTING (1.0%)				$ 250,000
	BOND INSURANCE (1.0%)				$ 250,000
	MISC. (PRINTING, ETC) (0.5%)				$ 125,000
				ADMINISTRATIVE SUB TOTAL	**$ 5,690,000**
				PROJECT TOTAL (2013 $)	**$ 30,622,000**

NOTES:

1. Preliminary construction prices are based on recent and historical data on local projects in Corpus Christi and costs should be escalated 3% per yr to the midpoint of construction in 2013 dollars.

LNV
engineers | architects | contractors

DATE: March 20, 2013
BY: WLB

PROJECT: Oso WRP Nutrient Removal Project (Ammonia) - Phase 2 Improvements
PROJECT NO: E09007
DESCRIPTION: Not Implementing Phase 2 Improvements

PRELIMINARY ESTIMATE OF PROBABLE CONSTRUCTION COST

Item	Description	Qty	Unit	Unit Price	Total Price
1	Greenwood WWTP Expansion to 12 MGD (Required in 5-10 Yrs - Programmed in CIP)	1	LS	$ 32,000,000	$ 32,000,000
2	Disinfection System Modifications & Chlorine Contact Basin Mech Equip. Replacement	4	EA	$ 250,000	$ 1,000,000
3	Digester No 2,3 & 4 Mech Equip Replacement	3	EA	$ 250,000	$ 750,000
4	East & West Plant Aeration Basin Rehabilitation including grit removal & diffuser replacement	1	EA	$ 11,170,000	$ 11,170,000
5	Influent Lift Station	1	LS	$ 7,620,000	$ 7,620,000
6	Headworks	1	LS	$ 7,484,000	$ 7,484,000
7	Laguna Madre WWTP Upgrades (Required in ±10yrs - Programmed in CIP)	1	LS	$ 20,765,000	$ 20,765,000
				SUB TOTAL	**$ 80,790,000**
				CONTINGENCIES (30%)	**$ 24,240,000**
				CONSTRUCTION SUB TOTAL (2013 $)	**$ 105,030,000**
	DESIGN - BASIC SERVICE (8.0%)				$ 8,403,000
	ENGINEERING - ADDITIONAL SERVICES (2.0%)				$ 2,101,000
	TOPOGRAPHIC SURVEY (0.3%)				$ 316,000
	CONTRACT ADMINISTRATION (3.0%)				$ 3,151,000
	ENGINEERING SERVICES (3.5%)				$ 3,677,000
	CONSTRUCTION INSPECTION (3.5%)				$ 3,677,000
	TESTING (1.0%)				$ 1,051,000
	BOND INSURANCE (1.0%)				$ 1,051,000
	MISC. (PRINTING, ETC) (0.5%)				$ 526,000
				ADMINISTRATIVE SUB TOTAL	**$ 23,960,000**
				PROJECT TOTAL (2013 $)	**$ 128,990,000**

NOTES:

1. Preliminary construction prices are based on recent and historical data on local projects in Corpus Christi and costs should be escalated 3% per yr to the midpoint of construction in 2013 dollars.