LJA Engineering, Inc.



# FORT BEND COUNTY LEVEE IMPROVEMENT DISTRICT NO. 7 STORMWATER PUMP STATION SITE LOCATION ALTERNATIVES ANALYSIS

**AUGUST 2020** 

FORT BEND COUNTY LEVEE IMPROVEMENT DISTRICT NO. 7 STORMWATER PUMP STATION SITE LOCATION ALTERNATIVES ANALYSIS



Prepared for Fort Bend County Levee Improvement District No. 7

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- Exhibit 2 Unconsolidated North Bank Site
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#### **EXECUTIVE SUMMARY**

Fort Bend County Levee Improvement District No. 7 (the "District") lies within the jurisdiction of Fort Bend County and the City of Sugar Land. Both agencies have implemented new drainage hydrology criteria which was determined by the National Oceanic and Atmospheric Administration (NOAA). The new hydrology, known as Atlas 14 Point Precipitation Frequency Estimates (Atlas 14), estimates that for various rainfall events, rainfall volumes used to design drainage and flood protection systems for levee districts have increased. Additionally, since the District's drainage and flood protection system was designed with a freeboard of 12 inches, the District directed LJA Engineering, Inc. ("LJA") to complete a Master Drainage Plan Update to confirm the existing freeboard within the District's existing drainage system using Atlas 14 rainfall volumes. Additionally, LJA was directed to determine drainage system improvements needed to increase freeboard to 18 inches within the District's drainage system. Freeboard is generally defined as the difference in elevation between the anticipated water surface of a water body for a given design storm event relative to the finished floor of a structure. LJA completed its study titled, "Fort Bend County Levee Improvement District No. 7 Master Drainage Plan Update" ("MDPU") on May 29, 2020. Based on the recommendations of the MDPU, the District was recommended to:

- 1. Construct an additional 115 acre-feet of stormwater detention storage.
- 2. Construct an additional 210,000 gallons per minute (gpm) pump station capacity.

Due to the fully developed status of the District, available sites to expand the District's pump station capacity are limited, and therefore, the District requested that LJA evaluate potential site alternatives for the additional pump station improvements.

In June of 2019, LJA began the process of considering locations and potential cost estimates for several locations within and near the District. The first phase of this process only included identifying potential locations which would satisfy the pumping capacity needs known at that time and the associated costs for that alternative. The capacity needs at the beginning of this process were estimated and then ultimately confirmed by the completion of hydrologic and hydraulic modeling. The second and final phase of this process included further evaluation of each alternative chosen during the first phase. The additional evaluation includes value engineering and ensuring that the site alternative satisfies seven needed characteristics discussed later in this report. The second phase of this process began in February 2020. LJA understands that the previous District engineer, Costello, Inc. had completed a very limited evaluation of site alternatives and that work was initiated before February 2019.

Based on the results of LJA's evaluation, the acquisition of Lots 29, 30 and 31 of Block 1 of the New Territory Parcel SF-34 subdivision and utilizing the space within the drainage easement for Ellis Creek directly north of the existing stormwater pump station will provide a location which is the most advantageous alternative to the District. This alternative is described as the "Consolidated North Bank Site" within the remaining report. The Consolidated North Bank Site alternative will provide the most advantageous solution from an engineering, economic, operations and maintenance standpoint.

### 1.0 BACKGROUND

Fort Bend County Levee Improvement District No. 7 (the "District") is located in the City of Sugar Land in southeast Fort Bend County. The Brazos River flows along the southern boundary of the District. The District abuts Fort Bend County Levee Improvement District No. 17 (Telfair) on the east, and US 90A bounds the District on the north. The west boundary of the District consists of undeveloped agricultural property. Access to the District is provided by US 90A and the Grand Parkway.

The District contains approximately 2,239 acres of land that is bisected by US 99 (Grand Parkway). A levee was constructed to provide protection for approximately 2,050 acres of land which has been developed for residential, commercial, institutional, and recreational uses. Additionally, The District's flood protection system includes a levee, 66,000 gpm storm water pump station and stormwater storage provided in channels and detention ponds.

In order to satisfy the regulations for Fort Bend County, the flood protection system of the District must:

- Protect development within the leveed areas of the District from storm events up to and including the 100-year event on the Brazos River.
- Adequately store and/or pump storm water within the District's levee protection system during high stages on the Brazos River that prevent gravity discharge while providing adequate freeboard within the District's channels and detention facilities (coincident event).
- Adequately convey storm water within the District's channels and detention facilities during a localized 100-year event while providing adequate freeboard within the District's channels and detention facilities (gravity event).

In October 2018, the National Oceanic and Atmospheric Administration (NOAA) released Volume 11 of the Atlas 14 Point Precipitation Frequency Estimates (Atlas 14). This technical paper redefined and increased the anticipated rainfall volumes for various storm frequencies. The rainfall depths using Atlas 14 are significantly higher than the hydrologic methodology used in previous analyses to design the existing District flood protection system. Based on Atlas 14, the 100-year, 24-hour rainfall event increased from 12.50 inches to 16.50 inches and the 10-year, 24-hour rainfall event went from 8.20 inches to 8.55 inches.

Understanding that various local governments such as Fort Bend County and the City of Sugar Land have adopted Atlas 14 in their drainage criteria, the District requested that LJA prepare an updated drainage analysis of the existing District system using the Atlas 14 rainfall volumes to determine the level of service of the existing system. Additionally, the analysis was to propose improvements to the District's flood protection system in order to increase the freeboard to 18 inches within the District's system while utilizing the higher rainfall volumes since the existing pump station and levee storage facilities were designed with only 12 inches of freeboard using assumed lower rainfall volumes.

### 2.0 PURPOSE AND OBJECTIVE

LJA completed its drainage analysis study titled "Fort Bend County Levee Improvement District No. 7 Master Drainage Plan Update" ("MDPU"). This study was submitted to both the City of Sugar Land and Fort Bend County for review and approval on May 29, 2020. The results of this study have determined that, in order to maintain 18 inches of freeboard for structures within the District's flood protection system during the coincident event while utilizing Atlas 14 rainfall rates, the following improvements are required:

- 1. Construction of an additional 115 acre-feet of stormwater detention storage.
- 2. Construction of an additional 210,000 gpm pump station.

When the Brazos River stages are high, the outfall structure flap gates will be closed and the existing and proposed storm water pumping stations will begin operating. With these pump stations in operation and the additional detention storage, the coincident event results in peak water surface elevations equal to or below elevation 71.5 feet (NAVD 88, 2001 adjustment) at critical locations. However, other locations, such as residences in the vicinity of Lake Sartartia and Lake Clayton subdivisions, will experience water surface elevations that exceed 71.5 feet, but are still provided with 18 inches of freeboard within these areas of the District.

## 3.0 PREFERRED CHARACTERISTICS FOR NEW PUMP STATION LOCATION

Since 2019, LJA has been evaluating various pump station alternatives and locations based on recommendations provided by the previous District engineer, Costello, Inc. However, once LJA completed the hydrologic and hydraulic models for the MDPU in early February 2020, LJA confirmed the actual pumping and stormwater detention which is necessary in order to increase freeboard to 18 inches. The next step was to determine a proposed location which could provide an additional 210,000 gpm of stormwater pumping capacity. The criteria used to evaluate a suitable pump station location was based on the following characteristics:

- 1. Location must be at the lowest point in the drainage system.
- 2. Location must be as close to the levee and external drainage channel as possible to minimize risk for breaches in the levee protection system and costs associated with longer forcemains and discharge pipes.
- 3. Location cannot impact the ability to maintain the existing pump station operations at all times during construction of the additional pumping capacity.
- 4. Location must provide adequate access and adequate space for construction, maintenance and operations.
- 5. Location must provide necessary space to consolidate all needed equipment in one site and to minimize impacts to residential neighborhoods due to noise and aesthetics.
- 6. Location must be within close proximity to existing electrical and natural gas power sources.
- 7. Location must provide a reasonable, economical solution to expand the pumping system.

In order to ensure the maximum usefulness of the pump station, the pump station should be located to maximize the ability to remove as much stormwater from within the leveed area of the District between rain events as possible. As seen in past storm events, storm events are unpredictable, and sometimes impact the District's system with one event after another. The ability of the pumping system to remove as much water as possible between rain events is critical to ensure that the maximum amount of storage is available to minimize the potential of flooding in the District.

Although breaches in levees and pump stations can be caused by many factors, one common cause is by seepage around hydraulic structures which pass through the flood protection structure. Therefore, it is very important to minimize this potential from occurring by minimizing the type and number of penetrations through a levee structure. Additionally, the more piping there is associated with a pump station, whether gravity pipes or pressure pipes, the more risk there is for potential failure of the piping. The stormwater pump station needs to be located as close to the take point of the detention system and outfall channel as possible to minimize the length of both the forcemains and gravity outfall structures needed for the stormwater pump station. The shorter pipes also provide more efficient and economical plants to construct and operate.

Due to the development status of the District and the approximately \$1.5 billion in taxable property value being protected by the District's levee protection system, a permanent and redundantly powered pumping system is needed during the construction of this project. In order to complete the expansion of the pumping system, the existing plant must be maintained

operational at all times. The final pump station site chosen must not at any time impact the ability for the District's operator to maintain and operate the pump station.

The location of the new pump station site should provide easy access and adequate space to construct, maintain and operate the pump station. Limited access and room for construction will impact the project schedule, potentially impact the residents of New Territory and increase the cost to construct the project. Limited access and space to maintain and operate the plant potentially creates an unsafe working environment for the operator and increases the risk of flooding due to the inability of the operator to perform his job efficiently and effectively during an emergency event. Additionally, limited access and workspace will likely increase the cost to maintain and operate the plant and complicate delivery of fuel, equipment and materials to the site during critical events.

The ability to consolidate all equipment within one plant site with adequate space is advantageous. It improves the ability of the District operator to maintain and operate the plant and identify and correct issues with equipment more easily. Additionally, consolidating the equipment and providing adequate space around equipment minimizes nuisance noise to residents and allows for landscaping buffers or acoustical barriers to be installed to improve aesthetics within the site and minimize noise from the site, respectively.

All stormwater pump stations require a reliable source of power to properly operate the plant. It is important that the power source be located near the proposed plant site to minimize costs to extend power facilities to the plant site. Additionally, it is important that the power source be redundant in the event a power line is damaged. Based on communication with representatives of CenterPoint Energy, the current location of the stormwater pump station and water plant is near reliable power facilities.

#### 4.0 PUMP STATION ALTERNATIVES

To expand the District's stormwater pumping capacity by 210,000 gpm, LJA evaluated five pump station site alternatives. These alternatives included the following locations:

- Alternative 1: Existing Site: Existing Stormwater Pump Station Site.
- Alternative 2: Unconsolidated North Bank Site: North of the existing plant site (within the drainage easement of Ellis Creek).
- Alternative 3: Smith Ranch Site: West of the existing plant and outside of the existing levee system.
- Alternative 4: Ball Park Site: East of the existing plant within the park south of Ellis Creek.
- Alternative 5: Consolidated North Bank Site: North of the existing plant site (within the drainage easement of Ellis Creek and Lots 29, 30 and 31 of Block 1 of the New Territory Parcel SF-34 subdivision).

The anticipated construction costs and associated expenses for each alternative are as follows:

#### Estimated Pump Station Location Cost Comparison

Location Alternatives	Construction Engineering/Lab <u>Costs Geotechnical Costs Land Co</u>		Land Cost	Total Alternative <u>Costs</u>
Existing Site (1)(2)(6)	N/A	N/A	N/A	N/A
Unconsolidated North Bank Site <sup>(2)</sup>	\$9,585,000	\$1,725,300	\$0	\$11,310,300
Smith Ranch Site <sup>(3)</sup> Ball Park Site <sup>(4)</sup>	\$13,965,000 \$13,952,700	\$2,513,700 \$2,511,486	\$500,000 \$75,000	\$16,978,700 \$16,539,186
Consolidated North Bank Site (5)	\$9,498,600	\$1,709,748	\$1,200,000	\$12,408,348

Notes:

- 1. Existing Site does not meet the requirements of the MDPU.
- 2. No land costs anticipated
- 3. Land acquisition and associated costs estimated at \$50,000 per acre.
- 4. Land acquisition cost estimated at \$75,000.
- 5. Land acquisition costs for three residential lots estimated at \$400,000 per lot.
- 6. The Existing Site alternative was eliminated early in the process due to feasibility concerns. It is not economically feasible to upgrade this site to the needed capacity while maintaining full operational capability of the existing facility. Additionally, the potential risk of damage to the existing facility during construction is high. No costs have been assigned to this option for this reason.

The costs associated with all alternatives include costs associated with rehabilitating the electrical equipment within the existing plant, but does not include the removal and replacement of the existing pumps. Finally, since the costs for each alternative above may have been evaluated at different times over the past year assuming different pumping capacities and including different detention alternatives, the size of the proposed plant and associated costs were updated for this report in order to provide analogous cost comparisons for each alternative.

From an engineering, operational, maintenance and economic standpoint, the best alternative location to expand the District's stormwater pumping capacity is the Consolidated North Bank Site alternative. The supporting reasons are provided in the following sections of this report.

### 5.0 EVALUATION OF POTENTIAL SOLUTIONS

#### Alternative 1: Existing Site

The first pump station location evaluated is the existing stormwater pump station plant site (see Exhibit 1). The District's previous engineer prepared this exhibit. This exhibit clearly shows the encumbrances of the existing stormwater pump station and water plant equipment within or adjacent to the existing stormwater pump station site. As shown on this exhibit, a new discharge box, piping, conduits and other equipment will have to be constructed within the existing stormwater pump station plant site. Due to the location and depth of the required improvements, damage to the existing discharge box or other critical structures to maintain the stormwater pump station operational and reliable from a flood protection standpoint could be compromised during construction. The cost to complete such a project is anticipated to be significantly more expensive than working on a site that is not encumbered with obstructions. The proposed improvements shown on this exhibit will require the main power facilities which provide power to both the existing stormwater pump station and water plant to be relocated. Finally, it is imperative that a stormwater pump station site be accessible by the District's operator at all times to ensure that the flood protection system can be properly operated. Construction activity within the existing plant site would negatively impact the operator's ability to do this. A larger plant expansion project is not a viable alternative at this location.

This site is not the most advantageous to the District due to the issues noted above and due to the following reasons:

- 1. Access to plant site for construction, maintenance and operations is poor.
- 2. Pumping capacity cannot be significantly expanded due to the limited size of the existing intake structures and pump housing.
- 3. Due to the limited plant site size and constraints from the location of the existing City of Sugar Land water plant and District levee, expansion of the plant is significantly impaired and not economically feasible.
- 4. Construction options to expand the existing plant create undue risk to the ability to maintain the plant operational at all times.
- 5. Costs associated with the re-routing of the major sanitary sewer system which serves the entire New Territory development will be required.
- 6. Costs associated with relocating existing 48-inch storm sewer will be required.
- 7. Cost for expansion is expected to significantly exceed the price for a newer plant with the same capacity.
- 8. Expected increased cost and lower quality of final product to retrofit the older plant compared to building a newer, more efficient and modern plant.
- 9. Existing plant is approximately 28 years old and nearing the end of its useful life.

Based on the existing intake structure and pump cans which house the pumps, the ability to expand the existing plant is very limited. LJA corresponded with the pump manufacturer for the existing pumps and confirmed that the existing 22,000 gpm pumps could be replaced and expanded with a 30,050 gpm pump. Since this plant has four pumps with one pump in standby, the total firm pumping capacity could be expanded from 66,000 gpm to approximately 90,150 gpm. However, the entire electrical system and generator would have to be replaced and

expanded to accommodate the higher electrical needs of the larger pumps. Although this expansion to the District pumping system would provide an additional 24,150 gpm of pumping, it falls short of the 210,000 gpm of additional capacity needed. The cost of this plant rehabilitation and expansion project was not estimated since it was not found to be a feasible alternative.

#### Alternative 2: Unconsolidated North Bank Site

The second pump station location is the site just north of the existing plant site and within the drainage easement of Ellis Creek (see Exhibit 2). This site is not the most advantageous to the District due to the following reasons:

- 1. Access to plant site for construction, maintenance and operations is poor.
- 2. Due to the limited access options, structural modifications would be required to provide access to new plant site and bridge across the existing outfall structure.
- 3. Equipment cannot be consolidated in the tract due to limited space. This creates additional costs associated with expensive electrical and communication cabling and equipment.
- 4. Costs associated with the re-routing of the major sanitary sewer system which serves the entire New Territory development may be required.
- 5. Due to the proposed plant location and its close proximity to the three residential lots (Lots 29, 30 and 31 of Block 1 of the New Territory Parcel SF-34 subdivision), it is anticipated that the value of the homes/lots will be negatively impacted.
- 6. Aesthetic issues for New Territory due to location of proposed control building adjacent to residential lots and generators on the levee near the existing pump station. Plant equipment will be visible from multiple subdivisions.
- 7. Inadequate space and severe elevation changes from levee to natural ground within the levee negatively impacts the ability for easy construction, maintenance and operation activities.

The anticipated cost to construct a plant at this location is estimated to be approximately \$11,310,300 (see Table 1 for breakdown of costs).

### Alternative 3: Smith Ranch Site

The third pump station location alternative is to construct a new plant and outfall structure on the west side of the existing plant and outside of the existing levee system (see Exhibit 3). This site is not the most advantageous to the District due to the following reasons:

- 1. Access to plant site for construction, maintenance and operations is poor.
- 2. Location requires the construction of a new outfall structure including sluice gates and flap gates.
- 3. Location requires the construction of a new levee structure.
- 4. Location requires the re-routing of Alcorn Bayou (external channel) and mitigation for lost Brazos River flood plain storage.
- 5. Location will require United States Army Corps of Engineer's permits that would be time consuming and costly.
- 6. Costs associated with demolishing and reconstructing the existing City of Sugar Land access road to the existing New Territory Wastewater Treatment Plant.
- 7. Costs associated with the re-routing of the major sanitary sewer system which serves the entire New Territory development may be required.
- 8. Complications to construct and reroute the existing 6 x 5-foot outfall storm sewer.
- 9. Overall cost of this alternative is more than all other alternatives.

The anticipated cost to construct a plant at this location is estimated to be approximately \$16,478,700 (see Table 2 for breakdown of costs).

#### Alternative 4: Ball Park Site

The fourth pump station location alternative is to construct a new plant on the east side of the existing plant within the park south of Ellis Creek (see Exhibit 4). This site is not the most advantageous to the District due to the following reasons:

- 1. Inadequate design solution which increases the potential of stormwater pump station failure and costs due to excessive forcemain pipe lengths.
- 2. Minimal forcemain route options due to the existing water plant and utilities south of the proposed station location.
- 3. Costs associated with relocating existing power facilities along Ellis Creek.
- 4. Poor visual access to external channel to monitor external channel conditions during a flood event.
- 5. Requires larger pumps and generator due to the length of the forcemains.
- 6. Costs associated with the re-routing of the major sanitary sewer system which serves the entire New Territory development will be required.
- 7. Overall cost is high.

Although this alternative provides good access and is expected to have lower land acquisition costs, the overall project cost is high. Furthermore, from an engineering standpoint, this alternative is not desirable alternative due to the anticipated higher risk associated with longer and larger forcemains. The anticipated cost to construct a plant at this location is estimated to be approximately \$16,464,186 (see Table 3 for breakdown of costs).

#### Alternative 5: Consolidated North Bank Site

The fifth pump station location is the site just north of the existing plant site and within the drainage easement of Ellis Creek, but also includes the acquisition of three residential lots. These lots include Lots 29, 30 and 31 of Block 1 of the New Territory Parcel SF-34 subdivision (see Exhibit 5). While this alternative potentially has the highest land acquisition costs, it provides an economical solution if more pumping capacity is needed due to governmental requirement changes. This alternative also will allow the District to improve the storm sewer system of the New Territory Parcel SF-34 subdivision since additional storm sewers can be extended through the proposed plant site and connect to the existing storm sewer system of the subdivision. Finally, potential property value impacts as described under Unconsolidated North Bank Site which are anticipated to Lots 29, 30 and 31 are mitigated since these landowners will be compensated by the District for their homes based on current values and other reasonable expenditures and hardships. The Consolidated North Bank Site alternative is the best alternative since it satisfies all seven characteristics for a suitable stormwater pump station location and is the most advantageous to the District. The anticipated cost to construct a plant at this location is estimated to be approximately \$11,208,348 (see Table 4 for breakdown of costs).

#### 6.0 CONCLUSIONS

In summary, the Consolidated North Bank Site alternative is the most advantageous alternative from an engineering, economic, operations and maintenance standpoint. This alternative satisfies all seven characteristics for a suitable stormwater pump station location and allows for the flexibility to economically accommodate additional capacity if needed in the future.

**EXHIBIT 1** 



EXHIBIT 2

PROP. 4160>480 TRANSFORMER

PROP. 480>120/240 TRANSFORMER

PROP. DISCHARGE BOX PROP. CONCRETE DRIVE Folooc

EX. 6'x5' RCB DISCHARGE

비

60

PROP. GENERATORS

PROP. DRIVEWAY EXPANSION -

PROP. DRIVEWAY GRADE DECREASE

15' STORM WATER ESMT 25' BUILDING ESMT

16' UE ESMT

PROP. CONTROL BUILDING (30'x55')

PROP. PUMP STATION EX. ELECTRICAL CONDUITS PROP. 16'x24' AEP TRANSFORMER EASEMENT EX. 48" STORM SEWER

> APPROX. LOCATION OF EX. SANITARY SEWER PROP. FENCE/PROPERTY REALIGNMENT

- EX. 48" STORM SEWER APPROX. LOCATION OF EX. SANITARY SEWER



GRAPHIC SCALE: 1" = 100'

100'

200'

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**EXHIBIT 3** 



EXHIBIT 4





GRAPHIC SCALE: 1" = 100"

100'

200'

LJA Engineering, Inc.

2929 Briarpark Drive Suite 600 Houston, Texas 77042



**EXHIBIT 5** 



GRAPHIC SCALE: 1" = 40'

PROP. 16'x24' CPE TRANSFORMER EASEMENT

PROP. CPE RISER POL

16' UE ESMT

PROP. TERMINAL POLE FOR CPE AERIAL PRIMARY FEEDER

PROP. CONCRETE DRIVE

POTENTIAL ROUTING OF CPE AERIAL PRIMARY

EXHIBIT 5 Fort Bend County LID No. 7 Storm Water Pump Station Expansion CONSOLIDATED NORTH BANK SITE

LJA Engineering, Inc.

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TABLE 1

# Unconsolidated North Bank Site Construction Cost Estimate

	ITEM	UNIT	QUANTITY	UNIT PRICE	TOTAL
	Base Bid Items				
1	Bonds, Mobilization,	LS	1	\$100,000.00	\$100,000.00
2	Site Work, Drainage, External Plateau & Access Improvements	LS	1	\$125,000.00	\$125,000.00
3	Structure, baffles, grating	LS	1	\$1,150,000.00	\$1,150,000.00
4	Intake Screen	LS	1	\$135,000.00	\$135,000.00
5	Cofferdam	LS	1	\$100,000.00	\$100,000.00
6	6" Conc. Pavement	SY	2500	\$90.00	\$225,000.00
7	Handrail	LF	250	\$40.00	\$10,000.00
8	Discharge Box	LF	300	\$1,500.00	\$450,000.00
9	Discharge Outfall Structure	LS	1	\$125,000.00	\$125,000.00
10	48" Flap Gate	EA	4	\$12,000.00	\$48,000.00
11	6' Chain Link Fence	LF	1000	\$30.00	\$30,000.00
12	Control Building	LS	1	\$350,000.00	\$350,000.00
13	North Site Boundary Retaining Wall	LF	200	\$300.00	\$60,000.00
14	70,000 gpm Pumps	EA	4	\$365,000.00	\$1,460,000.00
15	Electrical (Generator, MCC, Controls, etc)	LS	1	\$3,300,000.00	\$3,300,000.00
16	Embankment for Generators	LS	1	\$55,000.00	\$55,000.00
17	Relocation of Exist STM SWR	LS	1	\$50,000.00	\$50,000.00
				SUB-TOTAL	\$7,773,000.00
	Miscellaneous Items				
1	Reinforced Silt Fence	LF	500	\$2.00	\$1,000.00
2	Surface Dewatering	LS	1	\$50,000.00	\$50,000.00
3	Construction Exit	LS	1	\$1,500.00	\$1,500.00
4	Crushed Stone	CY	200	\$40.00	\$8,000.00
5	Seeding	LS	1	\$7,500.00	\$7,500.00
6	Well Points	LS	1	\$50,000.00	\$50,000.00
7	Construction Staking	LS	1	\$7,500.00	\$7,500.00
8	Rock Filter Dam	LF	150	\$100.00	\$15,000.00
9	Haul Excavated Spoils Offsite	CY	1,850	\$40.00	\$74,000.00
				SUB-TOTAL	\$214,500.00
				TOTAL	\$7,987,500.00
				20% CONT.	\$1,597,500.00

- CONSTRUCTION SUBTOTAL \$9,585,000.00
- ENGINEERING/LAB/GEOTECHNICAL \$1,725,300.00
  - TOTAL \$11,310,300.00

TABLE 2

#### **Smith Ranch Option**

#### **Construction Cost Estimate**

	ITEM	UNIT	QUANTITY	UNIT PRICE	TOTAL
	Base Bid Items				
1	Bonds. Mobilization.	LS	1	\$100.000.00	\$100.000.00
2	Site Work, Drainange	LS	1	\$125,000.00	\$125,000.00
3	Structure, baffels, grateing	LS	1	\$1,100,000.00	\$1,100,000.00
4	Intake Screen	LS	1	\$135,000.00	\$135,000.00
5	Cofferdam	LS	1	\$100,000.00	\$100,000.00
6	Remove and Reconstruct COSL Concrete Access Road	SY	2,500	\$150.00	\$375,000.00
7	Concrete Slope Protection	SY	7,000	\$90.00	\$630,000.00
8	6" Concrete Pavement	SY	3,000	\$90.00	\$270,000.00
9	Handrail	LF	450	\$40.00	\$18,000.00
10	Discharge Box	LF	350	\$1,200.00	\$420,000.00
11	Discharge Outfall Structure	LS	1	\$100,000.00	\$100,000.00
12	42" Flap Gate	EA	4	\$9,000.00	\$36,000.00
13	6' Chain Link Fence	LF	800	\$30.00	\$24,000.00
14	Control Building	LS	1	\$350,000.00	\$350,000.00
15	70,000 gpm Pumps	EA	4	\$365,000.00	\$1,460,000.00
16	Levee Outfall Headwalls	LS	1	\$240,000.00	\$240,000.00
17	Outfall Sheet Pile Wall	SF	6,500	\$40.00	\$260,000.00
18	5-10'x10' Outfall Boxes	LF	200	\$1,200.00	\$240,000.00
19	10'x10' Sluice Gates	EA	5	\$150,000.00	\$750,000.00
20	10'x10' Flap Gates	EA	5	\$55,000.00	\$275,000.00
21	Reroute Existing 6'x5' Discharge Box	LF	300	\$900.00	\$270,000.00
22	Electrical (Generator, MCC, Controls, etc)	LS	1	\$3,300,000.00	\$3,300,000.00
23	Excavation and Embankment for Levee and Channel	CY	174,800	\$5.00	\$874,000.00
				SUB-TOTAL	\$11,452,000.00
	Miscellaneous Items				
1	Reinforced Silt Fence	LF	500	\$2.00	\$1,000.00
2	Surface Dewatering	LS	1	\$50,000.00	\$50,000.00
3	Construction Exit	LS	1	\$1,500.00	\$1,500.00
4	Crushed Stone	CY	200	\$40.00	\$8,000.00
5	Seeding	LS	1	\$12,500.00	\$12,500.00
6	Well Points	LS	1	\$50,000.00	\$50,000.00
7	Construction Staking	LS	1	\$7,500.00	\$7,500.00
8	Rock Filter Dam	LF	150	\$100.00	\$15,000.00
9	Haul Excavated Spoils Offsite	CY	1,000	\$40.00	\$40,000.00
				SUB-TOTAL	\$185,500.00
				TOTAL	\$11,637,500.00
				20% CONT.	\$2,327,500.00
			CONSTRU	JCTION SUBTOTAL	\$13,965,000.00
			ENGINEERING/LA	AB/GEOTECHNICAL	\$2,513,700.00
				TOTAL	\$16,478,700.00

TABLE 3

#### **Ball Park Site**

#### **Construction Cost Estimate**

	ITEM	UNIT	QUANTITY	UNIT PRICE	TOTAL
	Base Bid Items				
1	Bonds, Mobilization,	LS	1	\$100,000.00	\$100,000.00
2	Site Work, Drainage, External Plateau & Access Improvements	LS	1	\$125,000.00	\$125,000.00
3	Structure, baffles, grating	LS	1	\$1,000,000.00	\$1,000,000.00
4	Intake Screen	LS	1	\$135,000.00	\$135,000.00
5	Cofferdam	LS	1	\$100,000.00	\$100,000.00
6	6" Conc. Pavement	SY	1500	\$90.00	\$135,000.00
7	Handrail	LF	250	\$40.00	\$10,000.00
8	Discharge Piping	LF	4000	\$700.00	\$2,800,000.00
9	Discharge Outfall Structure	LF	1	\$125,000.00	\$125,000.00
10	Discharge Box	LF	300	\$1,500.00	\$450,000.00
11	Check Valves	EA	4	\$50,000.00	\$200,000.00
12	6' Chain Link Fence	LF	1000	\$30.00	\$30,000.00
13	Control Building	LS	1	\$350,000.00	\$350,000.00
14	70,000 gpm Pumps	EA	4	\$425,000.00	\$1,700,000.00
15	Electrical (Generator, MCC, Controls, etc)	LS	1	\$3,650,000.00	\$3,650,000.00
				SUB-TOTAL	\$10,910,000.00
	Miscellaneous Items				
1	Reinforced Silt Fence	LF	500	\$2.00	\$1,000.00
2	Surface Dewatering	LS	1	\$50,000.00	\$50,000.00
3	Construction Exit	LS	1	\$1,500.00	\$1,500.00
4	Crushed Stone	CY	200	\$40.00	\$8,000.00
5	Seeding	LS	1	\$7,500.00	\$7,500.00
6	Well Points	LS	1	\$50,000.00	\$50,000.00
7	Construction Staking	LS	1	\$7,500.00	\$7,500.00
8	Rock Filter Dam	LF	150	\$100.00	\$15,000.00
9	Relocate Existing Sanitary Sewer	LS	1	\$516,750.00	\$516,750.00
10	Haul Excavated Spoils Offsite	CY	1,500	\$40.00	\$60,000.00
				SUB-TOTAL	\$717,250.00
				TOTAL	\$11,627,250.00
				20% CONT.	\$2,325,450.00
			CONST	RUCTION SUBTOTAL	\$13,952,700.00

ENGINEERING/LAB/GEOTECHNICAL \$2,511,486.00

TOTAL \$16,464,186.00

TABLE 4

#### Consolidated North Bank Site Construction Cost Estimate

	ITEM	UNIT	QUANTITY	UNIT PRICE	TOTAL
	Base Bid Items				
1	Bonds, Mobilization,	LS	1	\$100,000.00	\$100,000.00
2	Site Work, Drainage, External Plateau & Access Improvements	LS	1	\$125,000.00	\$125,000.00
3	Structure, baffles, grating	LS	1	\$1,000,000.00	\$1,000,000.00
4	Intake Screen	LS	1	\$135,000.00	\$135,000.00
5	Cofferdam	LS	1	\$100,000.00	\$100,000.00
6	6" Conc. Pavement	SY	3500	\$90.00	\$315,000.00
7	Handrail	LF	250	\$40.00	\$10,000.00
8	Discharge Box	LF	300	\$1,500.00	\$450,000.00
9	Discharge Outfall Structure	LS	1	\$125,000.00	\$125,000.00
10	48" Flap Gate	EA	4	\$12,000.00	\$48,000.00
11	6' Chain Link Fence	LF	600	\$30.00	\$18,000.00
12	Control Building	LS	1	\$350,000.00	\$350,000.00
13	Pumps	EA	4	\$365,000.00	\$1,460,000.00
14	Electrical (Generator, MCC, Controls, etc)	LS	1	\$3,000,000.00	\$3,000,000.00
15	Relocation of Exist STM SWR	LS	1	\$50,000.00	\$50,000.00
				SUB-TOTAL	\$7,286,000.00
	Miscellaneous Items				
1	Reinforced Silt Fence	LF	500	\$2.00	\$1,000.00
2	Surface Dewatering	LS	1	\$50,000.00	\$50,000.00
3	Construction Exit	LS	1	\$1,500.00	\$1,500.00
4	Crushed Stone	CY	200	\$40.00	\$8,000.00
5	Seeding	LS	1	\$7,500.00	\$7,500.00
6	Well Points	LS	1	\$50,000.00	\$50,000.00
7	Landscaping and Irrigation	LS	1	\$50,000.00	\$50,000.00
8	Brick Façade/Metal Roof on Control Building	LS	1	\$100,000.00	\$100,000.00
9	Construction Staking	LS	1	\$7,500.00	\$7,500.00
10	Rock Filter Dam	LF	150	\$100.00	\$15,000.00
11	8 foot Brick Wall	LF	400	\$350.00	\$140,000.00
12	Storm Sewer Improvements for Subdivision	LS	1	\$125,000.00	\$125,000.00
13	Haul Excavated Spoils Offsite	CY	1,850	\$40.00	\$74,000.00
				SUB-TOTAL	\$629,500.00
				TOTAL	\$7,915,500.00
				20% CONT.	\$1,583,100.00
			CONST	RUCTION SUBTOTAL	\$9,498,600.00

ENGINEERING/LAB/GEOTECHNICAL \$1,709,748.00

TOTAL \$11,208,348.00