

## M E M O R A N D U M

**DATE:** April 21, 2016

**TO:** Mike Drozeck, Kelly Nowell, Grace Chua – Orange County Stormwater Management Division

**FROM:** Tom Amstadt & Mark Ellard - Geosyntec Consultants

**SUBJECT:** Big Sand Lake Outfall Modification Options

The County is interested in modifying the outfall from Big Sand Lake in order to provide improved flood relief for residents around the lake. Also due to the planned expansion of Interstate 4 (I-4), which crosses the Big Sand Lake outfall, the County desires to estimate the appropriate elevation of the proposed culverts under I-4 such that the I-4 culverts would function with the modified outfall. Based on discussions with County staff in March 2016, three outfall modification endpoints were selected to compare the resulting proposed I-4 culvert elevations to the existing culverts and other elevations (drainwells, 100-year, NHWE) within the lake. Note that endpoint #1 was the previously assumed endpoint based on earlier (pre March 2016) discussions with County staff. The relevant outfall modification endpoint elevations and proposed I-4 culvert elevations are summarized in the table below. Refer to the attached figure for the endpoint locations and plan and profile of the existing and proposed pipe elevations.

**Table 1 - Outfall Modification Endpoint Comparison**

<b>Endpoint</b>	<b>Existing Pipe Elevation at Endpoint (feet, NAVD)</b>	<b>Proposed I-4 Culvert Elevation (feet, NAVD)<sup>1</sup></b>	<b>Existing Drainwell Elevation (91.7') Comparison (feet)</b>	<b>Existing Outfall Discharge Elevation (95.34') Comparison (feet)</b>	<b>NHWE (89.03') Comparison (feet)</b>
<b>1</b>	94.5	<b>94.5</b>	+2.8	-0.84	+5.47
<b>2</b>	92.43	<b>93.1</b>	+1.4	-2.24	+4.07
<b>3</b>	88.91	<b>91.0</b>	-0.7	-4.34	+1.97

1 – Calculated by assuming a 0.1% minimum pipe slope from the endpoint to the FDOT right of way.

The County may use the above table and attached figure to preliminarily select an outfall modification endpoint and notify the FDOT's I-4 design consultant of the proposed I-4 culvert invert elevation needed to accommodate the outfall improvements.

Cost estimates for each of the above outfall modification endpoint options were developed. Additionally, an estimate to construct a pump station to control elevations in the lake in lieu of modifying the outfall was developed for comparison purposes. The County's cost to construct each option are summarized below. Refer to the attached cost estimate tables for cost breakdowns of each option. Note that it was assumed that the culverts crossing I-4 and the I-4 on/off ramps would be replaced as part of the planned I-4 expansion project. As such, the below cost estimates do not include costs to replace the I-4 culverts.

- **Endpoint #1** – This option would consist of replacement of the 42" RCP and 54" RCP culverts under Palm Parkway west of I-4 and the 3x36" RCP and 48" RCP culverts east of I-4 up to Endpoint #1. The estimated cost to construct this option is **\$520,584**.
- **Endpoint #2** – This option would consist of replacement of the 42" RCP and 54" RCP culverts under Palm Parkway west of I-4 and the 3x36" RCP and 48" RCP culverts east of I-4 up to endpoint #2. It is noted this option would require construction within private property or construction of a parallel system within the Central Florida Parkway right of way. For cost estimating purposes, it was assumed that the existing pipe within private property would be replaced within a drainage easement to be acquired by the County. The estimated cost to construct this option is **\$831,850**.
- **Endpoint #3** – This option would consist of replacement of the 2x48" RCP culverts west of Palm Parkway, the 42" RCP and 54" RCP culverts under Palm Parkway west of I-4 and the 3x36" RCP and 48" RCP culverts east of I-4 up to endpoint #3. It is noted this option would require construction within private property or constructing a parallel system within the Central Florida Parkway right of way. For estimating purposes, it was assumed that the existing pipe within private property would be replaced within a drainage easement to be acquired by the County. Also, it was assumed that the 48" RCP along Central Florida Parkway would be realigned to reduce impacts to travel lanes during construction. It was assumed this would result in the construction of two additional manholes. The estimated cost to construct this option is **\$1,755,961**.
- **Pump Station** – This option would consist of constructing a pump station adjacent to the existing outfall canal near the lake and constructing a force main from the pump station to the existing outfall high point. Refer to the attached figure for the location of the pump station and force main. It is assumed that the pump station would consist of two 11,250 gpm (25 cfs) electric power driven pumps with a total station capacity of 50 cfs. Additionally, the pump station would consist of a concrete wet well, trash screens, and a pump house. The pump station would be powered from aerial power line and emergency backup power provided by a generator. Easement acquisition and an access road are assumed to be needed to construct the station. The estimated cost to construct this option is **\$2,953,992**.

It should be noted that the above cost estimates do not include cost for utility relocations or operation and maintenance (O&M). The type, size, and location of utilities would be determined during design. Although not quantified at this time, the O&M costs of the pump station option would be expected to be significantly higher than the gravity outfall options, due to costs for electric power and maintenance of the pumps and other pump station features.

**TABLE A1 - PRELIMINARY OPINION OF PROBABLE COST<sup>1</sup>**

Cost estimate based on conceptual alignment, assumed slope and pipe sizing. Detailed design required to determine actual alignment and pipeline properties, which may impact costs significantly.

**OUTFALL MODIFICATION ENDPOINT 1**

Item	Pay Item No.	Description	Units	Unit Cost	Quantity	Total
1	101-1	Mobilization (10%)	LS	varies	1	\$29,129.00
2	102-1	Maintenance of Traffic (10%)	LS	varies	1	\$29,129.00
3	104-1	Prevention, Control and Abatement of Erosion and Water Pollution (5%)	LS	varies	1	\$14,564.50
4	110-1-1	Clearing and Grubbing (5%)	LS	varies	1	\$14,564.50
5	120-1	Excavation, Embankment, and Grading	LS	\$5,000.00	1	\$15,000.00
6	160-4	Type B Stabilization	SY	\$3.50	700	\$2,450.00
7	285-709	Optional Base, Base Group 9	SY	\$15.00	750	\$11,250.00
8	334-1-13	Superpave Asphaltic Concrete, Traffic C	TN	\$91.00	120	\$10,920.00
9	337-7-33	Asphalt Concrete Friction Course, Traffic C, FC-12.5, Rubber	TN	\$107.00	60	\$6,420.00
10	400-2-2	Concrete Class II, Endwalls	CY	\$1,500.00	45	\$67,500.00
11	425-2-92	Manholes, J-8, >10'	EA	\$10,000.00	2	\$20,000.00
12	430-175-136	Pipe Culvert, Optional Material, Round 36", S/CD	LF	\$120.00	267	\$32,040.00
13	430-175-142	Pipe Culvert, Optional Material, Round 42", S/CD	LF	\$140.00	200	\$28,000.00
14	430-175-148	Pipe Culvert, Optional Material, Round 48", S/CD	LF	\$170.00	163	\$27,710.00
15	430-175-154	Pipe Culvert, Optional Material, Round 54", S/CD	LF	\$270.00	200	\$54,000.00
16	520-1-10	Concrete Curb and Gutter, Type F	LF	\$17.00	200	\$3,400.00
17	570-1-2	Sodding (Bahia) (All disturbed areas)	SY	\$2.50	5000	\$12,500.00
18	900-1	Indemnification	LS	\$100.00	1	\$100.00
19	900-2	Contingency (20%)	LS	varies	1	\$58,258.00
			<b>CONSTRUCTION SUBTOTAL:</b>			<b>\$436,935.00</b>
20	900-3	Surveying and Testing (5%)	LS	varies	1	\$14,564.50
21	900-4	Design (15%)	LS	varies	1	\$43,693.50
22	900-5	Permitting (2%)	LS	varies	1	\$5,825.80
23	900-6	Construction Administration	LS	\$5,000.00	1	\$5,000.00
24	900-7	Construction Inspection and Oversight (5%)	LS	varies	1	\$14,564.50
			<b>ENGINEERING SUBTOTAL:</b>			<b>\$83,648.30</b>
			<b>ESTIMATED TOTAL COST:</b>			<b>\$520,584.00</b>

NOTES:

- 1) Above estimate does not include cost for utility relocations.
- 2) Pay items where Unit Cost = varies are estimated as a % of the sum of construction Items 5 to 17 as described.

**TABLE A2 - PRELIMINARY OPINION OF PROBABLE COST<sup>1</sup>**

Cost estimate based on conceptual alignment, assumed slope and pipe sizing. Detailed design required to determine actual alignment and pipeline properties, which may impact costs significantly.

**OUTFALL MODIFICATION ENDPOINT 2**

Item	Pay Item No.	Description	Units	Unit Cost	Quantity	Total
1	101-1	Mobilization (10%)	LS	varies	1	\$39,935.00
2	102-1	Maintenance of Traffic (10%)	LS	varies	1	\$39,935.00
3	104-1	Prevention, Control and Abatement of Erosion and Water Pollution (5%)	LS	varies	1	\$19,967.50
4	110-1-1	Clearing and Grubbing (5%)	LS	varies	1	\$19,967.50
5	120-1	Excavation, Embankment, and Grading	LS	\$15,000.00	1	\$15,000.00
6	160-4	Type B Stabilization	SY	\$3.50	1050	\$3,675.00
7	285-709	Optional Base, Base Group 9	SY	\$15.00	1125	\$16,875.00
8	334-1-13	Superpave Asphaltic Concrete, Traffic C	TN	\$91.00	180	\$16,380.00
9	337-7-33	Asphalt Concrete Friction Course, Traffic C, FC-12.5, Rubber	TN	\$107.00	90	\$9,630.00
10	400-2-2	Concrete Class II, Endwalls	CY	\$1,500.00	45	\$67,500.00
11	425-2-92	Manholes, J-8, >10'	EA	\$10,000.00	4	\$40,000.00
12	430-175-136	Pipe Culvert, Optional Material, Round 36", S/CD	LF	\$120.00	267	\$32,040.00
13	430-175-142	Pipe Culvert, Optional Material, Round 42", S/CD	LF	\$140.00	200	\$28,000.00
14	430-175-148	Pipe Culvert, Optional Material, Round 48", S/CD	LF	\$170.00	545	\$92,650.00
15	430-175-154	Pipe Culvert, Optional Material, Round 54", S/CD	LF	\$270.00	200	\$54,000.00
16	520-1-10	Concrete Curb and Gutter, Type F	LF	\$17.00	500	\$8,500.00
17	570-1-2	Sodding (Bahia) (All disturbed areas)	SY	\$2.50	6000	\$15,000.00
18	900-1	Indemnification	LS	\$100.00	1	\$100.00
19	900-2	Contingency (20%)	LS	varies	1	\$79,870.00
<b>CONSTRUCTION SUBTOTAL:</b>						<b>\$599,025.00</b>
<b>EASEMENT ACQUISITION SUBTOTAL:</b>						<b>\$120,000.00</b>
20	900-3	Surveying and Testing (5%)	LS	varies	1	\$19,967.50
21	900-4	Design (15%)	LS	varies	1	\$59,902.50
22	900-5	Permitting (2%)	LS	varies	1	\$7,987.00
23	900-6	Construction Administration	LS	\$5,000.00	1	\$5,000.00
24	900-7	Construction Inspection and Oversight (5%)	LS	varies	1	\$19,967.50
<b>ENGINEERING SUBTOTAL:</b>						<b>\$112,824.50</b>
<b>ESTIMATED TOTAL COST:</b>						<b>\$831,850.00</b>

**NOTES:**

- 1) Above estimate does not include cost for utility relocations.
- 2) Pay items where Unit Cost = varies are estimated as a % of the sum of construction Items 5 to 17 as described.



**TABLE A3 - PRELIMINARY OPINION OF PROBABLE COST<sup>1</sup>**

Cost estimate based on conceptual alignment, assumed slope and pipe sizing. Detailed design required to determine actual alignment and pipeline properties, which may impact costs significantly.

**OUTFALL MODIFICATION ENDPOINT 3**

Item	Pay Item No.	Description	Units	Unit Cost	Quantity	Total
1	101-1	Mobilization (10%)	LS	varies	1	\$89,613.20
2	102-1	Maintenance of Traffic (15%)	LS	varies	1	\$134,419.80
3	104-1	Prevention, Control and Abatement of Erosion and Water Pollution (5%)	LS	varies	1	\$44,806.60
4	110-1-1	Clearing and Grubbing (5%)	LS	varies	1	\$44,806.60
5	120-1	Excavation, Embankment, and Grading	LS	\$25,000.00	1	\$15,000.00
8	160-4	Type B Stabilization	SY	\$3.50	3162	\$11,067.00
9	285-709	Optional Base, Base Group 9	SY	\$15.00	3355	\$50,325.00
10	334-1-13	Superpave Asphaltic Concrete, Traffic C	TN	\$91.00	530	\$48,230.00
11	337-7-33	Asphalt Concrete Friction Course, Traffic C, FC-12.5, Rubber	TN	\$107.00	260	\$27,820.00
6	400-2-2	Concrete Class II, Endwalls	CY	\$1,500.00	67	\$100,500.00
7	425-2-92	Manholes, J-8, >10'	EA	\$10,000.00	9	\$90,000.00
8	430-175-136	Pipe Culvert, Optional Material, Round 36", S/CD	LF	\$120.00	267	\$32,040.00
9	430-175-142	Pipe Culvert, Optional Material, Round 42", S/CD	LF	\$140.00	200	\$28,000.00
10	430-175-148	Pipe Culvert, Optional Material, Round 48", S/CD	LF	\$170.00	2265	\$385,050.00
11	430-175-154	Pipe Culvert, Optional Material, Round 54", S/CD	LF	\$270.00	200	\$54,000.00
16	520-1-10	Concrete Curb and Gutter, Type F	LF	\$17.00	2000	\$34,000.00
13	570-1-2	Sodding (Bahia) (All disturbed areas)	SY	\$2.50	8000	\$20,000.00
14	900-1	Indemnification	LS	\$100.00	1	\$100.00
15	900-2	Contingency (20%)	LS	varies	1	\$179,226.40
			<b>CONSTRUCTION SUBTOTAL:</b>			<b>\$1,389,005.00</b>
			<b>EASEMENT ACQUISITION SUBTOTAL:</b>			<b>\$120,000.00</b>
16	900-3	Surveying and Testing (5%)	LS	varies	1	\$44,806.60
17	900-4	Design (15%)	LS	varies	1	\$134,419.80
18	900-5	Permitting (2%)	LS	varies	1	\$17,922.64
19	900-6	Construction Administration	LS	\$5,000.00	1	\$5,000.00
20	900-7	Construction Inspection and Oversight (5%)	LS	varies	1	\$44,806.60
			<b>ENGINEERING SUBTOTAL:</b>			<b>\$246,955.64</b>
			<b>ESTIMATED TOTAL COST:</b>			<b>\$1,755,961.00</b>

NOTES:

- 1) Above estimate does not include cost for utility relocations.
- 2) Pay items where Unit Cost = varies are estimated as a % of the sum of construction Items 5 to 13 as described.

**TABLE A4 - PRELIMINARY OPINION OF PROBABLE COST<sup>1</sup>**

Cost estimate based on conceptual pump station. Detailed design required to determine actual pump station details, which may impact costs significantly.

**STORMWATER PUMP STATION**

Item	Pay Item No.	Description	Units	Unit Cost	Quantity	Total
1	101-1	Mobilization (5%)	LS	varies	1	\$82,380.00
2	102-1	Maintenance of Traffic (5%)	LS	varies	1	\$82,380.00
3	104-1	Prevention, Control and Abatement of Erosion and Water Pollution (5%)	LS	varies	1	\$82,380.00
4	110-1-1	Clearing and Grubbing (5%)	LS	varies	1	\$82,380.00
5	120-1	Excavation, Embankment, and Grading	LS	\$10,000.00	1	\$10,000.00
6	N/A	22500 GPM (50 CFS) Stormwater Pump Station and Features <sup>4</sup>	EA	\$900,000.00	1	\$900,000.00
7	N/A	Electrical for Pump Station <sup>5</sup>	EA	\$700,000.00	1	\$700,000.00
8	N/A	Fence Enclosure	EA	\$15,000.00	1	\$15,000.00
9	N/A	Access Road to Pump Station (gravel)	EA	\$15,000.00	1	\$15,000.00
10	570-1-2	Sodding (Bahia) (All disturbed areas)	SY	\$2.50	3000	\$7,500.00
11	900-1	Indemnification	LS	\$100.00	1	\$100.00
12	900-2	Contingency (25%)	LS	varies	1	\$411,900.00
			<b>CONSTRUCTION SUBTOTAL:</b>			<b>\$2,389,020.00</b>
			<b>EASEMENT ACQUISITION SUBTOTAL:</b>			<b>\$197,500.00</b>
13	900-3	Surveying and Testing (5%)	LS	varies	1	\$82,380.00
14	900-4	Design (10%)	LS	varies	1	\$164,760.00
15	900-5	Permitting (2%)	LS	varies	1	\$32,952.00
16	900-6	Construction Administration	LS	\$5,000.00	1	\$5,000.00
17	900-7	Construction Inspection and Oversight (5%)	LS	varies	1	\$82,380.00
			<b>ENGINEERING SUBTOTAL:</b>			<b>\$367,472.00</b>
			<b>ESTIMATED TOTAL COST:</b>			<b>\$2,953,992.00</b>

**NOTES:**

- 1) Above estimate does not include cost for utility relocations.
- 2) Pay items where Unit Cost = varies are estimated as a % of the sum of construction Items 5 to 15 as described.
- 3) Land acquisition cost calculated as (Land Value / Parcel Area \* Area) \* 25% contingency.
- 4) Includes cost for pump with gears, drive shafts, electric engine, 30" piping, flap gates, fuel tanks. Also, includes installation of pumps, electric motors, piping, wet well construction, trash screens, slab on grade construction, and pump house.
- 5) Includes cost of providing aerial power and an emergency generator with backup fuel supply for the pump station.



