SANITARY SEWER COLLECTION SYSTEM MASTER PLAN
FINAL REPORT
BOARD OF WATER AND SEWER COMMISSIONERS OF THE CITY OF SARALAND
PROJECT NO. 1074304
JUNE 2022

APPENDIX B

SARALAND SEWER SYSTEM 10-YEAR PLAN

By: Volkert & Associates, Inc.

Dated: October 2008

VOLKERT, INC.
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VOLKERT

SARALAND SEWER SYSTEM
10 YEAR PLAN

CITY OF SARALAND, ALABAMA

KEN WILLIAMS	MAYOR
DR. HOWARD RUBENSTEIN	PRESIDENT
CHARLES HARBEN	VICE PRESIDENT
MARVIN E. ADAMS, JR.	COUNCIL MEMBER
NEWTON CROMER	COUNCIL MEMBER
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DENISE JERNIGAN	CITY CLERK/TREASURER
RICKY HERRING	WASTEWATER SUPERINTENDENT

October 6, 2008

SARALAND SEWER SYSTEM 10 YEAR PLAN
AMENDMENTS OCTOBER 20, 2008

EXECUTIVE SUMMARY:

With the anticipated growth for the City of Saraland and the City's commitment to providing quality services for its citizens and commercial partners, a report was prepared evaluating the existing sewer system and identifying potential needs to continue effective operations. The existing sewer system is in overall good condition with capacity deficiencies experienced during wet weather events due to inflow and infiltration (I/I). The wastewater treatment facility continues to meet all permit limits and produces a higher quality effluent than required.

Potential infrastructure improvements with a magnitude of cost were identified as a planning tool. The need for these improvements will be influenced by the rate of growth for the City, the location of the growth, and regulatory changes. Since the actual period for performing any of these improvements is unknown, a more detailed project cost estimate will need to be developed during the planning stages of a particular project. The following is a summary of the potential infrastructure improvements with an order of anticipated need and timeframe. A detailed explanation of these items is included in the report.

I. INFRASTRUCTURE IMPROVEMENTS TO REPAIR DEFICIENCIES AND/OR MAINTENANCE ITEMS

Description	Estimated Timeframe	Estimated Costs
1. Smoke/Dye Testing & Corrective Measures	Annual	$50,000 - $100,000
2. Cleaning Of Sewer Interceptors (* Currently $5,000 is spent annually to clean depressed sewers)	Annual	$5,000* - $125,000
3. Lining Manholes with Force Main Discharges	Annual	$10,000
4. Upgrades to Existing Lift Stations For Existing Demand	2 to 3 Years	$500,000
5. WWTP Equipment O&M Needs	Annual Beginning in Year 2 or 3	$80,000 - $100,000
6. Update Sewer Mapping	Annual	$2,500
7. Inverted Siphon 24" Hwy 43/ Norton Creek	Refer to Item 3, Sec. II	$175,000

II. POTENTIAL INFRASTRUCTURE IMPROVEMENTS TO RESPOND TO GROWTH

Description	Estimated Timeframe	Estimated Costs
1. Infrastructure for West Celeste Basin Phase A	Annual	Refer to Item 1, Sec I
2. Upgrades to Lift Stations for Future Demand	4 to 6 Years	$750,000
3. Various Options for Additional Capacity to Address I/I	3 to 5 Years	$800,000 - $1,000,000
4. Infrastructure for West Celeste Basin Phase B, Upgrades to Existing Infrastructure	5 to 6 Years	$700,000
5. Infrastructure for West Celeste Basin Phase C, New Infrastructure	8 to 10 Years	$2,500,000
6. Various Options for Treatment of Wastewater Including a New Plant – 10 Years	10 Years	$7,000,000

III. POTENTIAL INFRASTRUCTURE IMPROVEMENTS TO RESPOND TO ANTICIPATED REGULATORY CHANGES

Description	Estimated Timeframe	Estimated Costs
1. Nutrient Limits	5 to 8 Years	$1,700,000
2. Back Up Service for Existing Lift Stations – Average Cost Per Site $35,000	As Needed	$1,050,000
3. Class A Biosolids	10 Years	$2,500,000
4. Extension of Existing WWTP Outfall	10 Years	$3,500,000

IV. PROGRAMS TO IMPROVE OVERALL OPERATING EFFICIENCY

Description	Estimated Timeframe	Estimated Costs
1. Amend Standard Specifications	Annual	$ 2,000
2. Subdivision Reviews	Annual	$10,000
3. Monitor SID Program	Annual	$1,500
4. Grease Control Program	When Desired	$500 Per Location
5. Include Alternative Fuels in Grease Program	When Desired	$15,000

Saraland Sewer System
10 Year Plan

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Saraland Sewer System
10 Year Plan

I. GENERAL OVERVIEW AND PURPOSE

The City of Saraland is a rapidly growing community. As stated in the Vision of the City's Strategic plan, "Saraland is a growing community, committed to providing economic, educational, and recreational opportunity for all, in a clean, safe environment that focuses on family values." One aspect of this commitment is sanitary sewer service. The City's sanitary sewer system has two essential elements; the wastewater collection system and wastewater treatment facility (WWTF) that serves the Saraland area.

A progressive maintenance and upgrade plan is crucial for a sanitary sewer system to ensure sound operation, minimize the potential for service interruptions, provide a positive impact on the environment, and provide for growth in the community. This report has been prepared to assist the City of Saraland Mayor, Council, and Staff with evaluating the existing wastewater treatment and collection facilities and to develop planning required to continue effective operations.

II. EXISTING INFRASTRUCTURE

The wastewater collection system serves approximately 5,600 customers and is comprised of over 70 miles of gravity sanitary sewer lines, over 1,300 manholes, over 11 miles of force mains, and 35 lift stations. The sewer is transported to the City's Wastewater Treatment Facility (WWTF) where it is treated and effluent is discharged into Bayou Sara approximately one mile north of the intersection with the Mobile River. Refer to Exhibit A for an overview of the existing sewer system.

COLLECTION SYSTEM SEWER MAINS

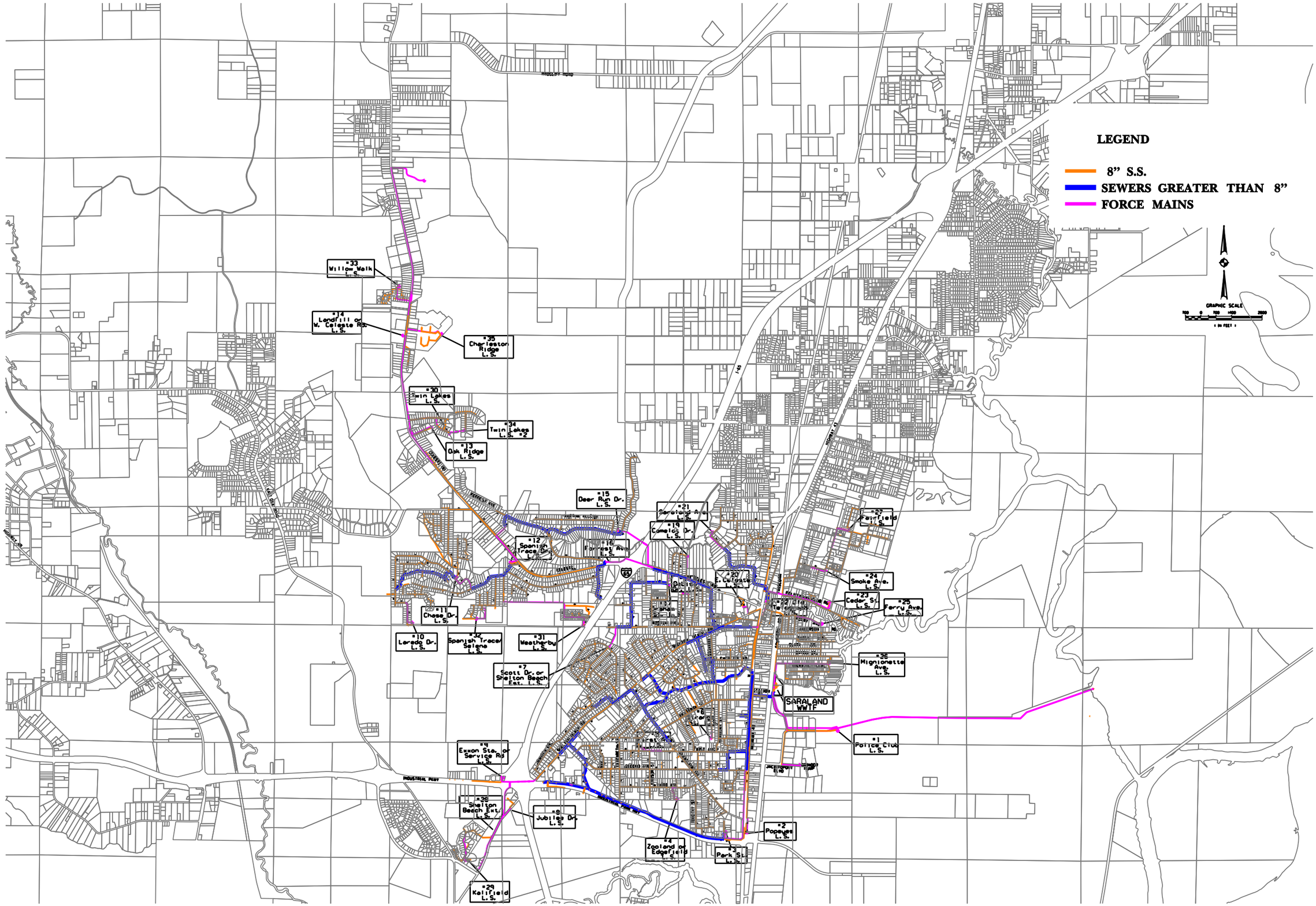
Portions of the sanitary sewer collection system are over 40 years old. Due to the age of many of the sewers and the corrosive nature of sewage, the collection system experiences significant infiltration/inflow (I/I) into the sewer system. Infiltration is groundwater which enters the sanitary sewer mains and laterals through defects in the sanitary sewer system such as defective pipes, pipe joints, connections, and manhole walls. Inflow is water that enters sanitary sewer laterals and mains from the surface during rainfall events through defects in the sanitary sewer system and from sources such as storm drain cross connections, roof drains, and manhole covers. Excessive I/I diminishes the capacity of the sanitary sewer mains and increases the flow to the WWTF.

Currently, the City does not perform flow monitoring of the collection system on a regular basis. Therefore, the measure of I/I experienced in the collection system is monitored by measuring the increased flow received at the WWTF. The WWTF currently receives an average daily flow of 1.7 MGD. During a typical rainfall event it is not unusual for the WWTF to receive flows in excess of 4 MGD with flows reaching 8 MGD during severe weather events such as hurricanes. The additional flow experienced during rainfall events results in sanitary sewer overflows (SSOs) in isolated areas of the collection system due to surcharging caused by current capacity limitations.

In 2005, a capacity analysis of the sewer collection system was performed. The analysis was a process used to identify hydraulic deficiencies in the wastewater collection system. During this analysis, flow monitoring data was collected from temporary flow monitors at key locations in the collection system. Also, field investigations of various critical manholes during dry weather and rainfall events were performed to compare observed flow conditions to flow metered and modeled flows.

The analysis provided two invaluable tools which were utilized during this report and will continue to be a great resource for the City's staff and engineers to evaluate growth areas. First, a workable map of the sanitary sewer collection system was developed. The map depicts locations of sanitary sewer manholes, sanitary sewer gravity mains, force mains and lift stations.

Secondly, an interactive computer hydraulic model of the interceptor sewers within the wastewater collection system was constructed using Bentley/Haestad's SewerCAD program. The model is utilized to evaluate the system for potential surcharged areas and capacity-limited areas. The model also enables development of more accurate and cost-effective system maintenance and upgrade methods. Interceptor sewers with a diameter of 10 inches and larger and any 8-inch diameter mains functioning as interceptor sewers are included in the model. Sewer drainage basins were developed to assist in the evaluation of the sewer system. Refer to Exhibit B for a map showing these sewer drainage basins.



PROJECT NO.: 660107.10

EXHIBIT A

PROJECT NAME: CITY OF SARALAND 10 YEAR MASTER PLAN

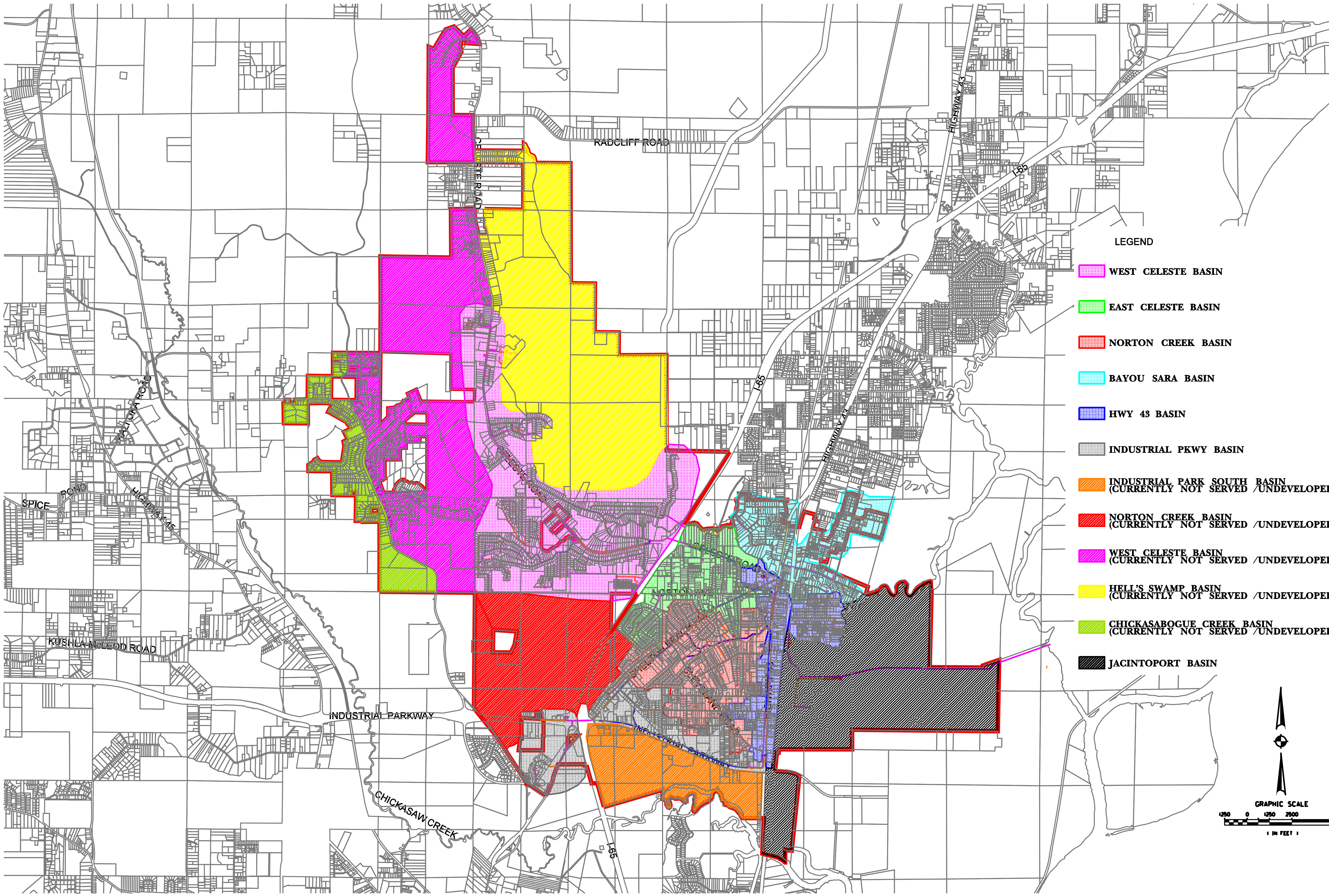
SHEET NAME: SEWER SYSTEM

VOLKERT & ASSOCIATES, INC.

EXHIBIT A

DATE: 05/31/11

Exhibit A Sewer System.dgn 5/31/2011 9:22:56 AM



PROJECT NO.: 660:07.10

EXHIBIT B

PROJECT NAME: CITY OF SARALAND 10 YEAR MASTER PLAN

SHEET NAME: SEWER DRAINAGE BASINS

VOLKERT & ASSOCIATES, INC.

EXHIBIT B

DATE: 10/03/08

The following table summarizes by basin the flow monitoring and modeling analyses previously reported along with lift station and modeling analyses for areas where flow monitoring was not performed:

Basin Description	Dry Weather Capacity	Wet Weather Capacity	Additional Comments
West Celeste	Adequate	Accommodates	Spanish Trace Lift Station Capacity Concerns
East Celeste	Moderate	Inadequate	Moderate I/I & Significant Sedimentation
Norton Creek	Adequate	Accommodates	Significant I/I
Bayou Sara	Adequate	Accommodates	Significant I/I
Highway 43	Adequate	Accommodates/ Inadequacies	Rehabilitating Anderson neighborhood to address current inadequacies
Industrial Parkway	Adequate	Adequate	Moderate I/I

The cleaning of a portion of the 21" sanitary sewer interceptor along Norton Creek assisted with regaining capacity. A reduction in SSOs in the service area of this interceptor was experienced following the cleaning. In the portion of the interceptor that was cleaned and videoed, no major defects in the pipe were located. However, a substantial amount of debris, primarily silt, was removed from the sewer interceptor. The accumulation of debris is a result of significant I/I. Also, with the recent rehabilitation of the sewer mains in the Anderson neighborhood, constructed with the $1.89 million Community Block Development Grant, a reduction in I/I has been accounted for with a decrease in run time by the lift station that services this area during wet weather events along with a reduction in SSOs. However, during the recent wet weather experienced with Hurricane Gustav, an SSO occurred in this area. It is believed that proposed grant improvements to the lift station which will increase storage capacity and pump capacity will further assist with the reduction and elimination of SSOs in this area. The Anderson neighborhood sanitary sewer system is an isolated system that pumps directly to the WWTF. It is an example that with the rehabilitation to mainlines and manholes, I/I is reduced significantly but not eliminated since I/I still enters the system through sewer laterals that service private properties.

The following recommendations are offered for the existing sewer main infrastructure:

- The sewer map should periodically be corrected/updated as new field information is obtained in the future. The Sewer Department should make interim notes on the wall map located at the WWTF as additional information is discovered or as new subdivisions are added. Also, as new developments are constructed, the sewer system should be provided by developers in an electronic format to the City for incorporating into the City's mapping and modeling system.

- A routine cleaning schedule of the interceptors is needed to assist with maximizing the existing capacity of the sewer collection system. Currently the City concentrates its cleaning efforts on historical problem areas including the depressed sewers under creeks and drainage structures. The following areas have depressed sewers: Highway 43 near Norton Creek, Cleveland Road, Forrest Avenue, Oak Street, Strange Avenue, and Lee Street. These areas are cleaned on average every 3 months. On average, to clean the larger interceptors, 18" and 21" diameters, the cost is approximately $15,000 per 1,000 feet.

- Correcting the inverted siphon along the 24-inch sewer near Highway 43/Norton Creek along with a section of pipe upstream that has inadequate grades. The invert elevation upstream is approximately 1.5 feet lower than the downstream manhole. Therefore, a "bottleneck" is present that restricts flow and leads to sedimentation collection and capacity loss upstream of this manhole. The estimated project cost to correct these items is $175,000. However, the City could receive additional benefit from reallocating the funds for this project and using them to fund a new lift station and force main to the WWTF. The lift station could be sized to only operate under high flow conditions to minimize the size required for the pumps and operational run times. The estimated cost to construct a new lift station and force main to the WWTF is approximately $800,000.

- Smoke and dye testing of sewer mains in the Norton Creek, East Celeste, and Industrial Parkway Basins. Also, the City may want to consider creating a private/public lateral replacement program to repair defective private side and public side laterals systematically throughout the system to correct I/I introduced to the collection system. On average, smoke testing of 1,000 linear feet of pipe is approximately $5,000.

- Develop a scheduled for long term rehabilitation of sanitary sewer mains in the critical areas after smoke, dye and additional clean and videoing are performed.

- Create a grease control public information program to inform customers about the negative impacts improper grease disposal has on the sewer system.

- Lining of manholes with a urethane/epoxy rehabilitation product where force mains currently discharge. The City has performed past emergency repairs to manholes that had deteriorated due to hydrogen sulfide (H2S) gases from the sewer. The deteriorated manhole can lead to a collapse of the surface often in or near pavement and created a hazard. Due to the velocity of flow in force mains and the level at which a force main typically enters a manhole, H2S gases are released from the sewer. The current standard specifications require the lining of all manholes that have a force main discharge. It is estimated that there are 30 existing manholes that need to be lined for an estimated cost of $100,000.

COLLECTION SYSTEM LIFT STATIONS

The Sewer Department staff visits all 35 lift stations a minimum of twice weekly to visibly confirm operational conditions. This procedure is in accordance with industry recommended operational and maintenance guidelines where Supervisory Control and Data Acquisition (SCADA) is provided. Since the capacity analysis was performed, SCADA has been added to all the existing lift stations. SCADA will send pager alarms to City staff when a critical condition is occurring at a lift station such as high water level or power outage. This allows staff to respond quickly to a problem to assist with preventing a SSO. The SCADA also provides critical operational data which can be used to evaluate changed conditions in the system or at the lift station. For example, a significant decrease in a pump run time may be attributed to a possible line break while a significant increase in run time during dry weather may be attributed to pump malfunction. The SCADA data is reviewed daily by staff. Reviewing SCADA information along with visits to the lift stations are critical tools in maintaining the system. The SCADA system also allows the flexibility to reduce site visits from the industry recommended daily schedule without SCADA.

As detailed in the chart below, lift stations which service the older portions of the collection system experienced significant increase in run times during wet weather events due to I/I:

Lift Station	Average Runtime Wet	Average Runtime Dry	Percent Increase
WEST CELESTE BASIN			
Willow Walk	0.64	0.50	28.0%
Twin Lakes II	0.81	0.61	32.2%
Laredo	7.26	1.53	375.3%
Landfill	1.60	1.08	47.8%
Twin Lakes	5.09	4.11	23.8%
Chase Drive	4.40	2.81	56.6%
Selena	1.14	1.03	10.7%
Oak Ridge	1.67	1.10	51.5%
Weatherby	0.90	0.74	21.2%
Spanish Trace	8.14	3.35	143.0%
Deer Run	8.16	4.59	77.9%
Forrest Ave	9.51	1.39	585.8%
BAYOU SARA BASIN			
Fairfield	4.88	2.88	69.2%
Smoke	3.41	2.44	39.9%
Ferry Ave	0.42	0.21	104.8%
Cedar St	6.69	2.51	166.5%
Saraland Ave	0.88	0.47	87.9%
Old Telegraph	4.52	1.90	138.1%

Lift Station	Average Runtime Wet	Average Runtime Dry	Percent Increase
EAST CELESTE BASIN			
Camelot	1.70	0.83	104.8%
Graham	15.61	7.31	113.5%
Delisa	5.22	1.91	172.8%
Scott Dr	35.14	22.68	55.0%
HWY 43 BASIN			
Mignionette	31.27	12.86	143.1%
Police Club	9.75	2.58	277.4%
E. Celeste	0.25	0.08	200.0%
Popeyes	3.57	1.11	220.4%
INDUSTRIAL PARKWAY BASIN			
Edgefield	0.82	0.44	84.2%
Exxon	3.83	2.26	69.7%
Jubilee Dr	1.10	0.40	172.7%
Shelton Beach Ext.	0.77	0.38	103.5%
Kalifield	0.34	0.27	25.6%
Park St	20.30	4.41	360.0%
NORTON CREEK BASIN			
First Ave	11.02	4.44	148.0%
Strange St	0.74	0.45	65.7%

Note: Lift stations that are new to the system that are currently servicing areas that are largely undeveloped have not been used in the above table.

Typically during normal operating conditions the multiple lift stations will not run simultaneously for extended periods. However, during wet weather events when run times are increased, simultaneous run cycles of the lift stations for extended periods are experienced. Currently the lift stations that pump to Spanish Trace exceed the capacity of Spanish Trace lift station by approximately 200 gpm. Also, Old Telegraph lift station capacity is exceeded by those lift stations pumping into it by approximately 300 gpm.

Two lift stations, Scott Drive and Mignionette Avenue, are currently being upgraded as part of a Community Development Block Grant (CDBG). Both lift stations will have increased storage and pumping capacity. The Scott Drive Lift Station will operate using variable frequency drives (VFDs) in order to accommodate downstream lift stations until additional upgrades can be performed downstream.

Included in Exhibit C is a lift station flow chart to show which lift stations pump into subsequent lift stations. Also, schematics of the collection system basins were generated to further assist with reviewing capacity limitations of the lift station. These drawings assist with performing capacity analyses for potential residential or commercial development in the future.

The following recommendations are offered for the existing lift stations:

- Graham Street Lift Station is producing high run times, especially during rainfall events. Therefore, these pumps should be replaced with higher capacity pumps.

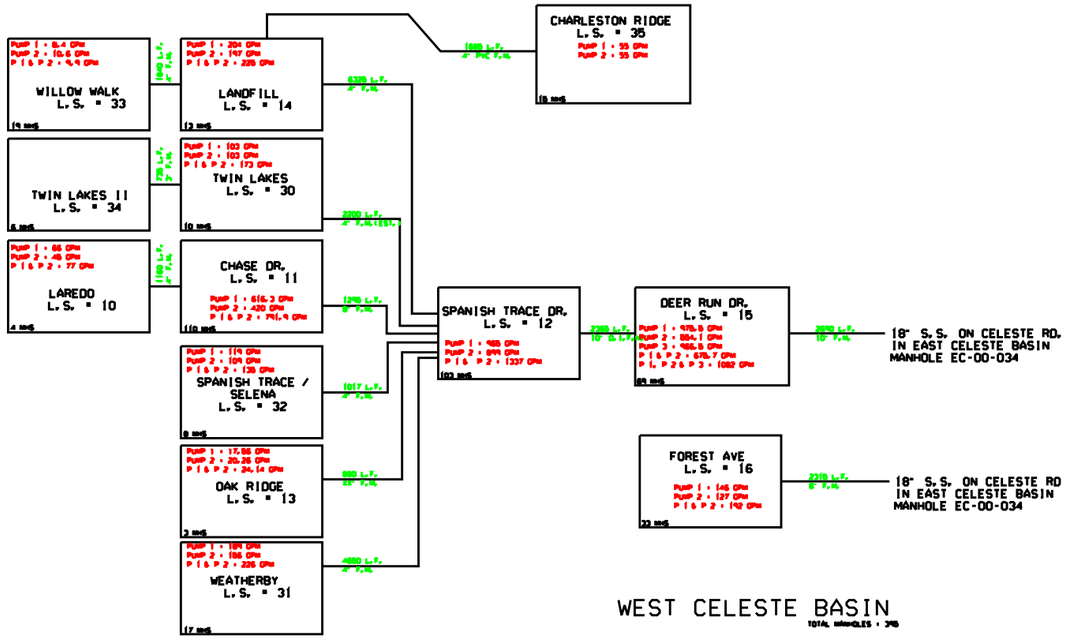
- Continue to replace parts attributed to mechanical wear of the pumps as needed including impellers, wear plates, seal assemblies, bearings, gaskets, flap valves (Gorman Rupp pumps only), belts and sheaves, check valves, and plug valves.

- Upgrade the capacity of Spanish Trace Lift Station and Old Telegraph Lift Station with larger pumps.

WASTEWATER TREATMENT FACILITY (WWTF)

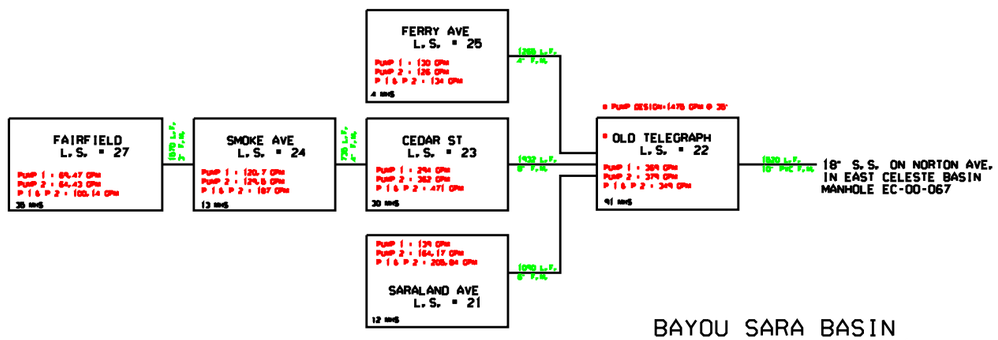
The Wastewater Treatment Facility (WWTF) is located at 104 Station Street. The original facility was constructed in 1965 with a treatment capacity of 0.5 million gallons per day (MGD). This facility was replaced at the same site in 1987 with an activated sludge facility designed for a treatment capacity of 2.6 MGD with a short-term peak flow of 5.0 MGD. Due to increasingly stringent water quality standards and increases to the wastewater flows and strength of sewage received at the WWTF, the plant previously had difficulties consistently complying with the effluent permit requirements. Therefore, in 2004, the WWTF was converted to an activated sludge sequencing batch reactor (SBR) treatment process. The SBR conversion along with completed upgrades to other components of the WWTF including screening, pumping, disinfection, biosolids management, and instrumentation allowed the City to meet its goal of providing quality services to the community and to enhance the surrounding environment. The following table shows the influent characteristics and permit conditions that the upgrades were designed for and the current influent and effluent conditions:

Description	Design Condition		Permitted	Current Conditions	
	Influent	Effluent	Effluent (Summer/Winter)*	Influent	Effluent (Summer/Winter)*
Flow (MGD)	2.6	N/A	2.6	1.7	N/A
BOD (mg/l)	350	9	10/25	273	1.22/1.33
TSS (mg/l)	400	10	30/30	247	3.1/3.1
NH(3)-N (mg/l)	40	0.5	2/8	N/A	0.24/0.09
* Summer limits are permitted as May through November and Winter limits are permitted as December through April					



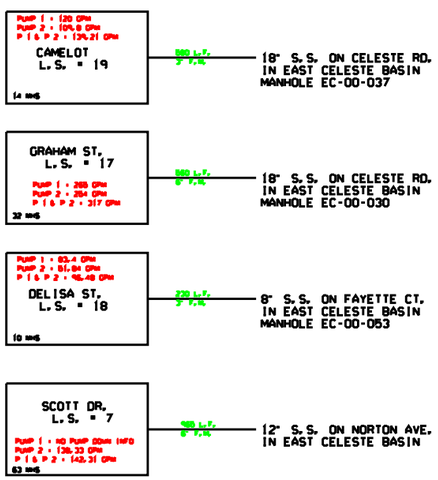
WEST CELESTE BASIN

TOTAL MANHOLES = 345



BAYOU SARA BASIN

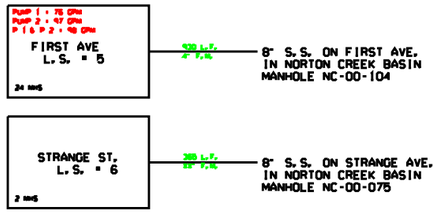
TOTAL MANHOLES = 185



EAST CELESTE BASIN

72 MHS (including EC-00-007A & EC-00-007B1 MANHOLES DIRECTLY INTO TRUNKLINES)

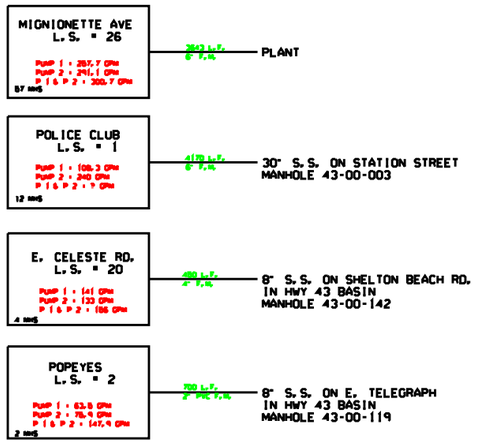
TOTAL MANHOLES = 191



NORTON CREEK BASIN

284 MHS (including NC-00-008A & NC-00-042A) TOTAL MANHOLES = 310

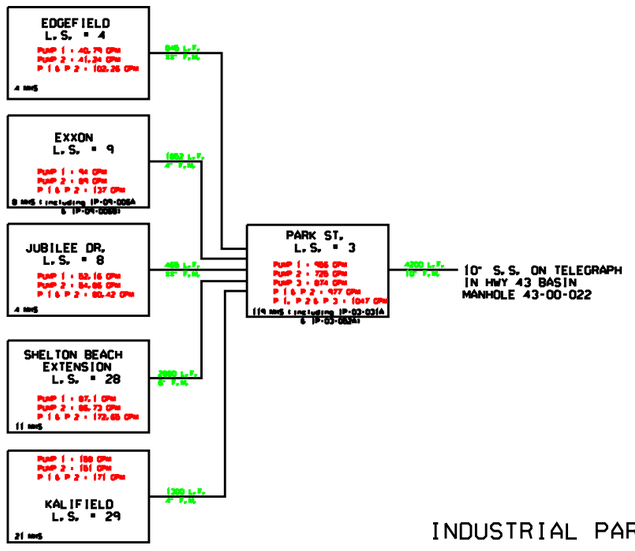
MANHOLES DIRECTLY INTO TRUNKLINES



HWY 43 BASIN

116 MHS (including 43-00-016A & 43-00-103A, 43-00-103B & 43-00-100C) TOTAL MANHOLES = 140

MANHOLES DIRECTLY INTO TRUNKLINES



INDUSTRIAL PARKWAY BASIN

TOTAL MANHOLES = 167

PROJECT NO.:
660107.10

EXHIBIT C

PROJECT NAME:
CITY OF SARALAND
10 YEAR MASTER PLAN

SHEET NAME
LIFT STATIONS SCHEMATICS

VOLKERT & ASSOCIATES, INC.

EXHIBIT
C

DATE: 10/03/08

Plot Scale=$$SCALE$$
$$PENTABLE$$

User Id: $$USERNAME$$
$$DGNNS

The SBR treatment process allows for varying strengths of wastewater and flows to be received by the WWTF while maintaining the biological process. The upgrades also increased the hydraulic capacity of the treatment facility to 8 MGD. The WWTF experienced a real-time test during Hurricane Ivan on September 16, 2004 when flows in excess of 8 MGD passed through the facility. The biological process and permit compliance were both maintained during this event. Refer to Exhibits D - H for additional graphs showing the enhanced water quality of the effluent produced at the WWTF since the 2004 upgrades.

The following recommendations are offered for the WWTF:

- The renovations performed in 2004 are adequately meeting the needs of the WWTF as it continues to produce a higher quality effluent than required by permit. Staff should continue to perform routine maintenance of all mechanical equipment in accordance with equipment manufacturers O&M recommendations.

EXHIBIT D
Saraland Wastewater Treatment Facility
Ammonia Winter Graph (Dec-Apr)

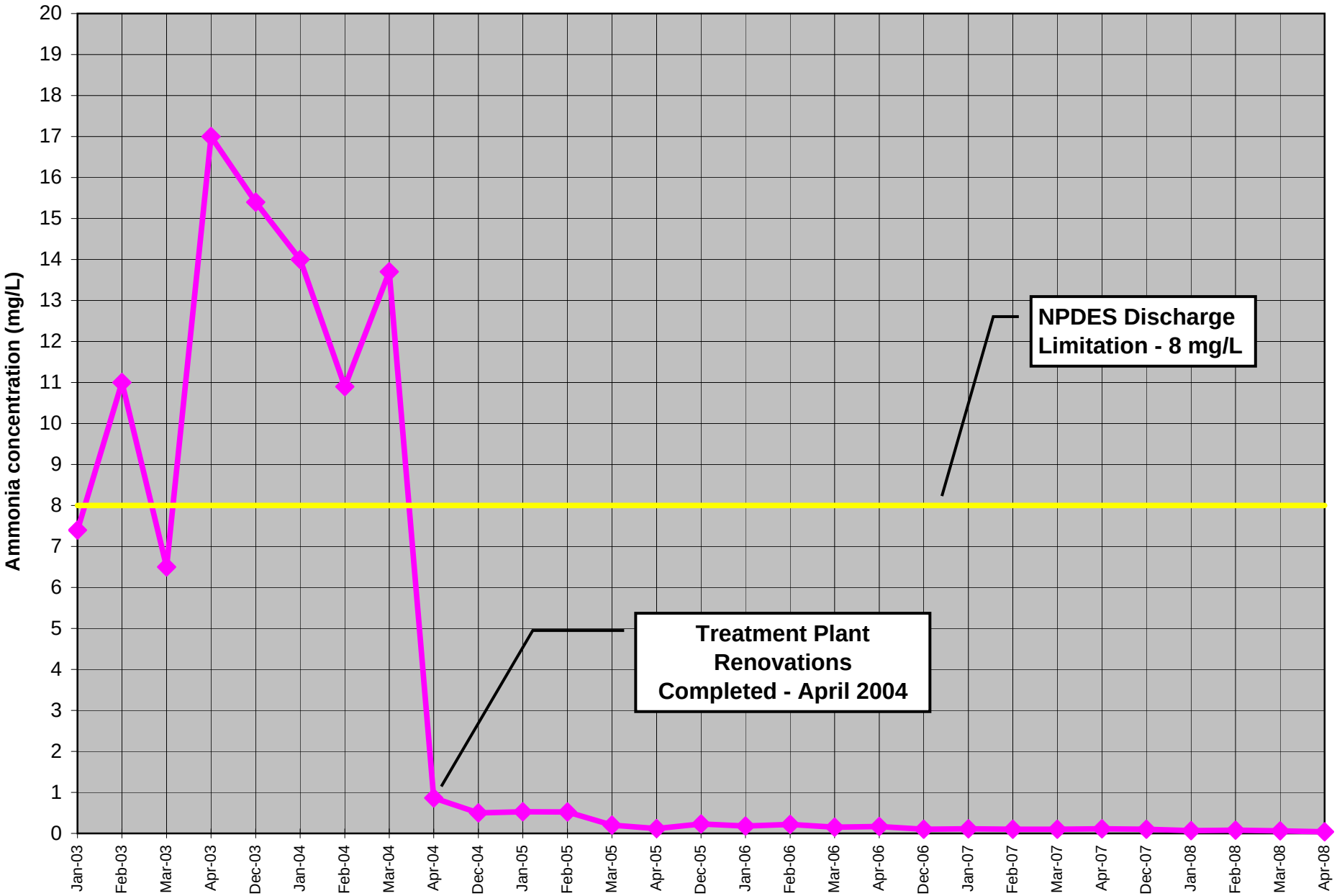


EXHIBIT E

Saraland Wastewater Treatment Facility

Ammonia Summer Graph (May-Nov)

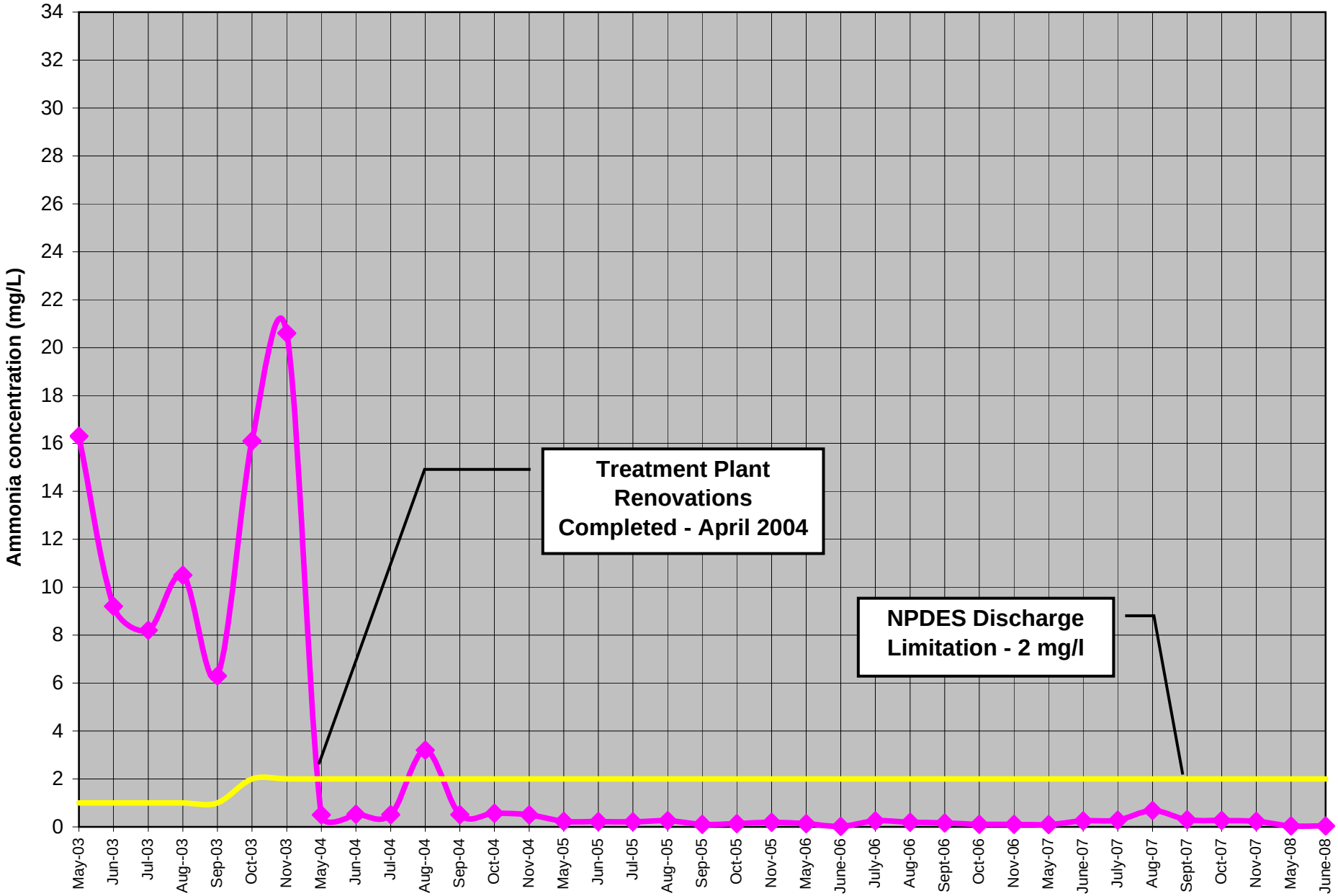


EXHIBIT F
Saraland Wastewater Treatment Facility
BOD Winter Graph (Dec-Apr)

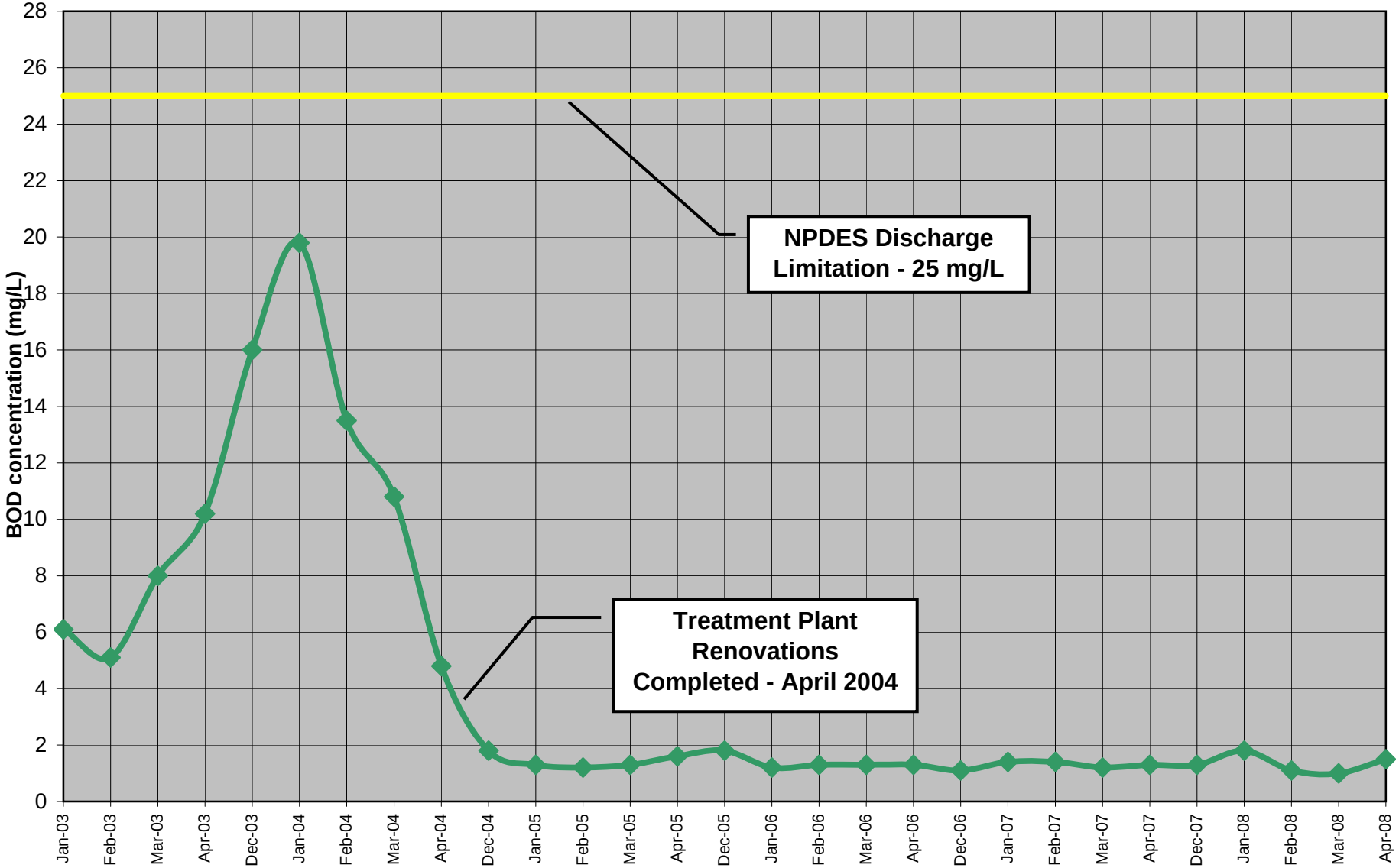


EXHIBIT G
Saraland Wastewater Treatment Facility
BOD Summer Graph (May-Nov)

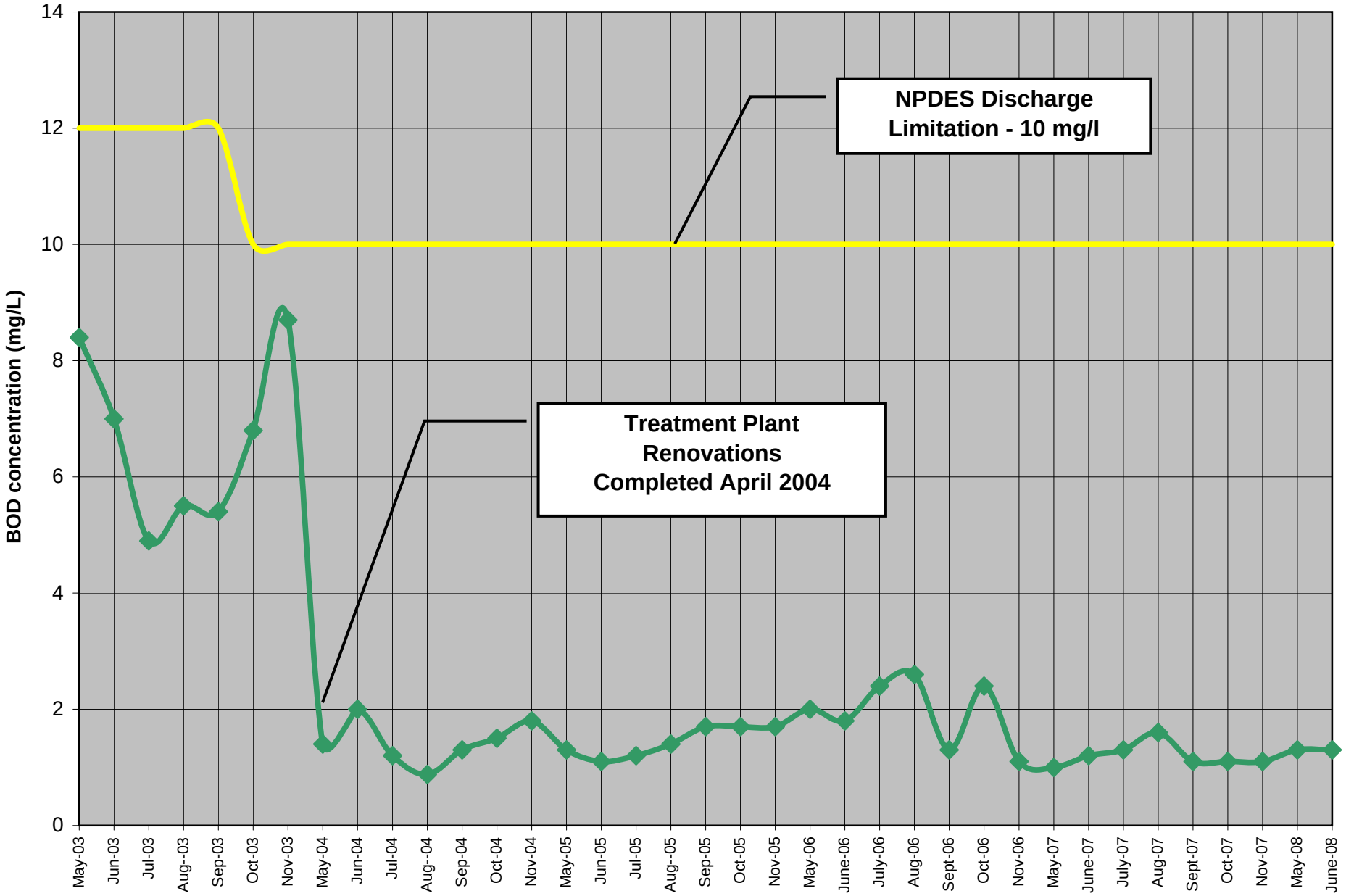
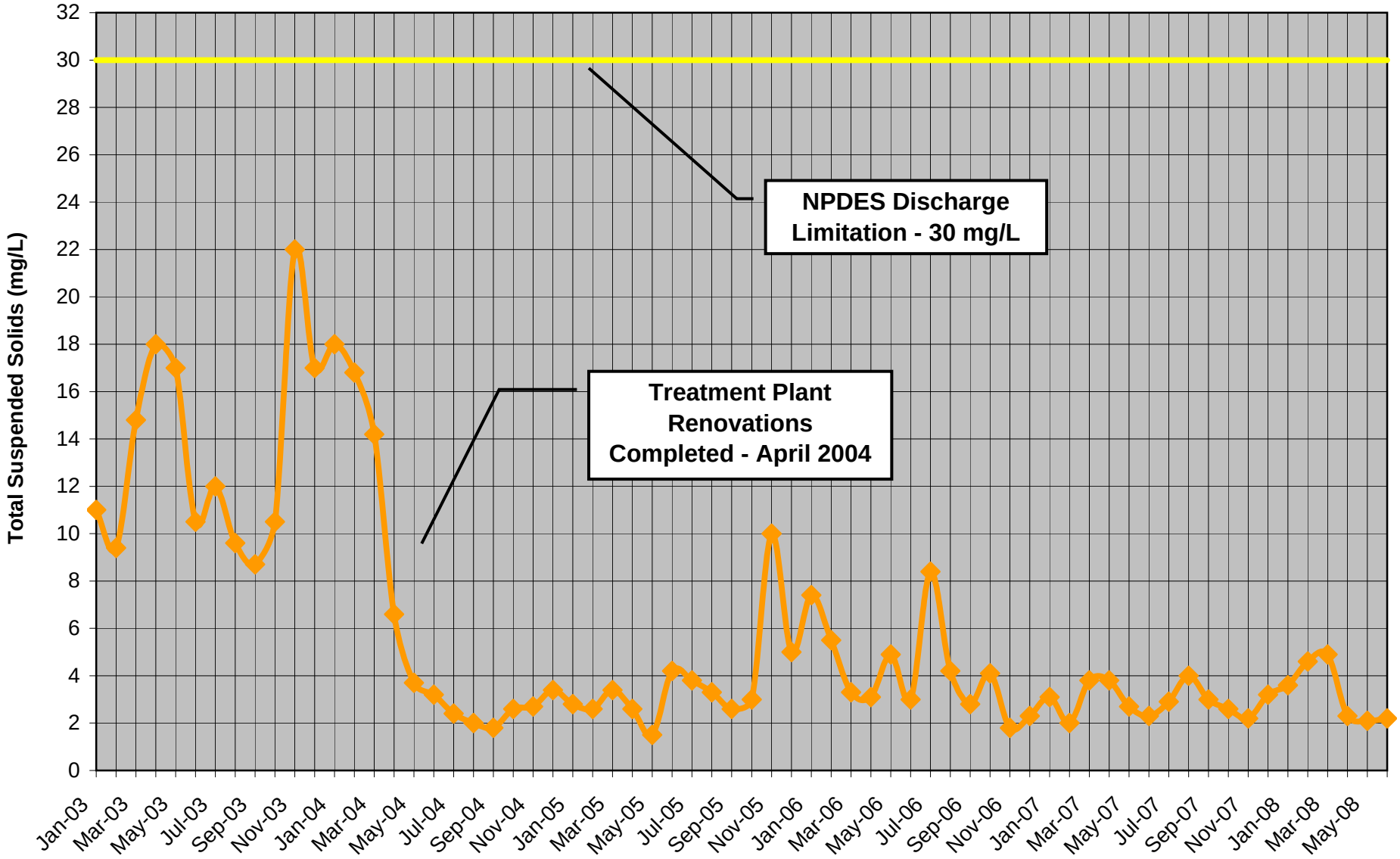


EXHIBIT H
Saraland Wastewater Treatment Facility
TSS Graph (All Months)



III. STAFFING

The City's Sewer Department currently has 6 employees to operate and maintain the sewer collection system and the WWTF including a Grade IV and Grade III operator. ADEM has assigned Grade classifications to operators and the Saraland WWTF is a Grade III facility based on its permitted flow which requires Grade III operators or higher. Grade IV is the highest level designated by ADEM.

The current staff needs to continue their efforts to have proper operator certifications. Also, staff needs to continue to attend training seminars to stay abreast of current technologies, regulations, and operational and maintenance procedures. These training opportunities also provide the necessary continuing education credits in order to maintain operator certificates.

As the City of Saraland grows, additional infrastructure will be constructed for the City's ownership and maintenance. The City will need to evaluate personnel needs to ensure adequate staffing. Systems of similar size for the anticipated growth of the Saraland sewer system typically have 3 to 5 WWTF personnel and 4 to 5 collection system personnel.

IV. SERVICE AREA/DEMAND

The existing sanitary sewer system serves approximately 5,600 customers comprised of residential, commercial, and industrial accounts within the City limits and surrounding area. There are approximately 5125 residential accounts, 460 commercial/retail accounts, and 15 industrial accounts. Of the industrial customers, 2 are assigned State Indirect Discharge (SID) permits by ADEM. Also, there are areas within the City limits that currently do not have sewer service since they are largely unpopulated. Data was collected from various sources including population percentage estimates over the last five years, 1990 and 2000 census data, and population and growth projections for Saraland through 2030 provided in the study performed by the South Alabama Regional Planning Commission (SARPC). These published population projections are provided in the table below:

Description	Previous Five Years	1990 Census	2000 Census	2010 Projection	2020 Projection	2030 Projection
Saraland	.8%	11,751	12,288	13,211	14,532	15,985
Mobile County	.3%	378,643	399,843	440,827	484,910	533,401

It is believed that due to recent events including proposed developments locating to the greater Mobile County area including ThyssenKrupp, the City creating its own School system, and the amenities that Saraland offers its residents and commercial partners that these growth projections are significantly low for Saraland.

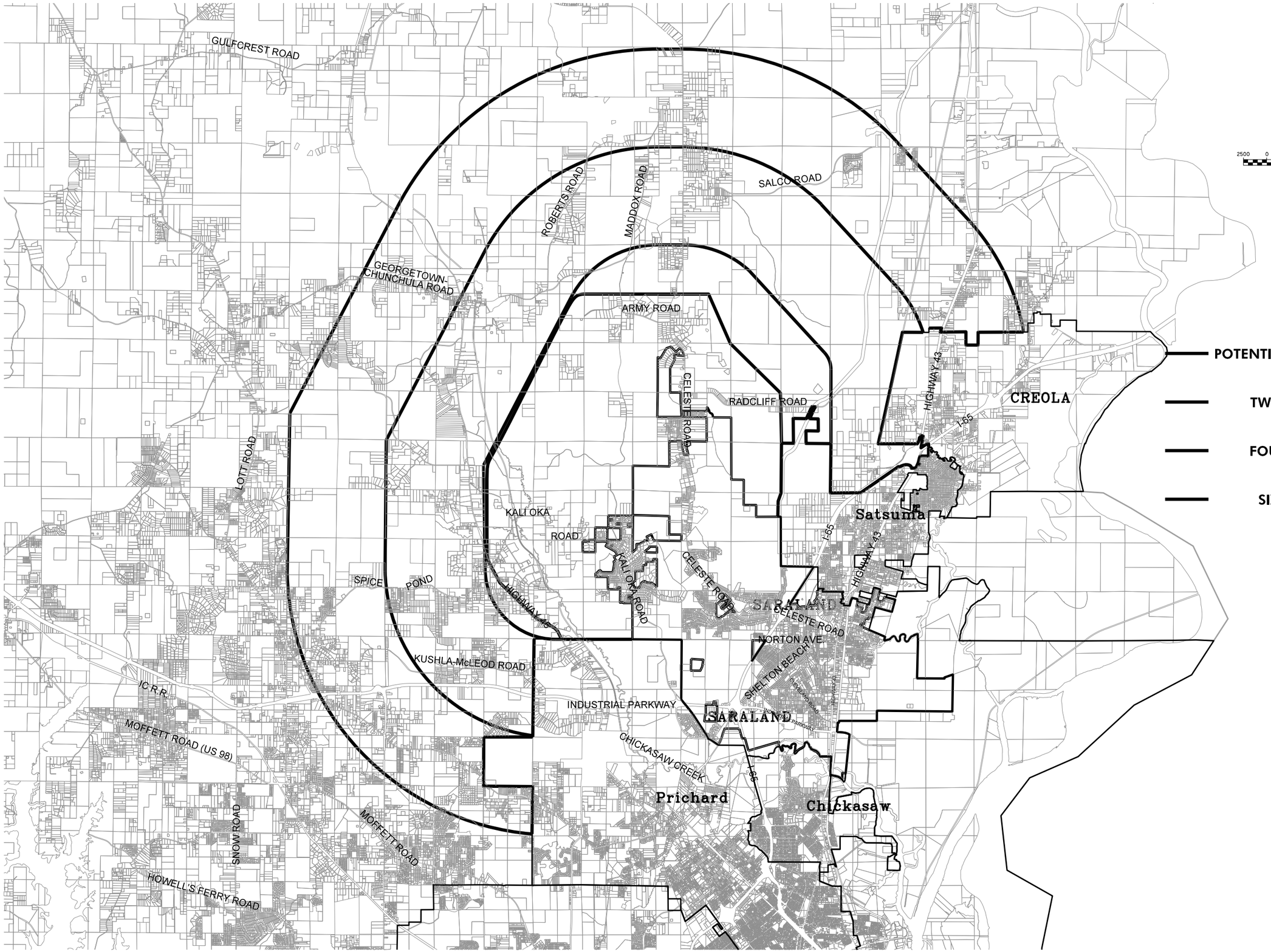
There have been several proposed significant developments for the City of Saraland over the past 24 months. These proposed developments are at various stages in the planning process with some entering into construction but all having approached the City about sewer services. The following table summarizes these proposed developments and which sewer drainage basin they would impact. It is estimated that these developments could impact the City's sewer system with a total additional average daily flow of approximately 1.0 - 1.6 MGD.

Description	Sewer Drainage Basin	Type
North Ridge Estates	West Celeste/Hells Swamp	114 Residential
Old Kali-Oka Road Dev.	West Celeste	33 Residential
MIK Development	West Celeste/Hells Swamp	PUD 500 Residential
Sandy Ridge Road Dev.	West Celeste/Hells Swamp	PUD Residential
Spanish Trace Unit 10	West Celeste	Residential
Charleston Ridge	West Celeste	Residential
Gateway Centre Shopping	Industrial Parkway	Retail/Commercial
Best Western	Industrial Parkway	3 Story Hotel
Country Inn Hotel	Industrial Parkway	3 Story Hotel
Microtel	Industrial Parkway	4 Story Hotel
Holiday Inn	Industrial Parkway	4 Story Hotel
Bayou Fastener	Industrial Parkway	Warehouse
Comfort Inn	Industrial Parkway	3 Story Hotel
Olde Oak Apartment	Industrial Parkway	240 Apartment Unit

Description	Sewer Drainage Basin	Type
Heritage Oaks Apartment	Industrial Parkway	320 Apartment
Saraland High School	Industrial Parkway	1200 Student High School
Commercial West I-65/ South Hwy 158	Industrial Parkway	29.5 Acre Commercial
East Celeste Development	East Celeste	PUD 744 Residential
Huddle House	East Celeste	Commercial
Horizon Service Station	East Celeste	Commercial
Peirce Pointe	Norton Creek	Residential Constructed
Racetrack	Norton Creek	Retail/Commercial Surrounding the Racetrack
Nordan Business Park	Highway 43	Commercial

The City has also been approached by several residents in nearby existing subdivisions desiring to be annexed into the City. A 2-mile, 4-mile and 6-mile radius from the current City limits was extended to review potential growth areas. These potential growth areas only accounted for areas currently in unincorporated portions of Mobile County. A projected potential growth area was developed as shown on Exhibit I. The table below summarizes future projected flows by drainage basins.

Drainage Basin	Future 10 Year Projected Flows (MGD)	
	Within City Limits	Potential Growth Area
West Celeste	0.4	0.2
East Celeste	0.03	-
Norton Creek	0.3	-
Bayou Sara	0.03	-
Highway 43	0.02	-
Industrial Parkway	0.25	
Sub Total of Existing Basins	**1.03**	**0.2**
Potential New Drainage Basins		
Hell's Swamp	0.3	0.05
Chickasabogue Creek	0.1	0.25
Jacintoport	0.2	-
Sub Total for Potential New Drainage Basins	**0.6**	**0.3**
Total Future 10 Year Projected Flows	**1.63**	**0.5**



PROJECT NO.:
660107.10

EXHIBIT I

PROJECT NAME: CITY OF SARALAND 10 Y AR MAST R PLAN

SHEET NAME: POTENTIAL GROWTH AREAS

VOLKERT & ASSOCIATES, INC.

EXHIBIT I

DATE: 10/03/08

The above estimates represent potential sewer flows over the next ten years and do not represent potential build out of the proposed drainage basins. Varying percentages for build out were utilized for each basin along with varying percentages for residential and commercial users. Based on the current data and projections, it is estimated that the sewer system could potentially experience an estimated additional 2.1 MGD over the next 10 years with the current anticipated growth. As previously stated in this report, existing infrastructure currently has limitations primarily experienced during wet weather events when I/I causes a significant increase in flows. The anticipated future flows will require infrastructure improvements to accommodate service to these areas and are discussed in further detail in Section VIII of this report. Capacity fees discussed in Section VII of this report will assist with funding these improvements.

V. REGULATIONS

The wastewater industry is a heavily regulated field. With the passage of the Clean Water Act in 1977, a significant interest was placed on protecting the environment through sound and responsible treatment of sewage collection systems. The Alabama Department of Environmental Management (ADEM) is the state agency that permits the discharge of treated wastewater along with administering the various regulations established by the Environmental Protection Agency (EPA), or themselves. This report concentrates on 6 areas of regulations that are current areas of interest by regulating agencies and/or anticipated to be changing. These areas include the following: Nutrient Limits, Biosolids, Alternative Fuels, Sanitary Sewer Overflows, Operator Certifications, and Capacity Management, Operations, and Maintenance (CMOM).

- **Nutrient Limits:** In conjunction with the request by EPA, ADEM has been studying the levels of nutrients including phosphate, nitrate, nitrite, and TKN in the receiving waters in the Mobile area. Starting this year with wastewater treatment facilities'' NPDES permit renewals, ADEM has advised that they will be requiring monitoring of these nutrients in the wastewater treatment facilities' effluent stream.

  At the end of the permit period in 2012, it is currently anticipated that nutrient limits will be included on the permits with an estimated 3 years to make the necessary upgrades to comply with limits. Currently facilities in the northern part of the state have nutrient limits. Nutrient limits typically require advance treatment of the wastewater in order to obtain the desired effluent quality. The nutrients are typically treated by achieving a nitrification - denitrification cycle in the aeration basin along with filters following clarification. During the recent plant conversion to SBR, nutrient limits as a potential future regulation were considered. With the addition of advanced controls and filters, the existing treatment process could be upgraded to meet typical nutrient limits. The estimated costs for these improvements is approximately $1,700,000.

- **Biosolids:** Currently the City's WWTF aerobically digests the biosolids/sludge produced at the facility. The digested biosolids are then dewatered to reduce hauling and disposal costs. Currently, the City's biosolids are classified as Class B. This allows for restrictive land application of the biosolids which is currently being performed by Merrell Brothers.

  Class A is the highest level of treatment for biosolids and allows for unrestrictive disposal of the biosolids. This means that with proper documentation and within the guidelines set for spreading, the biosolids can be placed on any land. Class A biosolids are often used by farmers and have more potential for application than Class B biosolids, which the City produces. The addition of a dryer or chemical conversion equipment would be necessary to convert the existing Class B biosolids to Class A biosolids.

  It is estimated that the equipment for the conversion would be approximately $2,500,000. As available landfill and land application space designated for Class B biosolids lessens and the regulations for disposal become more stringent, Class A biosolids will become a necessity. However, it is estimated that this may not occur for 10 to 15 years as currently there are no pending regulations requiring Class A biosolids.

- **Sanitary Sewer Overflows:** All sanitary sewer overflows (SSOs) must be reported to ADEM in a timely manner. There are several factors that cause sanitary sewer overflows including inflow and infiltration (I/I) of stormwater into the sewer mains, blockages and mechanical failures.

  Inflow and Infiltration of stormwater into the sewer system can be caused by defects in the pipe such as defective joints, root intrusion, breakages, and cross connections with storm sewer and roof drains. Increase in flow from I/I limits the capacity of the system to critical levels. Blockages create impediments to flow and the additional flow created by I/I may produce a SSO.

  Improper disposal of cooking grease is also a significant contributing factor to sanitary sewer overflows. Grease from households congeals in manholes and mains within the sewer system to create blockages. During a storm event or period of increased flow, these blockages prevent the sewage from moving downstream and cause the sewage to overflow from the manholes.

  The City may consider the implementation of a Grease Recycling Program, which would provide public education regarding the proper disposal of grease from cooking. Proper disposal of cooking grease will reduce grease accumulation in the sanitary sewer lines and lower the number of overflow occurrences. It will also assist with reducing the frequency of sanitary sewer main cleaning in order to prevent SSOs from occurring. It is estimated that a grease recycling program could be initiated by the City for approximately $500 per “drop off location.” This cost would allow for the purchase of materials to construct and supply “drop-off” locations for the public to bring their cooking grease.

- **Alternative Fuels:** With the increase cost of crude oil and gasoline, alternative methods for fuel are being studied and considered. The City is currently using an alternative fuel source for City vehicles and equipment. An additional potential source of alternative fuels is the conversion of used cooking oil to fuel. As mentioned above, grease blockages are one of the leading causes of SSOs and grease removal is a routine maintenance item in an effort to prevent SSOs. Through public awareness and grease recycling discussed herein, a grease recycling program could be implemented at the City. This process could be completed in two phases with the grease recycling occurring first and then the implementation of converting that used cooking oil to biodiesel. It is estimated that the capital cost for equipment to convert the used cooking oil to biodiesel is approximately $15,000.

- **CMOM:** The Capacity Management, Operations, and Maintenance (CMOM) Program was developed by EPA to improve wastewater system planning and operations. Currently, the program is voluntary with an overall purpose of ensuring that wastewater systems have sufficient capacity to convey wastewater from the source to the wastewater treatment facility without loss. The Program identifies system capacity limitations relative to projected peak flows, which are based on historical data, and facilitates management decisions regarding new sewer service connections and system improvements. Goals of the Program include identifying reserve capacity, hydraulic deficiencies, and capacity needs.

VI. PROCEDURES

Due to the rate and anticipated growth of the City, the Sewer Department has modified some of its procedures to assist with accommodating anticipated growth while maintaining quality operations. For the purpose of this report, 3 primary procedures are discussed including the Industrial Pretreatment Program, Standard Specifications, and Development Plan Reviews.

The City currently has 2 SID customers registered with ADEM which operate under the Pretreatment Program. Industries that are included in the Pretreatment Program have a waste strength that is significantly higher than the typical residential or commercial customer. Therefore, the sewage from these facilities has an increased impact on the WWTF than the flow volume indicates. The following table shows the two SID permittees and their impact as a percentage of the flow and biological capacity at the WWTF. These percentages are based on the SID's permitted discharges to the WWTF through ADEM. Similar to the WWTF, the SID's typically maintain influent waste strengths that are below the permitted limits. These typical strengths have also been included in the table below:

Description	Permit Avg. /Max	Permit % of WWTF Capacity	Current Maximum	Current Max % of WWTF Capacity	Current Average	Current Avg % of WWTF Capacity
	Aaron Oil					
Flow (MGD)	0.025	0.96%	0.025	0.96%	0.013	0.5%
BOD (ppd)	1900 / 2900	25%/38%	2874	38%	1203	16%
	QSI					
Flow (MGD)	0.01	0.38%	0.01	0.38%	0.007	0.27%
BOD (ppd)	146/167	1.9%/2.2%	152	2%	85	1.1%

In the chart above, the percentages comparing the SID's permitted, maximum, and average flow and BOD versus the WWTF's design flow and influent BOD are based on loadings versus concentrations. Concentrations are listed in mg/l and are used in the conversion to loadings which takes into account the flow received. For example, the treatment facility has a design influent concentration of 350 mg/l for BOD but a design loading of 7590 pounds per day (ppd) for BOD. Listing the percentages as a percent of the loading to the WWTF versus the concentration is a more accurate representation.

The City's Pretreatment Program also establishes financial surcharges that apply to the biological loadings in excess of a typical commercial user.

The Sewer Department recently revised their standard specifications to include current standards and practices. The standard specifications are primarily utilized by developers when designing and construction sewer infrastructure which will be submitted to the City for acceptance of ownership and maintenance. The standard specifications is an evolving document as new products are introduced and practices and standards are modified.

The sewer department works closely with the Building Inspection Department to ensure a timely review of subdivision and commercial applications. Currently, proposed development plans are submitted to review for compliance with the Standard Specifications. Prior to beginning construction all review comments should be incorporated into the development plans. The sewer department staff currently performs periodic cursory field reviews of the construction to ensure that the methods utilize concurs with the Standard Specifications and the reviewed construction plans. However, it is primarily the responsibility of the Engineer working for the development to ensure that construction methods comply with the project plans and specifications and the City's standards. With the recent amendments to the Standard Specifications, a final checklist was created to ensure that all proper documentation including record drawings, internal videos of the new gravity sewer mains installed and all required testing have been provided. The Building Department works closely with the Sewer Department to ensure that Certificate of Occupancies are not issued until all documentation has been provided and the system has been accepted by the sewer Department.

The following recommendations are offered for the Department's Procedures:

- Continue evaluation of other industrial customers not listed as SID permittees with ADEM to ensure that their wastewater strength does not exceed that of a typical commercial customer. If it is discovered that their waste stream is excessive, they should be added to the Pretreatment Program.

- Perform annual revisions of the standard specifications to incorporate current standards and practices unless a more frequent interval is needed to address a field concern.

- Continue to work closely with the City's Inspection Department to ensure that reviews are performed prior to construction and that all necessary documentation is provided prior to acceptance of new facilities.

- Monitor the proposed development schedules to determine if additional assistance is needed to inspect the construction activities.

VII. REVENUE

There are currently 2 primary sources of revenue for the sewer department, capacity fees and user fees. Over the years, recent changes have been adopted by the Council regarding both of these items. The current capacity fees and user fees are listed below.

- **User Fees:** Calculated based on ninety percent (90%) of the water rate with a five percent (5%) increase annually until hundred percent (100%) is reached. The water rate is a $9.00 minimum for the first 3,000 gallons with a charge of $2.75 per 1,000 gallon for each additional 1,000 gallons.

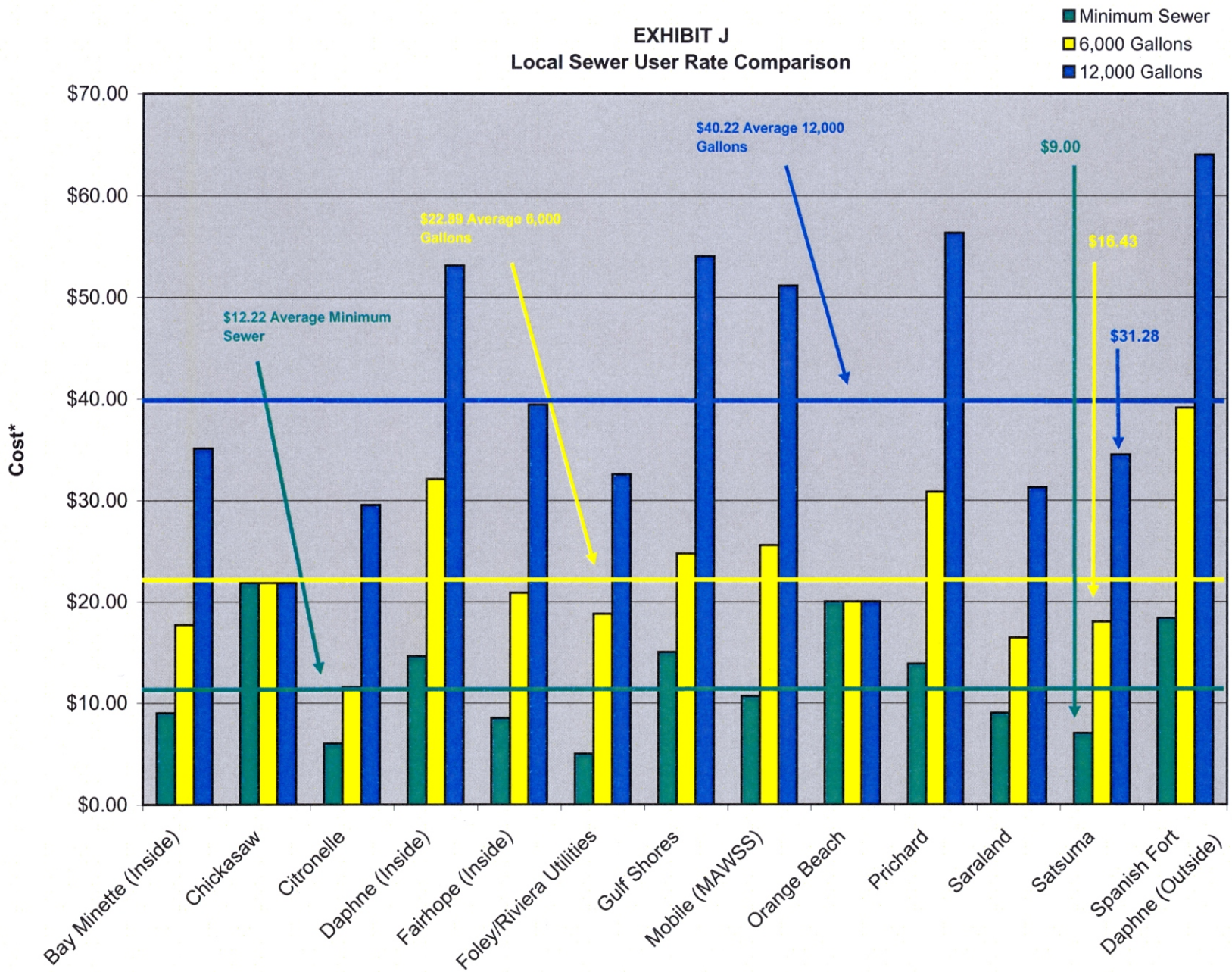
- **Capacity Fees:** Calculated based on an equivalent residential connection (ERC) for dwellings units and meter based for all other users. The following tables show the equivalent residential connection conversion for dwelling units other than a single family dwelling such as apartment and the conversions used for meter size calculations.

Dwelling Unit	ERC	Sewer
Single-family	1.00	$648.00
2 to 4 dwelling units (each unit)	0.75	$486.00
Mobile home/multifamily (each apt/condo unit)	0.50	$324.00
Hotel/motel/guest house/bed and breakfast (each room)	0.25	$162.00

Meter Size (inches)	ERC	Sewer
5/8	1.0	$648.00
3/4	1.5	$972.00
1	2.5	$1,620.00
1 ½	5.0	$3,240.00
2	8.0	$5,184.00
3	16.0	$10,368.00
4	25.0	$16,200.00
6	36.0	$23,328.00
8	64.0	$41,472.00
10	100.0	$64,800.00

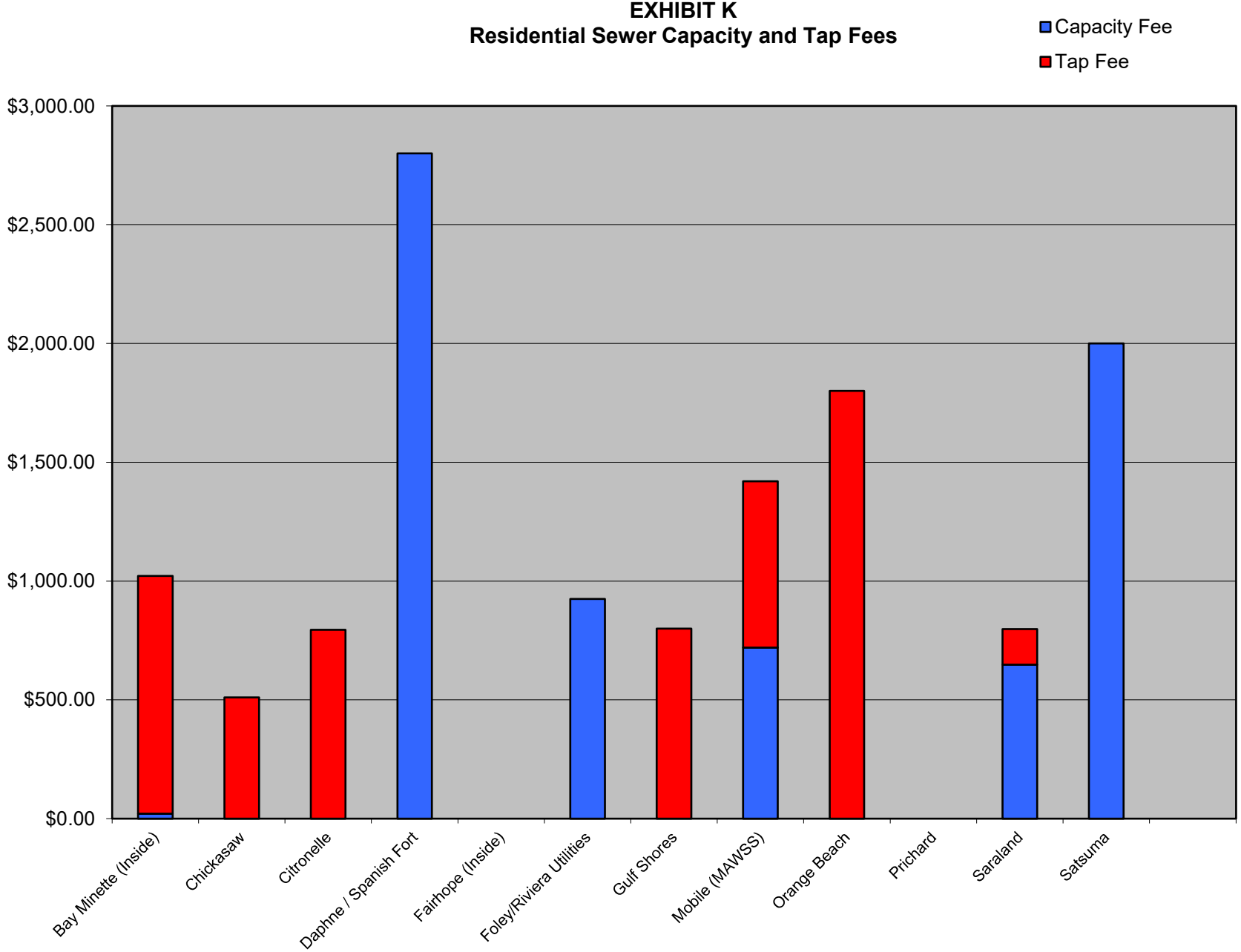
Also, the City charges a permit fee/tap fee of $125 for a residential building and $750 for commercial buildings.

Refer to Exhibits I - K to review comparisons with surrounding communities of typical residential user fees and commercial capacity fees. Fiscal year 2007-2008, user fees accounted for approximately $1,050,000 of the revenue while capacity fees were approximately $56,000 and tap/permit fees were approximately $28,000. The sewer department also receives revenue from surcharges charged to permittees in the



*Costs are based on phone conversations with representatives from the various municipal systems and rate data from websites.

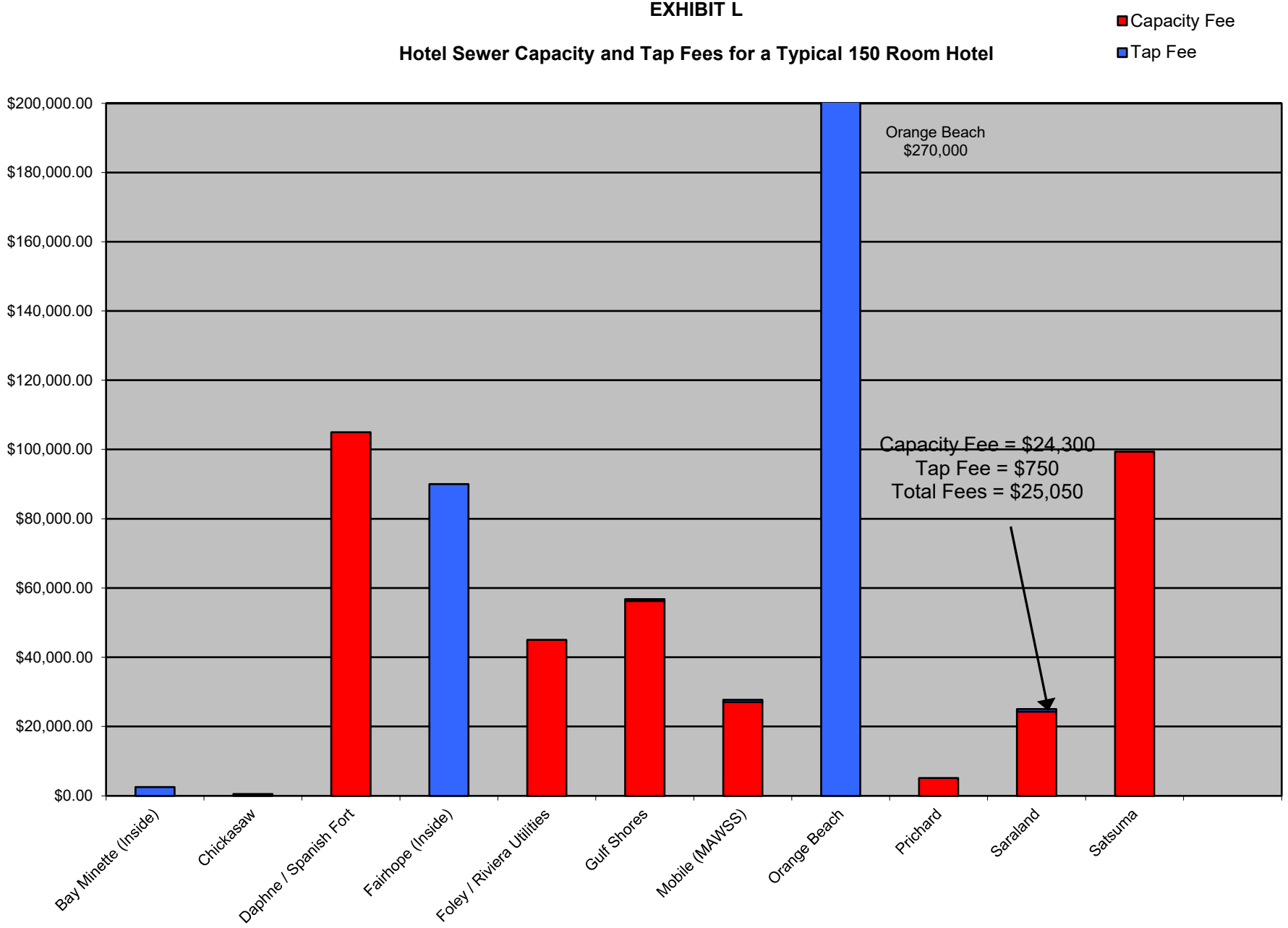
EXHIBIT K
Residential Sewer Capacity and Tap Fees



* Citronelle/ South Alabama Utilities currently has no standards and evaluates on an individual basis.

EXHIBIT L

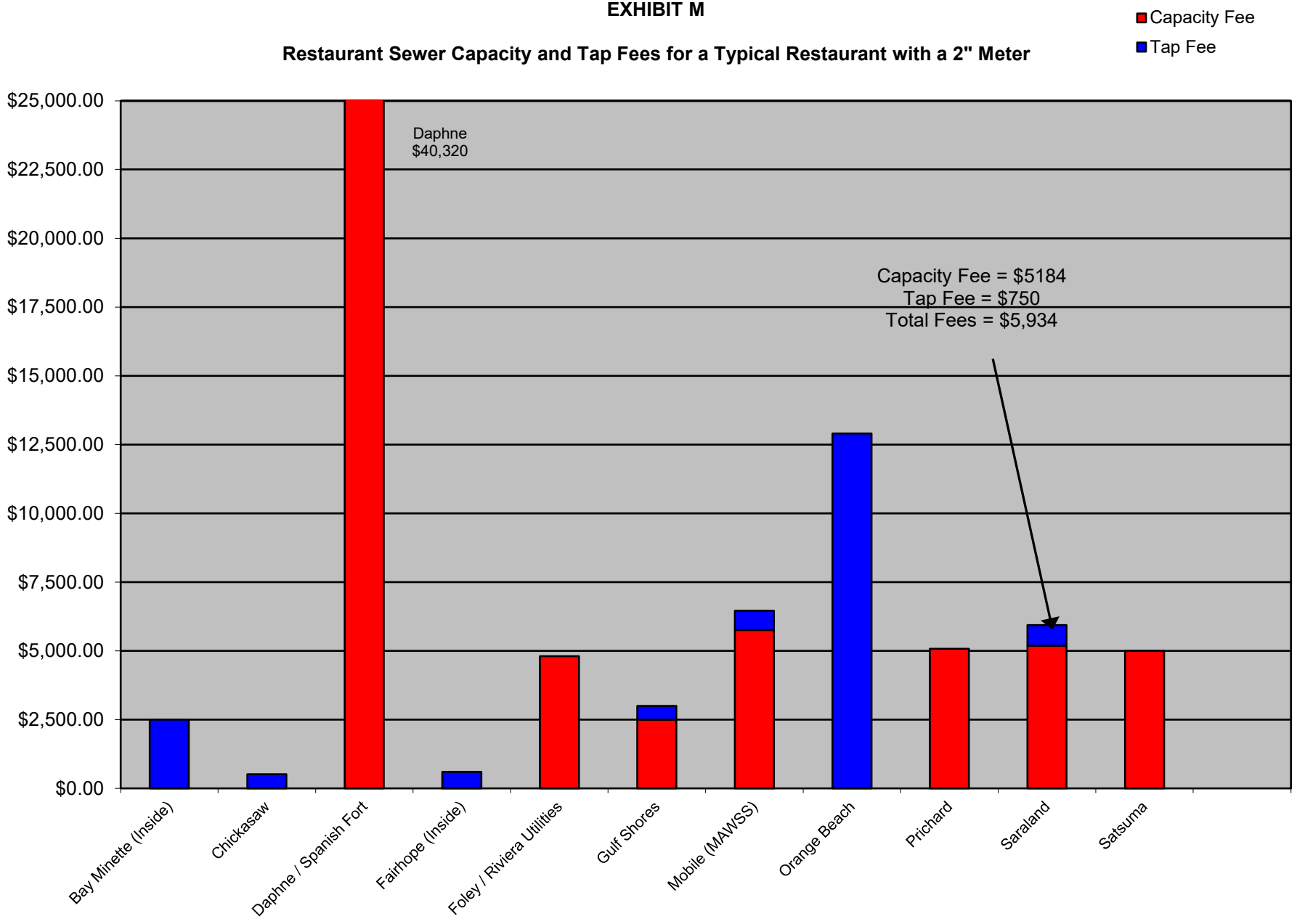
Hotel Sewer Capacity and Tap Fees for a Typical 150 Room Hotel



* Citronelle/ South Alabama Utilities currently has no standards and evaluates on an individual basis.

EXHIBIT M

Restaurant Sewer Capacity and Tap Fees for a Typical Restaurant with a 2" Meter



* Citronelle/ South Alabama Utilities currently has no standards and evaluates on an individual basis.

pretreatment ordinance. Capacity fees are maintained in separate accounts to use as a funding source for future system capacity upgrades. Examples of potential capacity revenue from some of the proposed developments included in this report are $16,200 for 100-room hotel and $64,800 for a 100-lot residential subdivision.

ADEM and EPA recommend that user fees be sufficient to accommodate normal operating costs. It is recommended that the City periodically evaluate their rate structure to ensure that it accommodates the operational requirements for the sewer department along with establishing a fund to address future infrastructure improvements that will be necessary to accommodate the anticipated growth along with improvements to aging infrastructure. This account can also assist with emergency repairs that occur due to aging infrastructure and natural incidents such as lighting strikes.

VIII. POTENTIAL INFRASTRUCTURE IMPROVEMENTS

With the anticipated growth and regulatory changes previously discussed in this report, the following are potential infrastructure improvements that will be needed to meet these future conditions. A brief explanation and magnitude of cost has been provided for each potential improvement. The magnitude of cost has been provided as a current dollar figure amount. Since the actual period for performing any of these improvements is unknown, a more detailed project cost estimate will need to be developed during the planning stages of a particular project. Some of these items have multiple options to achieve the same goal which would be evaluated during development of the project scope to determine the most cost effective option for the City.

- **Upgrades to Various Lift Stations:** Several of the existing lift stations will require upgrades to increase storage capacity and/or pumping capacity to accommodate anticipated growth. It is estimated that as developments approach the City, opportunities may be presented for shared cost in upgrading lift stations to accommodate the flow. It is estimated that over the next ten years, approximately $1,250,000 will be required to upgrade existing lift stations.

- **Force Main and Lift Stations for West Celeste Sewer Basin Flow:** It is currently estimated that one of the primary growth areas for the City will significantly impact the West Celeste Sewer basin. Since downstream infrastructure of this basin is currently taxed during wet weather conditions with capacity being reached or exceeded during wet weather conditions, additional infrastructure will be necessary to accommodate continued growth in this area. Since current lift station run times are not excessive during dry weather in this area, it is anticipated that current anticipated growth over the next 3 to 5 years will not adversely affect dry weather conditions. However, since I/I has a significant adverse impact on this area, aggressive smoke testing and dye testing needs to be performed in this area, to identify and correct any significant areas of inflow.

  Based on current estimated growth, it is anticipated that necessary infrastructure improvements could be constructed in phases starting in 5 or 6 years with upgrades to the existing infrastructure and construction of new lift stations and force mains starting in 8 to 10 years. The estimated costs for improvements to existing infrastructure is approximately $700,000 new infrastructure estimated at $2,500,000.

- **Gravity Mains, Lift Stations, & Force Mains:** Over the next 10 years, growth is anticipated in areas that existing sewer infrastructure does not exist today. Currently, there are multiple interested parities proposing to develop property that is over a mile away from existing infrastructure. The City may want to consider partnerships that would assist with the installation of needed infrastructure that would be sized for the anticipated service area for the proposed infrastructure and not just the proposed development. Examples of partnerships include the infrastructure being installed by a developer with a percentage of future capacity fees being repaid to the developer over an established time frame. Also, as the City grows, new infrastructure installed for developments will be accepted by the City for ownership and maintenance. It is anticipated that with the known proposed development and the anticipated growth areas that over the next 10 years the City's system will be expanded by 50 to 60 miles of sewer main and 15 to 20 lift stations.

- **Treatment Facility for Potential Annexed Area Versus Expansion at Existing WWTF and Infrastructure Expansions:** If growth begins to extend to the far extremities of the City's service area, a new treatment facility in the potential northwestern service area may be a viable option compared to installing the needed infrastructure to carry the sewage to the existing WWTF and possible expansion of that facility. If a new treatment facility were constructed, it is anticipated that the permit limits would require advanced treatment. A typical advanced package treatment facility designed for 1 MGD including an outfall line and property is estimated at $7,000,000. The treatment facility could be constructed in phases as the flow increased to the facility.

- **Upgrades to the WWTF for Expansion and Anticipated Nutrient Removal Permit Requirements:** It is anticipated that with the NPDES permit renewal in 2013, nutrient limits will be required. The addition of nutrient limits along with the anticipated growth will require upgrades at the WWTF. The costs of these improvements is estimated at $1,700,000. Since the current facility was designed for higher influent loadings than are currently being received, the current facility can accommodate additional flow beyond the current 2.6 MGD rated treatment capacity by approximately 1 MGD based on the current average influent loadings. This will allow the plant to continue to comply with the permit limits during the initial growth and prior to nutrient limits being added.

- **Biosolid Upgrades for Class A:** As previously stated the City currently land applies Class B biosolids in accordance with all EPA and ADEM regulations. If due to disposal costs, regulations, or the City's desire to treat to a Class A biosolids, the existing facility could be upgrade by the installation of a dryer to produce a Class A biosolid. It is estimated that this cost would be approximately $2,500,000.

- **Replacement of Aging Equipment at the WWTF including Blowers and Pumps:** Due to the aggressive nature of wastewater, mechanical equipment used to treat wastewater typically has a life expectancy of 8 to 15 years. It is anticipated that starting in 2011, the sewer department operating budget should be increased to include annual rebuild and replacement of existing blowers and pumps. This will allow for 1 or 2 components to be rebuilt annually in lieu of large capital expenses to replace several components at the same time. Also the overall treatment capabilities of the WWTF will be maintained along with improved efficiencies. Currently, there is new technology for blowers that has significant energy savings over previous industry standard technologies. With the increased awareness of energy resources, future options for increased energy efficiencies are anticipated. An increased operational budget of approximately $80,000 to $100,000 would allow for annual rebuilds and/or replacement of critical equipment.

- **Equipment for Service:** In order to continue to provide quality services, the sewer department has identified equipment that would enhance their operational activities by reducing man-hours and the need for outside contracting services. The following pieces of equipment have been identified: Backhoe, service truck with hoist, smoke testing equipment, TV camera for sewer main videos, and an internal cleaning vehicle. The internal cleaning vehicle and TV camera may become a more cost effective option if regulations are changed to mandatory cleaning operations. Currently, cleaning of sewer mains is a recommended O&M procedure.

- **Backup Services for Lift Stations:** During power outages that are often experienced during wet weather events and due to failure of equipment, backup resources of either generators or bypass pumps are necessary at lift station sites in order to continue to provide uninterrupted service and prevent adverse impact to the environment by SSOs. Currently, all new lift stations with a horsepower of 5 or more installed by developers require generators. The City should continue its efforts to fund generators and backup pumps for existing facilities through Disaster HMGP grants often available following severe weather events and in the City's capital budget when funds are available.

- **Extension of Outfall to Mobile River:** Since the City's current outfall line is approximately 1 mile north of the intersection of Bayou Sara and the Mobile River, an extension of the outfall line would allow the City flexibility when reviewing treatment facility upgrades due to stringent permit limits. Permit limits are set by ADEM after studies are conducted on the receiving stream. Larger bodies of water are not as significantly impacted by nutrients found in wastewater effluent. This option should be part of the evaluation when effluent limits are decreased.

IX. CONCLUSION

This report is intended to provide the City of Saraland with a general evaluation of the existing facilities and assist with planning for the future and the anticipated growth. The City is committed to ensuring that the environment is protected while fostering a community that promotes smart growth and development. Planning for properly maintaining and operating a sanitary sewer collection and treatment system is imperative to ensure economic growth and quality of life experienced by the citizens of Saraland.

Implementation of a plan for maintaining the City's sewage facilities is recommended to ensure continuous service and NPDES compliance.

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