

SECTION 4: DEVELOPMENT OF ALTERNATIVES

Section 4

4.1 COLLECTION AND TREATMENT ALTERNATIVES

Several wastewater collection alternatives were evaluated for the areas in Calhoun County, which currently are not served by a public wastewater collection system. Several factors were considered when identifying wastewater collection alternatives for providing new wastewater service to the un-served area. For wastewater service, one component is the consideration of conveyance/collection. Several alternatives of different technological and economic complexities are available for providing wastewater service to the area. The collection alternatives considered for this project are described herein.

4.1.1 Collection Alternatives

4.1.1.1 Gravity Sewer

A gravity sewer system is one that collects wastewater from connections (like homes and businesses) and gradually combines it into larger and larger pipes until it reaches its destination, all by gravity flow. When the destination cannot be reached by gravity alone, lift stations are constructed to allow the wastewater to continue on by gravity to the next destination without requiring deep trenching for pipe. Eventually, the wastewater is either collected and pumped through a force main to a wastewater treatment plant or is lifted a final time and allowed to flow through a wastewater treatment plant by gravity.

Gravity sewers are the most common wastewater collection system found in the United States. It is important to design them with a minimum and maximum slope in the appropriate range to ensure that solids are not settled out. It is also important to do soil borings to determine what the maximum acceptable depth for burial is constructible and cost-effective. See **Figure 4-1**.

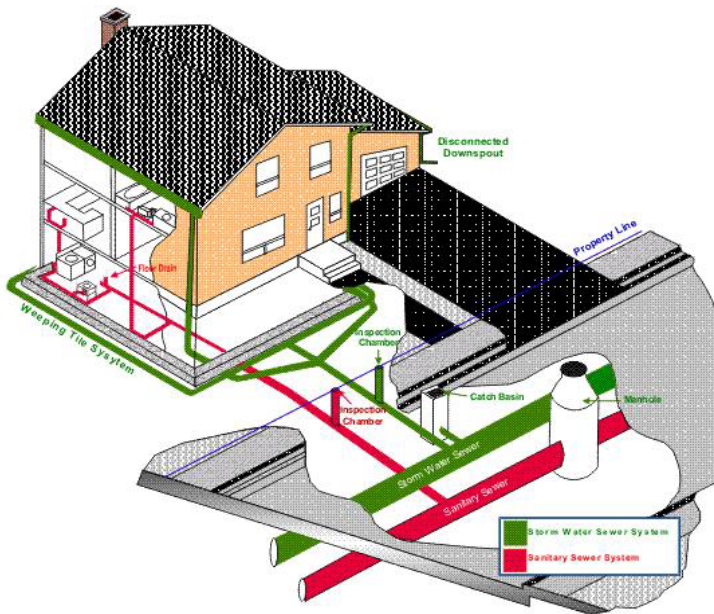


Figure 4-1 Gravity Sewer System (Source: City of Surrey)

4.1.1.2 Vacuum Sewer

A vacuum sewer system is a sewer system where wastewater flows by gravity from homes to a holding tank known as a valve pit. When the wastewater level reaches a certain level, sensors within the holding tank open a vacuum valve that allows the contents of the tank to be sucked into the network of vacuum sewer collection piping.

The vacuum or draw within the collection system is created at a vacuum station. A vacuum station consists of vacuum pumps, wastewater pumps, a collection tank, and a control panel. The vacuum pumps provide the suction to transport the sewage from each valve pit to the vacuum station, and the wastewater pumps transfer the sewage from the collection tanks to a force main for transport to the ultimate treatment or disposal destination.

Vacuum sewers were only introduced in the United States in the last 30 years and are, in general, considered as an alternative to gravity sewers when circumstances make gravity sewers impractical. It is generally recommended that there be at least 75 properties per pump station for the use of a vacuum sewer system to be cost effective. This minimum property requirement tends to make vacuum sewers most conducive for

small communities with a relatively high density of properties per acre.
(See Figure 4-2)

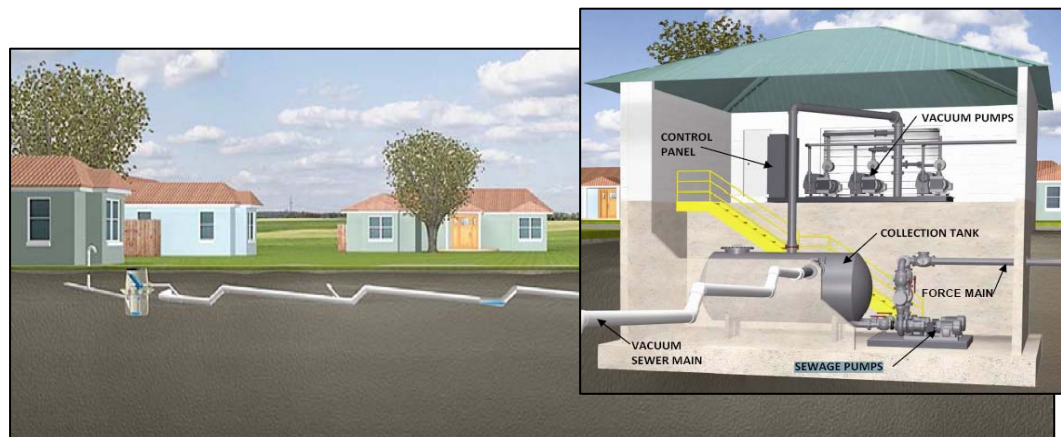


Figure 4-2 Vacuum Sewer (Source: Demi John Report by CDM INC)

4.1.1.3 Pressure Sewer

The keys to understanding the differences between conventional gravity sewer systems and pressure sewer systems are the piping network and the reduction of solids size in the wastewater. Pressure sewer systems (See Figure 4-3) use grinder type pumps located at each residence, to

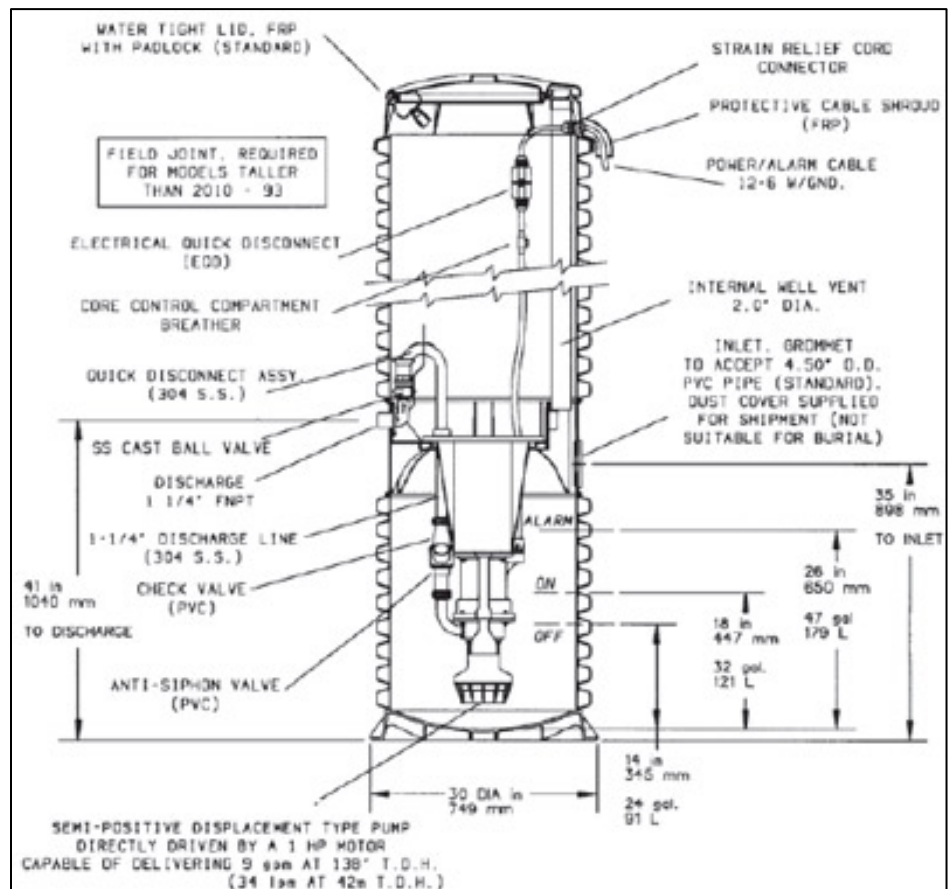


Figure 4-3 Pressure Sewer

reduce the solids present to particles, which can easily be moved through small diameter pipes. The grinder pumps pump the wastewater with reduced particle size in a network of pipes that deliver the flow to a local, package WWTP or to a conventional lift station for conveyance to a regional treatment facility. Because of smaller pipes and because the flow is pumped and the lines do not have to be installed at a constant down gradient, these systems are typically the least expensive organized collection system.

4.1.1.4 OSSF (On-Site Septic System)

As an alternative to organized collection systems, all houses built in the future on vacant lots could continue to use their own approved systems. Historically in Calhoun County, septic systems have been used, but more recent developments using OSSFs have opted to use aerobic systems.

According to EPA "adequately managed decentralized wastewater systems [e.g. septic tanks] are a cost-effective and long-term option for meeting public health and water quality goals, particularly in less densely populated areas." (EPA Report to Congress, 1997). See **Figure 4-4** for a schematic of an OSSF attached to a residence.

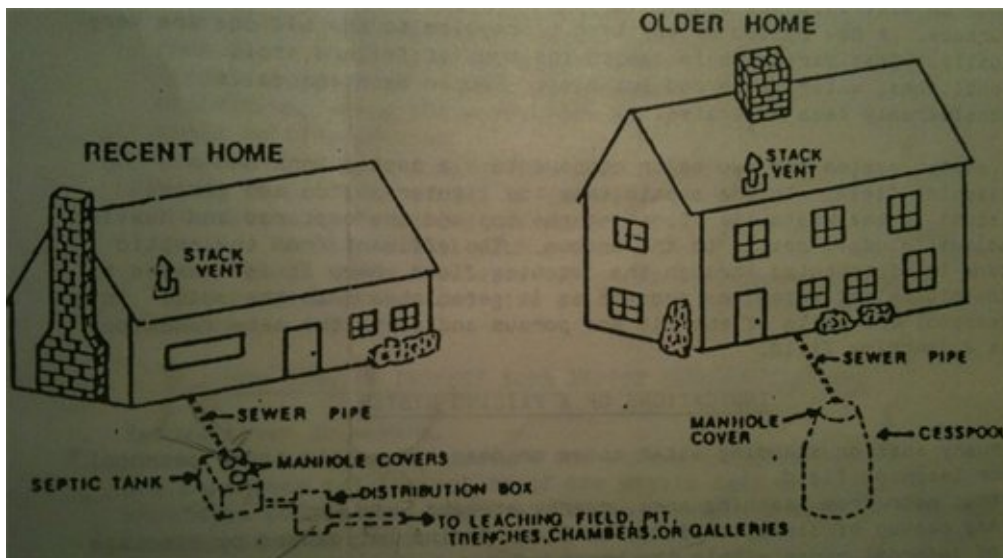


Figure 4-4 OSSF

However, the soils in Calhoun County are not ideal for the use of septic systems. The new systems that would be used in Calhoun County would be typically aerobic systems. An aerobic system uses a mechanism to

inject air into a tank which encourages biological decomposition that produces a higher quality effluent than septic tanks. Aerobic systems typically include pretreatment to reduce the amount of clogging solids, an aeration process, settling of suspended solids and disinfection. The effluent from aerobic systems can be disposed off in a drain field similar to a septic tank, but typically the effluent is disposed of by surface irrigation or low pressure dosing.

4.1.2 Treatment Alternatives

CDM analyzed two options for treating the collected wastewater; either conveying the sewage to a neighboring community wastewater treatment facility or building a new package type treatment facility nearby. A package plant is a pre-engineered and usually prefabricated wastewater treatment plant, scaled to meet the appropriate flows and treatment requirements of a particular wastewater source and effluent requirements. The pieces of the treatment process are trucked to the treatment site and quickly assembled.

The wastewater flows through a bar screen to remove large solids then into an aeration basin, where oxygen is added to promote growth of the microorganisms. From the aeration basin, the mixed liquor flows to a clarifier. The settled solids are returned to the aeration basin. Wasted activated sludge is sent to the digesters or removed from the plant. The clear liquid that overflows the clarifier and drains to the chlorine contact tank is chlorinated (and dechlorinated if required by permit) before being discharged. The TAC rules require that wastewater treatment plants will discharge treated effluent in compliance with its discharge permit at all times. To meet such requirements, sufficient redundancy is required among the wastewater treatment elements.

The Texas Administration Code (TAC) rules specify the design capacity of a wastewater treatment plant must be based on selected daily wastewater flow (gallons/person) and strength (mg/l BOD₅). The selection of design criteria can be based on historical records of water consumption, wastewater flow measurements and testing. When such records are not available, the TAC Rule 217.32(a)(3), Table B.1 specifies for municipality residential wastewater dischargers, 75-100 gallon/person and 200-350 mg/l BOD₅ can be used to estimate daily flow and wastewater strength respectively. The quantity and strength of wastewater flow discharged from a household depends closely on the supply of drinking water and the life style of the residents.

4.2 ADVANTAGES AND DISADVANTAGES OF COLLECTION AND TREATMENT ALTERNATIVES

4.2.1 Gravity Sewer

Advantages of a gravity wastewater collection system are discussed below.

- It is a proven, effective and widely used system for collecting wastewater from households and commercial facilities.
- It does not require individual resident's attention and maintenance effort.
- A properly designed system is usually forgiving as it is usually designed with a safety factor to provide cushioning capacity.
- Being buried deeper in the ground it does not require special means of protection for traffic loads and reduces conflict with other underground utilities.
- Access for maintenance is relatively easy.
- For a properly designed system, required routine maintenance is infrequent.
- The possibility of contaminating potable water mains by leaking wastewater from the system is less than pressure sewer system as gravity sewer lines are required to be buried lower than the water mains.
- There will be no specific odor control stations along the sewer mains to deal with odorous air released from air release valves.

Disadvantages of the gravity wastewater collection system are as follows:

- High ground water renders high construction costs from deeper trenching and the requirements of dewatering, trench shoring, etc.
- The possible infiltration and inflow (I&I) quantity from leaking joints is higher than a pressurized system in Calhoun County's high ground water table conditions.
- Pump stations installed deeper than 10 feet could require significant additional costs, for example, for dewatering and sheet piling during construction.

- The wastewater collection mains must be installed precisely to the specified slope in order to provide a minimum solids carrying velocity. As such it will take high effort and skill during construction.

4.2.2 Vacuum Sewer

A vacuum sewer system claims the following benefits over gravity sewer collection systems:

- Vacuum sewers have less I/I problems than do gravity sewer systems, resulting in less demand on the downstream wastewater treatment facility.
- Vacuum sewers are installed at shallower depths than gravity sewers, making future connections and repairs easier than deeply trenched gravity sewers.
- Vacuum sewers generate fewer odors than gravity sewers since no manholes or other openings exist within a vacuum collection system.
- Vacuum mains are significantly smaller than gravity mains, which result in decreased excavation costs.
- Vacuum stations provide a clean place for operators to work as all the wastewater is completely contained.

On the other hand, installation of a vacuum sewer system generates the following concerns:

- The maintenance and operation of this system requires a system operator with the necessary training. This can make the operation and maintenance costs of vacuum sewers exceed those of other systems.
- Vacuum sewer systems require valve pits, which will be owned and operated by the utility company, to be installed on the homeowner's private property. The utility company will require access to the homeowner's property to maintain the valve pits, which may cause problems.

Vacuum sewer systems have gained more popularity in recent years. Its use in southeast Texas is limited. However, the wastewater collection system installed at the Sanctuary Development near Port O'Connor is a vacuum sewer system.

4.2.3 Pressure Sewer

Summary of advantages of a pressure sewer system are as follows:

- Conveying pipe diameters of a pressure system are usually smaller than a gravity system as higher flow velocity could be designed into the system easily.

- Pressure pipes have no slope requirements and can be buried shallower and above the high ground water in Calhoun County. However, high points should be minimized to reduce the need of air release valves.
- System clogging probability is lower as wastewater solids will be ground into smaller pieces.
- A maintenance shop can be set up easily to keep all individual grinder pumps going without prolonged delay.
- Individual small pump maintenance is easier than heavier equipment and higher horsepower pump maintenance. There will be no hoisting or special tools required.
- I&I will not be a factor. It will reduce eventual centralized pumping to the treatment facility.
- Using pressure sewer system also reduces burial depth of pipes. Also this type of sewer system does not require the saw tooth profile and can be easily placed under large drainage ditches and creeks.

Summary of disadvantages of a pressure system are as follows:

- There will be a lot of grinder pump stations to care for at build out instead of just one centralized pump station.
- Properly located air release valves throughout the system are necessary to avoid air traps that could reduce system capacity.
- Odor control stations will be required to process odorous air released by air release valves.
- Homeowners will need to change household practices in flushing sand and hard debris into their drains to avoid damaging the grinder pump rotating cores.
- Because of the small collection pipe sizes, interior inspection for damages will not be easy.
- Damaged force mains will release wastewater out of the pipe and potentially will contaminate ground water.
- Separation from drinking water supply lines must be done according to regulations without exceptions. As such there might be more conflicts with existing utilities in the ground.

4.2.4 Package Treatment Plants

There are several advantages with constructing a package wastewater treatment plant. They are easy to design based on flows and treatment

objectives. There are similar facilities throughout the area so proper maintenance is well-known. Treatment can also be adjusted based on changing influent conditions so that there is some flexibility in the process. The disadvantages are that the facility is larger than a simple pump station and the facility would be easily visible. Also, this alternative requires a part-time operator to make daily visits to the facility to monitor the facility and take appropriate readings and samples.

- It will avoid pumping the collected wastewater flow over long distances to a remote wastewater treatment facility.
- This will avoid constructing a high horsepower transfer pump station.
- Effluent can be recycled locally, when there is a need.

The following is a summary of disadvantages of package wastewater treatment plant for communities of interest:

- It is a facility that requires constant attention in permit compliance management (testing, recording, reporting to name a few), proper operations, maintenance and security, even though it will be on a part time basis for each effort. However, when all efforts were to be provided by one person, it would be a full time job.
- The processing cost per gallon will be higher than a larger collective wastewater treatment facility.
- The construction cost per gallon will be higher than a larger collective wastewater treatment facility
- Potential discharge violation penalties from exceeding BOD and TSS concentration limits and chlorine residual.

4.2.5 Pumping to a Regional Treatment Plant

This treatment option will require all of the wastewater to be collected at a common point and then pumped the over a long distance to the nearest wastewater treatment plant. The treatment plant will charge the new customers a fee to treat their wastewater. One of the pumping options is the use of a packaged lift station. Pumping the collected wastewater to a regional treatment facility will eliminate the need of a new local treatment site. However, the force main will require space in the right of way. This option will have more construction than the local treatment alternatives due to the length of the pipeline required to reach the WWTP.

Summary of advantages from pumping wastewater to a regional WWTP are:

- The site/land to be purchased for the pump station will be much smaller than a treatment plant.
- No operation permit will be required. As a result, no permit compliance management will be necessary.
- The operation and maintenance of the pump station will be limited to a small electrical panel and two submersible pumps.
- The operation cost for the pump station will be much less than a package treatment plant.
- The operation and maintenance of the pump station and the force main could be contracted to the WWTP for their services. This will provide the public utility services similar to many other small communities and release the community from being concerned about their operation and maintenance. Paying monthly fees is no different from paying other utilities.

Summary of disadvantages for pumping wastewater to a regional WWTP:

- Due to the long conveyance distance and the low pumping quantity, wastewater could remain in the force main for several days. As a result hydrogen sulfide could increase and be trapped in the wastewater flow. The trapped hydrogen sulfide will be released as the pumped flow discharges into the headworks of the receiving WWTP. As a result, an odor control process may need to be added to the receiving WWTP, which could add cost to the option.
- Long force mains include the risk of shutting down the pumping system temporarily due to force main damages. Quick emergency response is required.
- Remote lift stations must be properly secured from being vandalized as shutting down the pump station for a prolonged period will paralyze the community.

4.3 DEVELOPMENT AND DESCRIPTION OF INITIAL ALTERNATIVES

The study area which comprises all of Calhoun County was divided into four major areas for development and evaluation of alternatives as shown in **Figure 4-5**. Full size maps of the study area and the different areas can be found in **Appendix C**.

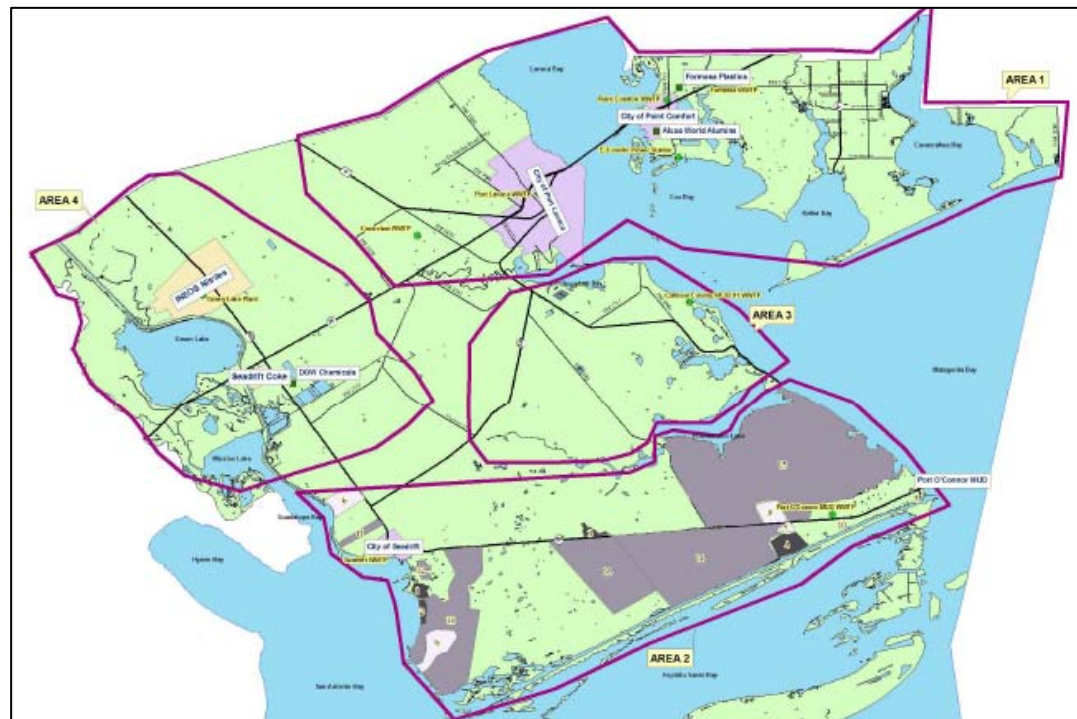


Figure 4-5 Overview Map of Study Area

Area 1 (See Figure 4-6) comprises City of Port Lavaca, City of Point Comfort and corresponding subdivisions of concern. For the study, based on the geographical constraints, Area 1 was divided into Area 1A and Area 1B.

4.3.1 Area 1A

Study Area 1A includes the City of Port Lavaca and the surrounding subdivisions of concern.

The various options considered for providing wastewater services in Area 1A are:

1. City of Port Lavaca provides wastewater service to all the subdivisions of concern.
2. Install package plants in each subdivision of concern.
3. Install a package plant to serve Royal Estates, Shoreline Acres, Bay Meadows and Six Mile Area.
4. Crestview WWTP extends service to Meadowbrook Park, Bowman, Hackberry Junction and Matson Subdivision.
5. Pump effluent from City of Port Lavaca WWTP to Formosa/Alcoa for reuse.

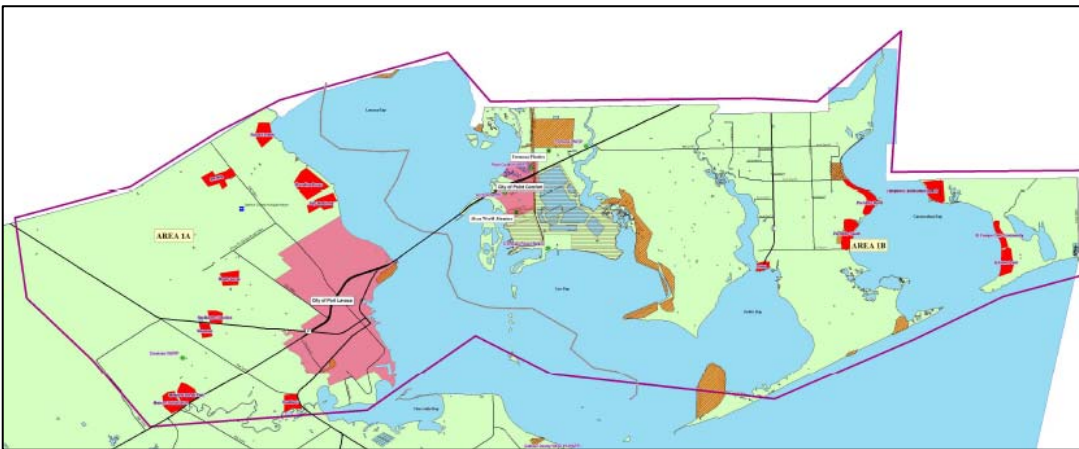


Figure 4-6 Overview Map of Area 1

4.3.2 Area 1B

Study Area 1B includes the City of Point Comfort, and surrounding subdivisions of concern, and the industries of Alcoa and Formosa plastics.

The various options considered for providing wastewater services in Area 1B are:

1. City of Point Comfort provides wastewater service to all subdivisions of concern.
2. Install package plants in each subdivision of concern.
3. Two regional WWTPs to serve the subdivisions on either side of Keller Bay (One to serve the subdivisions of Olivia, Port Alto South and Port Alto North and the other to serve the subdivisions of Schicke Point, El Campo Beach, Campbell Beach and Carancahua Beach).

4.3.3 Area 2

Area 2 (See Figure 4-7) includes the City of Seadrift, Port O'Connor MUD and current/potential/planned subdivisions between the City of Seadrift and Port O'Connor MUD.

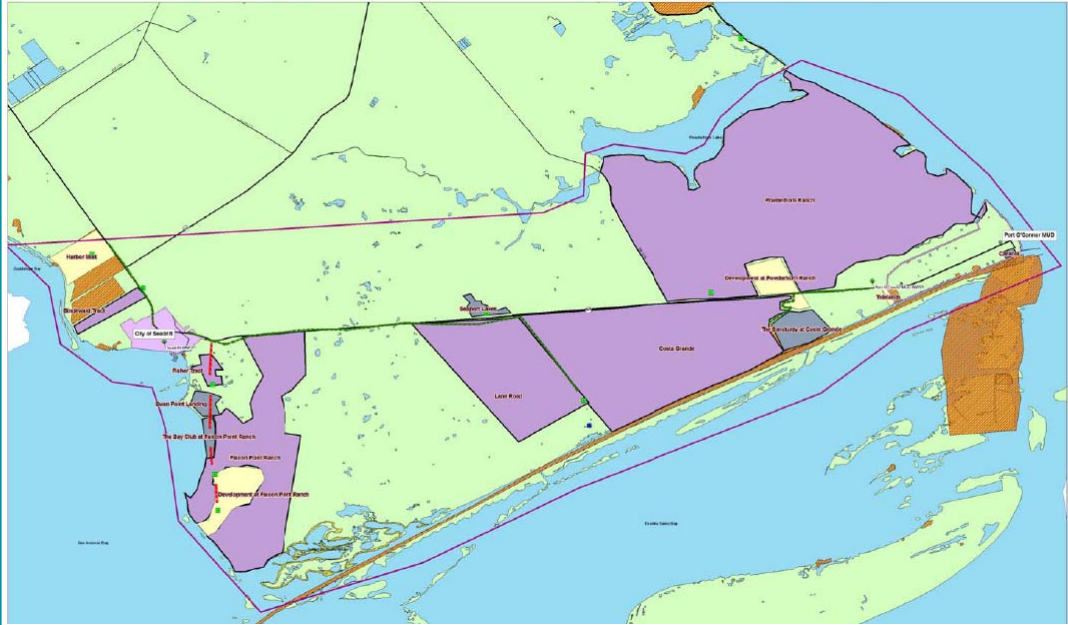


Figure 4-7 Overview Map of Area 2

The various options considered for Area 2 are:

1. Each subdivision permits, builds and operates its own package WWTP.
2. City of Seadrift serves Swan Point Landing and Lane Road development and other developments north and south on highway 185 and to the east of Lane Road development.
3. Port O' Connor MUD extends wastewater service west along highway 185 to the Sanctuary, Powderhorn Ranch, Costa Grande development and others.

4.3.4 Area 3

Area 3 (See Figure 4-8) includes the subdivisions in between City of Port Lavaca and Port O'Connor MUD namely Magnolia Beach, Alamo Beach, Baypoint and Indianola.

The various options considered for Area 3 are:

1. Each subdivision permits, builds and operates its own WWTP.
2. Southern Calhoun County WCID No.1 WWTP expands its system to serve Indianola, Alamo Beach, Baypoint Subdivision and other nearby OSSF systems.

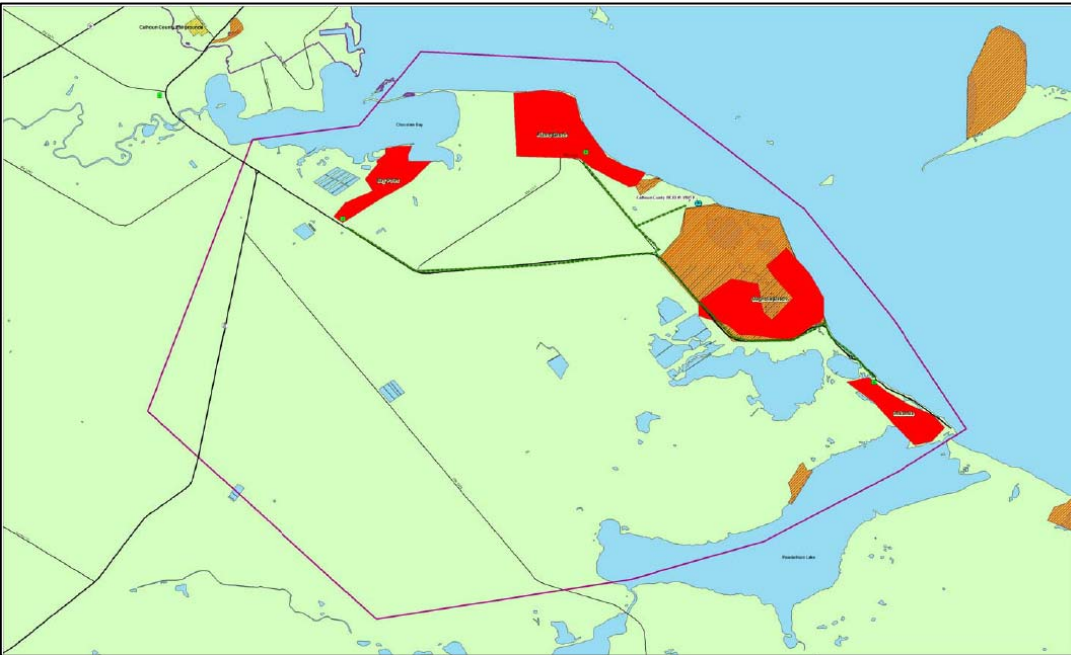


Figure 4-8 Overview Map of Area 3

4.3.5 Area 4

Area 4 (See Figure 4-9) includes the industries of DOW Chemicals, INEOS Nitriles and Seadrift Coke.

The various options considered for Area 4 are:

1. Construct small package plant to provide centralized wastewater service to 300 acre site adjacent to INEOS Nitriles.
2. Seadrift Coke and DOW Chemical receive treated effluent for reuse from City of Seadrift and new INEOS Nitriles package plant.

4.4 ADVANTAGES AND DISADVANTAGES OF INITIAL ALTERNATIVES

4.4.1 Area 1

CDM

The subdivisions of Campbell Beach, Carancahua Beach, El Campo Club and Schicke point are located far from the City of Point Comfort service area and are also separated by the Keller Bay from the rest of the County. Hence, the conveyance of wastewater to a regional WWTP or to the City of Point Comfort WWTP would be cost prohibitive. Further consideration of these subdivisions was not recommended by the breakout group.

The option of providing effluent for reuse from the City of Port Lavaca WWTP to the industries near City of Point Comfort will potentially include directional drilling under Lavaca Bay which could potentially have other environmental and cost concerns associated with it.

4.4.2 Area 2

All options proposed for Area 2 provide wastewater service to the current, planned and potential subdivisions, which would promote population growth in the southern Calhoun County.

4.4.3 Area 3

All the options for Area 3 would address the concerns of the subdivisions which are on OSSFs. These options would prevent accidental discharge of wastewater, wastewater pooling and eliminate odor problems. Moreover, the possibility of the public being exposed to raw sewage as a result of a leak from OSSFs is potentially eliminated.

All options proposed for Area 3 provide wastewater service to the potential Baypoint subdivision, which would promote population growth in the area.

4.5 SCREENING OF INITIAL ALTERNATIVES

Based on the evaluation of initial alternatives, the following changes were made to the proposed options:

- The subdivisions of Campbell Beach, Carancahua Beach, El Campo Club and Schicke point were removed from the Area 1B study area.
- An option of sending the excess effluent from the City of Port Lavaca for reuse to DOW/INEOS Nitriles was added to be evaluated.
- The option of sending the excess effluent from City of Seadrift WWTP to Seadrift Coke and DOW Chemical for reuse was eliminated. It was determined that a more feasible alternative would be to send effluent from City of Port Lavaca WWTP for reuse.

- The evaluation of the INEOS 300 acre site was not possible because there was little information provided on the proposed concept for the development of this site. If the site is developed for an industrial use, the quality and volume wastewater produced would be highly dependent on the type of industry and without specific knowledge of industrial user, developing a wastewater plan would be meaningless. If the 300 acre site is developed for residential uses, the cost for developing a wastewater system would be similar to the cost for the developments in Area 2 using Option 2 (separate package plant for each development).

4.6 REGIONAL ALTERNATIVES SELECTED FOR DETAILED EVALUATION

4.6.1 Area 1A & 1B

The alternatives developed for the various entities in Area 1 and subdivisions of concern are listed below:

- City of Port Lavaca provides wastewater service to Royal Estates, Shoreline Acres, Bay Meadows, Double D, Shady Acres, Meadow Brook Park, Bowman, Hackberry Junction, Matson Subdivision and Six Mile Area.
- Installing a package plant for each subdivisions of concern in both Area 1A and 1B.
- Install small package plant to serve Royal Estates, Shoreline Acres, Bay Meadows & Six Mile Area/ Crestview WWTP extend service to Meadow Brook Park, Bowman, Hackberry Junction & Matson Subdivision.
- Install package plant to serve Olivia, Port Alto WSC subdivisions.
- City of Point Comfort provide centralized wastewater service to Port Alto WSC, Olivia and other developments in the area.
- Formosa Plastics and Alcoa receive treated effluent/reuse from Cities of Point Comfort and Port Lavaca.

4.6.2 Area 2

- City of Seadrift serve Swan Point Landing, Falcon Point and others located in close proximity. Port O'Connor MUD extend wastewater service west along Highway 185 to Lane Road, Sanctuary, Powderhorn Ranch and Costa Grande.
- City of Seadrift and Port O'Connor MUD provide wastewater service to their existing areas; install package plant near Lane Road Development to serve development to serve developments along Highway 185.

4.6.3 Area 3

- Southern Calhoun County WCID No. 1 WWTP expand its system to serve Indianola, Alamo Beach, Baypoint Subdivision and other area on septic systems along with the existing service area of Magnolia beach.

4.6.4 Area 4

- Seadrift Coke and DOW Chemical receive treated effluent/reuse from City of Port Lavaca.

4.7 EFFLUENT REUSE EVALUATION

4.7.1 Industrial Effluent Reuse

Effluent discharged from industries are eligible for “authorization for reuse” as reclaimed water, if the effluent satisfies special requirements specified in 30 TAC 210 Subchapter E. There are a few Standard Industrial Classification (SIC) codes under 30 TAC §210.54 that are not eligible for authorization under this subchapter regardless of effluent quality or end use. The SIC codes that are not eligible for 210 authorization and are pertinent to industries involved in this study are listed below:

- Gum and wood chemical manufacturing
- Steam electric power generating and
- Mineral mining and processing

Discharges from Formosa LLC, Alcoa and Ineos Nitriles, associated with sources classified under the above mentioned SIC codes are not eligible for reuse authorization. The complete list of the prohibited SIC’s can be found in **Appendix D**.

The effluent from Seadrift Coke L.P. and DOW chemical’s (producer) is eligible for the 30 TAC 210 Subchapter E authorization. The producer is eligible for Level 1 authorization if the producer uses any of the following wastes on-site and has a primary disposal method as an alternate to reuse. The wastewater discharged from the industries with measured effluent concentration at or below threshold levels is as listed in **Table 4-1** would qualify for use as reclaimed water. For all other priority pollutants in 40 CFR Part 122 **Appendix D**, the threshold level is set at the Maximum Allowable Limits (MAL).

Table 4-1 Threshold Levels for Industrial Reclaimed Water
Threshold Levels for Industrial Reclaimed Water

Parameter	Threshold (mg/L)	MAL (mg/L)
Conventionals & Nonconventionals		
Oil & Grease	10	-
Total Dissolved Solids	2000	-
Nitrate Nitrogen	10	-
Metals		
Antimony	0.09	0.03
Arsenic	0.03	0.01
Barium	0.03	0.01
Beryllium	0.015	0.005
Cadmium	0.003	0.001
Copper	0.03	0.01
Lead	0.015	0.005
Manganese	0.05	-
Mercury	0.002	0.0002
Nickel	0.03	0.01
Selenium	0.03	0.01
Silver	0.06	0.002
Thallium	0.03	0.01
Zinc	0.015	0.005
Cyanide	0.2	-

The water needs and reuse needs for the various industries are discussed below.

4.7.2 DOW Seadrift

The Dow Seadrift facility (Dow) has significant potential to reduce water consumption if there is sufficient financial incentive. Any water reduction/reuse programs implemented would increase the water supply available to other users.

Dow uses incoming water for the following purposes:

1. Boilers;
2. Non-contact cooling water;
3. Pad washdown water;
4. Lavatories;
5. Firewater; and
6. Miscellaneous potable water needs.

Dow purchases source water from the GBRA. Incoming source water from the Guadalupe River via the Goff Bayou is pumped to either the boiler feed water basin or the cooling water basin. Water from the boiler feed basin is pre-treated prior to use in the boilers. Dow uses a cooling water system which cycles cooling water through heat exchangers and a series of ponds so that the water is used in multiple cooling steps. The cooling water is reported to have elevated hardness.

Table 4-2 shows the average daily water usage by Dow from 2007 through 2009 in million gallons per day (MGD).

Table 4-2: Average daily water usage at Dow Seadrift.

Year	Water Usage (MGD)
2007	10.0
2008	11.9
2009	11.8

Dow's purchased water cost in 2009 totaled approximately \$616,000, equating to a purchased cost of \$0.14 per thousand gallons. This cost does not reflect Dow's internal costs for labor and maintenance associated with treatment and handling of the incoming purchased water."

With the exception of the cooling water, waste streams at Dow are comingled prior to treatment. The comingled waste streams are treated through a series of ponds and constructed wetlands. Flow data for the treated wastewater effluent, which excludes the cooling water, are provided in **Table 4-3**. Plant data show no flow for 46 days in 2009. This lack of flow is attributed to drought conditions during which the flows of comingled waste streams entering the treatment ponds and wetlands were offset by evaporation.

Table 4-3 also shows discharge data for the cooling water. This waste stream is not treated prior to discharge. Average and median values for cooling water are based on reported average monthly data.

Table 4-3: Effluent flow data at Dow Seadrift.

		Flow (MGD)			
		Average	Median	Max	No. of Flow Measurements
Treated Effluent	2008	1.02	0.85	4.51	366
	2009	1.14	0.57	5.38	365
Cooling Water	2008	3.74	3.97	13.1	11
	2009	3.62	3.98	10.4	12
	2010	4.01	4.06	8.7	12

4.7.3 INEOS Nitriles

The INEOS Nitriles (INEOS) complex consists of approximately 4,000 acres, of which approximately 300 acres are available for development. This land could be used to store or treat reuse water. Additionally, INEOS could supply effluent to another facility for reuse.

INEOS purchases raw water from the Guadalupe-Blanco River Authority (GBRA). In 2010, average water usage was approximately 3 million gallons per day (MGD).

INEOS has three major discharge streams:

1. Plant process wastewater is discharged to deep wells;
2. Treated sanitary effluent and utility wastewater is discharged to the Victoria Barge Canal via Outfall 001; and
3. Stormwater runoff discharges from ponds through permitted outfalls.

From 2008 to 2010, the Outfall 001 discharges averaged approximately 0.5 million gallons per day (MGD).

4.7.4 FORMOSA

Formosa Plastics Corporation (Formosa) needs new water supplies to meet current water demand. Formosa also generates cooling tower blowdown which is available for use by Alcoa for dust suppression and process wastewater needs.

Formosa uses incoming water for the following purposes:

1. Boilers;
2. Cooling towers (non-contact cooling water);
3. Washdown water;
4. Lavatories;
5. Firewater; and
6. Various processing needs within the 16 on-site process units.

Source water from Lake Texana is purchased from the LNRA. Incoming water is directed to one of three raw water ponds. Raw Water Pond C is routed through potable water treatment and is used for lavatories, lunch rooms, and safety showers. Flows to this pond average approximately 120,000 gallons per day (gpd). Other facility water needs are provided from Raw Water Ponds A and B, with incoming average flows of approximately 29.4 million gallons per day (MGD) and 3.4 MGD, respectively. The total site water usage thus averages approximately 33 MGD.

Formosa is exploring the use of water from new sources to supplement existing water supplies. Wastewater streams discharged from Formosa are shown in **Table 4-4** with corresponding average flow rates. The biological treatment effluent includes a reported average stormwater contribution of 590,000 gpd.

Table 4-4: Wastewater Streams at Formosa Plastics Corporation

Wastewater Stream	Average Flow Rate (gpd)
Biological Treatment Effluent (Trains A and B)	4,300,000
Treated Groundwater from the VCM Process Unit	30,000
Cooling Tower Blowdown	1,200,000
Inorganic Waste Streams from Utilities and the IEM Process Unit	2,100,000
Sanitary Wastewater (Partial Flow) to the POTW	7,200
TOTAL	7,600,000

4.7.5 ALCOA

Alcoa Point Comfort Operations (Alcoa) is interested in source water for dust suppression and process water use. However, this water source is only needed during dry weather conditions. Alcoa receives water from three sources for its operations:

1. Groundwater wells supply potable water for drinking and lavatory use;
2. Water from Lavaca Bay is used for cooling water; and
3. Water from Cox Creek is used for process needs and for dust suppression. In 2010, Alcoa used approximately 454 million gallons of water from Cox Creek.

When the capacity of water flow from Cox Creek is insufficient, groundwater is used for dust suppression and process water to meet the fresh water demands of the facility.

4.7.6 SEADRIFT COKE L.P.

Seadrift Coke L.P. is interested in opportunities to reduce costs for purchasing water and opportunities to implement water reduction and recycle strategies.

Seadrift Coke L.P. uses incoming water for the following purposes:

1. Boilers;
2. Cooling towers (non-contact cooling water);
3. Washdown water;
4. Lavatories;
5. Firewater; and
6. Process quench water.

Seadrift Coke L.P. operates a groundwater well. The groundwater passes through a Reverse Osmosis (RO) unit and feeds the boilers.

Other water needs at Seadrift Coke L.P. are supplied by water purchased from GBRA which is stored in a raw water pond. This raw water is treated through clarification, sand filtration, and chlorination prior to use. Seadrift Coke L.P. average water consumption from the GBRA from March 2010 through February 2011 was approximately 325,000 gallons per day (gpd). Note that the groundwater well was not operational throughout the entire period, so typical daily usage with the well operational is expected to be lower.

Wastewater streams generated at Seadrift Coke L.P. are shown in **Table 4-5** with corresponding average flow rates.

Table 4-5: Wastewater Streams at Seadrift Coke L.P.

Wastewater Stream	Average Flow Rate (gpd)
Industrial Wastewater	110,000
RO Reject	52,000
Sanitary	20,000
Cooling Tower Blowdown	20,000
Fire Training Drainage	Varies
Stormwater	Varies
TOTAL (Dry Weather)	202,000

4.8 WATER CONSERVATION AND DROUGHT CONTINGENCY PLANS

Senate Bill 1 (SB-1), passed by the Texas Legislature in 1997, increased the number of entities required to submit water conservation and drought contingency plans. As part of a regionalization strategy, all involved entities would need to draft and adopt Water Conservation and Drought Contingency Plans under the conditions of SB-1. In addition, the TWDB requires project participants receiving grant funding through the Regional Water/Wastewater Facilities Planning Grant Program to prepare and implement water conservation and drought contingency plans. These plans must meet all minimum requirements outlined by the Texas Commission on Environmental Quality (TCEQ).

Many of the project participants currently using treated surface water already have water conservation and drought contingency plans in place. Sample templates for preparing water conservation and drought contingency plans are provided in **Appendix A** for reference. These templates were provided by the Texas Water Development Board and have been used by previous participants of TWDB planning studies as a guide.