

**CITY OF TITUSVILLE
CRAWFORD COUNTY, PA**

**ACT 537 PLAN UPDATE/SPECIAL STUDY
FOR
WASTEWATER TREATMENT PLANT EXPANSION**

SERVING

**CITY OF TITUSVILLE
AND
PORTIONS OF OIL CREEK TOWNSHIP**

FINAL REPORT – MARCH 2011

Project No. 48638.901



PITTSBURGH, PENNSYLVANIA

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PLAN SUMMARY

The Pennsylvania Sewage Facility Act (Act 537) requires that every municipality within the Commonwealth develop and maintain an up-to-date sewage facilities plan. On October 25, 2010, a Consent Order and Agreement (CO&A) was executed by the City of Titusville with the Pennsylvania Department of Environmental Protection (DEP). The City of Titusville is under a CO&A to bring the Titusville Wastewater Treatment Plant (WWTP) into compliance with the Clean Streams Law, the Sewage Facilities Act and the NPDES and WQM Permits. According to the CO&A, the WWTP is not being operated in a manner to adequately treat flows greater than 7.5 MGD and raw sewage overflows at the Brown Street CSO under high flow conditions. The COA also cites operation and maintenance problems at the WWTP.

The CO&A requires the City of Titusville to prepare an Act 537 Plan Update Revision/Special Study for the expansion of the WWTP for future sewage needs of the City of Titusville and a portion of Oil Creek Township.

The City of Titusville authorized the preparation of this update to determine adequate conveyance and treatment for the future sewage needs of the City and portions of Oil Creek Township and investigate the possibility of providing service to Cherrytree Township, Venango County.

This Plan Update was prepared in accordance with Act 537 as described in the Pennsylvania Department of Environmental Protection's (PADEP's) "Guide for Preparing Act 537 Update Revisions," dated January 7, 2003. Major issues addressed included projections of service area growth through 2035 for the municipalities, resultant wastewater generation, evaluation of the capability of existing facilities to handle projected flow, development of wastewater management alternatives to meet anticipated demands, and selection of recommended alternatives to handle the anticipated needs.

This Plan Update is divided into eight chapters with support documentation and mapping provided in the appendices. The first four chapters establish the current and predict the future wastewater conveyance and treatment needs for the service area. The last four chapters develop

and evaluate alternatives for satisfying the projected wastewater needs of the service area.

The City of Titusville owns and operates a sewerage system, three (3) remote pump stations, and a 4.0 MGD Wastewater Treatment Plant (WWTP) within the City. The sewer system which dates to the 1860s is comprised of approximately 33 miles of pipe ranging from 6" to 48" diameter. The system is partially separate but predominantly combined. The City originally had five (5) permitted Combined Sewer Overflows (CSOs) but closed the Central Avenue CSO in 2001. There are four (4) permitted CSOs on the system as follows:

- 02 WWTP Bypass – Overflow Chamber
- 03 Brown Street – Overflow Chamber
- 04 Bank & Allen Street – Overflow chamber
- 06 Bank & Roberts Streets – Overflow Manhole

The Main Interceptor has a capacity of 6.2 MGD. The Parallel Interceptor constructed in 2003 has a capacity of 7.0 MGD. The two interceptors have a total combined capacity of 13.2 MGD. The raw sewage pumps are designed to handle 12 MGD with two (2) pumps operating but according to plant flow charts flows up to 16 MGD can be pumped when the static head is reduced by a surcharged wet well.

In accordance with accepted Chapter 94 methodology, which is based on the 3-consecutive maximum month average daily flows processed at the WWTP, the WWTP is not hydraulically overloaded. However, in the past the influent gate was throttled to prevent inflow of stream flow from Oil Creek through the WWTP CSO and the wash-out of solids in the SBR tanks, which causes overflows at the WWTP and Brown St. CSO. The overflows were not included in the WWTP flow records. Early in 2010 the plant influent gate was operated fully open and all flows are recorded up to the capacity of the influent pumps. Also in accordance with Chapter 94 methodology, which is based on the average daily load exceeding the organic design capacity, the WWTP is not organically overloaded but is projected to be organically overloaded in five years.

The current service area equivalent population is estimated to be 8,209 and the projected population for year 2035 is 8,950.

Draft #1 of the Act 537 Plan Update/Special Study was submitted to PaDEP in November 2010 to comply with the October 25, 2010 Consent Order and Agreement (CO&A) between the City of Titusville and PaDEP.

Since submission of Draft #1 of the Act 537 Update, additional sewage flow records have been reviewed and discussions have continued with SBR manufacturers to determine the capabilities of the existing 4-tank SBR system converted to an Intermittent Cycle Extended Aeration System (ICEAS).

A significant rain event occurred on November 30 – December 1, 2010 which confirmed the design flow figures in the Draft #1 Report as follows:

ADF	4 MGD
PDF	12 MGD
PHF	16 MGD

According to ABJ the existing four (4) tanks converted to the ICEAS process could handle the following flows:

ADF	3.4 MGD
PDF	8.0 MGD
PHF	10.7 MGD

If this scenario was implemented, more frequent overflows would occur at the Brown Street. CSO, or approximately 3.4 MGD of Equalization capacity would be required.

Supplement #1 of the Act 537 Plan Update/Special Study was submitted to PaDEP in January 2011 and is integrated in this submission as the Final Act 537 Plan. According to the Final Plan, the most cost-effective Alternative (2A.1) is the addition of a fifth SBR tank and conversion of the existing four (4) tanks to the ICEAS process. This Alternative 2A.1 would be able to handle the PHF of 16 MGD and significantly reduce overflows. The estimated construction and project costs for this Alternative are \$3,635,500 and \$4,653,000, respectively.

Major findings of this Plan Update include:

- The WWTP does not have sufficient capacity for the current or projected flows in the service area. Additional capacity will be needed.
- Continued use of the existing WWTP facilities along with the recommended improvements is the most cost-effective approach.

After an evaluation of available alternatives the recommended alternative is as follows:

- Alternative No. 2A.3 – ABJ SBR System which includes replacing the batch system with the ICEAS process in the existing four (4) tanks and constructing one (1) new ICEAS tank. The plan also includes updating the sludge dewatering system, improving the headworks facility and making the necessary repairs to the WWTP. Construction is already underway to install the air diffuser system in the existing tanks to accommodate the ICEAS process.

The total project cost for the recommended Alternative 2A.3 is \$6,454,000. The recommended financing alternative is an application for Pennvest or USDA-RD Loan/Grant.

The majority of the institutional arrangements necessary for implementation of this Plan Update already exist. An increase in sewer user fees of approximately \$15/month will be required to implement the recommended alternative.

Table 1 summarizes the action to be taken by the City to implement the recommended alternatives. Table 1 also lists the anticipated schedule for implementation of each action.

Table 1

**Act 537 Plan Update
Tentative Milestone Schedule**

IMPLEMENTATION SCHEDULE

Task or Milestone	Target Date
Receive approval of TAR	Complete
Receive Updated CO&A	Complete
Start Act 537 Plan	Complete
Submit Draft Act 537 Plan to PaDEP & Service Area Municipalities	November 30, 2010
Submit Supplement to Draft Act 537 Plan to PaDEP	Complete
Submit Final Act 537 Plan to PaDEP	March 2011
Receive Comments	TBD ⁽²⁾
Finalize Report ⁽¹⁾	60 Days from Receipt of Comments
Receive Approval from PaDEP of the Act 537 Plan	TBD ⁽²⁾
Prepare Plans and Specification	TBD ⁽²⁾
Submit Part II Permit Application	TBD ⁽²⁾
Receive Permits	TBD ⁽²⁾
Advertise For Bids	TBD ⁽²⁾
Receive Bids	TBD ⁽²⁾
Award Contract	TBD ⁽²⁾
Start Construction	TBD ⁽²⁾
Complete Construction / Facilities Operational /	December 31, 2013

(1) Provided Final Update Revision is approved by PaDEP and administratively and technically complete.

(2) TBD – To be determined based on approval of Act 537 Plan by PaDEP.

1.0 PREVIOUS WASTEWATER PLANNING

1.1 Sewage Facility Planning

The Pennsylvania Sewage Facilities Act requires that every municipality within the Commonwealth develop and maintain an up-to-date sewage facilities plan. The Pennsylvania Department of Environmental Protection (PADEP) administers the Act 537 program. PADEP has produced A Guide for Preparing Act 537 Update Revisions, dated January 7, 2003, which includes the Act 537 Plan Content and Environmental Assessment Checklist. This Plan has been prepared in conformance with Act 537 and the PADEP checklist. The City of Titusville retained the services of Gannett Fleming, Inc. to assist with preparation of the Plan. The Plan is based on the items indicated in the approved TAR. A completed copy of the PADEP checklist indicating where each required item can be found within the Plan is located in Appendix A.

Listed below are the previous sewage facilities planning documents for the City of Titusville:

Planning Study	Year Prepared	Recommendation
Act 537 Plan Comprehensive Sewage Facilities Planning Study for the City of Titusville	1986	Noted in the Final Phase II Act 537 Plan/Long Term Control Plan (LTCP) prepared by Killam Associates, March 2002
Act 537 Plan Update for the City of Titusville	1996	Noted in the Final Phase II Act 537 Plan/LTCP prepared by Killam Associates, March 2002
Act 537 Plan Update and Technical Peer Review for the City of Titusville	1998	Noted in the Final Phase II Act 537 Plan/LTCP prepared by Killam Associates, March 2002
Final Phase II Act 537 Plan/LTCP	2002	The plan recommended a parallel interceptor sewer from Brown Street to the WWTP, upgrades at the WWTP to handle peak flows, upgrades at the three pump stations, and sewer rehabilitation in accordance with the priority list in the areas of South Perry, Dairy Street, South and North Franklin Street.
Post Construction Monitoring Report Implementation Plan and Schedule	2008	Additional SBR Capacity Recommended

1.2 Planned by a Sewer Authority Under Chapter 94 Corrective Action Plan

There are no plans by a Sewer Authority under Chapter 94 Corrective Action Plan to carry out the recommendations in the prior plans. The City of Titusville received bids on September 1, 2010 to install new fine bubble diffuser aeration systems in the four SBR tanks. The fine bubble aeration system is an integral part of the eventual full conversion of the SBR system to an ICEAS Type System, which full conversion is anticipated to be the Phase III project of the LTCP.

2.0 PHYSICAL AND DEMOGRAPHIC ANALYSIS

2.1 Introduction

A Consent Order & Agreement (CO&A) was entered into between the City of Titusville and PADEP on December 18, 1996 to eliminate overflows from the sewerage system. This CO&A was modified on February 19, 1999, updated on January 31, 2001, revised again in February 2004 and amended on January 23, 2008 to include the Post Construction Monitoring Plan and Schedule. The Post Construction Monitoring Plan was submitted to PADEP in November 2008 which included a schedule to implement improvements to the system. A new CO&A was entered into between the City of Titusville and PADEP on October 25, 2010. A copy of the CO&A is included in Appendix B.

The City of Titusville is under a CO&A to bring the WWTP into compliance with the Clean Streams Law, the Sewage Facilities Act and the NPDES and WQM Permits. According to the CO&A, the WWTP is not being operated in a manner to adequately treat flows greater than 7.5 MGD and raw sewage overflows during high flows at the Brown Street CSO. The COA also cites operation and maintenance problems at the WWTP.

The CO&A requires the City of Titusville to prepare an Act 537 Plan Update Revision/Special Study for the expansion of the WWTP for future sewage needs of the City of Titusville and a portion of Oil Creek Township.

The service area includes the City of Titusville and portions of Oil Creek Township as shown on Plate I - Service Area. Cherrytree Township, Venango County is exploring the option of collecting sewage from the area south of the City of Titusville and conveying the flows to the City of Titusville's sewerage system. The population and flows from Cherrytree will be utilized in sizing of the WWTP.

2.2 Potable Water Supplies

Public water service is provided to the plan area by Titusville Water Works. The raw water is supplied by ten wells in the ground water aquifer.

2.3 Wetlands

Wetlands are defined by Pennsylvania Title 25, Chapter 105 as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions; including swamps, marshes, bogs and similar areas. The three essential characteristics possessed by wetlands are: (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology, the driving force creating wetlands. The presence of wetlands on a property limits the type of activities that can take place on the wetland portions of the property.

The Fish and Wildlife Service of the U.S. Department of Interior has mapped wetlands adjacent to the WWTP site as part of the National Wetlands Inventory (NWI) as shown on Plate II.

3.0 EXISTING SEWAGE FACILITIES

3.1 Map and Describe Sewage Facilities in the Plan Area

The City of Titusville owns and operates a sewerage system, three (3) remote pump stations, and a 4.0 MGD Wastewater Treatment Plant (WWTP) within the City. The sewer system which dates to the 1860s is comprised of approximately 33 miles of pipe ranging from 6" to 48" diameter. The system is partially separate but predominantly combined. There are four (4) permitted combined sewer overflows (CSOs) on the system as follows:

- 02 WWTP Bypass – Overflow Chamber
- 03 Brown Street – Overflow Chamber
- 04 Bank & Allen Streets – Overflow chamber
- 06 Bank & Roberts Streets – Overflow Manhole

The Main Interceptor has a capacity of 6.2 MGD. The Parallel Interceptor constructed in 2003 has a capacity of 7.0 MGD. The two interceptors have a total combined capacity of 13.2 MGD. The raw sewage pumps are designed to handle 12 MGD with two (2) pumps operating but flows up to 16 MGD can be pumped when the wet well is surcharged.

In October 2008 a field survey was performed on the Main and Parallel Interceptor above and below the Brown Street CSO. The survey verified the suspicion that the 42-inch pipe above the CSO on manhole runs 10 to R-1 and on the 36-inch pipe from R-1 to R-2 were on negative grades. The Brown Street CSO overflow gate is at elevation 1173.83 and the invert of the 42-inch overflow to Church Run is 1172.9. The negative grades at Brown Street create a "bottle neck" in the system and contribute to overflows at the CSO. This condition was further exacerbated by the practice of throttling the bypass at the WWTP and the flat slope on the Main Interceptor between MHs 2 and 3. In 2010, the operators eliminated the practice of throttling the WWTP bypass and now all flow is discharged to the WWTP.

The City of Titusville WWTP serves the City of Titusville and a portion of Oil Creek Township. Oil Creek Township owns the collection system within their Township. Sewage flows from Oil Creek Township are conveyed to the City's interceptor by the Oil Creek Township Pump

Station. This study will include service to a portion of Cherrytree Township, Venango County south of the City of Titusville.

This Chapter will concentrate on the City of Titusville WWTP. Information pertaining to other sewage facilities that serve the City of Titusville, Oil Creek Township and Cherrytree Township presented above will not be discussed in detail.

3.1.1 Location, Size and Ownership of Treatment Facilities

Titusville WWTP

The WWTP is operated under NPDES Permit PA0036650 effective December 1, 2010 until November 30, 2015. The WWTP was constructed in 1958 utilizing the trickling filter process and had a capacity of 2.5 MGD. The original plant had fine screening, un-aerated grit chamber, primary clarification, trickling filters and a solids handling facility. In 1987, the WWTP was expanded to treat average daily flows of 4.0 MGD. A Sequential Batch Reactor (SBR) process replaced the trickling filter process and the primary clarifiers were converted to chlorine contact tanks. In 2003, the headworks of the WWTP was upgraded to convey average daily flows of 4.0 MGD and peak hourly flows of 12.0 MGD to the SBR tanks. However the SBR tanks were never upgraded to accept additional flow. The layout of the existing WWTP is shown on Plate III.

The NPDES effluent limits effective December 1, 2010 are as follows:

NPDES PERMIT LIMITS
NPDES PERMIT NO. PA0036650

Parameter	Mass Units (lbs/day)		Concentrations (mg/l)				Monitoring Requirements	
	Monthly Average	Average Weekly	Minimum	Monthly Average	Average Weekly	Instantaneous Maximum	Minimum Measurement Frequency	Required Sample Type
Flow (MGD)	XX	XX					Continuous	Measured
CBOD5	834	1334		25	40	50	2/week	24-hr comp
TSS	1000	1500		30	45	60	2/week	24-hr comp
Ammonia Nitrogen (05/01 – 10/31)	200			6		12	2/week	24-hr comp
	600			18		36	2/week	24-hr comp
Copper, Total	0.4			0.012		0.024	2/week	24-hr comp
Fecal Coliform (05/01 – 10/31)				200/100ml			2/week	grab
				2000/100 ml			2/week	grab
Total Residual Chlorine				0.4		1.1	daily	grab
pH			6.0			9.0	daily	grab

3.1.2 Narrative and Schematic of Facilities Treatment Process

The Titusville WWTP utilizes the SBR treatment process. Raw wastewater is screened and degrittied in the headworks before being pumped to the SBR tanks. Effluent then flows to the Chlorine Contact Tanks for disinfection prior to discharge to Oil Creek.

The facility stabilizes its solids through an aerobic digestion process. Waste Activated Sludge (WAS) is diverted into the Aerobic Digesters. The digested solids are dewatered with a belt filter press and disposed of at an approved landfill. Sludge drying beds are available as a back-up to the belt filter press.

A schematic of the treatment plant process is located in Appendix C.

3.1.3 Problems With Treatment Plant Facilities

Titusville WWTP

The four 800,000 SBR tanks have a total capacity of 3.2 MGD. During peak flows the SBR tanks which act strictly as a batch process are hydraulically overloaded. The Design Engineer's Report for the Phase II project completed in 2003 indicated that the SBR design relied heavily on fine tuning F/M ratios and operating sequence to yield higher capacities. It also assumed the SBRs would act as upflow sludge blanket clarifiers during peak flows. The performance considered the I/I would be reduced and the decanting system would be upgraded. The sewer system which is mainly combined is still subject to I/I and the SBR decanting system was not upgraded. Therefore the system has not performed as anticipated in the Design Engineer's Report.

In accordance with accepted Chapter 94 methodology, which is based on the 3-consecutive maximum month average daily flows processed at the WWTP, the WWTP is not hydraulically overloaded. However, the system is considered overloaded since all flows are not included in the WWTP flows. Also in accordance with Chapter 94 methodology, which is based on the average daily load exceeding the organic design capacity, the WWTP is not organically overloaded but is projected to be organically overloaded in five years.

The City of Titusville is under a CO&A to bring the WWTP into compliance with the Clean Streams Law, the Sewage Facilities Act and the NPDES and WQM Permits. According to the COA, the WWTP is not being operated in a manner to adequately treat flows greater than 7.5 MGD and raw sewage overflows at the Brown Street CSO. The CO&A also cites operation and maintenance problems at the WWTP.

3.2 Wastewater Sludge and Septage Generation

3.2.1 Location of Sources of Wastewater Sludge or Septage

The location of sludge generated in the plan area is the WWTP.

3.2.2 Quantities of the Types of Sludge

The WWTP generates aerobically digested sludge that is dewatered by a belt filter press.

3.2.3 Present Disposal Method

Sludge from the WWTP is disposed of at a Landfill.

4.0 POPULATION AND WASTEWATER FLOW PROJECTIONS

4.1 Municipal and County Planning Documents

4.1.1 Land Use Plans and Zoning Map

The following information was based on documentation from on City of Titusville's website pertaining to Zoning and Land Use. According to the Zoning Ordinance dated 2009 for the City of Titusville, the City is divided into eleven (11) zoning districts. The zoning districts are S-1-Special Conservation, R-1-Single-Family Residential District, R-2-Two-Family Residential District, R-3 - Multiple-Family Residential District, RLB- Residential Limited Business, Gallery Overlay District, C-1-Commercial District, C-2 – Commercial District, I-Industrial District, U1-Urban Industrial District, and IOD-Industrial Overlay District. The WWTP is located in the Urban Industrial District. A copy of the zoning map is located in Appendix D.

4.1.2 Zoning or Subdivision Regulations

There are no lot sizes in the City's zoning ordinance which are based on sewage disposal method. The ordinance provides minimum lot area, minimum depth of front yard, rear yard, and side yard requirements for each district.

4.1.3 Limitations and Plans Related to Floodplain and Stormwater Management

The Flood Insurance Rate Map for the City of Titusville dated February 15, 1978 shows the WWTP is located in the 100-year floodplain designation Zone A6. The PADEP Domestic Wastewater Facilities Manual (Section 41.3) requires "the treatment plant structures, electrical and mechanical equipment shall be protected from physical damage by the 100-year flood. Treatment plant should remain fully operational and accessible during the 25-year flood." In addition, the City of Titusville require that structures in the floodplain area have the lowest floor (including basement) of any new structure or substantial improvement to an existing structure be at least one and one-half (1.5) feet above the one hundred (100) year flood elevation.

4.2 Population

The type, capacity and cost of required wastewater collection and treatment facilities are dictated largely by the number of people served. A detailed investigation has therefore been made of the population in the municipalities considered in this plan and the portion of each municipality in the service area.

4.2.1 Areas With Existing and/or Proposed Development

The City of Titusville received correspondence from The EADS Group, consulting Engineer for Cherrytree Township, Venango County regarding the option of a portion of Cherrytree Township being conveyed to the City of Titusville's WWTP. The anticipated EDUs from this area are 140 initial with an additional 5 EDUs over the next 20 years. A copy of the correspondence from The EADS Group is located in Appendix E.

4.2.2 Land Use Designations

The land use designations for the City of Titusville were presented in item 4.1.1. The 537 Plan is for the expansion of the WWTP on the site of the existing WWTP and therefore the current land use designation will not change. The existing land use for the sewersheds in the City of Titusville and a portion of Oil Creek Township will not change.

4.2.3 Projected Population

Source information used in the plan was secured from the U.S. Census, State Water Plan, letter from The EADS Group, water consumption analysis, and previous engineering studies.

The U.S. Census data presented in Table 4-1 reveals that the population of the City of Titusville has decreased from 1970 to 2000, Oil Creek Township increased in population from 1970 to 1990 and decreased from 1990 to 2000, and Cherrytree Township increased in population from 1970 to 1980 and decreased from 1980 to 2000. The population of the City of Titusville for Year 2000 was 6,146.

Table 4-1 – United States Census Data

Municipality	Year			
	1970	1980	1990	2000
City of Titusville	7,331	6,884	6,434	6,146
Oil Creek Township	1,743	2,035	2,069	1,880
Cherrytree Township	1,522	1,635	1,601	1,543

PaDEP Bureau of Watershed Management Water Conservation Center State Water Plan provides population projections for each municipality in Pennsylvania for years 2010, 2020, 2030. The projected populations for the City and Townships are presented in the following Table 4-2.

Table 4-2 – State Water Plan

Municipality	Year		
	2010	2020	2030
City of Titusville	5,765	5,438	5,430
Oil Creek Township	1,819	1,684	1,694
Cherrytree Township	1,499	1,447	1,448

Table 4-2 shows a continued decrease in population for the City of Titusville from year 2000 and shows a decrease in population for Oil Creek and Cherrytree Townships to year 2020 and then a slight increase in year 2030.

The majority of the City is fully developed and includes residential and commercial establishments as well as the University of Pittsburgh Campus. Based on a review of the water consumption records for the City of Titusville it was estimated that the water consumption for a residential user was 65,000 gallons per year. Utilizing this information and the total annual metered water consumption for all classifications it was determined that the number of current EDUs for the City of Titusville was 3,264 EDUs. The EDUs for the current service area are as follows:

Table 4-3 - Current EDUs

Municipality	EDUs		
	Residential	Non-Residential	TOTAL
City of Titusville	1,983	1,281	3,264
Oil Creek Township	98	0	98
TOTAL	2,081	1,281	3,362

The equivalent population for the current service area is shown in Table 4-4.

Table 4-4 – Current Service Area Equivalent Population

Municipality	EDUs	Population Density	Equivalent Population
City of Titusville	3,264	2.44	7,964
Oil Creek Township	98	2.50	245
TOTAL	3,362		8,209

As shown above, Table 4-4 shows the equivalent population for sewage flow purposes for the service area including residential and non-residential EDUs. Actual population is based on residential only.

New construction is mostly to replace demolished structures. Growth would most likely occur by redeveloping commercial and industrial sites throughout the City or surrounding Oil Creek Township. For the Plan, minimal growth has been projected for the City of Titusville and no projected growth in Oil Creek Township. As stated previously, the City received population projections for the portion of Cherrytree under consideration for conveyance to the City of Titusville for treatment. The total projected EDUs to be served by the WWTP are provided in Table 4-5.

Table 4-5 – Projected EDUs

Municipality	EDUs					
	2010	2015	2020	2025	2030	2035
City of Titusville	3,264	3,274	3,284	3,294	3,304	3,312
Oil Creek Township	98	98	98	98	98	98
Cherrytree Township	140	165	190	215	240	240
TOTAL	3,502	3,537	3,572	3,607	3,642	3,650

The projected population based on the projected EDUs is presented below in Table 4-6.

Table 4-6 – Projected Equivalent Population

Municipality	Equivalent Population					
	2010	2015	2020	2025	2030	2035
City of Titusville	7,964	7,989	8,013	8,037	8,062	8,081
Oil Creek Township	245	245	245	245	245	245
Cherrytree Township	364 ⁽¹⁾	429	494	559	624	624
TOTAL	8,573	8,663	8,752	8,841	8,931	8,950

(1) Currently not connected

The State Water Plan indicated decline in population for the City of Titusville. The projected increase in population for the City of Titusville is minimal.

4.2.4 Regulations, Comprehensive Plans and Existing Plans of Other Agencies Relating to the Development, Use and Protection of Land and Water Resources

The Zoning Ordinance for the City of Titusville has a Special Conservation, Gallery Overlay, and Historic Overlay Districts. The Special Conservation District is for areas where steep slopes or other physical concerns limit development. The Gallery Overlay District is along Main Street to allow for alternative uses of the City’s older structures. These structures are often historic. The Historic Overlay district is for property owners to protect historically significant areas of the City. The Ordinance also contains a Special Provisions section to regulate prime agricultural land, historic preservation and forestry.

4.2.5 Sewage Planning

Sewage planning is required to provide adequate wastewater service to the service area based on projected growth over the twenty year planning period. As stated in Chapter 3, the sewage flows from the service area will be conveyed to the WWTP. The WWTP currently has a hydraulic capacity of 4 mgd and organic capacity of 3,000 lbs/day.

Sewage volumes in the service area are directly related to water consumption. Accordingly water consumption in the service area was studied. Water is supplied by the City of Titusville to Titusville and Oil Creek Township. Based on a review of the water consumption records it was determined that the daily water usage is approximately 73 gallons per person per day. Therefore the current and projected water consumption for the service area is as follows:

Year	Population	GPCD	MGD
2010	8,573	73	0.626
2035	8,950	73	0.653

Sewage Flows

The sewage flows at the WWTP for the past five (5) years based on the Chapter 94 report are presented in Table 4-7.

Table 4-7 – Hydraulic Loading (MGD)

Month	2005	2006	2007	2008	2009
January	3.81	3.19	3.91	3.35	2.49
February	3.51	3.11	2.43	3.69	3.49
March	3.02	2.75	4.06	3.84	3.39
April	2.90	2.44	3.15	3.19	3.09
May	2.86	2.42	2.44	2.63	2.47
June	2.49	1.92	2.03	2.19	2.27
July	2.31	2.49	1.87	2.35	2.26
August	2.27	2.28	2.07	1.88	2.24
September	2.76	2.66	1.87	1.67	1.80
October	2.20	3.88	1.94	1.79	2.15
November	2.36	3.31	2.64	2.24	1.99
December	2.98	3.23	3.72	3.21	2.67
Annual Average Flow	2.79	2.81	2.68	2.67	2.53
Maximum 3-Month Average Daily Flow	3.45	3.47	3.47	3.63	3.32

The average of the annual average flows for the past five years is 2.72 MGD. The flows in Table 4-7 do not reflect the impact of peak flows because the influent gate was throttled which did not allow all the flow to the plant. The following flows in Table 4-8 show the peak flows for Year 2010 and are based on all the flow to the plant.

Table 4-8 – Year 2010 Flows (MGD)

Month	Average Daily Flow (ADF)	Peak Daily Flow (PDF)	Peak Hourly Flow (PHF)
January	2.61	5.95	
February	2.07	2.71	
March	2.40	3.78	
April	1.89	2.93	
May	2.50	3.76	
June	2.36	4.03	13.80
July	1.80	3.00	15.00
August	1.71	2.64	9.40
Annual Average Daily Flow (ADF)	2.17		

The ADF from January to August 2010 is 2.17 MGD and the PDF is 3.60 MGD. Recent flow charts show the PHF for September 2010 was 15.8 MGD. The sewage flows presented in Tables 4-7 and 4-8 show flows significantly greater than the estimated water consumption reflecting the influence of combined sewers and infiltration/inflow (I/I). As evidenced by Table 4-8 the WWTP should have the capacity to handle 15 to 16 MGD Peak Hourly Flow.

Design Flows

The design flows for the 10 year projected population will be based on the ADF of 2.72 MGD for year 2010. The estimated sewage flows for the 10-year projected population for the service area are shown in Table 4-9.

Table 4-9 – 10-Year Projected Sewage Flows in the Service Area

	Population	ADF (mgd)	Peak Daily Flow (mgd)	Peak Hourly Flow (mgd)
Existing Customers	8,209	2.72	5.95	15.00
Additional Customers				
City of Titusville	49	0.00	0.00	0.00
Oil Creek Township	0	0.00	0.00	0.00
Cherrytree Township	494	0.06	0.18	0.22
TOTAL	8,752	2.78	6.13	15.22

The WWTP with a capacity of 4.0 MGD, PDF of 12.0 MGD and a PHF of 16.0 MGD will be capable of handling the projected flows in 10 years or in Year 2020.

The estimated sewage flows for the 20-year projected population for the service area are shown in Table 4-10.

Table 4-10 – 20-Year Projected Sewage Flows in the Service Area

	Population	ADF (mgd)	Peak Daily Flow (mgd)	Peak Hourly Flow (mgd)
Existing Customers	8,209	2.72	5.95	15.00
Additional Customers				
City of Titusville	98	0.01	0.03	0.04
Oil Creek Township	0	0.00	0.00	0.00
Cherrytree Township	624	0.09	0.27	0.36
TOTAL	8,931	2.82	6.25	15.40

The existing WWTP process is designed for an average dry weather flow of 4.0 MGD and a peak daily flow of 10.0 MGD. The headworks is designed for 12.0 MGD. The WWTP should be designed for an average dry weather flow of 4.0 MGD, a peak daily flow of 12 MGD and a peak hourly flow of 16.0 MGD.

The projected sewage flows to the design year are presented in Table 4-11.

Table 4-11 Projected Sewage Flows for the Service Area

	2010	2020	2025	2035
ADF, MGD	2.72	2.78	2.80	2.84
PDF, MGD	12.00	12.00	12.00	12.00
PHF, MGD	16.00	16.00	16.00	16.00

Sewage Pollution Loadings

As with flows the magnitude of raw sewage pollution loadings will to a great extent determine the capacity and cost of the required Titusville treatment facilities in future years. A detailed review was made accordingly of plant operation records for the past five (5) years to determine the strength of the wastewater.

The 2005-2009 historical WWTP loadings reported in the 2009 Chapter 94 Report are presented in Table 4-12.

Table 4-12 – Organic Loading – 1,000 lbs/day

Month	2005	2006	2007	2008	2009
January	2.540	2.482	2.669	1.602	2.205
February	2.051	2.239	2.681	1.377	2.155
March	1.413	1.894	1.835	1.770	2.538
April	3.096	2.387	1.670	2.441	2.813
May	3.613	2.087	1.821	1.224	1.945
June	2.707	2.553	1.741	2.356	1.457
July	1.999	2.228	1.785	2.214	1.762
August	2.193	2.839	1.827	1.907	1.772
September	2.751	1.637	1.892	3.012	2.247
October	2.338	1.384	1.749	2.004	1.714
November	2.901	1.930	1.481	2.439	1.430
December	3.625	1.291	0.907	1.967	2.109
Annual Average	2.602	2.079	1.838	2.026	2.012
Maximum Month	3.625	2.839	2.681	3.012	2.813

The loadings presented in Table 4-12 are computed based on flows that were throttled at the plant. Organic loadings for Year 2010 are shown in Table 4-13.

Table 4-13 – Year 2010 Organic Loading 1,000 lbs/day

Month	Average Organic Loading
January	2.379
February	2.124
March	2.255
April	1.941
May	2.171
June	1.885
July	2.269
August	1.379
Average	2.050
Max Month	2.379

Based upon the concentrations the loadings for design year 2035 and the original WWTP ADF of 4.0 MGD are shown in Table 4-14.

Table 4-14 Projected Loadings for the Service Area

		2010	2035
Flow, MGD		2.72	4.00
BOD	150 mg/l	3,403 lbs/day	5,004 lbs/day
Suspended Solids	100 mg/l	2,269 lbs/day	3,336 lbs/day
TKN	25 mg/l	567 lbs/day	834 lbs/day

5.0 ALTERNATIVES TO PROVIDE NEW OR IMPROVED WASTEWATER DISPOSAL FACILITIES

Rules and Regulations pertaining to the content of Act 537 Plans are contained in Title 25 Pennsylvania Code Chapter 71. These Rules and Regulations require that each Act 537 plan predict and evaluate alternatives for sewage service. PaDEP's guidelines for the preparation of Act 537 plans indicate that alternatives should consider use of the following.

- Conventional collection, conveyance and treatment systems;
- Individual sewage disposal systems;
- Small flow treatment facilities;
- Community land disposal facilities;
- Non-structural comprehensive planning activities;
- Sewage management programs and/or
- No action alternative

Based on the approved Plan Outline, the Plan considers alternatives under conventional collection, conveyance, treatment systems and No action Alternative for the study area.

5.1 Conventional Collection, Conveyance and Treatment Alternatives

New alternatives were investigated for providing new or improved sewage facilities for the Titusville WWTP under Potential for Continued Use of Existing Municipal Sewage Facilities and Repair/Replacement of Existing Collection and Conveyance System Components.

5.1.1 Potential for Regional Wastewater Treatment Plant

The Titusville WWTP is a regional WWTP that currently serves the City of Titusville and a portion of Oil Creek Township. The original WWTP was constructed in 1958 utilizing the trickling filter process with a design capacity of 2.5 MGD. In 1987 the trickling filters were replaced with the SBR process with a design capacity of 4.0 MGD and peak hourly flow of 10.0 MGD. In 2003 the capacity of the WWTP headworks was increased to 12.0 MGD. Process problems have occurred at the WWTP when flows approach 7.0 MGD causing solids wash-out in the SBR tanks. The WWTP has adequate capacity to treat the average daily sewage flow but the Peak Daily Flow and Peak Hourly Flow exceed the plant capacity and overflows occur at the Brown Street CSO. The plant operators confirm that peak flows have been the problem with

solids washout and carry over resulting in effluent violations. Alternatives were developed to expand and/or modify the existing Titusville WWTP to serve the current and projected hydraulic and organic loadings. The SBR process can easily be converted to a Biological Nutrient Removal (BNR) system for enhanced nitrogen and phosphorous removal required in the future. Cycles can incorporate alternating periods of on-off-on during the react phase to produce aerobic/anoxic/anaerobic conditions to promote nitrification/denitrification and phosphorus release and uptake.

This section of the Draft and Supplemental Reports were expanded based on the recent flow data and additional information received from ABJ and Ashbrook. The Alternatives considered in this Final Report are shown in Table 5-1.

**TABLE 5-1
ALTERNATIVES**

Alternative	Description
1	Existing 4-Tank SBR System Improvements
2A	ABJ SBR – 6-Tank System
2A.1	ABJ SBR – 5-Tank System
2A.2 ^(a)	ABJ SBR – 4-Tank System
2A.3	ABJ SBR – 5 Tanks With WWTP Improvements
2A.4	ABJ SBR – 4 Tanks With WWTP Improvements
2B	ABJ Aqua-Aerobic – 8-Tank System
2C	Ashbrook SBR – 4-Tank System
2C.1	Ashbrook SBR – 5-Tank System
2C.2	Ashbrook SBR – 5-Tanks With WWTP Improvements
3	2 MG EQ Tanks With 4-Tank ABJ SBR System
3A	1 MG EQ Tank With 4-Tank ABJ SBR System

(a) Alternative 2A.2 was investigated to determine the capacity of a 4-tank system. According to ABJ, the 4-tank system can handle ADF = 3.4 MGD, PDF = 8.0 MGD and PHF = 10.7 MGD.

The projected average flows from the current service area and the portion of Cherrytree Township south of the City will have little impact on the required treatment facilities. The size of the facilities is primarily based on peak flows which are heavily influenced by the City's combined sewers.

Two (2) types of SBR processes were evaluated namely "pure sequencing batch process" and the "continuous feed intermittent cycle (ICEAS) process." The ICEAS process is different from the sequencing batch reactor process in that it operates on the principal of continuous feed with intermittent cycles of aeration, settling and effluent decanting. It is not necessary to bypass a basin during settling and decanting.

The ICEAS process usually results in less tankage than the pure batch process since peak flows and loads are distributed equally to all basins in service due to the parallel fill pattern and this process handles highly variant loading.

Alternative No. 1 – Existing 4-Tank SBR System Improvements

This alternative involves making improvements to of the existing 4-tank SBR system. The existing SBR system is a true batch-type process. Three manufacturers were contacted to determine if the current 4-tank SBR can handle the design flows and effluent requirements. ABJ and Aqua Aerobics indicated that additional tankage was needed. Ashbrook indicated that a 4-tank system would be adequate but further review identified major problems with the design. Therefore, this alternative was not evaluated further.

Alternative Nos.2A, 2B, 2C and 3 involve replacement of the existing SBR system with SBR systems that meet the current and 25-year projected loadings. ABJ, Aqua Aerobic and Ashbrook provided detailed information. The ABJ submittal is for an ICEAS process and the other manufacturers submitted batch processes. Alternatives 3 and 3A also include the construction of Equalization Tanks.

Alternative No. 2A –ABJ SBR System – 6-Tank System

This alternative involves the conversion of the SBR system to the ICEAS process. Although the ICEAS process normally results in less tankage, the ABJ proposal included the addition of two tanks so that two tanks will not decant simultaneously. The layout of the ABJ SBR system is shown on Plate IV.

Alternative No. 2A.1 –ABJ SBR System – 5-Tank System

ABJ was requested to analyze a 5-tank system. This system will occasionally require simultaneous decant of two (2) tanks and installation of five (5) aeration systems.

Alternative No. 2A.2 – 4-Tank System

ABJ was requested to analyze the flow scenarios that a four (4) tank system could handle. ABJ determined that they could not handle the design flows but reduced flows in note (a) of Table 5-1.

Alternative No. 2A.3 and 2A.4

These Alternatives are the same as Alternatives 2A.2 and 2A.1 but include WWTP improvements.

Alternative No. 2B –Aqua Aerobic SBR System – 8-Tank System

This alternative involves replacing the existing SBR system with the Aqua SBR system that uses the batch process. The system will require the addition of four tanks and therefore was not investigated further.

Alternative No. 2C – Ashbrook SBR System – 4-Tank System

This alternative involves replacing the existing SBR system with the SBR “Plus” system that uses the batch process. According to the Manufacturer, this alternative does not require additional tankage. However, the Ashbrook proposal is of concern since the F/M ratio is much higher than the other two proposals, the peak decant rate is substantially higher than the ICEAS process, modifications are required to the SBR tanks, the hydraulic retention time is extremely low and the storm cycle is too frequent and solids

washout have occurred with the existing 4-tank batch system. Ashbrook has been asked to reevaluate their proposal.

Alternative No. 2C.1 – 5-Tank System

Ashbrook investigated a five (5) tank system because of concerns with peak flows and solids washout with the existing four (4) tank system.

Alternative No. 2C.2 – 5-Tank System With WWTP Improvements

The same as Alternative 2C.1 with the addition of WWTP improvements.

The SBR System alternatives above also involve replacing the existing “Jet Tech” process with a new aeration system and decanting operation. A comparison of each alternative process is presented in Appendix F.

Alternative No. 3 - Addition of Equalization Tanks to the Existing System

This alternative consists of construction of an equalization facility at the WWTP, and conversion of the existing SBR tanks to the ICEAS process which would prevent the need to treat peak wet weather flows. A layout of the two 2 MG Equalization Tanks is shown on Plate V.

Alternative No. 3.A - Addition of 1 MG Equalization Tank

This Alternative consists of construction of one 1.0 MG tank at the WWTP site and conversion of the existing 4 tanks to the ABJ ICEAS process but does not handle the design flow.

5.1.2 Repair or Replacement of Existing Collection and Conveyance System Components

No repair or replacement of existing collection and conveyance system components are proposed under this plan.

5.2 No-Action Alternative

The no-action alternative would consist of not expanding the WWTP and continue with overflows on the system.

5.2.1 Water Quality/Public Health

The no-action alternative could be a potential health hazard and could cause degradation of the waters of the Commonwealth. The presence of untreated human wastes exposes the general population to waterborne diseases, such as cholera, typhoid, or other intestinal illnesses. The presence of partially or untreated sewage upon the ground's surface can contribute to such infections, as well as contamination of surface and ground waters. The untreated waste degrades the waters of the Commonwealth, which is a hazard to humans and animal and aquatic life.

5.2.2 Growth Potential

The no-action alternative can limit growth in the service area with tap restrictions imposed by PaDEP.

5.2.3 Community Economic Conditions

As stated previously, the no-action alternative can limit growth in the service area with restrictions to taps from PaDEP. The limiting of growth will affect the economic conditions in the area.

5.2.4 Recreational Opportunities

The no-action alternative could result in closures or limited use of recreational activities involving the waters of the Commonwealth. The presence of partially or untreated sewage upon the ground's surface can contribute to infections, as well as contamination of surface and ground waters which would prevent activities on or in the waters of the Commonwealth.

5.2.5 Drinking Water Sources

The no-action alternative could result in contamination of wells or surface waters of the Commonwealth. The presence of partially or untreated sewage upon the ground's surface can contribute to contamination of surface and ground waters.

5.2.6 Other Environmental Concerns

The no-action alternative could also affect animal and aquatic life.

6.0 EVALUATION OF ALTERNATIVES

6.1 Consistency Analysis

Wastewater management alternatives developed as part of the Act 537 planning process must be evaluated in terms of their relationship to the goals and objectives of various planning, environmental, and natural resource laws and policies of the Commonwealth of Pennsylvania. Chapter 71.21(a) (5) of PADEP's regulations requires that the Act 537 Plan address the consistency of each wastewater management alternative with eleven of the Commonwealth's goals and policies. Based on the approved TAR and plan outline, eight of the eleven will be evaluated in this plan. The goals and policies not addressed are as follows:

- Plans developed under Title II of the Clean Water Act (33 U.S.C.A. 1281-1299) or Titles II and VI of the Water Quality Act of 1987 (33 U.S.C.A 1251-1376).
- Comprehensive plans developed under the Pennsylvania Municipalities Planning Code. (Reference-Title 25, §71.21.a.5.i.D).
- State Water Plans developed under the Water Resources Planning Act (42 U.S.C.A. 1962-1962 d-18). (Reference-Title 25, §71.21.a.5.i.F).

If a recommended alternative is determined to conflict with or is inconsistent with one of the goals and objectives, the conflict and inconsistencies must be resolved before PADEP will approve the alternative.

The following sections discuss the eleven evaluation categories and the consistency analysis. Consistency analyses were performed for alternatives listed in Chapter 5. Based on the following analysis, the alternatives are consistent with the eight criteria.

6.1.1 Comprehensive Water Quality Management Plan

Sections 4 and 5 of the Clean Streams Law require that consideration be given to water quality management and pollution control in a watershed as a whole. Sections 208 of the Clean Water Act calls for the development of plans that identify the facilities necessary to meet anticipated municipal and industrial waste treatment needs. Comprehensive Water Quality Management Plans

(COWQMP) have been developed under Sections 4 and 5 of the Clean Streams Law and 208 of the Clean Water Act for areas in Pennsylvania. A copy of the COWAMP could not be attained.

6.1.2 Municipal Wasteload Management Plans

Annual Chapter 94 Municipal Wasteload Management Reports are submitted to PADEP for Titusville's WWTP. The 2009 Chapter 94 Municipal Wasteload Management Report indicated that the plant is not hydraulically overloaded and is not projected to be overloaded in the next five years. However, overflows on the system have occurred which are not included in the WWTP flows. The alternatives considered in this Plan are consistent with the goal of eliminating overflows.

6.1.3 Chapter 93, 95, and 102 Antidegradation Requirements

Chapters 93 and 95 under Pennsylvania's Clean Streams Law classifies all surface waters according to uses to be protected and establishes water quality criteria which need to be maintained in the surface waters. The surface water discharge proposed by the alternatives in this plan is from the existing Titusville WWTP. The facility will be designed so that the effluent will comply with the effluent limits assigned by PADEP.

Chapter 102 requires a soil erosion and sedimentation control plan be prepared and followed for any construction activity impacting greater than one acre. The selected alternative(s) will be completed in compliance with necessary erosion and sedimentation control plan.

6.1.4 Prime Agricultural Land Policy

The policy was established to protect prime agricultural land from irreversible conversions to uses that result in the loss of the land as an environmental or essential food source resource. The expansion of the Titusville WWTP will occur on property owned by the City of Titusville which is not prime agricultural land. The WWTP alternatives of this Plan are consistent with the Prime Agricultural Land Policy.

6.1.5 County Stormwater Management Plans

A Crawford County Act 167 Stormwater Management Plan has been prepared by HRG, Inc. dated June 2010. The objective of the plan is to provide a plan for comprehensive watershed stormwater management throughout the County. According to the plan implementing PA BMPs

volume control and 100% peak rate control should limit the impact of future projected growth. The alternatives shall meet the stormwater management requirements of the City of Titusville.

6.1.6 Wetlands

Based on mapping provided by the US Fish and Wildlife Service, no wetlands are identified on the WWTP site however wetlands do exist adjacent to the site. Construction of the alternative will be on the site of the existing WWTP. The WWTP alternatives of this Plan are consistent with wetlands.

6.1.7 Pennsylvania Natural Diversity Inventory

Pennsylvania Natural Diversity Inventory (PNDI) maintains a database containing site information on regulated plant and animal species, outstanding geological features, and significant natural communities. PNDI Project Environmental Review was done on October 19, 2010 for the Titusville WWTP site. Based on the PNDI Project Environmental Review Receipt, there is a potential impact for the Pennsylvania Game Commission. On November 4, 2010 information was submitted to the Pennsylvania Game Commission for review. A copy of the PNDI receipt and correspondence with the Pennsylvania Game Commission are included in Appendix G.

6.1.8 Historical and Archeological Resource Protection

Pennsylvania Title 37, Section 507 requires cooperation between public officials and the Pennsylvania Historical and Museum Commission (PHMC). The project will take place on the existing previously disturbed site of the WWTP. The WWTP alternatives of this Plan are consistent with Historical and Archeological Resource Protection. On November 4, 2010 information was submitted to the Pennsylvania Historical Museum Commission for review. On November 16, 2010 the PHMC responded that the project will have no effect on historic or archaeological resources. Copies of the request and response letter are included in Appendix H.

6.2 Resolution of Inconsistencies

Based on the above analyses, it does not appear there are any inconsistencies, at the planning stage, between the alternatives and the various goals and objectives of the planning, environmental and natural resource laws and policies of the Commonwealth of Pennsylvania.

6.3 Water Quality Standards

The alternatives will be designed to meet the current effluent limits.

6.4 Cost Estimates

Construction cost estimates prepared for the alternatives were based on recent construction experiences and adjusted to 2011 dollars. Project costs were considered to be equal to estimated construction costs plus an allowance for other project related costs including contingencies, engineering, financing and project administration. Project related costs were estimated to be 35% of construction costs and then added to construction costs to generate total estimated project costs.

Cost estimates were developed only for the Alternatives that appeared to be viable. The eight (8) tank proposal from Aqua Aerobics was not evaluated further.

The estimated costs for all Alternatives discussed in Chapter 5 along with the flows each Alternative can handle are summarized in Table 6-1. The detailed estimated costs for Alternatives from each manufacturer are shown in the Appendices, including recommended WWTP improvements.

TABLE 6-1

CITY OF TITUSVILLE WWTP ADDITIONS – SUMMARY OF ESTIMATED COSTS ⁽¹⁾

Alternative	Flow – MGD			Estimated Construction Cost	Estimated Project Cost	Increase in Annual O&M Cost	Present Worth Cost
	ADF	PDF	PHF				
2A.1 ABJ SBR – 5 Tanks ⁽²⁾	4.00	12.00	16.00	\$3,635,500	\$4,653,000	\$25,000	\$4,940,000
2A.2 ABJ SBR With 4 Tanks	3.40	8.00	10.70	\$2,607,000	\$3,519,000	\$0	\$3,519,000
2A.3 ABJ SBR – 5 Tanks With WWTP Improvements ⁽²⁾	4.00	12.00	16.00	\$5,041,850	\$6,454,000	\$25,000	\$6,741,000
2A.4 ABJ SBR – 4 Tanks With WWTP Improvements	3.40	8.00	10.70	\$4,011,000	\$5,415,000	\$0	\$5,455,000
2C.1 Ashbrook SBR – 5 Tanks	4.00	12.00	16.00	\$4,253,000	\$5,742,000	\$25,000	\$6,029,000
3A 1.0 MG EQ Tank With 4-Tank ABJ SBR	4.00	9.00	11.70	\$4,015,000	\$5,420,000	\$2,000	\$5,649,000
3B 1.0 MG EQ Tank With 4-Tank ABJ SBR With WWTP Improvements	4.00	9.00	11.70	\$5,433,000	\$7,335,000	\$2,000	\$7,564,000

(1) Detailed costs provided in Appendix R.

(2) Use 28% Related Project Cost and 50% Installation Cost.

Operation and Maintenance Cost for the Alternatives

The operation and maintenance costs for the alternatives are presented in Table 6-2 and included in Table 6-1. It should be noted that these costs are in addition to the current annual O&M costs. The additional costs are for electric power and maintenance. No additional labor costs are included.

TABLE 6-2

Additional Operation and Maintenance Cost Alternatives

Alternative	Increase in Annual O&M Cost
2A.1 – ABJ SBR System – 5 Tanks	\$25,000
2C.1 – Ashbrook SBR System – 5 Tanks	\$25,000
3 – Equalization Tanks – 1 MG	\$2,000

Present Worth Analysis for the Alternatives

These first level cost estimates are appropriate for planning level detail and should not be considered final costs for financing purposes. All wastewater treatment facilities have been sized on the basis of projected year 2030 needs. All cost estimates are in year 2011 dollars. The operation and maintenance costs for each alternative will be projected to the 2030 year and added to the project costs developed for that alternative.

Present Worth Costs

Present Worth is the sum, which if invested now at a given fixed rate, would provide the funds required to make all future payments. By doing this, dollars spent on construction at the beginning of the planning period are made equivalent to dollars spent on operating costs throughout the planning period.

The following assumptions formed the basis for the present worth analysis:

- The planning period is from 2011 to 2030.
- Costs reflect 2011 Pittsburgh, Pennsylvania prices.

- The interest rate is 6.0%.
- Annual Operation and Maintenance (O&M) costs were adjusted for inflation and operation changes.

Although every effort has been made to ensure that the costs are reasonable, it should be recognized that there is some level of uncertainty inherent in any attempt to plan for the future. The objective at this point in the planning process is not to define what the charge to the users of each alternative will be, but to develop costs that are internally consistent and allow a valid comparison of alternatives. The present worth analysis of the viable alternatives is provided in Table 6-1.

Based on the cost and the present worth analysis, the 5-tank SBR system is the recommended alternative. The ICEAS process is recommended over the batch process because it is better suited to handle larger fluctuations in flow.

6.5 Funding Methods

PADEP guidelines for preparation of Act 537 Plans specify that an analysis be made of funding methods available to finance the proposed expansion. Based on present worth analysis the cost for the recommended alternative is provided in table 6-3.

6.5.1 Funding Sources Available

Brief descriptions of various financing methods which may apply to this project are set forth in the following sections.

a. Grants-in-Aid

The first method of financing available to alleviate partial construction costs is grants-in-aid.

A grant is a monetary award to a project without provision for reimbursement. The grant programs which may apply to this project are discussed below.

(1) Crawford County Community Development Block Grant

Community Development Block Grants are awarded to communities within the County for various public works projects. These grants are awarded on an individual project basis to service areas of low and moderate income.

(2) Pennsylvania Infrastructure Investment Authority (PENNVEST)

PENNVEST has been capitalized by State and Federal Funds to provide an innovative approach to financing local infrastructure in Pennsylvania. The PENNVEST Board meets several times each year to consider funding applications and award funds to water and sewage infrastructure development projects. This is usually a grant and loan program.

(3) Department of Community and Economic Development (DCED)

DCED has funds available under the Community Revitalization Program. The Community Revitalization Program supports local projects that improve the stability of communities and enhance local economic conditions. Eligible projects include construction or rehabilitation of infrastructure. Assistance from this program is in the form of a grant.

b. Loans

Loans are repaid at an agreed upon rate of return over a stipulated time period. The loan programs that may apply to private as well as public facilities are discussed below.

(1) Commercial or Bank Loans

Bank financing is readily accessible and requires a much shorter interval from project start to construction. This loan option requires less administrative costs than expected with a bond issue. The main disadvantage to a bank loan is that the term usually does not extend beyond 15 years.

(2) Pennsylvania Infrastructure Investment Authority (PENNVEST)

PENNVEST has been capitalized by State and Federal funds to provide an innovative approach to financing local infrastructure in Pennsylvania. The interest rates for this program are determined based on prevailing economic conditions. A number of grants have also been awarded under this program.

(3) Rural Utility Service (RUS)

The RUS loan and supplemental grant program was established to provide human amenities, alleviate health hazards, and promote the orderly growth of rural areas by meeting the need for new and improved water and waste disposal systems.

Restrictions with regard to population of the area, financing capability, and project administration must be met. RUS usually provides a combination grant/loan.

(4) Bond Issues

Bond issues are a common method by which municipalities and authorities obtain money to fund projects. Revenue bond issues are normally calculated to achieve a level annual payment for each year of the issue and are presently issued for a maximum term of 30 years at prevailing interest rates. A 20 year term is more common. The annual payment for debt service (interest and principal) is made from annual operating revenues. Bond Issues normally require 10 to 20 percent coverage on top of the average annual debt service cost.

The costs for legal services and printing of bonds are substantial. As a rule, bond issues may be considered for total project costs in excess of \$500,000.

Financing scenarios for a PENNVEST loan, RUS grant/loan and a bond issue were developed to determine the most cost-effective Funding Option. Commercial bank loans were not considered because of the short term on these loans, as mentioned above. Table 6-3 lists the anticipated principal amount to be financed under each scenario, assumed interest rates, annual debt service payments, and anticipated user rates impact. Appendix M provides backup calculations for the financing alternatives. The financing scenarios rely on long-term loans only, and user rate adjustments to pay for the proposed project.

**Table 6-3
Comparison of Financing Alternatives for
Recommended Project
(See Appendix M For Backup Calculations)**

	Pennvest Funding	RUS Funding	Bond Issue
Anticipated Annual Interest Rate, (%)	1.000	2.50	4.50
Payment Period, (years)	20	40	30
Total Amount to be Financed	\$6,454,000	\$6,454,000	\$6,454,000
Monthly Increase per Customer, (\$/EDU/mo.)	\$9.49	\$7.63	\$11.42

The average monthly bill for a residential customer of the City of Titusville who utilizes 4,000 gallons a month is \$54.43. This is based on the base rate of \$38.87 and \$15.56 for 4,000 gallon usage. Based on Table 6-3 the new average monthly bill can range from \$62.06 to \$65.85 depending upon the chosen financing alternative.

6.6 Immediate or Phased Implementation

There are no known critical public health hazards in the WWTP service area associated with wastewater that need to be addressed however, a potential health hazard exists with the discharge of untreated sewage to the waters of the Commonwealth. Completion of the activities described in the previous sections are necessary to eliminate the overload conditions during wet weather, enable continued orderly growth in the service area, and to ensure the long-term reliability of the existing public sewage system.

Table 8-1 presents a tentative schedule for completion of the system improvements identified in this Act 537 Plan.

6.7 Administrative Organizations and Legal Authority

The City of Titusville will be the administrative organization to implement the expansion of the WWTP. The City has implemented projects in the past.

7.0 INSTITUTIONAL EVALUATION

7.1 Existing Wastewater Treatment Authorities

The City of Titusville has a Municipal Water Authority for the water system but there are no existing wastewater treatment authorities in the service area. The City of Titusville owns, operates and maintains the collection, conveyance, and treatment system that serves the City of Titusville and a portion of Oil Creek Township. Oil Creek Township owns the system within the Township. Cherrytree Township is considering a sanitary sewer extension project south of Titusville.

The City is in good financial standing and has the personnel to continue to operate and maintain its system. The City can and has set user fees, take purchasing actions, negotiate agreements, and raise capital for construction and operation and maintenance. The City has and can take action against Ordinance violators.

7.2 Analysis and Description of the Institutional Alternatives

No new municipal departments or municipal authorities are required to implement the proposed plan. The City will implement the recommendations in the plan.

7.3 Administrative and Legal Activities Necessary to Implement Plan

As stated previously, no municipal departments or municipal authorities are required to implement the proposed plan. The functions of the Townships and the City are anticipated to remain the same.

The Townships have existing ordinances, regulations, and standards pertaining to the sewer systems.

7.4 Chosen Institutional Alternative

The chosen institutional alternative is for the City to implement the expansion of the Titusville WWTP to handle the design flows.

8.0 SELECTED ALTERNATIVES

8.1 Selected Wastewater Management Approach

The recommended alternative is Alternative No. 2A.3 – ABJ SBR 5-Tank ICEAS System With WWTP Improvements. The total project cost for the recommended alternative is \$6,454,000. The funding acquired will be used for the recommended alternative.

Based on the analysis conducted as part of this Plan Revision, the selected alternative meets the requirement of the COA which dictated that the City prepare an Official Plan Revision that focuses on the current and future sewage needs of the sewerage system. The recommended alternative is the most cost effective alternative. The City has the available management and administrative systems to operate and maintain the recommended alternative.

Based on Table 6-3 the new average monthly bill can range from \$62.06 to \$65.85 depending upon the chosen financing alternative and exclusive of grants or contributions.

8.2 Selected Financing Method

The recommended financing method is a USDA-RD, RUS Loan and Grant (if applicable).

8.3 Implementation Schedule

The proposed implementation schedule for the recommended alternative is as follows:

TABLE 8-1
Implementation Schedule

Task or Milestone	Target Date
Receive approval of TAR	Complete
Receive Updated CO&A	Complete
Start Act 537 Plan	Complete
Submit Draft Act 537 Plan to PaDEP & Service Area Municipalities	Complete
Submit Supplement to Draft Act 537 Plan to PaDEP	Complete
Submit Final Act 537 Plan to PaDEP	March 2011
Receive Comments	TBD ⁽²⁾
Finalize Report ⁽¹⁾	60 Days from Receipt of Comments
Receive Approval from PaDEP of the Act 537 Plan	TBD ⁽²⁾
Prepare Plans and Specification	TBD ⁽²⁾
Submit Permit Applications	TBD ⁽²⁾
Receive Permits	TBD ⁽²⁾
Advertise For Bids	TBD ⁽²⁾
Receive Bids	TBD ⁽²⁾
Award Contract	TBD ⁽²⁾
Start Construction	TBD ⁽²⁾
Complete Construction / Facilities Operational /	December 31, 2013

(1) Provided Final Update Revision is approved by PaDEP and administratively and technically complete.

(2) TBD – To be determined based on approval of Act 537 Plan by PaDEP

APPENDICES

APPENDIX A

**ACT 537 PLAN CONTENT AND
ENVIRONMENTAL ASSESSMENT CHECKLIST**



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

Act 537 Plan Content and Environmental Assessment Checklist

PART 1 GENERAL INFORMATION

A. Project Information

1. Project Name Act 537 Plan Update/Special Study For Wastewater Treatment Expansion
2. Brief Project Description - Official Plan Sewage Facilities Plan Update for the City of Titusville and portions of Oil Creek and Cherrytree Townships to be served by the Titusville WWTP.

B. Client (Municipality) Information

Municipality Name	County	City	Boro	Twp
Titusville	Crawford	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Municipality Contact Individual - Last Name	First Name	MI	Suffix	Title
Maclean	Pennie			City Manager
Additional Individual Last Name	First Name	MI	Suffix	Title

Municipality Mailing Address Line 1	Mailing Address Line 2		
107 North Franklin Street			
Address Last Line -- City	State	ZIP+4	
Titusville	PA	16354	
Phone + Ext.	FAX (optional)	Email (optional)	
(814) 827-5300	(814) 827-9458		

C. Site Information

Site (or Project) Name	City of Titusville	(Municipal Name) Act 537 Plan
Treatment Facilities		
Site Location Line 1	Site Location Line 2	

D. Project Consultant Information

Last Name	First Name	MI	Suffix
Rae	John		F
Title	Consulting Firm Name		
Project Manager	Gannett Fleming, Inc.		
Mailing Address Line 1	Mailing Address Line 2		
Foster Plaza 3	601 Holiday Drive		
Address Last Line -- City	State	ZIP+4	Country
Pittsburgh	PA	15220	USA
Email	Phone + Ext.	FAX	
jrae@comcast.net	(412) 922-5575	(412) 922-3717	

PART 2 ADMINISTRATIVE COMPLETENESS CHECKLIST

DEP Use Only	Indicate Page #(s) in Plan	In addition to the main body of the plan, the plan must include items one through eight listed below to be accepted for formal review by the department. Incomplete Plans will be returned unless the municipality is clearly requesting an advisory review.
_____	<u>i-iv</u>	1. Table of Contents 2. Plan Summary
_____	<u>2</u>	A. Identify the proposed service areas and major problems evaluated in the plan. (Reference - Title 25, §71.21.a.7.i). B. Identify the alternative(s) chosen to solve the problems and serve the areas of need identified in the plan. Also, include any institutional arrangements necessary to implement the chosen alternative(s). (Reference Title 25 §71.21.a.7.ii).
_____	<u>3</u>	C. Present the estimated cost of implementing the proposed alternative (including the user fees) and the proposed funding method to be used. (Reference Title 25, §71.21.a.7.ii).
_____	<u>3</u>	D. Identify the municipal commitments necessary to implement the Plan. (Reference Title 25, §71.21.a.7.iii).
_____	<u>4</u>	E. Provide a schedule of implementation for the project that identifies the MAJOR milestones with dates necessary to accomplish the project to the point of operational status. (Reference Title 25, §71.21.a.7.iv).
_____	<u>App.P</u>	3. Municipal Adoption: Original , signed and sealed Resolution of Adoption by the municipality which contains, at a minimum, alternatives chosen and a commitment to implement the Plan in accordance with the implementation schedule. (Reference Title 25, §71.31.f) Section V.F. of the Planning Guide.
_____	<u>App.N</u>	4. Planning Commission / County Health Department Comments: Evidence that the municipality has requested, reviewed and considered comments by appropriate official planning agencies of the municipality, planning agencies of the county, planning agencies with area wide jurisdiction (where applicable), and any existing county or joint county departments of health. (Reference-Title 25, §71.31.b) Section V.E.1 of the Planning Guide.
_____	<u>App.O</u>	5. Publication: Proof of Public Notice which documents the proposed plan adoption, plan summary, and the establishment and conduct of a 30 day comment period. (Reference-Title 25, §71.31.c) Section V.E.2 of the Planning Guide.
_____	<u>App.N</u>	6. Comments and Responses: Copies of ALL written comments received and municipal response to EACH comment in relation to the proposed plan. (Reference-Title 25, §71.31.c) Section V.E.2 of the Planning Guide.
_____	<u>4 & 8-2</u>	7. Implementation Schedule: A complete project implementation schedule with milestone dates specific for each existing and future area of need. Other activities in the project implementation schedule should be indicated as occurring a finite number of days from a major milestone. (Reference-Title 25, §71.31.d) Section V.F. of the Planning Guide. Include dates for the future initiation of feasibility evaluations in the project's implementation schedule for areas proposing completion of sewage facilities for planning periods in excess of five years. (Reference Title 25, §71.21.c).
_____	<u>6-1</u>	8. Consistency Documentation: Documentation indicating that the appropriate agencies have received, reviewed and concurred with the method proposed to resolve identified inconsistencies within the proposed alternative and consistency requirements in 71.21.(a)(5)(i-iii). (Reference-Title 25, §71.31.e). Appendix B of the Planning Guide.

PART 3 GENERAL PLAN CONTENT CHECKLIST

DEP Use Only	Indicate Page #(s) in Plan	Item Required
_____	<u>1-1</u>	I. Previous Wastewater Planning
		A. Identify, describe and briefly analyze all past wastewater planning for its impact on the current planning effort:
_____	<u>1-1</u>	1. Previously undertaken under the Sewage Facilities Act (Act 537). (Reference-Act 537, Section 5 §d.1).
_____	<u>N/A</u>	2. Has not been carried out according to an approved implementation schedule contained in the plans. (Reference-Title 25, §71.21.a.5.i.A-D). Section V.F of the Planning Guide.
_____	<u>N/A</u>	3. Is anticipated or planned by applicable sewer authorities or approved under a Chapter 94 Corrective Action Plan. (Reference-Title 25, §71.21.a.5.i.A&B). Section V.D. of the Planning Guide.
_____	<u>1-1</u>	4. Through planning modules for new land development, planning "exemptions" and addenda. (Reference-Title 25, §71.21.a.5.i.A).
_____	<u>2-1</u>	II. Physical and Demographic Analysis utilizing written description and mapping (All items listed below require maps, and all maps should show all current lots and structures and be of appropriate scale to clearly show significant information).
_____	<u>2-1</u> <u>Plate I</u>	A. Identification of planning area(s), municipal boundaries, Sewer Authority/Management Agency service area boundaries. (Reference-Title 25, §71.21.a.1.i).
_____	<u>N/A</u>	B. Identification of physical characteristics (streams, lakes, impoundments, natural conveyance, channels, drainage basins in the planning area). (Reference-Title 25, §71.21.a.1.ii).
_____	<u>N/A</u>	C. Soils - Analysis with description by soil type and soils mapping for areas not presently served by sanitary sewer service. Show areas suitable for in-ground onlot systems, elevated sand mounds, individual residential spray irrigation systems, and areas unsuitable for soil dependent systems. (Reference-Title 25, §71.21.a.1.iii). Show Prime Agricultural Soils and any locally protected agricultural soils. (Reference-Title 25, §71.21.a.1.iii).
_____	<u>N/A</u>	D. Geologic Features - (1) Identification through analysis, (2) mapping and (3) their relation to existing or potential nitrate-nitrogen pollution and drinking water sources. Include areas where existing nitrate-nitrogen levels are in excess of 5 mg/L. (Reference-Title 25, §71.21.a.1.iii).
_____	<u>N/A</u>	E. Topography - Depict areas with slopes that are suitable for conventional systems; slopes that are suitable for elevated sand mounds and slopes that are unsuitable for onlot systems. (Reference-Title 25, §71.21.a.1.ii).
_____	<u>2-2</u>	F. Potable Water Supplies - Identification through mapping, description and analysis. Include public water supply service areas and available public water supply capacity and aquifer yield for groundwater supplies. (Reference-Title 25 §71.21.a.1.vi). Section V.C. of the Planning Guide.

- _____ 2-2
Plate II G. Wetlands-Identify wetlands as defined in Title 25, Chapter 105 by description, analysis and mapping. Include National Wetland Inventory mapping and potential wetland areas per USDA, SCS mapped hydric soils. Proposed collection, conveyance and treatment facilities and lines must be located and labeled, along with the identified wetlands, on the map. (Reference-Title 25, §71.21.a.1.v). Appendix B, Section II.I of the Planning Guide.

- _____ 3-1 III. **Existing Sewage Facilities in the Planning Area - Identifying the Existing Needs**
- _____ 3-2
Plate III A. Identify, map and describe municipal and non-municipal, individual and community sewerage systems in the planning area including:
 1. Location, size and ownership of treatment facilities, main intercepting lines, pumping stations and force mains including their size, capacity, point of discharge. Also include the name of the receiving stream, drainage basin, and the facility's effluent discharge requirements. (Reference-Title 25, §71.21a.2.i.A).
 2. A narrative and schematic diagram of the facility's basic treatment processes including the facility's NPDES permitted capacity, and the Clean Streams Law permit number. (Reference-Title 25, §71.21.a.2.i.A).
 3. A description of problems with existing facilities (collection, conveyance and/or treatment), including existing or projected overload under Title 25, Chapter 94 (relating to municipal wasteload management) or violations of the NPDES permit, Clean Streams Law permit, or other permit, rule or regulation of DEP. (Reference-Title 25, §71.21.a.2.i.B).
 4. Details of scheduled or in-progress upgrading or expansion of treatment facilities and the anticipated completion date of the improvements. Discuss any remaining reserve capacity and the policy concerning the allocation of reserve capacity. Also discuss the compatibility of the rate of growth to existing and proposed wastewater treatment facilities. (Reference-Title 25, §71.21.a.4.i & ii).
 5. A detailed description of the municipality's operation and maintenance requirements for small flow treatment facility systems, including the status of past and present compliance with these requirements and any other requirements relating to sewage management programs. (Reference-Title 25, §71.21.a.2.i.C).
 6. Disposal areas, if other than stream discharge, and any applicable groundwater limitations. (Reference-Title 25, §71.21.a.4.i & ii).
- _____ 3-4 & App
C. B. Using DEP's publication titled *Sewage Disposal Needs Identification*, identify, map and describe areas that utilize individual and community onlot sewage disposal and, unpermitted collection and disposal systems ("wildcat" sewers, borehole disposal, etc.) and retaining tank systems in the planning area including:
 1. The types of onlot systems in use. (Reference-Title 25, §71.21.a.2.ii.A).
 2. A sanitary survey complete with description, map and tabulation of documented and potential public health, pollution, and operational problems (including malfunctioning systems) with the systems, including violations of local ordinances, the Sewage Facilities Act, the Clean Stream Law or regulations promulgated thereunder. (Reference-Title 25, §71.21.a.2.ii.B).
 3. A comparison of the types of onlot sewage systems installed in an area with the types of systems which are appropriate for the area according to soil, geologic conditions, topographic limitations sewage flows, and Title 25 Chapter 73 (relating to standards for sewage disposal facilities). (Reference-Title 25, §71.21.a.2.ii.C).
- _____ 3-4
- _____ N/A

- _____ N/A 4. An individual water supply survey to identify possible contamination by malfunctioning onlot sewage disposal systems consistent with DEP's *Sewage Disposal Needs Identification* publication. (Reference-Title 25 §71.21.a.2.ii.B).
- _____ N/A 5. Detailed description of operation and maintenance requirements of the municipality for individual and small volume community onlot systems, including the status of past and present compliance with these requirements and any other requirements relating to sewage management programs. (Reference-Title 25, §71.21.a.2.i.C).
- _____ 3-5 C. Identify wastewater sludge and septage generation, transport and disposal methods. Include this information in the sewage facilities alternative analysis including:
 - _____ 3-5 1. Location of sources of wastewater sludge or septage (Septic tanks, holding tanks, wastewater treatment facilities). (Reference-Title 25 §71.71).
 - _____ 3-5 2. Quantities of the types of sludges or septage generated. (Reference-Title 25 §71.71).
 - _____ 3-5 3. Present disposal methods, locations, capacities and transportation methods. (Reference-Title 25 §71.71).
- _____ 4-1 **IV. Future Growth and Land Development**
 - A. Identify and briefly summarize all municipal and county planning documents adopted pursuant to the Pennsylvania Municipalities Planning Code (Act 247) including:
 - _____ 4-1 1. All land use plans and zoning maps that identify residential, commercial, industrial, agricultural, recreational and open space areas. (Reference-Title 25, §71.21.a.3.iv).
 - _____ 4-1 & App.D 2. Zoning or subdivision regulations that establish lot sizes predicated on sewage disposal methods. (Reference – Title 25§71.21.a.3.iv).
 - _____ 4-1 3. All limitations and plans related to floodplain and stormwater management and special protection (Ch. 93) areas. (Reference-Title 25 §71.21.a.3.iv) Appendix B, Section II.F of the Planning Guide.
 - B. Delineate and describe the following through map, text and analysis.
 - _____ 4-2 1. Areas with existing development or plotted subdivisions. Include the name, location, description, total number of EDU's in development, total number of EDU's currently developed and total number of EDU's remaining to be developed (include time schedule for EDU's remaining to be developed). (Reference-Title 25, §71.21.a.3.i).
 - _____ 4-2 2. Land use designations established under the Pennsylvania Municipalities Planning Code (35 P.S. 10101-11202), including residential, commercial and industrial areas. (Reference-Title 25,§71.21.a.3.ii). Include a comparison of proposed land use as allowed by zoning and existing sewage facility planning. (Reference-Title 25, §71.21.a.3.iv).
 - _____ 4-2 & App. E 3. Future growth areas with population and EDU projections for these areas using historical, current and future population figures and projections of the municipality. Discuss and evaluate discrepancies between local, county, state and federal projections as they relate to sewage facilities. (Reference-Title 25, §71.21.a.1.iv). (Reference-Title 25, §71.21.a.3.iii).

<hr/>	<u>4-5</u>		<p>4. Zoning, and/or subdivision regulations; local, county or regional comprehensive plans; and existing plans of any other agency relating to the development, use and protection of land and water resources with special attention to: (Reference-Title 25, §71.21.a.3.iv).</p> <ul style="list-style-type: none"> --public ground/surface water supplies --recreational water use areas --groundwater recharge areas --industrial water use --wetlands
<hr/>	<u>4-6</u>		<p>5. Sewage planning necessary to provide adequate wastewater treatment for five and ten year future planning periods based on projected growth of existing and proposed wastewater collection and treatment facilities. (Reference-Title 25, §71.21.a.3.v).</p>
<hr/>	<u>5-1</u>	V.	Identify Alternatives to Provide New or Improved Wastewater Disposal Facilities
		A.	Conventional collection, conveyance, treatment and discharge alternatives including:
<hr/>	<u>5-1</u>		1. The potential for regional wastewater treatment. (Reference-Title 25, §71.21.a.4).
<hr/>	<u>App. F</u>		
<hr/>	<u>N/A</u>		2. The potential for extension of existing municipal or non-municipal sewage facilities to areas in need of new or improved sewage facilities. (Reference-Title 25, §71.21.a.4.i).
<hr/>	<u>N/A</u>		3. The potential for the continued use of existing municipal or non-municipal sewage facilities through one or more of the following: (Reference-Title 25, §71.21.a.4.ii).
<hr/>	<u>N/A</u>		a. Repair. (Reference-Title 25, §71.21.a.4.ii.A).
<hr/>	<u>N/A</u>		b. Upgrading. (Reference-Title 25, §71.21.a.4.ii.B).
<hr/>	<u>N/A</u>		c. Reduction of hydraulic or organic loading to existing facilities. (Reference-Title 25, §71.71).
<hr/>	<u>N/A</u>		d. Improved operation and maintenance. Reference-Title 25, §71.21.a.4.ii.C).
<hr/>	<u>N/A</u>		e. Other applicable actions that will resolve or abate the identified problems. (Reference-Title 25, §71.21.a.4.ii.D).
<hr/>	<u>5-2</u>		4. Repair or replacement of existing collection and conveyance system components. (Reference-Title 25, §71.21.a.4.ii.A).
<hr/>	<u>N/A</u>		5. The need for construction of new community sewage systems including sewer systems and/or treatment facilities. (Reference-Title 25, §71.21.a.4.iii).
<hr/>	<u>N/A</u>		6. Use of innovative/alternative methods of collection/conveyance to serve needs areas using existing wastewater treatment facilities. (Reference-Title 25, §71.21.a.4.ii.B).
<hr/>	<u>N/A</u>	B.	The use of individual sewage disposal systems including individual residential spray irrigation systems based on:
<hr/>	<u>N/A</u>		1. Soil and slope suitability. (Reference-Title 25, §71.21.a.2.ii.C).
<hr/>	<u>N/A</u>		2. Preliminary hydrogeologic evaluation. (Reference-Title 25, §71.21.a.2.ii.C).
<hr/>	<u>N/A</u>		3. The establishment of a sewage management program. (Reference-Title 25, §71.21.a.4.iv). See also Part "F" below.
<hr/>	<u>N/A</u>		4. The repair, replacement or upgrading of existing malfunctioning systems in

- _____ N/A areas suitable for onlot disposal considering: (Reference-Title 25, §71.21.a.4).
- _____ N/A a. Existing technology and sizing requirements of Title 25 Chapter 73. (Reference-Title 25, §73.31-73.72).
- _____ N/A b. Use of expanded absorption areas or alternating absorption areas. (Reference-Title 25, §73.16).
- _____ N/A c. Use of water conservation devices. (Reference-Title 25, §71.73.b.2.iii).
- _____ N/A C. The use of small flow sewage treatment facilities or package treatment facilities to serve individual homes or clusters of homes with consideration of: (Reference-Title 25, §71.64.d).
- _____ N/A 1. Treatment and discharge requirements. (Reference-Title 25, §71.64.d).
- _____ N/A 2. Soil suitability. (Reference-Title 25, §71.64.c.i).
- _____ N/A 3. Preliminary hydrogeologic evaluation. (Reference-Title 25, §71.64.c.2).
- _____ N/A 4. Municipal, Local, Agency or other controls over operation and maintenance requirements through a Sewage Management Program. (Reference-Title 25, §71.64.d). See Part "F" below.
- _____ N/A D. The use of community land disposal alternatives including:
- _____ N/A 1. Soil and site suitability. (Reference-Title 25, §71.21.a.2.ii.C).
- _____ N/A 2. Preliminary hydrogeologic evaluation. (Reference-Title 25, §71.21.a.2.ii.C).
- _____ N/A 3. Municipality, Local Agency or Other Controls over operation and maintenance requirements through a Sewage Management Program (Reference-Title 25, §71.21.a.2.ii.C). See Part "F" below.
- _____ N/A 4. The rehabilitation or replacement of existing malfunctioning community land disposal systems. (See Part "V", B, 4, a, b, c above). See also Part "F" below.
- _____ N/A E. The use of retaining tank alternatives on a temporary or permanent basis including: (Reference- Title 25, §71.21.a.4).
- _____ N/A 1. Commercial, residential and industrial use. (Reference-Title 25, §71.63.e).
- _____ N/A 2. Designated conveyance facilities (pumper trucks). (Reference-Title 25, §71.63.b.2).
- _____ N/A 3. Designated treatment facilities or disposal site. (Reference-Title 25, §71.63.b.2).
- _____ N/A 4. Implementation of a retaining tank ordinance by the municipality. (Reference-Title 25, §71.63.c.3). See Part "F" below.
- _____ N/A 5. Financial guarantees when retaining tanks are used as an interim sewage disposal measure. (Reference-Title 25, §71.63.c.2).
- _____ N/A F. Sewage Management Programs to assure the future operation and maintenance of existing and proposed sewage facilities through:
- _____ N/A 1. Municipal ownership or control over the operation and maintenance of individual onlot sewage disposal systems, small flow treatment facilities, or other traditionally non-municipal treatment facilities. (Reference-Title 25, §71.21.a.4.iv).
- _____ N/A 2. Required inspection of sewage disposal systems on a schedule established by the municipality. (Reference-Title 25, §71.73.b.1.).
- _____ N/A 3. Required maintenance of sewage disposal systems including septic and aerobic treatment tanks and other system components on a schedule

established by the municipality. (Reference-Title 25,§1.73.b.2).

- N/A 4. Repair, replacement or upgrading of malfunctioning onlot sewage systems. (Reference-Title 25,§1.21.a.4.iv) and§1.73.b.5 through:
 - N/A a. Aggressive pro-active enforcement of ordinances that require operation and maintenance and prohibit malfunctioning systems. (Reference-Title 25,§1.73.b.5).
 - N/A b. Public education programs to encourage proper operation and maintenance and repair of sewage disposal systems.
- N/A 5. Establishment of joint municipal sewage management programs. (Reference-Title 25,§1.73.b.8).
- N/A 6. Requirements for bonding, escrow accounts, management agencies or associations to assure operation and maintenance for non-municipal facilities. (Reference-Title 25,§1.71).
- N/A G. Non-structural comprehensive planning alternatives that can be undertaken to assist in meeting existing and future sewage disposal needs including: (Reference-Title 25,§1.21.a.4).
 - 1. Modification of existing comprehensive plans involving:
 - N/A a. Land use designations. (Reference-Title 25,§1.21.a.4).
 - N/A b. Densities. (Reference-Title 25,§1.21.a.4).
 - N/A c. Municipal ordinances and regulations. (Reference-Title 25,§1.21.a.4).
 - N/A d. Improved enforcement. (Reference-Title 25,§1.21.a.4).
 - N/A e. Protection of drinking water sources. (Reference-Title 25,§1.21.a.4).
 - N/A 2. Consideration of a local comprehensive plan to assist in producing sound economic and consistent land development. (Reference-Title 25,§1.21.a.4).
 - N/A 3. Alternatives for creating or changing municipal subdivision regulations to assure long-term use of on-site sewage disposal that consider lot sizes and protection of replacement areas. (Reference-Title 25,§1.21.a.4).
 - N/A 4. Evaluation of existing local agency programs and the need for technical or administrative training. (Reference-Title 25,§1.21.a.4).
- 5-4 H. A no-action alternative which includes discussion of both short-term and long-term impacts on: (Reference-Title 25,§1.21.a.4).
 - 5-4 1. Water Quality/Public Health. (Reference-Title 25,§1.21.a.4).
 - 5-4 2. Growth potential (residential, commercial, industrial). (Reference-Title 25, §1.21.a.4).
 - 5-5 3. Community economic conditions. (Reference-Title 25,§1.21.a.4).
 - 5-5 4. Recreational opportunities. (Reference-Title 25,§1.21.a.4).
 - 5-5 5. Drinking water sources. (Reference-Title 25,§1.21.a.4).
 - 5-5 6. Other environmental concerns. (Reference-Title 25,§1.21.a.4).
- 6-1 VI. Evaluation of Alternatives
 - A. Technically feasible alternatives identified in Section V of this check-list must be evaluated for consistency with respect to the following: (Reference-Title 25, §1.21.a.5.i.).
 - 6-2 1. Applicable plans developed and approved under **Sections 4 and 5 of the Clean Streams Law or Section 208 of the Clean Water Act** (33 U.S.C.A. 1288). (Reference-Title 25, §1.21.a.5.i.A). Appendix B, Section II.A of the

Planning Guide.

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|-------|---------------------------|---|
| _____ | <u>6-2</u> | 2. Municipal wasteload management Corrective Action Plans or Annual Reports developed under PA Code, Title 25, Chapter 94. (Reference-Title 25, §71.21.a.5.i.B). The municipality's recent Wasteload Management (Chapter 94) Reports should be examined to determine if the proposed alternative is consistent with the recommendations and findings of the report. Appendix B, Section II.B of the Planning Guide. |
| _____ | <u>N/A</u> | 3. Plans developed under Title II of the Clean Water Act (33 U.S.C.A. 1281-1299) or Titles II and VI of the Water Quality Act of 1987 (33 U.S.C.A. 1251-1376). (Reference-Title 25, §71.21.a.5.i.C). Appendix B, Section II.E of the Planning Guide. |
| _____ | <u>N/A</u> | 4. Comprehensive plans developed under the Pennsylvania Municipalities Planning Code. (Reference-Title 25, §71.21.a.5.i.D). The municipality's comprehensive plan must be examined to assure that the proposed wastewater disposal alternative is consistent with land use and all other requirements stated in the comprehensive plan. Appendix B, Section II.D of the Planning Guide. |
| _____ | <u>6-2</u> | 5. Antidegradation requirements as contained in PA Code, Title 25, Chapters 93, 95 and 102 (relating to water quality standards, wastewater treatment requirements and erosion control) and the Clean Water Act. (Reference-Title 25, §71.21.a.5.i.E). Appendix B, Section II.F of the Planning Guide. |
| _____ | <u>N/A</u> | 6. State Water Plans developed under the Water Resources Planning Act (42 U.S.C.A. 1962-1962 d-18). (Reference-Title 25, §71.21.a.5.i.F). Appendix B, Section II.C of the Planning Guide. |
| _____ | <u>6-2</u> | 7. Pennsylvania Prime Agricultural Land Policy contained in Title 4 of the Pennsylvania Code, Chapter 7, Subchapter W. Provide narrative on local municipal policy and an overlay map on prime agricultural soils. (Reference-Title 25, §71.21.a.5.i.G). Appendix B, Section II.G of the Planning Guide. |
| _____ | <u>6-2</u> | 8. County Stormwater Management Plans approved by DEP under the Storm Water Management Act (32 P.S. 680.1-680.17). (Reference-Title 25, §71.21.a.5.i.H). Conflicts created by the implementation of the proposed wastewater alternative and the existing recommendations for the management of stormwater in the county Stormwater Management Plan must be evaluated and mitigated. If no plan exists, no conflict exists. Appendix B, Section II.H of the Planning Guide. |
| _____ | <u>6-3 & Plate II</u> | 9. Wetland Protection. Using wetland mapping developed under Checklist Section II.G, identify and discuss mitigative measures including the need to obtain permits for any encroachments on wetlands from the construction or operation of any proposed wastewater facilities. (Reference-Title 25, §71.21.a.5.i.I) Appendix B, Section II.I of the Planning Guide. |
| _____ | <u>6-3 & App.G</u> | 10. Protection of rare, endangered or threatened plant and animal species as identified by the Pennsylvania Natural Diversity Inventory (PNDI). (Reference-Title 25, §71.21.a.5.i.J). Provide DEP with a copy of the completed Request For PNDI Search document. Also provide a copy of the response letter from the Department of Conservation and Natural Resources' Bureau of Forestry regarding the findings of the PNDI search. Appendix B, Section II.J of the Planning Guide. |
| _____ | <u>6-3 & App. H</u> | 11. Historical and archaeological resource protection under P.C.S. Title 37, Section 507 relating to cooperation by public officials with the Pennsylvania Historical and Museum Commission. (Reference-Title 25, §71.21.a.5.i.K). Provide the department with a completed copy of a Cultural Resource Notice |

request of the Bureau of Historic Preservation (BHP) to provide a listing of known historical sites and potential impacts on known archaeological and historical sites. Also provide a copy of the response letter from the BHP. Appendix B, Section II.K of the Planning Guide.

- _____ 6-3 B. Provide for the resolution of any inconsistencies in any of the points identified in Section VI.A. of this checklist by submitting a letter from the appropriate agency stating that the agency has received, reviewed and concurred with the resolution of identified inconsistencies. (Reference-Title 25, §71.21.a.5.ii). Appendix B of the Planning Guide.
- _____ 6-4 C. Evaluate alternatives identified in Section V of this checklist with respect to applicable water quality standards, effluent limitations or other technical, legislative or legal requirements. (Reference-Title 25, §71.21.a.5.iii).
- _____ 6-4 D. Provide cost estimates using present worth analysis for construction, financing, on going administration, operation and maintenance and user fees for alternatives identified in Section V of this checklist. Estimates shall be limited to areas identified in the plan as needing improved sewage facilities within five years from the date of plan submission. (Reference-Title 25, §71.21.a.5.iv).
- _____ 6-10 & App. I, J, K, & L App. M E. Provide an analysis of the funding methods available to finance the proposed alternatives evaluated in Section V of this checklist. Also provide documentation to demonstrate which alternative and financing scheme combination is the most cost-effective; and a contingency financial plan to be used if the preferred method of financing cannot be implemented. The funding analysis shall be limited to areas identified in the plan as needing improved sewage facilities within five years from the date of the plan submission. (Reference-Title 25, §71.21.a.5.v).
- _____ 6-13 F. Analyze the need for immediate or phased implementation of each alternative proposed in Section V of this checklist including: (Reference-Title 25, §71.21.a.5.vi).
- _____ 6-13 1. A description of any activities necessary to abate critical public health hazards pending completion of sewage facilities or implementation of sewage management programs. (Reference-Title 25, §71.21.a.5.vi.A).
- _____ 6-13 2. A description of the advantages, if any, in phasing construction of the facilities or implementation of a sewage management program justifying time schedules for each phase. (Reference-Title 25, §71.21.a.5.vi.B).
- _____ 6-13 G. Evaluate administrative organizations and legal authority necessary for plan implementation. (Reference - Title 25, §71.21.a.5.vi.D.).
- _____ 7-1 **VII. Institutional Evaluation**
- _____ 7-1 A. Provide an analysis of all existing wastewater treatment authorities, their past actions and present performance including:
 - _____ 7-1 1. Financial and debt status. (Reference-Title 25, §71.61.d.2).
 - _____ 7-1 2. Available staff and administrative resources. (Reference-Title 25, §71.61.d.2)
 - _____ 7-1 3. Existing legal authority to:
 - _____ 7-1 a. Implement wastewater planning recommendations. (Reference-Title 25, §71.61.d.2).
 - _____ 7-1 b. Implement system-wide operation and maintenance activities. (Reference-Title 25, §71.61.d.2).
 - _____ 7-1 c. Set user fees and take purchasing actions. (Reference-Title 25, §71.61.d.2).
 - _____ 7-1 d. Take enforcement actions against ordinance violators. (Reference-Title 25,

§71.61.d.2).

- _____ 7-1 e. Negotiate agreements with other parties. (Reference-Title 25, §71.61.d.2).
- _____ 7-1 f. Raise capital for construction and operation and maintenance of facilities. (Reference-Title 25, §71.61.d.2).
- _____ 7-1 B. Provide an analysis and description of the various institutional alternatives necessary to implement the proposed technical alternatives including:
- _____ 7-1 1. Need for new municipal departments or municipal authorities. (Reference-Title 25, §71.61.d.2).
- _____ 7-1 2. Functions of existing and proposed organizations (sewer authorities, onlot maintenance agencies, etc.). (Reference-Title 25, §71.61.d.2).
- _____ 7-1 3. Cost of administration, implementability, and the capability of the authority/agency to react to future needs. (Reference-Title 25, §71.61.d.2).
- _____ 7-1 C. Describe all necessary administrative and legal activities to be completed and adopted to ensure the implementation of the recommended alternative including:
- _____ 7-1 1. Incorporation of authorities or agencies. (Reference-Title 25, §71.61.d.2).
- _____ 7-1 2. Development of all required ordinances, regulations, standards and inter-municipal agreements. (Reference-Title 25, §71.61.d.2).
- _____ 7-1 3. Description of activities to provide rights-of-way, easements and land transfers. (Reference-Title 25, §71.61.d.2).
- _____ 7-1 4. Adoption of other municipal sewage facilities plans. (Reference-Title 25, §71.61.d.2).
- _____ 7-1 5. Any other legal documents. (Reference-Title 25, §71.61.d.2).
- _____ 7-1 6. Dates or timeframes for items 1-5 above on the project's implementation schedule.
- _____ 7-1 D. Identify the proposed institutional alternative for implementing the chosen technical wastewater disposal alternative. Provide justification for choosing the specific institutional alternative considering administrative issues, organizational needs and enabling legal authority. (Reference-Title 25, §71.61.d.2).

8-1 VIII. Implementation Schedule and Justification for Selected Technical & Institutional Alternatives

- _____ 8-1 A. Identify the technical wastewater disposal alternative which best meets the wastewater treatment needs of each study area of the municipality. Justify the choice by providing documentation which shows that it is the best alternative based on:
- _____ 8-1 1. Existing wastewater disposal needs. (Reference-Title 25, §71.21.a.6).
- _____ 8-1 2. Future wastewater disposal needs. (five and ten years growth areas). (Reference-Title 25, §71.21.a.6).
- _____ 8-1 3. Operation and maintenance considerations. (Reference-Title 25, §71.21.a.6).
- _____ 8-1 4. Cost-effectiveness. (Reference-Title 25, §71.21.a.6).
- _____ 8-1 5. Available management and administrative systems. (Reference-Title 25, §71.21.a.6).

8-1

6. Available financing methods. (Reference-Title 25, §71.21.a.6).

8-1

7. Environmental soundness and compliance with natural resource planning and preservation programs. (Reference-Title 25, §71.21.a.6).

8-1

B. Designate and describe the capital financing plan chosen to implement the selected alternative(s). Designate and describe the chosen back-up financing plan. (Reference-Title 25, §71.21.a.6)

8-2

C. Designate and describe the implementation schedule for the recommended alternative, including justification for any proposed phasing of construction or implementation of a Sewage Management Program. (Reference – Title 25 §71.31d)

Q

IX. Environmental Report (ER) generated from the Uniform Environmental Review Process (UER)

A. Complete an ER as required by the UER process and as described in the DEP Technical Guidance 381-5511-111. Include this document as "Appendix A" to the Act 537 Plan Update Revision. Note: *An ER is required only for Wastewater projects proposing funding through any of the funding sources identified in the UER.*

APPENDIX B

CONSENT ORDER AND AGREEMENT

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

IN THE MATTER OF:

City of Titusville	:	Clean Streams Law
107 North Franklin Street	:	Sewage Facilities Act
Titusville, PA 16354	:	NPDES Permit No. PA0036650

CONSENT ORDER AND AGREEMENT

This Consent Order and Agreement is entered into this 25th day of October 2010, by and between the Commonwealth of Pennsylvania, Department of Environmental Protection ("Department") and the City of Titusville ("Titusville").

Findings

The Department has found and determined the following:

- A. The Department is the agency with the duty and the authority to administer and enforce The Clean Streams Law, Act of June 22, 1937, P.L. 1987, *as amended*, 35 P.S. §§691.1-691.1001 ("Clean Streams Law"); the Pennsylvania Sewage Facilities Act, Act of January 24, 1966, P.L. 1535, *as amended*, 35 P.S. §§750.1-750.20a ("Sewage Facilities Act"); Section 1917-A of the Administrative Code of 1929, Act of April 9, 1929, P.L. 177, *as amended*, 71 P.S. §§510-17 ("Administrative Code"); and the rules and regulations promulgated thereunder ("Regulations").
- B. Titusville is a "municipality," as defined in Section 1 of the Clean Streams Law, 35 P.S. §691.1, and has a mailing address of 107 North Franklin Street, Titusville, Pennsylvania 16354.
- C. Titusville owns and operates a publicly-owned treatment works ("POTW") which consists of a wastewater treatment plant ("Plant") and sewer system located within the boundaries of the City of Titusville and a portion of Oil Creek Township in Crawford County.

D. Pursuant to Water Quality Management Permit No. 2002410 ("WQM Permit"), the Plant is designed and permitted to treat an average flow of 4.0 million gallons per day ("MGD") with a 10.0 MGD process peak and a 12.0 MGD hydraulic peak.

E. The POTW consists of both "combined" and "separate" sanitary sewer systems, as those terms are defined in 25 Pa. Code §94.1. When hydraulically overloaded, the system discharges combined wastewater through combined sewer overflows ("CSOs"), which are allowed to discharge only when flows in the combined sewer system exceed conveyance or treatment capacity of the system during wet weather periods.

F. All entities that discharge pollutants into waters of the Commonwealth must first obtain a National Pollutant Discharge Elimination System ("NPDES") permit for their discharges, as required by the Federal Water Pollution Control Act, 33 U.S.C. §1257, *et seq.*, and the Clean Streams Law.

G. On July 19, 1999, the Department issued NPDES Permit No. PA0036650-Amendment No. 1 ("NPDES Permit") to Titusville, for the POTW's discharges to Oil Creek and Church Run, which are "waters of the Commonwealth," as defined in Section 1 of the Clean Streams Law, 35 P.S. §691.1.

H. The NPDES Permit authorizes the use of five CSOs, including CSO Outfall 003 located at Petroleum Street/Brown Street ("Brown Street CSO").

I. At all times relevant hereto, Titusville is permitted to discharge only as authorized by, and subject to the terms, conditions, and limitations set forth in the NPDES Permit.

J. The NPDES Permit contains an expiration date of July 18, 2004. Therefore, in accordance with 25 Pa. Code §92.9(b), an application to renew the NPDES Permit was due to the Department by January 20, 2004.

K. On January 16, 2004, the Department received an application from Titusville to renew the NPDES Permit.

L. On February 4, 2005, the Department published a notice of the draft renewal NPDES Permit in the *Pennsylvania Bulletin* and Titusville has reviewed and commented on the draft renewal NPDES Permit. Upon signing this Consent Order and Agreement, the Department will issue the final renewal NPDES Permit to Titusville. The final renewal NPDES Permit is attached as Exhibit A and incorporated by reference.

Consent Order and Agreement

M. On February 4, 2004, the Department and Titusville entered into a Consent Order and Agreement ("2004 Agreement") to resolve violations of the NPDES Permit and the Clean Streams Law.

N. As part of the 2004 Agreement, Titusville was required to install a new headworks at the Plant, which included the installation of new pumps, blowers, electrical equipment, and the replacement of its programmable logic controllers so that the Plant could accept and treat peak flows of 12.0 MGD ("Phase II Upgrade Project"). The Phase II Upgrade Project also included the installation of a 24-inch parallel interceptor relief sewer to carry the wastewater around the Brown Street CSO and into the Plant, thereby reducing the frequency of sewage overflows at the Brown Street CSO

O. Titusville completed the Phase II Upgrade Project as approved by the Department pursuant to a Water Quality Management permit on January 31, 2005, and Titusville has completed all of the other obligations of the 2004 Agreement.

Operation of the Plant

P. On August 7, 2007, the Department inspected the Plant and determined that the Plant is not being operated in a manner to adequately treat flows greater than 7.5 MGD. Under high flow

conditions, the Plant's influent gate is partially closed to prevent acceptance of peak flows. This mode of operation restricts the amount of flow to be treated at the Plant and on occasion may cause sewage flow to back up and overflow at the Brown Street CSO. Titusville's operation of the Plant, in this manner, is contrary to the WQM Permit.

Q. On September 1, 2009, the Department inspected the Plant and documented operational and mechanical problems with the sequential batch reactors. The aeration system, decant piping, and associated equipment for the sequential batch reactors are outdated and in poor condition, and impair the Plant's ability to handle peak flows. As a result, Titusville authorized its engineers to prepare plans and specifications to correct this problem.

Sewerage Facilities Planning

R. Section 5 of the Sewage Facilities Act, 35 P.S. §750.5, and 25 Pa. Code §71.11, requires every municipality to develop and implement a comprehensive official sewage plan ("Official Plan"), which provides for the resolution of the existing and future sewage disposal needs of a municipality.

S. Section 5(d) of the Sewage Facilities Act, 35 P.S. §750.5(d), requires that every Official Plan provide for adequate sewage treatment facilities which will prevent the discharge of untreated or inadequately treated sewage or other waste into any waters of the Commonwealth or otherwise provide for the safe and sanitary treatment of sewage or other waste.

T. The Department has determined that Titusville is not meeting the existing sewage needs of its community because the Plant is not able to accept and treat wastewater flows in accordance with its WQM Permit.

Violations

U. Titusville's failure to comply with the WQM Permit constitutes violations of Sections 207 and 402 of the Clean Streams Law, 35 P.S. §§691.207 and 691.402.

V. Titusville's failure to properly operate and maintain the Plant constitutes violations of Sections 201, 202, and 401 of the Clean Streams Law, 35 P.S. §§691.201, 691.202, and 691.401, and the NPDES Permit.

W. Titusville's failure to meet the existing sewage needs of its community constitutes violations of Section 5 of the Sewage Facilities Act, 35 P.S. §750.5, and Sections 401 and 601 of the Clean Streams Law, 35 P.S. §§691.401 and 691.601.

X. The violations set forth in Paragraphs U and V, above, constitute unlawful conduct under Section 611 of the Clean Streams Law, 35 P.S. §691.611; a statutory nuisance under Sections 401 and 601 of the Clean Streams Law, 35 P.S. §§691.401 and 691.601; and subject Titusville to civil penalty liability under Section 605 of the Clean Streams Law, 35 P.S. §691.605.

Y. The violations set forth in Paragraph W, above, constitute a statutory nuisance under Section 14 of the Sewage Facilities Act, 35 P.S. §750.14; and subject Titusville to civil penalty liability under Section 13a of the Sewage Facilities Act, 35 P.S. §750.13a.

Z. Through this Consent Order and Agreement, Titusville agrees to bring the Plant into compliance with the Clean Streams Law, the Sewage Facilities Act, the final renewal NPDES Permit, and the WQM Permit on a schedule acceptable to the Department.

Order

After full and complete negotiation of all matters set forth in this Consent Order and Agreement, and upon mutual exchange of the covenants contained herein, the Parties desiring to avoid litigation and intending to be legally bound, it is hereby ORDERED by the Department and AGREED to by Titusville as follows:

1. **Authority.** This Consent Order and Agreement is an Order of the Department authorized and issued pursuant to Section 610 of the Clean Streams Law, 35 P.S. §691.610; Sections

5 and 10 of the Sewage Facilities Act, 35 P.S. §§750.5 and 750.10; and Section 1917-A of the Administrative Code.

2. Findings.

a. Titusville agrees that the Findings in Paragraphs A through Z are true and correct and, in any matter or proceeding involving Titusville and the Department, Titusville shall not challenge the accuracy or validity of these Findings.

b. The Parties do not authorize any other persons to use the Findings in this Consent Order and Agreement in any matter or proceeding.

3. Corrective Actions. Titusville shall take all actions necessary at the Plant, including obtaining all funding and necessary permits and/or planning approvals from the Department to, comply with the Clean Streams Law, the Sewage Facilities Act, the final renewal NPDES Permit, the WQM Permit, and all relevant Regulations. In addition, Titusville shall complete the following tasks in accordance with the following schedule, below:

a. Brown Street CSO Meter Engineering Evaluation.

i. Titusville shall conduct an "Engineering Evaluation" of the Brown Street CSO and the ability of its flow meter to accurately measure overflow rates and volumes, as such information will be needed to develop any future revisions to the Official Plan.

ii. Within 90 days of the date of this Consent Order and Agreement, Titusville shall submit a written report, for Department review and approval that identifies the findings of its Engineering Evaluation ("Evaluation Report"). The Evaluation Report shall contain:

- 1) a physical description and drawings of the current Petroleum Street/Brown Street regulator structure;
- 2) a detailed description of how CSO overflow rates and volumes are currently metered at the Brown Street CSO;
- 3) a discussion on whether any problems exist with the current setup that could cause inaccurate or false CSO overflow rates or volumes to be recorded;

- 4) a description of any necessary improvements or modifications needed to ensure accurate measurement and recording of CSO overflow rates or volumes; and,
- 5) if improvements are necessary a schedule for completing those improvements.

b. Update Revision.

- i. **By November 30, 2010**, Titusville shall submit to the Department a draft Update Revision to its Official Plan. The draft Update Revision shall be in accordance with 25 Pa. Code §§71.21 and 71.31, and shall contain an implementation schedule that provides for all necessary corrective actions to come into compliance with current and future sewage needs.
- ii. Within 60 days of receiving written comments from the Department concerning the draft Update Revision, Titusville shall submit to the Department a final Update Revision ("Final Update Revision"). The Final Update Revision shall be Administratively Complete, in accordance with 25 Pa. Code §§71.21 and 71.31, and contain an implementation schedule that provides for the construction of the corrective actions necessary to come into compliance with current and future sewage needs by **December 31, 2013**. The Final Update Revision shall include a resolution from Titusville ("Resolution") evidencing adoption of the Final Update Revision as an update to Titusville's Official Plan.
- iii. If the Department determines that the Final Update Revision is Administratively Complete but, has technical deficiencies, Titusville shall, within 60 days of receiving the Department's written comments, submit to the Department a revised Final Update Revision that addresses the Department's written comments.
- iv. If the Department determines that revisions to the Final Update Revision under Paragraphs 3.b.iii. above, represent significant changes to the selected alternative and/or the implementation schedule set forth in the original Final Update Revision submitted pursuant to Paragraph 3.b.ii. above, Titusville agrees upon written notice from the Department of such determination, to submit to the Department an updated Resolution evidencing its adoption of the revised Final Update Revision.
- v. If the Department disapproves the revised Final Update Revision submitted pursuant to Paragraph 3.b.iii. above, Titusville shall, within 60 days of receipt of the Department's written disapproval, submit a new revised Final Update Revision that includes the Resolution evidencing the adoption of the new revised Final Update Revision.

This process shall continue until such time as the Department has approved an Update Revision for Titusville.

- vi. Upon the Department's written approval of the Final Update Revision the revised Final Update Revision, or a new revised Final Update Revision, as provided for in Paragraph 3.b. above, Titusville, shall implement and complete by **December 31, 2013**, the approved Final Update Revision in accordance with the schedule(s) therein. The approved Final Update Revision and implementation schedule(s) shall be incorporated herein by reference and shall be obligations under this Consent Order and Agreement and enforceable hereunder.

4. **Quarterly Progress Reports.** Titusville shall submit to the Department quarterly written progress reports of its efforts to comply with the requirements of this Consent Order and Agreement. Reports shall be due to the Department on or before the 30th day after the end of each quarterly calendar period (*i.e.* January 30, April 30, July 30, October 30, *et seq.*) and shall continue thereafter until this Consent Order and Agreement is terminated.

5. **Submission of Documents.** Except for the Update Revision documents submitted in accordance with Paragraph 3.b., above, with regard to any other document that Titusville is required to submit pursuant to this Consent Order and Agreement, the Department will review the document and will approve or disapprove the document, or portion thereof, in writing. If the Department disapproves the document, or any portion of the document, Titusville shall submit a revised document to the Department that addresses the Department's concerns within a time specified by the Department. The Department will approve or disapprove the revised document in writing. Upon approval by the Department the document shall become a part of this Consent Order and Agreement for all purposes and shall be enforceable as such.

6. **Agreement Not to Appeal the Final Renewed NPDES Permit.** Titusville hereby agrees not to appeal the final renewal NPDES Permit, which will be issued by the Department to Titusville upon execution of this Consent Order and Agreement. Titusville has reviewed, commented, and approved the final renewal NPDES Permit.

7. **Civil Penalty Settlement.** Upon signing this Consent Order and Agreement, Titusville shall pay a civil penalty of \$1,000. The payment is in settlement of the Department's claim for civil penalties for the violations set forth in Paragraphs U, V, and W above, covering the dates set forth herein. The payment shall be made by corporate check or the like made payable to Commonwealth of Pennsylvania Clean Water Fund and sent to the individual at the address set forth in Paragraph 13 (Correspondence with the Department), below.

8. **Stipulated Civil Penalties.** If Titusville fails to comply with any term or provision of this Consent Order and Agreement, including failing to comply with any obligation and schedule in a document approved by the Department under this Consent Order and Agreement, Titusville shall be in violation of this Consent Order and Agreement and, in addition to other applicable remedies, shall pay a civil penalty in the amount determined under the following schedule:

- a. Titusville shall pay the following civil penalties:
 - i. \$250 per month for any and all effluent discharge violations, in a month, as reported on the monthly Discharge Monitoring Reports; and,
 - ii. \$100 per day for failing to comply with the due dates in Paragraph 3 and 4, above, and in any schedule of a document submitted under Paragraph 3, above, as approved by the Department.
- b. Stipulated civil penalty payments shall be payable monthly on or before the 30th day of each succeeding month, and shall be forwarded as described in Paragraph 7 (Civil Penalty), above.
- c. Any payment under this Paragraph shall neither waive Titusville's duty to meet its obligations under this Consent Order and Agreement nor preclude the Department from commencing an action to compel Titusville's compliance with the terms and conditions of this Consent Order and Agreement. The payment resolves only Titusville's liability for civil penalties arising from the violation of this Consent Order and Agreement for which the payment is made.

d. Stipulated civil penalty payments shall be due automatically and without notice.

e. For all other violations of the obligations under this Consent Order and Agreement, Titusville shall be subject to civil penalty liability pursuant to Section 605 of the Clean Streams Law, 35 P.S. §691.605, and Section 13a of the Sewage Facilities Act, 35 P.S. §750.13.1(a).

9. ***Additional Remedies.***

a. If Titusville fails to comply with any provision of this Consent Order and Agreement, the Department may, in addition to the remedies prescribed herein, pursue any remedy available for a violation of an order of the Department, including an action to enforce this Consent Order and Agreement.

b. The remedies provided by this Paragraph and Paragraph 8 above, are cumulative and the exercise of one does not preclude the exercise of any other. The failure of the Department to pursue any remedy shall not be deemed to be a waiver of that remedy. The payment of a stipulated civil penalty, however, shall preclude any further assessment of civil penalties for the violation for which the stipulated civil penalty is paid.

10. ***Reservation of Rights.*** The Department reserves the right to require additional measures to achieve compliance with applicable law. Titusville reserves the right to challenge any action which the Department may take to require those measures.

11. ***Liability of Titusville.*** Titusville shall be liable for violations of this Consent Order and Agreement, including those caused by, contributed to, or allowed by its board members, officers, directors, supervisors, agents, employees, contractors, successors, and assigns.

12. *Transfer of POTW and/or Plant.*

a. Titusville's duties and obligations under this Consent Order and Agreement shall not be modified, diminished, terminated, or otherwise altered by the transfer of any legal or equitable interest in the POTW, the Plant, or any part thereof.

b. If Titusville intends to transfer any legal or equitable interest in the POTW, the Plant, or any part thereof, which is affected by this Consent Order and Agreement, Titusville shall serve a copy of this Consent Order and Agreement upon the prospective transferee of the legal and equitable interest at least 30 days prior to the contemplated transfer and shall simultaneously inform the Department of such intent pursuant to Paragraph 13 (Correspondence with the Department), below.

c. If Titusville is in compliance with all of its obligations under this Consent Order and Agreement, the Department in its sole discretion, may agree to modify or terminate Titusville's duties and obligations under this Consent Order and Agreement upon transfer of the POTW, the Plant, or any part thereof, and upon the transferee entering into an enforceable agreement with the Department concerning the matters addressed in this Consent Order and Agreement. Titusville agrees to waive its rights to appeal the Department's decision in this regard.

13. *Correspondence with the Department.* All correspondence with the Department concerning this Consent Order and Agreement shall be addressed to:

Compliance and Monitoring Manager
Water Management
Northwest Region
Commonwealth of Pennsylvania
Department of Environmental Protection
230 Chestnut Street
Meadville, PA 16335-3481
Telephone: 814-332-6942
Fax: 814-332-6121

14. ***Correspondence with Titusville.*** All correspondence with Titusville concerning this Consent Order and Agreement shall be addressed to:

City Manager
City of Titusville
107 North Franklin Street
Titusville, PA 16354
Telephone: 814-827-5300
Fax: 814-827-9458

Titusville shall notify the Department, in writing, whenever there is a change in the contact person's address. Service of any notice or any legal process for any purpose under this Consent Order and Agreement, including its enforcement, may be made by mailing a copy by first class-mail to the above addresses.

15. ***Decisions Under Consent Order and Agreement.*** Except as provided in Paragraph 12.c., above, and Paragraph 22, below, any decision which the Department makes under the provisions of this Consent Order and Agreement, including a notice that stipulated civil penalties are due, is intended to be neither a final action under 25 Pa. Code §1021.2, nor an adjudication under 2 Pa.C.S.A. §101. Any objection, which Titusville may have to the decision, will be preserved until the Department enforces this Consent Order and Agreement.

16. ***Severability.*** The Paragraphs of this Consent Order and Agreement shall be severable and should any part hereof be declared invalid or unenforceable, the remainder shall continue in full force and effect between the Parties.

17. ***Entire Agreement.*** This Consent Order and Agreement shall constitute the entire integrated agreement of the Parties. No prior or contemporaneous communications or prior drafts shall be relevant or admissible for purposes of determining the meaning or intent of any provisions herein in any litigation or any other proceeding.

18. **Attorney Fees.** The Parties shall bear their respective attorney fees, expenses, and other costs in the prosecution or defense of this matter or any related matters, arising prior to execution of this Consent Order and Agreement.

19. **Modifications.** No changes, additions, modifications, or amendments of this Consent Order and Agreement shall be effective unless they are set out in writing and signed by the Parties.

20. **Force Majeure.**

a. If Titusville is prevented from complying in a timely manner with any time limit imposed in this Consent Order and Agreement solely because of a strike, fire, flood, act of God, or other circumstances beyond Titusville's control and which Titusville, by the exercise of all reasonable diligence, is unable to prevent, then Titusville may petition the Department for an extension of time. An increase in the cost of performing the obligations set forth in this Consent Order and Agreement shall not constitute circumstances beyond Titusville's control. Titusville's economic inability to comply with any of the obligations of this Consent Order and Agreement shall not be grounds for any extension of time.

b. Titusville shall only be entitled to the benefits of this Paragraph if they notify the Department within five working days by telephone and within 10 working days in writing of the date they become aware, or reasonably should have become aware, of the event impeding performance. The written submission shall include all necessary documentation, as well as a notarized affidavit from an authorized individual specifying the reasons for the delay, the expected duration of the delay, and the efforts which have been made and are being made by Titusville to mitigate the effects of the event and to minimize the length of the delay. The initial written submission may be supplemented within 10 working days of its submission. Titusville's failure to comply with the requirements of this Paragraph specifically and in a timely fashion shall render this Paragraph null and of no effect as to the particular incident involved.

c. The Department will decide whether to grant all or part of the extension requested on the basis of all documentation submitted by Titusville and other information available to the Department. In any subsequent litigation, Titusville shall have the burden of proving that the Department's refusal to grant the requested extension was an abuse of discretion based upon the information then available to it.

21. ***Titles.*** A title used at the beginning of any Paragraph of this Consent Order and Agreement may be used to aid in the construction of that Paragraph, but shall not be treated as controlling.

22. ***Termination of this Consent Order and Agreement.***

a. The obligations, but not the Findings, of this Consent Order and Agreement shall terminate when Titusville has: 1) completed all obligations set forth in this Consent Order and Agreement; 2) achieved compliance with the final renewal NPDES Permit, the Clean Streams Law, the Sewage Facilities Act, and all applicable Regulations; and 3) paid any outstanding stipulated civil penalties due under this Consent Order and Agreement.

b. Titusville's compliance with this Consent Order and Agreement shall be determined by the Department and shall not be appealable by Titusville.

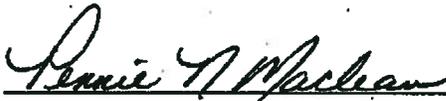
c. The Department, in its sole discretion, may decide to terminate this Consent Order and Agreement at any time and Titusville agrees to waive its rights to appeal any decision in this regard.

23. ***Resolution.*** Attached as Exhibit B is a resolution from Titusville authorizing its signatory below to enter into this Consent Order and Agreement on its behalf.

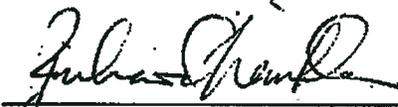
IN WITNESS WHEREOF, the Parties have caused this Consent Order and Agreement to be executed by their duly authorized representative. The undersigned representatives of Titusville certifies under penalty of law, as provided by 18 Pa.C.S.A. §4904, that she is authorized to execute

this Consent Order and Agreement on behalf of Titusville; that Titusville consents to the entry of this Consent Order and Agreement as a final ORDER of the Department; and that Titusville hereby knowingly waives its right to appeal this Consent Order and Agreement and to challenge its content or validity, which rights may be available under Section 4 of the Environmental Hearing Board Act, the Act of July 13, 1988, P.L. 530, No. 1988-94, 35 P.S. §7514; the Administrative Agency Law, 2 Pa.C.S.A. §103(a) and Chapters 5A and 7A; or any other provision of law. Signature by Titusville's attorney certifies only that this Consent Order and Agreement has been signed after consulting with counsel.

FOR THE CITY OF TITUSVILLE:



Pennie N. Maclean
City Manager



Richard Winkler, Esq.
Attorney for the City of Titusville

FOR THE COMMONWEALTH OF PENNSYLVANIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION:



John A. Holden
Regional Manager
Water Management
Northwest Region



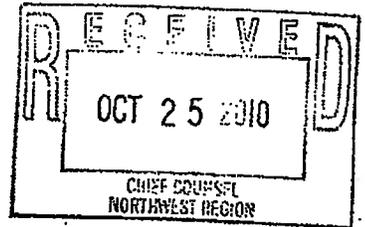
Michael A. Braymer
Assistant Counsel

EXHIBIT A

FINAL RENEWAL NPDES PERMIT - CITY OF TITUSVILLE (PA0036650)

EXHIBIT B

RESOLUTION OF THE CITY OF TITUSVILLE



RESOLUTION NO. 10 OF 2010

CITY OF TITUSVILLE, PENNSYLVANIA

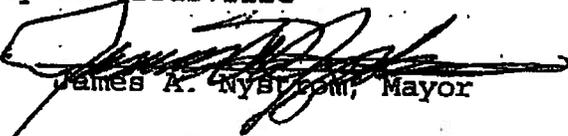
RESOLVED, by the Council of the City of Titusville,

That:

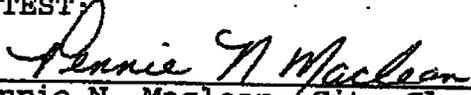
1. The attached Consent Order and Agreement is hereby approved and adopted as and for a binding and effective agreement of the City of Titusville in accord with its terms; and
2. The City Manager and Mayor are hereby authorized and directed to execute such copies of the attached agreement in the manner required by law as may be reasonably required for the purposes of the parties thereto.

This Resolution has been duly adopted the first day of June, 2010.

City of Titusville

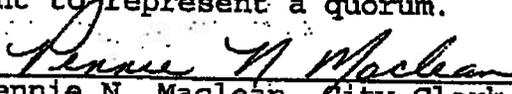
By 
James A. Nystrom, Mayor

ATTEST


Pennie N. Maclean, City Clerk

CERTIFICATION

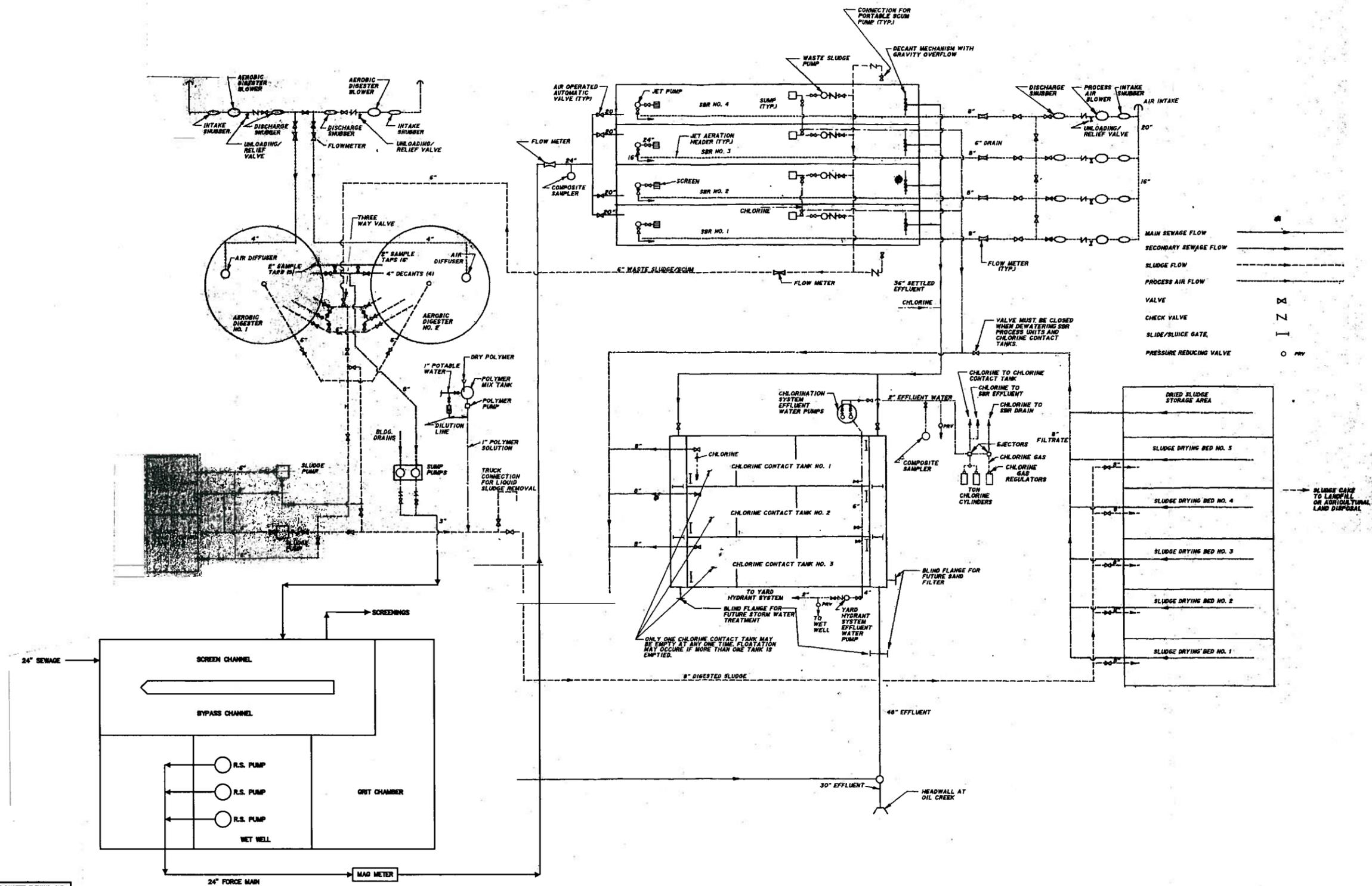
I, Pennie N. Maclean, hereby certify that I am the duly appointed City Clerk of the City of Titusville, Pennsylvania, that the above Resolution was adopted at a special meeting of the City Council of the City of Titusville held on June 1, 2010, and that a minimum number of Council members were present to represent a quorum.


Pennie N. Maclean, City Clerk

APPENDIX C

SCHEMATIC OF TREATMENT PLANT PROCESS

Drawing: N:\048638 Titusville\901\E. Prj\Wk\c. CADD\DWGS\PLATE 8.dwg Plotted: Nov 22, 2010 - 12:42pm



THIS DRAWING IS AND SHALL REMAIN THE PROPERTY OF GANNETT FLEMING, INC. ANY REVISIONS, CHANGES, ALTERATIONS, ADDITIONS, AND/OR DELETIONS OF THESE DRAWINGS OR PROJECT EXTENSIONS OR OTHER PROJECTS SHALL BE AT THE USER'S SOLE RISK AND WITHOUT LIABILITY TO GANNETT FLEMING, INC. IN THE EVENT THAT A CONFLICT ARISES BETWEEN THE SEALED DRAWINGS AND THE ELECTRONIC FILES, THE SEALED DRAWINGS WILL PREVAIL.

PRELIMINARY

No.	DESCRIPTION	DATE	BY
REVISIONS			

DESIGNED E.W.M.	CADD R.S.D.	SCALE NONE
CHECKED X.X.X.	APPROVED X.X.X.	APPROVED X.X.X.


Gannett Fleming
 MERCER, PENNSYLVANIA

THE CITY OF TITUSVILLE
CRAWFORD COUNTY, PENNSYLVANIA
ACT 537 PLAN

**EXISTING & PROPOSED
PROCESS
FLOW DIAGRAM**

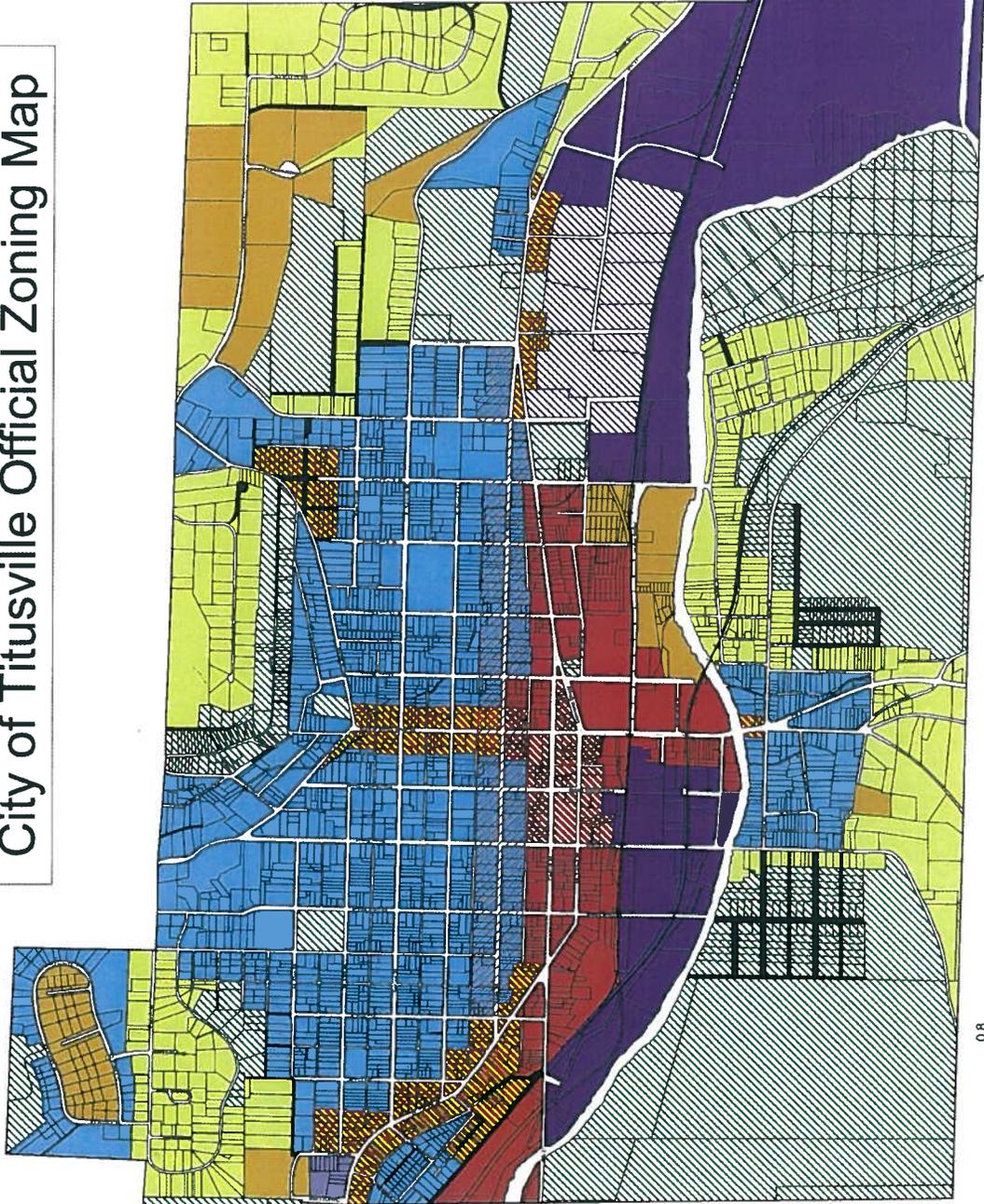
JOB No. 48638.901	SHEET No.
DATE OCTOBER 2010	

PROPOSED FACILITIES

APPENDIX D

CITY OF TITUSVILLE ZONING MAP

City of Titusville Official Zoning Map



Zoning Districts

-  Commercial 1
-  Commercial 2
-  Gallery District
-  Industrial
-  Industrial Overlay District
-  Urban Industrial
-  One Family Residential (R-1)
-  Two Family Residential (R-2)
-  Multi Family Residential (R-3)
-  Residential Limited Business
-  Special Conservation
-  Paper Streets

This Official Zoning Map is part of the zoning ordinance of the City of Titusville, County of Crawford, Commonwealth of Pennsylvania, obtained and enacted this 26th day of May, 2002.


 (Seal)
 City Clerk

City Engineer



APPENDIX E
THE EADS GROUP CORRESPONDENCE



46630/EADS-01

ENGINEERING ARCHITECTURE and DESIGN SERVICES

August 2, 2007

Mr. Jack Rae
Gannett Fleming
Foster Plaza III
Suite 200
601 Holiday Drive
Pittsburgh, PA 15220-2728

RECEIVED

AUG 3 - 2007

RE: City of Titusville, Crawford County

GANNETT FLEMING INC.

Mr. Rae,

The EADS Group is currently working with Cherrytree Township, Venango County, Pennsylvania to develop an Act 537 Sewage Facilities Plan. As part of that plan the Township is examining the option of collecting sanitary sewage from the area south of the City of Titusville and conveying to the City of Titusville collection and treatment system. I have enclosed a map outlining the area of the Township. This area includes approximately 140 homes and businesses.

It is anticipated that 36,000 gpd (140 customers * 100 gpd/capita * 2.6 people/home) of sanitary sewage would be generated by the existing area, with potential growth in the future of an additional 26,000 gpd (100 customers * 100 gpd/capita * 2.6 people/home). Anticipated BOD₅ loading is 62 PPD (140 customers * 0.17 PPD/capita * 2.6 people/home) initially with an additional 44 PPD (100 customers * 0.17 PPD/capita * 2.6 people/home). Growth is projected at 5 connections per year over the next 20 years.

The Township is requesting the information to assist in the completion of their Act 537 Plan.

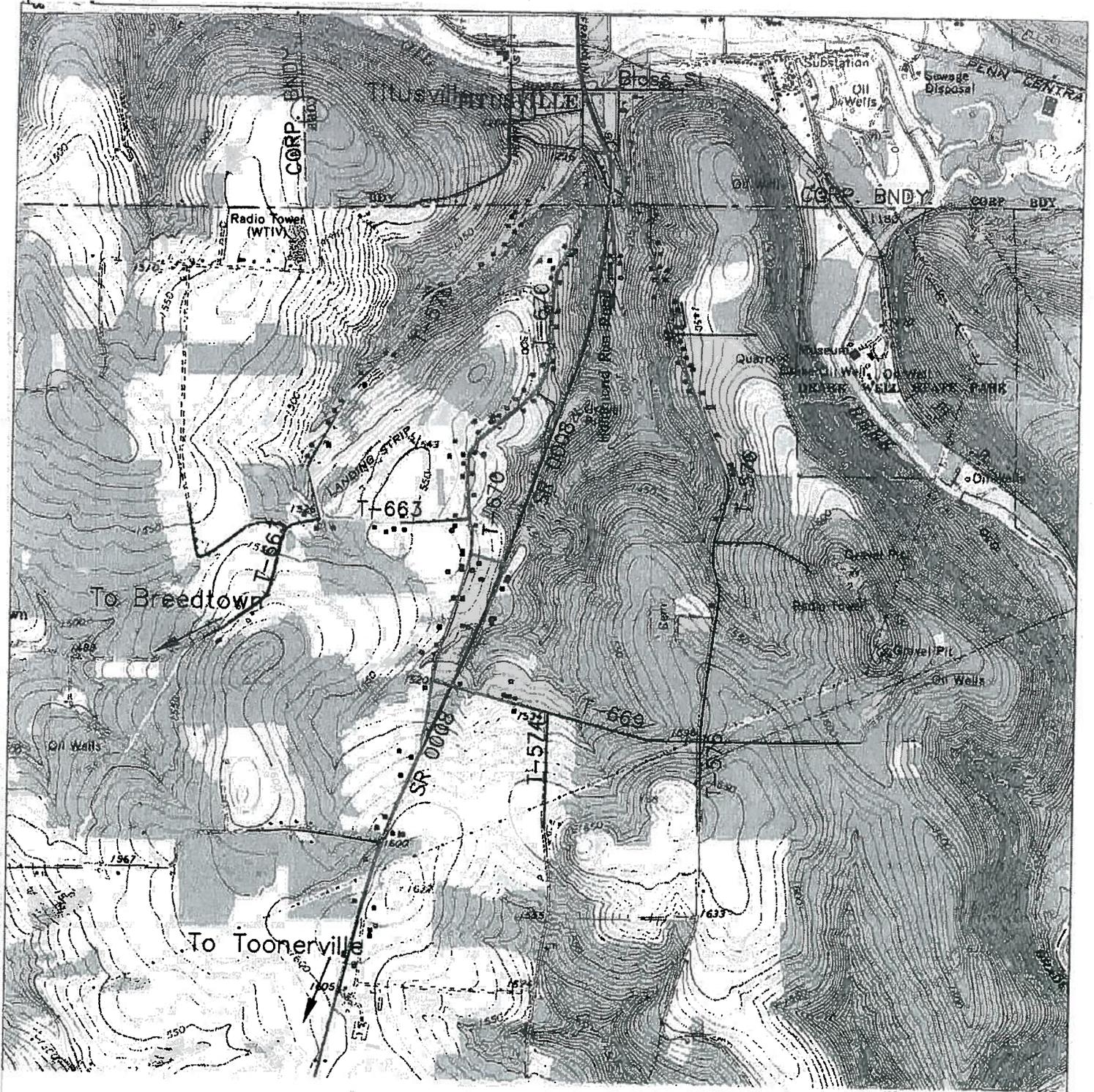
- (1) A description of the City's wastewater treatment plant, including permit limits and if it has the treatment capacity to include the Township's projected flows.
- (2) Capacity of the Bloss St. pump station and if it has capacity to include the Township's projected flows.
- (3) Estimated bulk treatment fees per 1,000 gallons
- (4) Sections of the City's most recent Act 537 that are relevant to the Township (projected growth, reserved capacity, connection fees, etc.)
- (5) Any other information you feel would be applicable.

Thank you for your time and consideration in this. Should you have any questions feel free to call me at the office.

Sincerely,

The EADS Group

David Neill



- | | | | |
|--------|-----------------|---|-----------------------------------|
| SR0008 | State Route 8 | ■ | Home or Business |
| T-574 | Shreve Road | — | Roads |
| T-576 | Dutch Hill Road | — | Streams |
| T-578 | Trout Run | — | Dutch Hill Road, Hammond Run Road |
| T-663 | Breedtown Road | — | Sewer Line |
| T-669 | Black Road | — | Old Route 8 Sewer Line |
| T-670 | Old Route 8 | — | Trout Run Sewer Line |
| | | — | State Route 0008 Sewer Line |

THE EADS GROUP, INC.
 Engineering, Architecture and Design Services
 15392 Route 322 Clarion PA. 16214

CHERRYTREE TOWNSHIP DUTCH HILL AREA
 FEASIBILITY STUDY

SCALE 1" = 2000'
 DATE September 2006

DWG NAME EXHIBIT 5

EXHIBIT 5: CONCEPTUAL SEWER SYSTEM

APPENDIX F

COMPARISON OF ALTERNATIVE SBR SYSTEMS

Comparison of Alternative SBR Systems

Alternative	Manufacturers			
	ABJ	Aqua-Aerobic	Ashbrook	
	2A.1	2A.2	2B	2C.1
Design Information				
Average Dry Weather Flow	4.0 MGD	3.4 MGD	4.0 MGD	4.0 MGD
Peak Dry Weather Flow	12.0 MGD	8.0 MGD	15.0 MGD	12.0 MGD
Peak Hourly Flow	16.0 MGD	10.7 MGD	16.0 MGD	16.0 MGD
BOD ₅ (20°C)	150 mg/l	150 mg/l	150 mg/l	150 mg/l
BOD ₅ (20°C)	5,004 lbs/day	4,243 lbs/day	5,004 lbs/day	5,007 lbs/day
Suspended Solids	100 mg/l	100 mg/l	100 mg/l	100 mg/l
TKN	25 mg/l	25 mg/l	25 mg/l	25 mg/l
Alkalinity	183 mg/l	184 mg/l	NA	150 mg/l
Max Wastewater Temperature	20° C	20° C	20° C	20° C
Min. Wastewater Temperature	10° C	10° C	4.4° C	10° C
Ambient Air Temperature	20-90° F	20-90° F	20-90° F	-20-104°F
Site Elevation	1,200 ft.	1,200 ft.	1,174 ft.	1,200 ft.
Effluent Quality				
BOD ₅ (20°C)	10 mg/l	10 mg/l	10 mg/l	10 mg/l
Suspended Solids	10 mg/l	10 mg/l	10 mg/l	10 mg/l
NH ₃ -N	1 mg/l	1 mg/l	NA	1 mg/l
Type of Process				
	ICEAS	ICEAS	Batch	Batch
No. of Tanks				
	5	4	8	5
Dimension of Tanks				
Length	150 ft.	150 ft.	151 ft.	150 ft.
Width	50 ft.	50 ft.	50 ft.	50 ft.
Top Water Level	15 ft.	15 ft.	15.6 ft.	15 ft.
Bottom Water Level	9.7 ft.	10.5 ft.	9 ft.	10.72 ft.
Freeboard	NA	NA	1.4 ft.	2 ft.

Comparison of Alternative SBR Systems

Alternative	Manufacturers			
	ABJ	Aqua-Aerobic	Ashbrook	
Alternative	2A.1	2A.2	2B	2C.1
Process Design Criteria				
F/M	0.048 lb BOD ₅ / lb MLSS/day	0.045 lb BOD ₅ / lb MLSS/day	0.049 lb BOD ₅ / lb MLSS/day	0.044 lb BOD ₅ / lb MLSS/day
SVI (after 30 minute settling)	150 ml/g	150 ml/g	NA	NA
MLSS at Bottom Water Level	4,601 mg/l	4,776 mg/l	3,000 mg/l	4,500 mg/l
Waste Sludge Produced	2,747 lbs/day	2,281 lbs/day	3,168 lbs/day	3,171 lbs/day
Volume of Sludge Produced (0.85% solids)	38,748 GPD	32,177 GPD	25,325 GPD	NA
Normal Decant Rate	6,667 GPM	5,557 GPM	NA	5,263 GPM
Peak Decant Rate	8,889 GPM	7,410 GPM	10,417 GPM	5,430 GPM
Hydraulic Retention Time	0.80 days	0.82 days	1.22 days	1.00 days
Sludge Age	33.78 days	36.81 days	29.1 days	35.6 days
No. of Cycle				
Normal	6/day	6/day	5/day	4/day
Storm	8/day	8/day	NA	10/day
Cycle Duration				
Normal	4 hours	4 hours	4.8 hours	6 hours
Storm	3 hours	3 hours	NA	2.4 hours
Equipment Required				
Automatic Inf. Control Valves	By Others	By Others	By Others	
Number				5
Diameter				24 in.
Automatic Air Control Valves				
Number	5	4	11	5
Diameter	10 in.	10 in.	10 in.	10 in.
Decanter				
Number	5	4	6	5
Size	40 ft. long	40 ft. long	2 - 16 X12 ft. 4 - 10X9 ft. Floating	9 ft. Floating

Comparison of Alternative SBR Systems

Alternative	Manufacturers			
	ABJ	Aqua-Aerobic	Ashbrook	
	2A.1	2A.2	2B	2C.1
Blowers				
Number	5	3	5 PD	6 PD
Capacity	1,750 SCFM	1,620 SCFM		1,221 SCFM
Horsepower	100	100	60	75
Fine Bubble Aeration System				
Number	5	4	6	5
Disc Diffusers/Basin	1,008	1,008	NA	By Others
Capacity, each	NA	NA	NA	1,221 CFM
Waste Sludge Pumps				
Numbers	5	4	6	5
Capacity	110 GPM	110 GPM	NA	198 GPM
Horsepower	2.4	2.4	2 - 3 Hp 4 - 2.4 Hp	3
D.O. Control	5	4	6	5
Process Control Center & MCC	1	1	1 - Does not include MCC	1 - Does not include MCC

APPENDIX G

PROJECT ENVIRONMENTAL REVIEW RECEIPTS

1. PROJECT INFORMATION

Project Name: **Titusville WWTP Exp**

Date of review: **10/19/2010 12:54:15 PM**

Project Category: **Waste Transfer, Treatment, and Disposal, Liquid waste/Effluent, Wastewater treatment plant (construction, expansion or modification)**

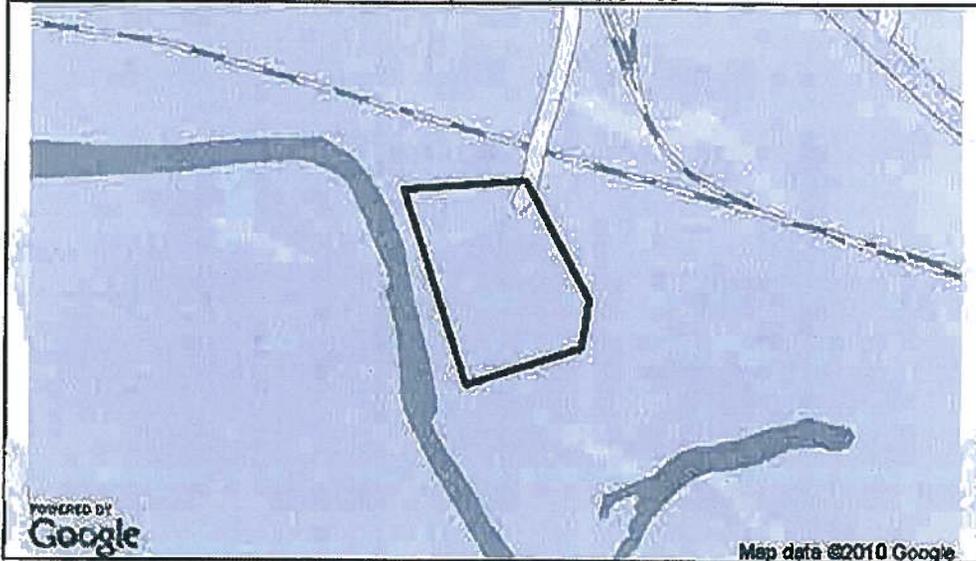
Project Area: **5.7 acres**

County: **Crawford Township/Municipality: Titusville**

Quadrangle Name: **TITUSVILLE SOUTH ~ ZIP Code: 16354**

Decimal Degrees: **41.622893 N, -79.655095 W**

Degrees Minutes Seconds: **41° 37' 22.4" N, -79° 39' 18.3" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	Potential Impact	FURTHER REVIEW IS REQUIRED, See Agency Response
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jurisdictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PGC Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)

Scientific Name: Sensitive Species**

Common Name:

Current Status: Special Concern Species*

Proposed Status: Special Concern Species*

PA Department of Conservation and Natural Resources

RESPONSE: No impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: No impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.

** Sensitive Species - Species identified by the jurisdictional agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of Minimum Materials to be submitted:

- SIGNED copy of this Project Environmental Review Receipt
- Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
- Project location information (name of USGS Quadrangle, Township/Municipality, and County)
- USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.

- A basic site plan (particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
- Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
- Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams
- The DEP permit(s) required for this project

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at <http://www.naturalheritage.state.pa.us>.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a preliminary screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
 Bureau of Forestry, Ecological Services Section
 400 Market Street, PO Box 8552, Harrisburg, PA.
 17105-8552
 Fax: (717) 772-0274

U.S. Fish and Wildlife Service
 Endangered Species Section
 315 South Allen Street, Suite 322, State College, PA.
 16801-4851
 NO Faxes Please.

PA Fish and Boat Commission
 Division of Environmental Services
 450 Robinson Lane, Bellefonte, PA. 16823-7437
 NO Faxes Please

PA Game Commission
 Bureau of Wildlife-Habitat Management
 Division of Environmental Planning and Habitat Protection
 2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
 Fax: (717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Debbie Suppie
 Company/Business Name: Garrett Fleming Inc.
 Address: toke Plaza 3 601 Holiday Dr
 City, State, Zip: Pittsburg, PA 15220
 Phone: (412) 922-5575 Fax: (412) 922-3717
 Email: dsuppie@getnet.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

Debbie Suppie
 applicant/project proponent signature

10/19/2010
 date



GANNETT FLEMING, INC.
Foster Plaza III, Suite 200
601 Holiday Drive
Pittsburgh, PA 15220-2728
Office: (412) 922-5575
Fax: (412) 922-3717
www.gannettfleming.com

November 4, 2010

Pennsylvania Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue
Harrisburg, PA 17110-9797

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Re: City of Titusville
Crawford County, Pennsylvania
Act 537 Plan Update/Special Study For
Wastewater Treatment Plant Expansion
GF 048638

Ladies/Gentlemen:

The City of Titusville is in the process of preparing an Act 537 Plan Update for alternatives to provide adequate treatment for the future sewage needs of the City of Titusville and portions of Oil Creek and Cherrytree Townships and for the elimination of all unpermitted discharges. The alternatives considered involve expansion and/or modifications to the Titusville Wastewater Treatment Plant. As part of the Act 537 Plan process, a PNDI project environmental review was done for the WWTP site. The PNDI project environmental review receipt indicated a potential impact requiring further review by the Pennsylvania Game Commission.

In accordance with the instructions we have enclosed the following:

- Signed copy of the Project Environmental Review Receipt
- Project Narrative
- USGS Map
- Site Plan

If you should have any questions, please contact us.

Sincerely,

GANNETT FLEMING, INC.

DEBORAH A. SAPPIE
Project Manager

Enclosures

A Tradition of Excellence



1. PROJECT INFORMATION

Project Name: **Titusville WWTP Exp**

Date of review: **10/19/2010 12:54:15 PM**

Project Category: **Waste Transfer, Treatment, and Disposal, Liquid waste/Effluent, Wastewater treatment plant (construction, expansion or modification)**

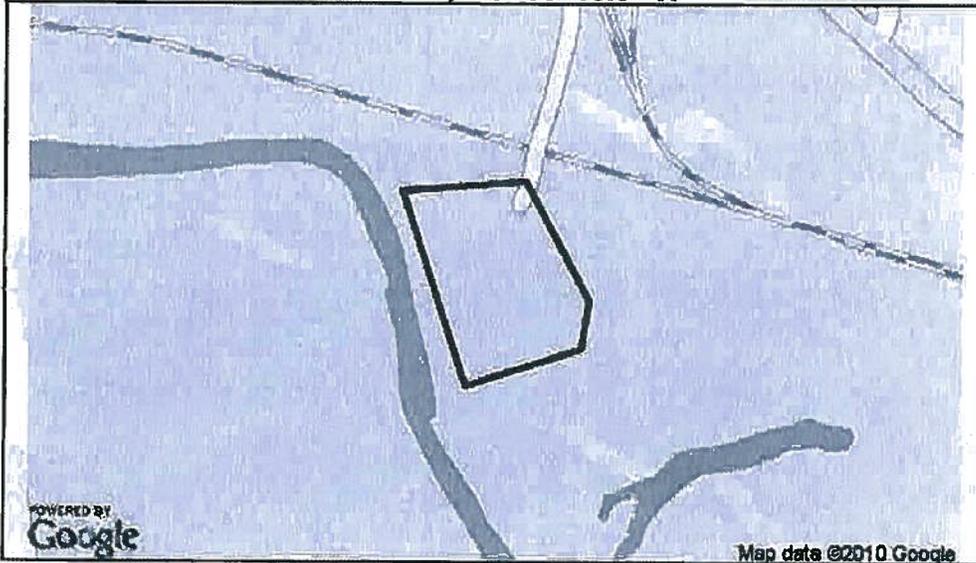
Project Area: **5.7 acres**

County: **Crawford Township/Municipality: Titusville**

Quadrangle Name: **TITUSVILLE SOUTH ~ ZIP Code: 16354**

Decimal Degrees: **41.622893 N, -79.655095 W**

Degrees Minutes Seconds: **41° 37' 22.4" N, -79° 39' 18.3" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	Potential Impact	FURTHER REVIEW IS REQUIRED, See Agency Response
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jurisdictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see **WHAT TO SEND**).

PGC Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)

Scientific Name: Sensitive Species**

Common Name:

Current Status: Special Concern Species*

Proposed Status: Special Concern Species*

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.

** Sensitive Species - Species identified by the jurisdictional agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of Minimum Materials to be submitted:

- SIGNED** copy of this Project Environmental Review Receipt
- Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
- Project location information (name of USGS Quadrangle, Township/Municipality, and County)
- USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.

- A basic site plan (particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
- Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
- Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams
- The DEP permit(s) required for this project

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at <http://www.naturalheritage.state.pa.us>.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a preliminary screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
 Bureau of Forestry, Ecological Services Section
 400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
 Fax:(717) 772-0271

U.S. Fish and Wildlife Service
 Endangered Species Section
 315 South Allen Street, Suite 322, State College, PA. 16801-4851
 NO Faxes Please.

PA Fish and Boat Commission
 Division of Environmental Services
 450 Robinson Lane, Bellefonte, PA. 16823-7437
 NO Faxes Please

PA Game Commission
 Bureau of Wildlife Habitat Management
 Division of Environmental Planning and Habitat Protection
 2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
 Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Debbie Sappie
 Company/Business Name: Gannett Fleming Inc.
 Address: Foster Plaza 3 601 Holiday Dr
 City, State, Zip: Pittsburg, PA 15220
 Phone: (412) 922-5573 Fax: (412) 922-3717
 Email: dsappie@gt.net.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

Debbie Sappie
 applicant/project proponent signature

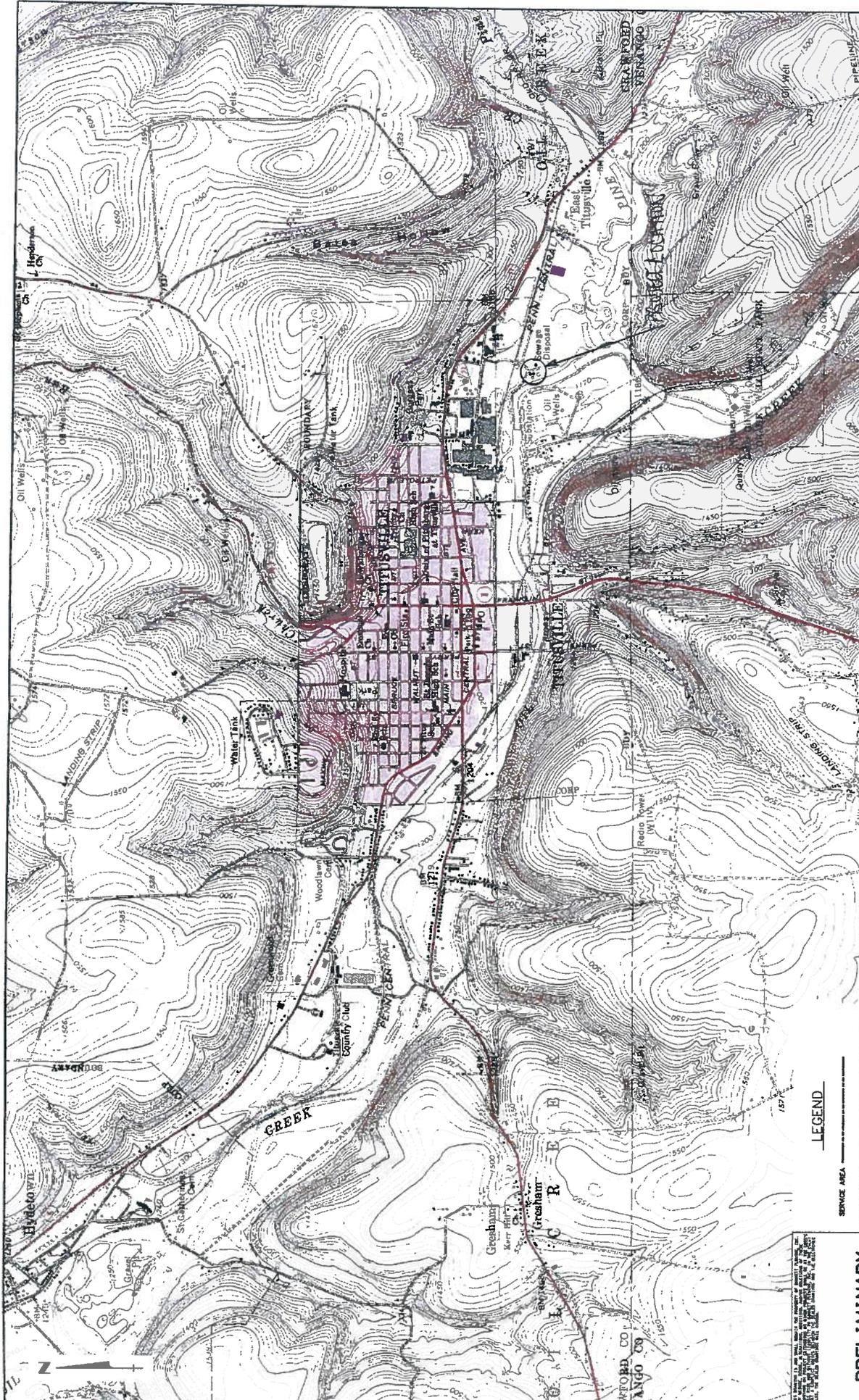
10/19/2010
 date

CITY OF TITUSVILLE
CRAWFORD COUNTY, PA
ACT 537 PLAN UPDATE/SPECIAL STUDY
FOR
WASTEWATER TREATMENT PLANT EXPANSION
PROJECT NARRATIVE
NOVEMBER 2010

The City of Titusville is in the process of preparing an Act 537 Plan Update/Special Study for alternatives to provide adequate treatment for the future sewage needs of the City of Titusville and portions of Oil Creek and Cherrytree Townships and for the elimination of all unpermitted discharges. The plan will evaluate alternatives to expand and/or modify the WWTP.

The City of Titusville is under a COA to bring the WWTP into compliance with the Clean Streams Law, the Sewage Facilities Act and the NPDES and WQM Permits. According to the COA, the WWTP is not being operated in a manner to adequately treat flows greater than 7.5 mgd and raw sewage overflows at the Brown Street CSO. The COA also sites operation and maintenance problems.

The Act 537 Plan will consider alternatives to expand and/or modify the Titusville WWTP to treat current and projected hydraulic and organic loadings. The alternatives will consider utilizing the existing structures to the extent possible. The disturbed acreage for the additional facilities is 0.40.



PRELIMINARY <small>THIS DRAWING IS THE PROPERTY OF GANNETT FLEMING AND IS NOT TO BE REPRODUCED OR COPIED IN ANY MANNER WITHOUT THE WRITTEN PERMISSION OF GANNETT FLEMING. ANY REPRODUCTION OR COPIING OF THIS DRAWING WITHOUT THE WRITTEN PERMISSION OF GANNETT FLEMING IS STRICTLY PROHIBITED AND WILL BE PROSECUTED TO THE FULL EXTENT OF THE LAW.</small>		LEGEND SERVICE AREA		<table border="1"> <tr> <th>NO.</th> <th>DATE</th> <th>BY</th> <th>REVISIONS</th> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>		NO.	DATE	BY	REVISIONS					<table border="1"> <tr> <td>DESIGNED</td> <td>E.W.M.</td> <td>X.X.X.</td> </tr> <tr> <td>CHECKED</td> <td>O.C.O.</td> <td>X.X.X.</td> </tr> <tr> <td>DRAWN</td> <td>X.X.X.</td> <td>X.X.X.</td> </tr> <tr> <td>SCALE</td> <td>NONE</td> <td>X.X.X.</td> </tr> </table>		DESIGNED	E.W.M.	X.X.X.	CHECKED	O.C.O.	X.X.X.	DRAWN	X.X.X.	X.X.X.	SCALE	NONE	X.X.X.	<table border="1"> <tr> <td>DATE</td> <td>BY</td> <td>REVISIONS</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>		DATE	BY	REVISIONS				<table border="1"> <tr> <td> Gannett Fleming MERCER, PENNSYLVANIA </td> <td> ACT 537 PLAN </td> </tr> </table>		Gannett Fleming MERCER, PENNSYLVANIA	ACT 537 PLAN	<table border="1"> <tr> <td> FILE NO. 48634.901 DATE OCTOBER 2010 </td> <td> THE CITY OF TITUSVILLE ACT 537 PLAN / SPECIAL STUDY SERVICE AREA PLATE I </td> </tr> </table>		FILE NO. 48634.901 DATE OCTOBER 2010	THE CITY OF TITUSVILLE ACT 537 PLAN / SPECIAL STUDY SERVICE AREA PLATE I
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**BUREAU OF WILDLIFE
HABITAT MANAGEMENT
717-787-6818**

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission
2001 ELMERTON AVENUE
HARRISBURG, PA 17110-9797

*"To manage all wild birds, mammals and their habitats
for current and future generations."*

ADMINISTRATIVE BUREAUS:

ADMINISTRATION.....	717-787-5670
HUMAN RESOURCES.....	717-787-7836
FISCAL MANAGEMENT.....	717-787-7314
CONTRACTS AND PROCUREMENT.....	717-787-6594
LICENSING.....	717-787-2084
OFFICE SERVICES.....	717-787-2116
WILDLIFE MANAGEMENT.....	717-787-5529
INFORMATION & EDUCATION.....	717-787-6286
WILDLIFE PROTECTION.....	717-783-6526
WILDLIFE HABITAT MANAGEMENT.....	717-787-6818
REAL ESTATE DIVISION.....	717-787-6568
AUTOMATED TECHNOLOGY SERVICES.....	717-787-4076

www.pgc.state.pa.us

RECEIVED

JAN 10 2011

GANNETT FLEMING INC.

December 30, 2010

PNDI Number(s): 20101019267116

Ms. Debbie Sappie
Gannett Fleming
Foster Plaza III, Suite 200
601 Holiday Drive
Pittsburgh, Pennsylvania 15220-2728

Re: Titusville WWTP Exp – Wastewater Treatment Plant Expansion
Titusville Township, Crawford County, Pennsylvania

Dear Ms. Sappie,

Thank you for submitting the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Receipt Number 20101019267116 for review. The Pennsylvania Game Commission (PGC) screened this project for potential impacts to species and resources of concern under PGC responsibility, which includes birds and mammals only.

No Impact Anticipated

PNDI records indicate species or resources of concern are located in the vicinity of the project. However, based on the information you submitted concerning the nature of the project, the immediate location, and our detailed resource information, the PGC has determined that no impact is likely. Therefore, no further coordination with the PGC will be necessary for this project at this time.

This response represents the most up-to-date summary of the PNDI data files and is valid for one (1) year from the date of this letter. An absence of recorded information does not necessarily imply actual conditions on site. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered.

Should the proposed work continue beyond the period covered by this letter, please resubmit the project to this agency as an "Update" (including an updated PNDI receipt, project narrative and accurate map). If the proposed work has not changed and no additional information concerning listed species is found, the project will be cleared for PNDI requirements under this agency for an additional year.

This finding applies to impacts to birds and mammals only. To complete your review of state and federally-listed threatened and endangered species and species of special concern, please be

sure that the U.S. Fish and Wildlife Service, the PA Department of Conservation and Natural Resources, and/or the PA Fish and Boat Commission have been contacted regarding this project as directed by the online PNDI ER Tool found at www.naturalheritage.state.pa.us.

Sincerely,



Olivia A. Braun

Environmental Planner

Division of Environmental Planning & Habitat Protection

Bureau of Wildlife Habitat Management

Phone: 717-787-4250, Extension 3128

Fax: 717-787-6957

e-Mail: OBraun@state.pa.us

A PNHP Partner



Pennsylvania Natural Heritage Program

OAB/oab

cc: Librandi Mumma, PGC
File

APPENDIX H

PHMC REQUEST LETTER AND RESPONSE



Commonwealth of Pennsylvania
Pennsylvania Historical and Museum Commission
Bureau for Historic Preservation
Commonwealth Keystone Building, 2nd Floor
400 North Street
Harrisburg, PA 17120-0093
www.phmc.state.pa.us
November 16, 2010

RECEIVED

NOV 22 2010

GANNETT FLEMING INC.

Deborah A. Sappie
Gannett Fleming, Inc.
Foster Plaza III, Suite 200
601 Holiday Drive
Pittsburgh, PA 15220-2728

TO EXPEDITE REVIEW USE
BHP REFERENCE NUMBER

Re: File No. ER 1997-1027-039-C
DEP ACT 537 PROGRAM: Act 537 Plan Update/
Special Study for Wastewater Treatment Plant
Expansion, City of Titusville, Crawford County

Dear Ms. Sappie:

The Bureau for Historic Preservation has reviewed the above named project under the authority of the Environmental Rights amendment, Article 1, Section 27 of the Pennsylvania Constitution and the Pennsylvania History Code, 37 Pa. Cons. Stat. Section 500 et seq. (1988). This review includes comments on the project's potential effect on both historic and archaeological resources.

There may be historic buildings, structures, and/or archaeological resources located in the project area. In our opinion the activities described in your proposal should have no effect on these resources. Should you become aware, from any source, that unidentified historic buildings, structures, and or archaeological resources are located at the project site, or that the project activities will have an effect on these properties, the Bureau for Historic Preservation should immediately be contacted.

If you need further information regarding archaeological survey please contact Kira Heinrich at (717) 705-0700. If you need further information concerning historic structures please consult Ann Safley at (717) 787-9121.

Sincerely,

Douglas C. McLearn, Chief
Division of Archaeology &
Protection

cc: DEP, Southwest Regional Office

DCM/tmw



GANNETT FLEMING, INC.
Foster Plaza III, Suite 200
601 Holiday Drive
Pittsburgh, PA 15220-2728
Office: (412) 922-5575
Fax: (412) 922-3717
www.gannettfleming.com

November 4, 2010

Pennsylvania Historical and
Museum Commission
400 North Street
Commonwealth Keystone Building, 2nd Floor
Harrisburg, PA 17120-0093

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Re: City of Titusville
Crawford County, Pennsylvania
Act 537 Plan Update/Special Study For
Wastewater Treatment Plant Expansion
GF 048638

Ladies/Gentlemen:

The City of Titusville is in the process of preparing an Act 537 Plan Update for alternatives to provide adequate treatment for the future sewage needs of the City of Titusville and portions of Oil Creek and Cherrytree Townships and for the elimination of all unpermitted discharges. The alternatives considered involve expansion and/or modifications to the Titusville Wastewater Treatment Plant. We have enclosed the following for your review:

- Cultural Resource Notice
- USGS Map and WWTP Site Plan
- Project Narrative

We greatly appreciate your assistance with this matter and look forward to hearing from you. If you have any questions, please contact us.

Very truly yours,

GANNETT FLEMING, INC.

DEBORAH A. SAPPIE
Project Manager

Enclosures
cc: File

A Tradition of Excellence





CULTURAL RESOURCE NOTICE

DEP USE ONLY

Date Received

Read the instructions before completing this form.

SECTION A. APPLICANT IDENTIFIER			
Applicant Name	City of Titusville		
Street Address	107 North Franklin Street		
City	Titusville	State	PA Zip 16354
Telephone Number	(814) 257-5300		
Project Title	Act 537 Plan Update/Special Study for Wastewater Treatment Plant Expansion		
SECTION B. LOCATION OF PROJECT			
Municipality	City of Titusville	County Name	Crawford DEP County Code 20
SECTION C. PERMITS OR APPROVALS			
Name of Specific DEP Permit or Approval Requested:	Act 537 Plan		
Anticipated federal permits:			
<input type="checkbox"/>	Surface Mining	<input type="checkbox"/>	404 Water Quality Permit
<input type="checkbox"/>	Army Corps of Engineers	<input type="checkbox"/>	Federal Energy Regulatory Commission
<input type="checkbox"/>	401 Water Quality Certification	<input type="checkbox"/>	Other:
SECTION D. GOVERNMENT FUNDING SOURCES			
<input type="checkbox"/>	State: (Name) _____	<input type="checkbox"/>	Local: (Name) _____
<input type="checkbox"/>	Federal: (Name) _____	<input type="checkbox"/>	Other: (Name) _____
SECTION E. RESPONSIBLE DEP REGIONAL, CENTRAL, DISTRICT MINING or OIL & GAS MGMT OFFICE			
DEP Regional Office Responsible for Review of Permit Application		<input type="checkbox"/>	Central Office (Harrisburg)
<input type="checkbox"/>	Southeast Regional Office (Conshohocken)	<input type="checkbox"/>	Northeast Regional Office (Wilkes-Barre)
<input type="checkbox"/>	Southcentral Regional Office (Harrisburg)	<input type="checkbox"/>	Northcentral Regional Office (Williamsport)
<input checked="" type="checkbox"/>	Southwest Regional Office (Pittsburgh)	<input type="checkbox"/>	Northwest Regional Office (Meadeville)
<input type="checkbox"/>	District Mining Office:	<input type="checkbox"/>	Oil & Gas Office:
SECTION F. RESPONSIBLE COUNTY CONSERVATION DISTRICT, if applicable.			
County Conservation District		Telephone Number, if known	
Crawford County		(814) 763-5269	
SECTION G. CONSULTANT			
Consultant, if applicable	John F. Rae, Gannett Fleming, Inc.		
Street Address	Foster Plaza 3, 601 Holiday Drive		
City	Pittsburgh	State	PA Zip 15220
Telephone Number	(412) 922-5575		

SECTION H. PROJECT BOUNDARIES AND DESCRIPTION

REQUIRED

Indicate the total acres in the property under review. Of this acreage, indicate the total acres of earth disturbance for the proposed activity.

Attach a 7.5' U.S.G.S. Map indicating the defined boundary of the proposed activity.

Attach photographs of any building over 50 years old. Indicate what is to be done to all buildings in the project area.

Attach a narrative description of the proposed activity.

Attach the return receipt of delivery of this notice to the Pennsylvania Historical and Museum Commission.

REQUESTED

Attach photographs of any building over 40 years old.

Attach site map, if available.

SECTION I. SIGNATURE BLOCK

11/04/2010

Applicant's Signature

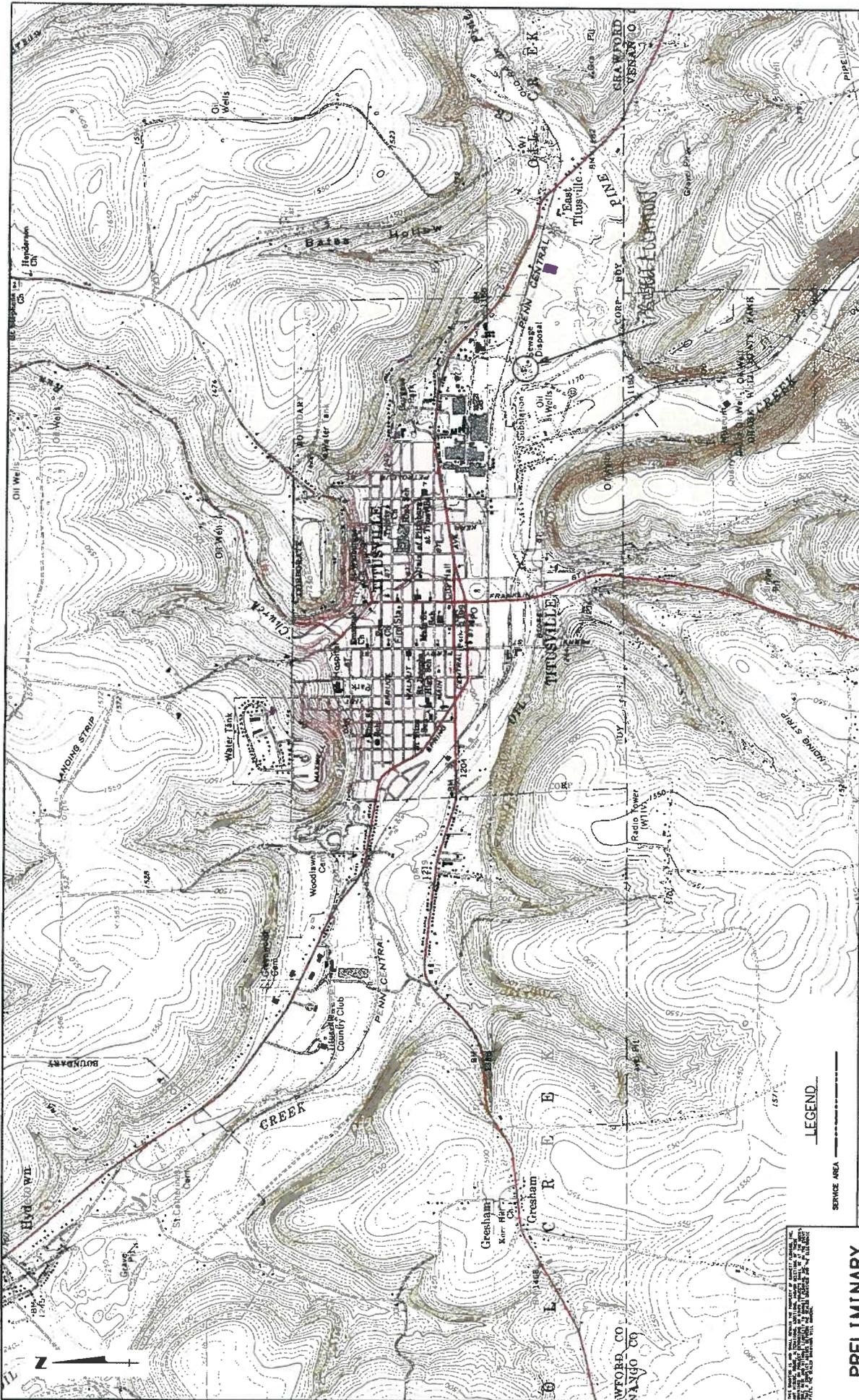
Date of Submission of Notice to PHMC

CITY OF TITUSVILLE
CRAWFORD COUNTY, PA
ACT 537 PLAN UPDATE/SPECIAL STUDY
FOR
WASTEWATER TREATMENT PLANT EXPANSION
PROJECT NARRATIVE
NOVEMBER 2010

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The City of Titusville is under a COA to bring the WWTP into compliance with the Clean Streams Law, the Sewage Facilities Act and the NPDES and WQM Permits. According to the COA, the WWTP is not being operated in a manner to adequately treat flows greater than 7.5 mgd and raw sewage overflows at the Brown Street CSO. The COA also sites operation and maintenance problems.

The Act 537 Plan will consider alternatives to expand and/or modify the Titusville WWTP to treat current and projected hydraulic and organic loadings. The alternatives will consider utilizing the existing structures to the extent possible. The disturbed acreage for the additional facilities is 0.40.



LEGEND

SERVICE AREA

PRELIMINARY



MERCER, PENNSYLVANIA

THE CITY OF TITUSVILLE
CAMBRIA COUNTY, PENNSYLVANIA

ACT 537 PLAN

THE CITY OF TITUSVILLE
ACT 537 PLAN / SPECIAL STUDY
SERVICE AREA
PLATE I

DATE
OCTOBER
2010

DATE	BY	APPROVED
NOV 10 2010	E.W.M.	APPROVED
	R.S.D.	APPROVED
	NONE	APPROVED

DATE	BY	APPROVED
X.X.X.	X.X.X.	X.X.X.
X.X.X.	X.X.X.	X.X.X.

APPENDIX I
ABJ PROPOSALS



KAPPE ASSOCIATES

I N C O R P O R A T E D RECEIVED

4268 Northern Pike • Monroeville, Pennsylvania 15146-2733
412-373-9303 • Fax: 412-373-9343

MAR 9 - 2011

March 7, 2011

Mr. Edward W. Monroe, PE
GANNETT FLEMING, INC.
Foster Plaza III, Suite 200
601 Holiday Drive
Pittsburgh, PA 15220

GANNETT FLEMING INC.

SUBJECT: TITUSVILLE, PA – WWTP EXPANSION PROJECT
ITT INDUSTRIES – SANITAIRE (ABJ) WASTEWATER TREATMENT
EQUIPMENT # 20943-09a

Dear Mr. Monroe:

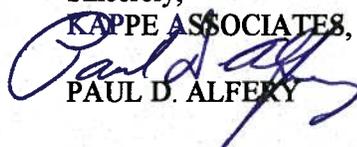
SANITAIRE/ABJ's proposed scope of supply for the subject project includes the following:

- Five (5) 40-ft. Decanter w/Drive Actuator
- Five (5) 100 HP, ICEAS PD Blower Packages w/Sound Enclosure
- One (1) ICEAS Fine Bubble Aeration System
- Five (5) 10" Air Control Valve
- Five (5) WAS pumps
- Five (5) D.O. Control Systems
- One (1) ICEAS Controls and MCC
- Freight to jobsite
- Ten (10) days of field service

The BUDGET PRICE for the above is **\$ 1,500,000.00**.

Thank you for this opportunity to prepare this proposal. Please let us know if you have any questions or need any additional data.

Sincerely,
KAPPE ASSOCIATES, INC.


PAUL D. ALFERY

Encl:

-1-

DESIGN PROPOSAL

Titusville WWTP Sanitaire #20943-09a

TABLE A

INFLUENT WASTEWATER CHARACTERISTICS AND SITE CONDITIONS

Average Dry Weather Flow (ADF)	4,000,000 GPD
Peak Dry Weather Flow (PDF)	12,000,000 GPD
Peak Wet Weather Flow (PHF)	16,000,000 GPD
BOD ₅ (20°C)	150 mg/l
BOD ₅ (20°C)	5,004 lb/day
Suspended Solids	100 mg/l
TKN	25 mg/l
Alkalinity	183 mg/l
Max Wastewater Temperature	20 °C
Min Wastewater Temperature	10 °C
Ambient Air Temperature	20 - 90 °F
Site Elevation	1,200 ft

TABLE B

ICEAS® EFFLUENT QUALITY (MONTHLY AVERAGE)

BOD ₅ (20°C)	10.00 mg/l
Suspended Solids	10.00 mg/l
NH ₃ -N	1.00 mg/l

TABLE C

ICEAS PROCESS DESIGN CRITERIA

F / M	0.048 lb BOD ₅ / lb MLSS / day
SVI (after 30 minutes settling)	150 ml/g
MLSS at Bottom Water Level	4,601 mg/l
Waste Sludge Produced (Approx.)	2,747 lb/day
Volume of Sludge Produced (Approx., 0.85% solids)	38,748 GPD
Normal Decant Rate	6,667 GPM
Peak Decant Rate	8,889 GPM
Hydraulic Retention Time	0.80 Days
Sludge Age	33.78 Days

CYCLE	AERATION	SETTLE	DECANT	TOTAL
Normal	120 min	60 min	60 min	4 hour
Storm	90 min	45 min	45 min	3 hour

TABLE D
KEY ICEAS DESIGN DETAILS

Number of ICEAS Basins	5
Top Water Level	15.0 ft
Basin Width	50.0 ft
Basin Length	150.0 ft
Bottom Water Level	9.7 ft

ICEAS EQUIPMENT		Motor HP	No. Req.
Decanter Mechanism	40.0 ' Weir length	1 /Basin	5
Decanter Drive Unit		3/4	5
ICEAS Blower	1,750 SCFM	6.8 PSIG	5
* ICEAS Fine Bubble Aeration System	1,008	Disc Diffusers/Basin	5 (1)
Air Control Valve	10 "		5
Waste Sludge Pump	110.0 GPM	2.4	5
ICEAS Controls & MCC			1
D.O. Control			5

* Price includes FB aeration for one (1) new tank.

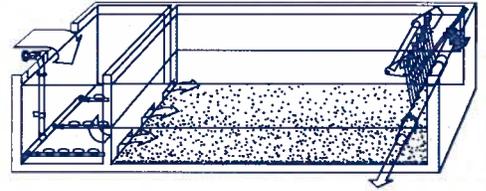
ICEAS POWER REQUIREMENTS				(At Average Aeration Depth)	Kwh/Day
Decant Drive Unit	0.6 BHP	5 run	@	6 Hrs/day	13.43
ICEAS Air Blowers	75.3 BHP	2 run	@	24 Hrs/day	2,696.15
ICEAS Air Blowers	75.3 BHP	1 run**	@	12 Hrs/day	674.04
Waste Sludge Pump	1.9 BHP	5 run	@	1.2 Hrs/day	8.41
				KWH/DAY	3,392.02
			AVERAGE	KWH/HR	141.33

** Dedicated ICEAS Blowers



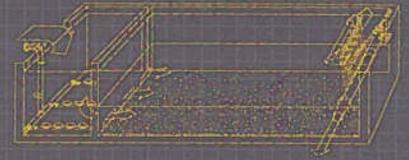
ITT

ICEAS[®] Advanced SBR Technology



Engineered for life

ICEAS® Advanced SBR Technology

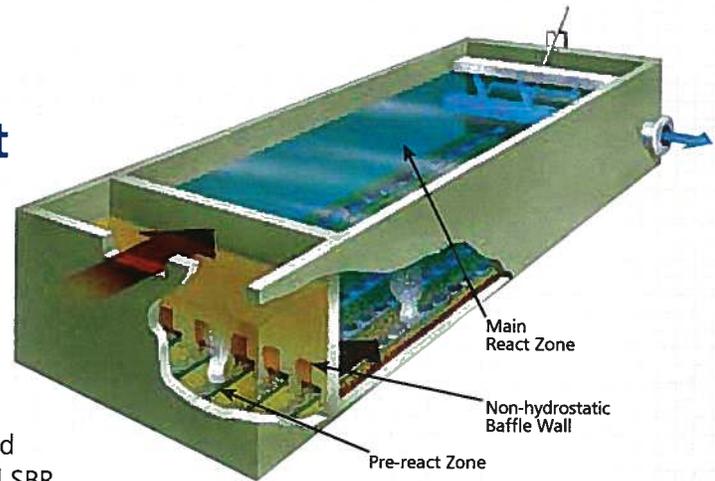


ABJ

Cost-Effective Wastewater Treatment

ITT Sanitaire has provided the wastewater treatment industry with innovative and cost-effective treatment technologies for over 35 years. This tradition continues with the ABJ Intermittent Cycle Extended Aeration (ICEAS) process, which is an advance sequencing batch reactor (SBR) technology for municipal and industrial wastewater treatment.

The conventional SBR, a variant of the activated sludge process, operates on the fill and draw principle. Fill, react, settle, decant and idle phases occur sequentially on a cyclic basis. In the conventional SBR configuration, flow is diverted from the basin during settling and decanting and requires two or more basins or an influent equalization tank to receive flow when settling and decanting. ITT Sanitaire can provide a conventional SBR but recommends the superior flexibility of the ICEAS design, which does not require any flow diversion.



The ICEAS Process

The advanced ABJ ICEAS process is a fully automated and simple to operate biological treatment system that:

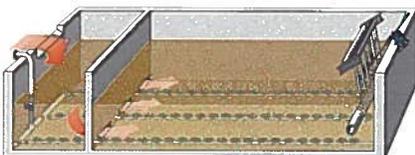
- Operates as a time-based control system allowing continuous inflow of wastewater during all phases of the cycle.
- Responds to flow and load variations.
- Can achieve processes of biological oxidation, nitrification, denitrification, phosphorus removal and liquid/solids separation continuously in a single basin.
- Easily expands and produces a high quality effluent.
- Provides two treatment zones (pre-react and main-react) separated by a non-hydrostatic baffle wall.
- Utilizes the pre-react zone as a biological selector for enhancing the growth of desirable organisms.
- Offers flexibility for meeting specific application needs with custom engineered process cycles.

The ICEAS Cycle

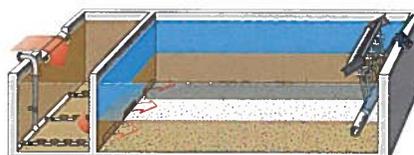
React – Periods of aeration and/or mixing are applied to achieve the desired biological treatment.

Settle – Aeration and/or mixing are discontinued allowing solids to settle to the bottom of the basin leaving a layer of clear, treated water at the top.

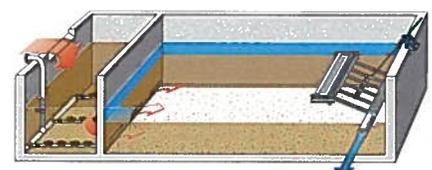
Decant – The clear, treated water is removed by an automated, time-controlled decant mechanism.



React



Settle



Decant

ICEAS Features

Continuous Inflow

- Provides equal loading and flow to all basins, simplifying operation and process control.
- Can be designed to accommodate up to six times average daily flow.
- Results in smaller basin size and less equipment, reducing construction and O&M costs.
- Eliminates primary and secondary clarifiers and return sludge pumps.
- Enables single-basin operation for maintenance and low flow conditions.

Decanter Design

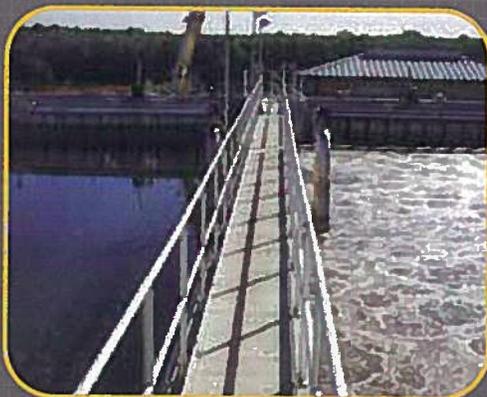
- High quality workmanship and advanced engineering provide a long-lasting decanter.
- Rugged, corrosion resistant stainless steel construction.
- Decants from the top down withdrawing only the uppermost clear water from the basin preventing disruption of the settling solids.
- Uses a proprietary scum exclusion float to prevent the carryover of floating material with the treated effluent.
- Flow over the decanter weir is visible from the basin walkway providing a check of effluent quality.
- Actuator operates via a VFD providing a constant rate of effluent discharge to downstream facilities.
- Parked above top water level during react and settling phases serving as an emergency overflow device in the event of extreme storm conditions or power failure.
- Actuator drive mounted outside of basin at walkway level for easy maintenance.

Energy Efficient Aeration Systems

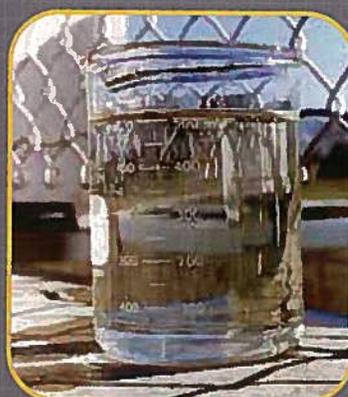
- State-of-the-art aeration systems have been applied worldwide in activated sludge and biological nutrient removal applications. ITT SANITAIRE diffusers provide high oxygen transfer efficiency, require minimal maintenance and are time proven for their durability in wastewater treatment processes..
- Fine Bubble Membrane aeration systems include advanced membrane material specifically engineered for domestic and industrial applications providing resistance to material property changes. The time-proven piping system accommodates thermal expansion and contraction and prevents air leakage, pipe separation and distributor rollover.
- Coarse Bubble aeration systems provide efficient wide band aeration and mixing with minimal maintenance. Stainless steel material provides corrosion resistance and structural integrity and is fully passivated after fabrication. (Available in fixed header and removable header options).

Municipal and Industrial Wastewater Treatment

The ABJ ICEAS process provides high quality effluent for both municipal and industrial wastewater treatment facilities. Typical industrial applications include waste from meat processing, beverage, pharmaceutical, food processing, pulp and paper and chemical plants.



Typical ABJ ICEAS process



ICEAS effluent sample



Stainless steel decanter

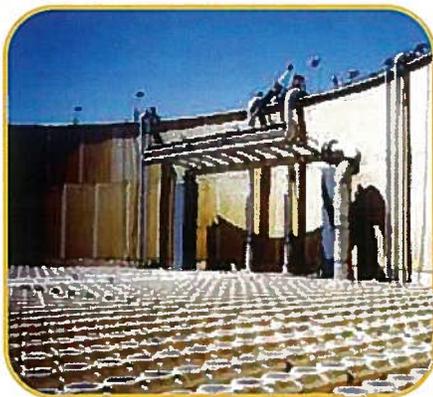
Biological Nutrient Removal (BNR)

The ABJ ICEAS process can be designed as a BNR system for enhanced nitrogen and phosphorus removal.

- Cycles can incorporate alternating periods of "air on" and "air off" during the react phase to produce aerobic/anoxic/anaerobic conditions to promote nitrification/denitrification and phosphorus release and uptake.
- Mixers can be added for operation during periods of "air off" to achieve optimum substrate/microorganism contact.
- New and existing plants can be designed to accommodate future BNR requirements without requiring additional basins.
- Separate aeration drop legs in the pre-react zone can add operational flexibility.



Mixer



Industrial wastewater treatment plant in circular tanks



Control System

- Process control with a PLC based system with a graphic operator interface (HMI).
- Uses state-of-the-art Supervisory Control and Data Acquisition (SCADA) software installed on a PC with modem and remote monitoring capabilities.

World Leader in SBR Technology

ABJ ICEAS facilities have been installed throughout the world over the past three decades. With all installations, ITT Sanitaire provides complete in-house support through its process, mechanical and control engineering departments. Customer assistance is available through in-house staff and representatives who market our products worldwide.



ITT

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DESIGN PROPOSAL

Titusville WWTP Sanitaire #20943-09a

TABLE A

INFLUENT WASTEWATER CHARACTERISTICS AND SITE CONDITIONS

Average Dry Weather Flow	3,391,313 GPD	
Peak Dry Weather Flow	8,000,000 GPD	PDDWF
Peak Wet Weather Flow	10,670,000 GPD	PDWWF
BOD ₅ (20°C)	150 mg/l	
BOD ₅ (20°C)	4,243 lb/day	
Suspended Solids	100 mg/l	
TKN	25 mg/l	
Alkalinity	184 mg/l	
Max Wastewater Temperature	20 °C	
Min Wastewater Temperature	10 °C	
Ambient Air Temperature	20 - 90 °F	
Site Elevation	1,200 ft	

TABLE B

ICEAS® EFFLUENT QUALITY (MONTHLY AVERAGE)

BOD ₅ (20°C)	10.00 mg/l
Suspended Solids	10.00 mg/l
NH ₃ -N	1.00 mg/l

TABLE C

ICEAS PROCESS DESIGN CRITERIA

F / M	0.045 lb BOD ₅ / lb MLSS / day
SVI (after 30 minutes settling)	150 ml/g
MLSS at Bottom Water Level	4,776 mg/l
Waste Sludge Produced (Approx.)	2,281 lb/day
Volume of Sludge Produced (Approx., 0.85% solids)	32,177 GPD
Normal Decant Rate	5,557 GPM
Peak Decant Rate	* 7,410 GPM <i>x 1440 = 10.7 MG</i>
Hydraulic Retention Time	0.82 Days
Sludge Age	36.81 Days

CYCLE	AERATION	SETTLE	DECANT	TOTAL
Normal	120 min	60 min	60 min	4 hour
Storm	90 min	45 min	45 min	3 hour

TABLE D
KEY ICEAS DESIGN DETAILS

Number of ICEAS Basins	4
Top Water Level	15.0 ft
Basin Width	50.0 ft
Basin Length	150.0 ft
Bottom Water Level	10.5 ft

ICEAS EQUIPMENT			Motor HP	No. Req.
Decanter Mechanism	40.0 ' Weir length		1 /Basin	4
Decanter Drive Unit			1/2	4
ICEAS Blower	1,620 SCFM	6.9 PSIG	100	3
* ICEAS Fine Bubble Aeration System	1,008	Disc Diffusers/Basin		4
Air Control Valve	10 "			4
Waste Sludge Pump	110.0 GPM		2.4	4
ICEAS Controls & MCC				1
D.O. Control				4

* *Price includes FB aeration for two (2) new tanks.*

ICEAS POWER REQUIREMENTS			(At Average Aeration Depth)		Kwh/Day
Decant Drive Unit	0.4 BHP	4 run	@	6 Hrs/day	7.16
ICEAS Air Blowers	69.5 BHP	2 run	@	24 Hrs/day	2,488.49
Waste Sludge Pump	1.9 BHP	4 run	@	1.2 Hrs/day	6.98
				KWH/DAY	2,502.63
			AVERAGE	KWH/HR	104.28

INSTALLATION SUPERVISION AND PLANT START-UP

Sanitaire shall provide a factory representative to supervise installation of equipment for a period of five (5) days during one (1) trip to the site, and also for plant start-up for a period of five (5) days during one (1) trip to the site.

Additional time not included can be provided to the contractor and/or owner at a rate of \$850.00 per day plus expenses.

PRICING

This estimate does not include any construction field work such as site preparation, unloading of equipment, excavation, backfill, concrete basin, design or construction, equipment installation, anchoring of equipment, field construction or assembly, yard piping, electrical field wiring or hook-up, field painting, or sales and use taxes.

Price to follow.

Respectfully submitted,

Sanitaire

Tyler Kunz, P.E.
Regional Manager



SANITAIRE ICEAS Detailed Design Calculations
BOD Removal and Nitrification Process

SANITAIRE Project #20943-09a
Titusville WWTP

Design Parameters

A. Flow

Average Daily Flow	3,391,313 GPD
Peak Dry Weather Flow	8,000,000 GPD
Peak Wet Weather Flow	10,670,000 GPD

B. Treatment

	Influent Quality	Effluent Requirement
BOD ₅ (20°C), mg/l	150	10
Suspended Solids, mg/l	100	10
TKN, mg/l	25	
NH ₃ -N, mg/l		1
Phosphorus	0	0

C. Environment

Alkalinity (Minimum Requirement)	185 mg/l
Max Wastewater Temperature	20 °C
Min Wastewater Temperature	10 °C
Ambient Air Temperature	20 - 90 °F
Site Elevation	1,200 ft

D. ICEAS Process Design Criteria

F / M	0.045 BOD ₅ / MLSS / day
SVI (after 30 minutes settling)	150 ml/g
Number of ICEAS Basins	4
Top Water Level	15 ft

E. Cycle Timing

		Normal	Storm
Air-On	min	120	90
Air-Off	min	0	0
Settle	min	60	45
Decant	min	60	45
Total	hrs	4	2

F. Detailed Calculations

BOD Load

$$\text{BODL} = \frac{Q \times \text{BODin} \times 8.34}{1,000,000} = \frac{847,828 \times 150 \times 8.34}{1,000,000} = 1,061 \text{ lb/day/basin}$$

where BODL = BOD Load (lb/day/basin)
 Q = Average Dry Weather Flow per basin (gal/day)
 BODin = Influent BOD concentration (mg/l)
 1,000,000 = conversion (l/mg)
 8.34 = conversion (lb/gal)

Mass of Biomass

$$\text{MBOD} = \frac{\text{BOD}_L}{F / M} = \frac{1,061}{0.045} = 23,570 \text{ lb/basin}$$

where Mbod = Mass of Biomass for BOD Removal (lb/day/basin)
 F / M = Food to Microorganism ratio (day⁻¹)

Volume of Biomass

$$\text{Vbio} = \text{MBOD} \times \text{SVI} = 23,570 \times 2.4 = 56,567 \text{ ft}^3/\text{basin}$$

where Vbio = Volume of Biomass (ft³/basin)
 Mbio = Mass of Biomass (lb/day/basin)
 SVI = Sludge Volume Index (ft³/lb)

Maximum Volume Above Bottom Water Level

Peak Dry Weather Flow:

$$\text{Vbwld} = \frac{\text{PDWF} \times (\text{NCT} - \text{NDT})}{24 \times 7.48} = \frac{2,000,000 \times (4.0 - 1.00)}{24 \times 7.48} = 33,422 \text{ ft}^3/\text{basin}$$

where Vbwld = Maximum Volume Above BWL at Peak Dry Weather Flow (ft³/basin)
 TPDWF = Peak Dry Weather Flow (gal/day)
 NCT = Normal Cycle Time (hr/cycle)
 NDT = Decant Time (hr/cycle)
 7.48 = conversion (gal/ft³)

Peak Wet Weather Flow:

$$V_{bwls} = \frac{PWWF \times (SCT - SDT)}{24 \times 7.48} = \frac{2,667,500 \times (3.0 - 0.75)}{24 \times 7.48} = 33,433 \text{ ft}^3/\text{basin}$$

where V_{bwls} = Maximum Volume Above BWL at Peak Wet Weather (Storm) Flow (ft³/basin)
 PWWF = Peak Wet Weather Flow (gal/day)
 SCT = Storm Cycle Time (hr/cycle)
 SDT = Storm Decant Time (hr/cycle)
 7.48 = conversion (gal/ft³)

MVAB is larger of Peak Dry Weather and Peak Wet Weather Calculation

$$MVAB = 33,433 \text{ ft}^3/\text{basin}$$

Decant Rates

Peak Dry Weather Flow:

$$PDR = \frac{MVAB \times 7.48}{NDT} + \frac{PDWF}{1,440} = \frac{33,433 \times 7.48}{60.0} + \frac{2,000,000}{1,440} = 5,557 \text{ gal/min}$$

where PDR = Normal Decant Rate (gal/min)
 NDT = Normal Decant Time (min/cycle)
 1440 = conversion (min/day)

Peak Wet Weather Flow:

$$PWR = \frac{MVAB \times 7.48}{SDT} + \frac{PWWF}{1,440} = \frac{33,433 \times 7.48}{45.0} + \frac{2,667,500}{1,440} = 7,410 \text{ gal/min}$$

where PWR = Peak Decant Rate (gal/min)
 SDT = Storm Decant Time (min/cycle)

Decanter Sizing

Peak Dry Weather Flow:

$$DL_a = \frac{PDR}{\text{Weir Loading Rate} \times 7.48} = \frac{5,557}{20 \times 7.48} = 37.14 \text{ ft}$$

where DL_a = Decanter Length for Average Dry Weather Flow (ft)
 20 = Weir Loading Rate (ft³/min/ft of decanter weir)

Peak Wet Weather Flow:

$$DL_p = \frac{PWR}{\text{Weir Loading Rate} \times 7.48} = \frac{7,410}{28 \times 7.48} = 35.38 \text{ ft}$$

where DL_p = Decanter Length for Peak Wet Weather (Storm) Flow (ft)
 28 = Weir Loading Rate (ft³/min/ft of decanter weir)

$$\text{Design Decanter Length} = 40.0 \text{ ft}$$

Basin Working Volume

$$BWV = MVAB + V_{bio} = 33,433 + 56,567 = 90,000 \text{ ft}^3/\text{basin}$$

where $MVAB$ = Maximum Volume Above BWL (ft³/basin)
 V_{bio} = Volume of Biomass (ft³/basin)

Basin Area

$$BA = \frac{BWV}{TWL - BZ} = \frac{90,000}{15.0 - 3.0} = 7,500 \text{ ft}^2/\text{basin}$$

where BA = Basin Area (ft²)
 TWL = Top Water Level (ft)
 BZ = Buffer Zone (ft) - Safety Factor

Sludge Depth

$$SD = \frac{V_{bio}}{BA} = \frac{56,567}{7,500} = 7.54 \text{ ft}$$

where SD = Sludge Depth (ft)

Decanter Draw Down

$$DD = \frac{MVAB}{BA} = \frac{33,433}{7,500} = 4.46 \text{ ft}$$

where DD = Draw Down (ft)
 $MVAB$ = Maximum Volume Above BWL (ft³)

Bottom Water Level

$$\text{BWL} = \text{SD} + \text{BZ} = 7.54 + 3.00 = 10.54 \text{ ft}$$

where BWL = Bottom Water Level (ft)

Vd = Depth of Chemical Sludge for Phosphorus precipitation (ft)

Top Water Level

$$\text{TWL} = \text{BWL} + \text{DD} = 10.54 + 4.46 = 15.00 \text{ ft}$$

where TWL = Top Water Level (ft)

Hydraulic Retention Time

$$\text{HRT} = \frac{\text{BA} \times \text{MAFD} \times 7.48}{\text{QT}}$$

where HRT = Hydraulic Retention Time (days)

BA = Basin Area (ft²)

MAFD = Maximum Average Flow Depth (ft)

QT = Fill Rate at Average Dry Weather Flow (gal/day)

$$\text{MAFD} = \frac{Q \times [(CT \times 60) - DT]}{\text{BA} \times 1,440 \times 7.48} + \text{BWL} = \frac{847,828 \times [(4.0 \times 60) - 60.0]}{7,500 \times 1,440 \times 7.48} + 10.54 = 12.43 \text{ ft}$$

$$\text{HRT} = \frac{7,500 \times 12.43 \times 7.48}{847,828} = 0.82 \text{ days}$$

MLSS Concentration at Bottom Water Level

$$\text{MLSS} = \frac{\text{M}_{\text{bio}} \times 1,000,000}{\text{BWL} \times \text{BA} \times 62.42} = \frac{23,570 \times 1,000,000}{10.54 \times 7,500 \times 62.42} = 4,776 \text{ mg/l}$$

where MLSS = Mixed Liquor Suspended Solids concentration at Bottom Water Level (mg/l)

M_{bio} = Mass of Biomass (lb/basin)

62.42/1E+06 = conversion (lb/mg x l/ft³)

Mass of Sludge Produced

$$\Delta M = \left(\frac{Y \times (\text{BOD}_{in} - \text{BOD}_{out})}{1 + (B \times \theta^{(T-20)} \times \text{SRT})} + Z_{io} + Z_{no} \right) \times \frac{Q \times 8.34}{1,000,000}$$

$$\Delta M = \left(\frac{0.6 \times (150 - 10.0)}{1 + (0.07 \times 1.04^{(10-20)} \times 36.8)} + 40.0 + 10.0 \right) \times \frac{8.5E+05 \times 8.34}{1,000,000} = 570 \text{ lb/day/basin}$$

(Lawrence-McCarthy Equation as presented in WEF MOP/8 4th Edition, pg 11-11, Eqn. 11.7)

- where ΔM = Mass of Sludge Produced (lb/day/basin)
 Y = Volatile cell yield (VSS/BODremoved)
 θ = Arrhenius Temperature Correction Factor
 B = Decay Rate, day⁻¹
 Z_{io} = Inert Solids, mg/l
 Z_{no} = Non-volatile suspended solids, mg/l
 T = Wastewater Temperature, °C

Volume of Sludge Produced

$$V_{ws} = \frac{\Delta M}{SF_{ws} \times 8.34} = \frac{570}{0.0085 \times 8.34} = 8,044 \text{ gal/day/basin}$$

- where V_{ws} = Volume of Waste Sludge (gal/day/basin)
 SF_{ws} = Solids Fraction in Waste Sludge
 8.34 = density (lb/gal)

Observed Yield Factor

$$Y_{obs} = \frac{\Delta M}{\text{BOD}_L} = \frac{570}{1,061} = 0.54 \frac{\text{MLSS}}{\text{BOD}}$$

Mean Cell Residence Time

$$\text{MCRT} = \frac{\text{Mbio}}{\Delta M + ((Q - Vws) \times \text{SSout} \times 8.34 / 1\text{E}+06)}$$

$$\text{MCRT} = \frac{23,570}{570 + ((847,828 - 8,044) \times 10.0 \times 8.34 / 1,000,000)} = 36.8 \text{ days}$$

where Mbio = Mass of Biomass (lb/basin)
SSout = Suspended Solids in Effluent (mg/l)
8.34E-06 = conversion (lb/mg x l/gal)

Sludge Age for Nitrification

Refer to Metcalf and Eddy, Edition IV pages 614 and 705

Constants and Temperature Corrections:

Coefficient	Base Value	Theta	Temperature Corrected	Symbol
Maximum Specific Growth Rate of Nitrifying bacteria, g VSS/g VSS.day	0.75	1.07	0.381	μ_{nm}
Half-Velocity constant for nitrifiers	0.74	1.053	0.442	K_n
Nitrifier decay rate	0.08	1.04	0.054	
Dissolved Oxygen, mg/l	2		2	DO
Half-Velocity Constant for Dissolved Oxygen, mg/l	0.5		0.5	K_o
Water Temperature, °C	10		10	T
Safety Factor	2		2	SF

Calculations:

$$\mu_n = \left(\mu_{nm}(T) \times \frac{TENH_3}{TENH_3 + K_n(T)} \times \frac{DO}{DO + K_o} \right) - K_{dn}(T)$$

$$\mu_n = \left(0.381 \times \frac{1.0}{1.0 + 0.442} \times \frac{2.0}{2.0 + 0.5} \right) - 0.054 = \mathbf{0.158 \text{ 1/days}}$$

$$SRT_{min} = \frac{1}{\mu_n} = \frac{1}{0.158} = \mathbf{6.3 \text{ days}}$$

$$SRT_{aerobic} = SRT_{min} \times SF = 6.3 \times 2 = \mathbf{12.7 \text{ days}}$$

$$SRT_{overall} = \frac{SRT_{aerobic} \times 24}{TA} = \frac{12.7 \times 24}{12.0} = \mathbf{25.4 \text{ days}}$$

Design sludge age adequate for nitrification.

where:

- μ_n = Maximum nitrifier growth rate at temperature, DO, and effluent NH₃, g/g-days
- SRT_{min} = Minimum Sludge age required for Nitrification, days
- SRT_{aerobic} = Design Aerobic Sludge Age, days
- SF = Safety Factor
- SRT_{overall} = Sludge Age accounting for entire ICEAS cycle, days
- TA = Aeration Time, hrs/day

Waste Sludge Pump Capacity

$$\text{WSP} = \frac{V_{ws} \times CT}{24 \times \text{SPT}} = \frac{8,044 \times 4.0}{24 \times 12.19} = 110 \text{ gal/min}$$

where WSP = Waste Sludge Pump Capacity(gal/min)
SPT = Sludge Pumping Time (min/cycle)

**SANITAIRE ICEAS Aeration Design Calculations
BOD Removal and Nitrification Process**

**SANITAIRE Project #20943-09a
Titusville WWTP**

Carbonaceous Oxygen Demand

$$AOR1 = A \times \frac{Q \times BOD_{in}}{1,000,000} \times 8.34 = 1.20 \times \frac{847,828 \times 150}{1,000,000} \times 8.34 = 1,273 \text{ lb/day/basin}$$

- where AOR1 = Actual Oxygen Required for BOD oxidation (lb/day/basin)
 A = O₂ / BOD
 Q = average flow (gal/day/basin)
 BOD_{in} = influent BOD received (mg/l)
 1,000,000 = conversion (g x mg)
 8.34 = conversion (lb x gal)

$$A = 1.20 \text{ O}_2/\text{BOD}$$

Nitrification Oxygen Demand

$$AOR2 = NLOAD \times 4.60 = 176.8 \times 4.60 = 813 \text{ lb/day/basin}$$

$$NLOAD = \frac{TKN_{in} \times Q \times 8.34}{1,000,000}$$

$$NLOAD = \frac{25.0 \times 847,828 \times 8.34}{1,000,000} = 176.8 \text{ lb/day/basin}$$

- where NH_{3in} = influent ammonia concentration (mg/l)
 NH_{3out} = effluent ammonia required (mg/l)
 Y_{obs} = Observed sludge Yield (MLSS / BOD removed)
 N_s = Sludge Nitrogen content (N / sludge)
 BOD_{out} = effluent BOD (mg/l)

Total Actual Oxygen Transfer

$$AOR = AOR1 + AOR2 = 1,273 + 813 = 2,086 \text{ lb/day/basin}$$

Total Standard Oxygen Transfer

$$\text{SOR} = \frac{\text{AOR}}{\text{AOR / SOR}} = \frac{2,086}{0.4830} = 4,319 \text{ lb/day/basin}$$

$$\frac{\text{AOR}}{\text{SOR}} = \frac{\alpha \times \theta^{(T_{\text{Site}} - 20)} \times (\beta \times C^*_{\text{sat}_{20}} \times P_{\text{site}} / P_{\text{std}} \times C_{\text{surf}_T} / C_{\text{surf}_{20}} - \text{D.O.})}{C^*_{\text{sat}_{20}}}$$

$$\frac{\text{AOR}}{\text{SOR}} = \frac{0.65 \times 1.024^{(20 - 20)} \times (0.98 \times 10.07 \times 14.12 / 14.70 \times 9.07 / 9.07 - 2.0)}{10.07} = 0.4830$$

- where
- α = alpha factor
 - θ = temperature coefficient
 - T_{site} = water temperature (°C)
 - β = beta factor
 - P_{site} = Site Atmospheric Pressure
 - P_{std} = standard atmospheric pressure (1 atm)
 - C*_{sat₂₀} = dissolved oxygen solubility at standard conditions (mg/l)
 - C_{surf_T} = dissolved oxygen solubility at site water temperature (mg/l)
 - C_{surf₂₀} = dissolved oxygen solubility at 20°C (mg/l)
 - D.O. = residual dissolved oxygen concentration (mg/l)

Aeration System Standard Oxygen Transfer Rate

$$\text{SOTR} = \frac{\text{Basin SOR}_{\text{Total}}}{\text{TA}} = \frac{4,319}{12} = 360 \text{ lb/hr}$$

where TA = Aeration Time, hrs/day

Aeration Depth

Average Aeration Depth

$$\text{MADad} = \frac{\text{ADWF} \times [(\text{NCT} \times 60) - (\text{NDT} + \text{NST})]}{2 \times 1,440 \times 7.48 \times \text{BA}} + \text{BWL}$$

$$\text{MADad} = \frac{847,828 \times [(4.0 \times 60) - (60 + 60)]}{2 \times 1,440 \times 7.48 \times 7,500.0} + 10.54 = 11.17 \text{ ft}$$

- where MADad = Maximum Aeration Depth at Average Dry Weather Flow (gpd)
 ADWF = Average Dry Weather Flow (gpd/basin)
 NCT = Normal Cycle Time (hr)

- NDT = Normal Decant Time (min)
- NST = Normal Settling Time (min)
- BA = Basin Area (ft²)
- 1440 = conversion (min/day)
- 7.48 = conversion (gal/ft³)

Maximum Aeration Depth

$$MAD_{pw} = \frac{PWWF \times [(SCT \times 60) - (SDT + SST)]}{1,440 \times 7.48 \times BA} + BWL$$

$$MAD_{pw} = \frac{2,667,500.0 \times [(3.0 \times 60) - (45 + 45)]}{1,440 \times 7.48 \times 7,500.0} + 10.54 = 13.51 \text{ ft}$$

$$MAD = 13.51 \text{ ft}$$

Air Flow Requirement

$$\text{Process Air} = \frac{SOTR \times 10,000}{\rho \times SOTE \times Opw \times 60} = \frac{360 \times 10,000}{0.075 \times 21.30 \times 23.2 \times 60} = 1,618 \text{ scfm}$$

- where Process Air = Process air flow requirement (scfm)
- ρ = air density (0.075 lb/day/ft³)
- 21.30 = Standard Oxygen Transfer Efficiency @ Submergence of 10.17 ft
- Opw = fraction of Oxygen in air by Weight
- 10,000 = conversion (100% * 100%)
- 60 = Conversion (min/hr)

$$\text{Mixing Air} = 0.125 \times BA = 0.125 \times 7,500.0 = 938 \text{ scfm}$$

- where Mixing Air = Mixing air flow requirement (standard scfm)
- 0.125 = recommended air flow per unit area of basin

Blower Unit Capacity

Blower unit capacity is the larger of the process air requirement and the mixing air requirement.

Process Air 1,618.4 scfm

Mixing Air 937.5 scfm

Use 1 blower per tank

$$BUC = 1,620 \text{ scfm}$$

Blower Pressure

$$\text{psig} = \text{MAD} \times 0.432 + \text{HL} = 13.51 \times 0.432 + 1.00 = \mathbf{6.9 \text{ psig}}$$

where psig = blower pressure (rounded to next psig)
 0.432 = water density (psi/ft)
 H_L = Cumulative piping and diffuser headloss (psig)

Average Blower Power

Blower power based on vendor curves, BUC, and Average Aeration Depth (10.17 ft)

$$\text{Power}_{\text{avg}} = \mathbf{69.5 \text{ bhp}}$$

APPENDIX J

AQUA AEROBICS PROPOSAL

PROCESS DESIGN REPORT



**AQUA-AEROBIC
SYSTEMS, INC.**

TITUSVILLE WWTP PA

Design#: 42193

Option: Preliminary Design - Retrofit

Designed by Ed Fritz, Jr. on Tuesday, October 12, 2010

The enclosed information is based on preliminary data which we have received from you. There may be factors unknown to us which would alter the enclosed recommendation. These recommendations are based on models and assumptions widely used in the industry. While we attempt to keep these current, Aqua-Aerobic Systems, Inc. assumes no responsibility for their validity or any risks associated with their use. Also, because of the various factors stated above, Aqua-Aerobic Systems, Inc. assumes no responsibility for any liability resulting from any use made by you of the enclosed recommendations.

Copyright 2010, Aqua-Aerobic Systems, Inc., Rockford, IL

Design Notes

Pre-SBR

- Neutralization is recommended/required ahead of the SBR if the pH is expected to fall outside of 6.5-8.5 for significant durations.
- Coarse solids removal/reduction is recommended prior to the SBR.

SBR

- The Maximum flow, as shown on the design, has been assumed as a hydraulic maximum and does not represent an additional organic load.
- The Four Reactor SBR has been designed to receive flow such that each reactor's fill period comprises the first 25% of the cycle. Two reactors will each consist of two existing basins. The other two reactors will each consist of one new basin.

Aeration

- The aeration system has been designed to provide 1.25 lbs O₂/lb BOD₅ and 4.6 lbs O₂/lb TKN at the design average loading conditions.
- Oxygen has been provided for Nitrification at 4.6 lbs O₂/lb TKN because nitrification is nearly unavoidable at the design sludge age, particularly during summer months.

Process/Site

- Sufficient alkalinity is required for nitrification, as approximately 7.1 mg alkalinity (as CaCO₃) is required for every mg of NH₃-N nitrified. If the raw water alkalinity cannot support this consumption, while maintaining a residual concentration of 50 mg/l, supplemental alkalinity shall be provided (by others).
- When flows are in excess of the maximum daily flow, the SBR system has been designed to advance cycles/day/basin in order to process a peak hydraulic flow of 16 MGD.

Equipment

- The existing basins' dimensions reported on the design have been based on information given for existing basins. Additional basin dimensions have been assumed based upon the required volumes and assumed basin geometry.
- Tanks are not included and shall be provided by others.
- Influent is assumed to enter the reactor above the waterline, located appropriately to avoid proximity to the decanter, splashing or direct discharge in the immediate vicinity of other equipment.
- If the influent is to be located submerged below the waterline, adequate hydraulic capacity shall be made in the headworks to prevent backflow from one reactor to the other during transition of influent.
- Existing basins will be limited to a freeboard of 1.4 ft. A minimum freeboard of 2.0 ft is recommended for diffused aeration in new basins.
- Influent slide gates are by others.
- Aqua-Aerobic Systems, Inc. (AASI) is familiar with the Buy American provision of the American Recovery and Reinvestment Act of 2009 as well as other Buy American provisions (i.e. FAR 52.225, EXIM Bank, USAid, etc.). AASI can provide a system that is in full compliance with Buy American provisions. As the project develops AASI can work with you to ensure full compliance with a Buy American provision, if required. Please contact the factory should compliance with a Buy American provision be required.

AquaSBR - Sequencing Batch Reactor - Design Summary

DESIGN INFLUENT CONDITIONS

Avg. Design Flow = 4 MG/Day = 15120 CM/Day
 Max. Design Flow ~~12~~ MG/Day = 56700 CM/Day
 Peak Hyd. Flow = 16 MG/Day = 60480 CM/Day

DESIGN PARAMETERS

	Influent	mg/l	Effluent			
			Required	<= mg/l	Anticipated	<= mg/l
Bio/Chem Oxygen Demand:	BOD5	150	BOD5	10	BOD5	10
Total Suspended Solids:	TSS	100	TSS	10	TSS	10
Total Kjeldahl Nitrogen:	TKN	25	--	--	--	--

SITE CONDITIONS

	Maximum		Minimum		Design		Elevation (MSL)
	F	C	F	C	F	C	
Ambient Air Temperatures:	90 F	32.2 C	20 F	-6.7 C	90 F	32.2 C	1174 FT
Influent Waste Temperatures:	68 F	20 C	40 F	4.4 C	68 F	20 C	357.8 M

SBR BASIN DESIGN VALUES

2 New Basins:

		Water Depth		Basin Vol./Basin	
		Min	Avg	Min	Avg
No./Basin Geometry:	= 2 Rectangular Basin(s)	9 FT	10.8 FT	1.017 MG	1.217 MG
Freeboard:	= 2 FT = (0.6 M)	(2.74 M)	(3.28 M)	(3848.3 CM)	(4605.4 CM)
Length of Basin:	= 151 FT = (46M)	(4.77 M)		1.767 MG	(6687.6 CM)
Width of Basin:	= 100 FT = (30.5M)				

4 Existing Basins (operating as 2 reactors in the larger 4 reactor system):

No./Basin Geometry:	= 4 Rectangular Basin(s)	Min = 9 FT = (2.74 M)	Min = 0.508 MG = (1924.1 CM)
Freeboard:	= 1.4 FT = (0.4 M)	Avg = 10.8 FT = (3.28 M)	Avg = 0.608 MG = (2302.7 CM)
Length of Basin:	= 151 FT = (46M)	Max = 15.6 FT = (4.77 M)	Max = 0.883 MG = (3343.8 CM)
Width of Basin:	= 50 FT = (15.2M)		

Number of Cycles: = 5 per Day/Basin (advances cycles beyond MDF)
 Cycle Duration: = 4.8 Hours/Cycle
 Food/Mass (F/M) Ratio: = 0.049 lbs. BOD5/lb. MLSS-Day ✓
 MLSS Concentration: = 3000 mg/l @ Min. Water Depth ✓
 Hydraulic Retention Time: = 1.217 Days @ Avg. Water Depth
 Solids Retention Time: = 29.1 Days
 Est. Net Sludge Yield: = 0.633 lbs. WAS/lb. BOD5
 Est. Dry Solids Produced: = 3168.1 lbs. WAS/Day = (1437 KG/Day)
 Est. Solids Flow Rate: = 200 GPM (25324.5 GAL/Day) = (95.9 CM/Day)
 Decant Flow Rate @ MDF: = 10417 GPM (as avg. from high to low water level) = (39.4 CMM)
 LWL to CenterLine Discharge: = 2 FT = (0.6 M)
 Lbs. O2/lb. BOD5 = 1.25
 Lbs. O2/lb. TKN = 4.6
 Actual Oxygen Required: = 10091 lbs./Day = (4577.4 KG/Day)
 SCFM/Basin: = 1796 = (50.9 CMM)
 Max. Discharge Pressure: = 8.2 PSIG = (56.5 KPA)
 Avg. Power Required: = 4168.3 KW-Hours/Day

Equipment Summary

AquaSBR

Influent Valves

6 Influent Sluice Gate(s) will be provided as follows:

- Electrically operated influent valves by others.

Mixers

16 AquaDDM Direct Drive Mixers will be provided as follows:

- 15 HP Aqua-Aerobic Systems Endura Series Model FSS DDM Mixer(s).

Mixer Mooring

16 Mixer cable mooring system(s) consisting of:

- #10 AWG four-conductor electrical service cable(s).
- Vinyl electrical cable float(s).
- Electrical cable strain relief grip(s), 2 eye, wire mesh.
- 304 stainless steel mooring cable.
- Maintenance mooring cable loop(s).
- Stainless steel mooring spring(s).
- 1/2" stainless steel eyebolt assembly(s).
- 316 stainless steel wire rope thimble(s).
- 316 stainless steel quick disconnect snaphook(s).

Decanters

2 Decanter assemblies for new 151'x100' basins consisting of:

- 16X12 Decanter(s) with fiberglass float, 304 stainless steel weir, galvanized restrained mooring frame, and painted steel power section with #14-10 conductor power cable.
- 24 inch diameter discharge pipe.
- Galvanized steel pipe saddle support assembly.
- Galvanized mooring post(s).
- Galvanized steel dewatering support post(s).
- Galvanized steel top mooring post supports.
- Galvanized steel bottom mooring post supports.
- 24 inch electrically operated butterfly valve(s).

4 Decanter assemblies for existing 151'x50' basins consisting of:

- 10x9 decanter(s) with fiberglass float, 304 stainless steel weir, galvanized restrained mooring frame, and painted steel power section with #14-10 conductor power cable.
- Schedule 80 PVC rigid discharge pipe complete with Vanstone flange.
- Galvanized steel pipe saddle support assembly.
- 4" schedule 40 galvanized restrained mooring post(s) with base plate.
- Galvanized steel dewatering support posts.
- 18 inch electrically operated butterfly valve(s).

Transfer Pumps/Valves

2 Submersible pump assemblies for new 151'x100' basins consisting of the following items:

- 3 HP Submersible Pump(s) with painted cast iron pump housing, discharge elbow, and multi-conductor electrical cable.
- Manual plug valve(s).
- 3 inch Nibco check valve(s).
- Galvanized steel slide rail assembly(ies).

4 Submersible pump assemblies for existing 151'x50' basins consisting of the following items:

- 2.4 HP Submersible Pump(s) with painted cast iron pump housing, discharge elbow, and multi-conductor electrical cable.
- Manual plug valve(s).

- 3 inch Nibco check valve(s).
- Galvanized steel slide rail assembly(ies).

Fixed Fine Bubble Diffusers

6 Fixed Fine Bubble Diffuser Assembly(ies) consisting of:

- 304 SS, 12 Ga. drop pipe(s).
- PVC, Sch 40 Manifold(s) with connection to drop pipe.
- PVC, Air distributor(s) with connection to the manifold and required PVC pipe joint connections.
- 304 Stainless steel piping supports with vertical supports, clamps, adjusting mechanism and adhesive anchor bolts.
- Fine bubble diffuser assemblies.
- 6" manual butterfly valve(s).

Positive Displacement Blowers

5 Positive Displacement Blower Package(s), with each package consisting of:

- Sutorbilt 7M Positive Displacement Blower Package with common base, V-belt drive, enclosed drive guard, pressure gauge, pressure relief valve, and vibration pads.
- 304 stainless steel anchors.
- Discharge silencer, check valve, manual butterfly isolation valve, and flexible discharge connector.
- Inlet filter and inlet silencer.
- 60 HP motor with slide base.

Air Valves

11 Air Control Valve(s) will be provided as follows:

- 10 inch electrically operated butterfly valve(s) with actuator.

Level Sensor Assemblies

6 Pressure Transducer Assembly(ies) each consisting of:

- KPSI Model 700 stainless steel submersible pressure transducer(s).
- Pressure transducer mounting assembly(ies).

6 Level Sensor Assembly(ies) will be provided as follows:

- Float switch(es).
- Float switch mounting bracket(s).
- 304 stainless steel adhesive anchors.

Instrumentation

6 Dissolved Oxygen Assembly(ies) consisting of:

- Hach LDO dissolved oxygen probe with replaceable sensor cap and 33 ft electric cable. Probe includes pole-mount kit for mounting to the handrail. One (1) probe per basin.
- Hach SC100 controller and display module(s).

Controls

Controls wo/Starters

1 The following Controls will be provided as follows:

- NEMA 12 panel enclosure suitable for indoor installation and constructed of painted steel.
- Fuse(s) and fuse block(s).
- Allen Bradley SLC 5/04 programmable controller.
- Panelview 1000 color touchscreen display.
- Remote access modem kit(s).

APPENDIX K
ASHBROOK PROPOSALS

Budgetary Proposal



WATER AND WASTEWATER TREATMENT SOLUTIONS

DATE: November 23, 2010

TO: Robert W. Dengler, II, P.E.
Project Manager

COMPANY: Gannett Fleming, Inc.
Foster Plaza III, Suite 200
601 Holiday Drive
Pittsburgh, PA 15220
Tel: (412) 922-5575 ext. 378
Mobile: (412) 310-6334

Process Systems Group
11600 East Hardy
Houston, Texas 77093-1098
Phone: (281) 985-4423
Fax: (281) 985-4431
Email: michael.yang@as-h.com

CC: George Pitcairn
Jaime Bengoechea

FROM: Michael Yang
Applications Engineer

SUBJECT: Titusville, PA
Sequencing Batch Reactor System

QUOTE NUMBER: 25391R3

In response to your inquiry for a 4,000,000 GPD wastewater treatment system, we are pleased to propose the state of the art Ashbrook™ Sequencing Batch Reactor (SBR) wastewater treatment system, model HSBR-4000-SH.

Basis of Design

Average Daily Flow Rate:	4,000,000 gpd
Peak Daily Flow Rate:	4,000,000 gpd (dry weather)
Peak Daily Flow Rate:	12,000,000 gpd (wet weather)
Peak Hourly Flow Rate:	16,000,000 gpd
Influent Temperature:	10 °C - 20 °C (average 15 °C)
Elevation:	1,200 ft AMSL

	<u>Influent</u>	<u>Projected Effluent</u>
BOD ₅ :	150 mg/L	≤ 10 mg/L
TSS:	100 mg/L	≤ 10 mg/L
TKN:	25 mg/L	-
Ammonia-N:	18 mg/L	≤ 1 mg/L
Phosphorus-P:	6 mg/L	-
Alkalinity:	150 mg/L	-
pH:	6.5 - 8.5	

Budgetary Proposal

Scope of Supply

Sequencing Batch Reactors

- Five (5) 841,559 gallon sequencing batch reactor basins (modify existing SBR basins and add a new fifth basin)
- Five (5) automatic influent control plug valves, 24"
- Five (5) automatic air control butterfly valves, 10"
- Five (5) 9-ft weir floating decanters, each decanting at 5,263 gpm at average flow conditions (4 MGD), 5,430 gpm at peak wet weather flow conditions (12 MGD) and 5,556 gpm at peak hourly flow conditions (16 MGD)
- Five (5) fixed fine bubble disc diffused aeration systems, 1,221 SCFM each (*by others*)
- Six (6) 75 hp positive displacement blower motor units with VFD, each delivering 1,221 SCFM @ 7.56 psig (5 duty & 1 standby)
- Five (5) 3 hp submersible waste sludge pumps complete with slide rails, 158 gpm @ 20 ft TDH each
- Five (5) D.O. probes with automatic controls
- Five (5) pressure transducers and liquid level sensor assemblies, one per basin
- One (1) process control center (PLC and software)

Technical Notes

- a) The SBR system offered by Ashbrook has been designed based on elevations shown in the hydraulic profile (drawing 180-09 dated March 1987 produced by K LH Engineers, Inc., and provided by Gannett Fleming to Ashbrook Simon-Hartley on 11/5/10). The Ashbrook Simon-Hartley SBR process design requires a bottom water level of 1,167.72'. This level would provide 3.22' of head above the top of the invert of the 36" decant pipe to insure the transfer of the decant flow to the existing chlorine contact tanks.
- b) The effective volume of the (3) existing chlorine contact tanks is 381,650 gallons. This would provide a minimum contact time of 34 minutes when (2) SBR basins decant simultaneously at 5,556 gpm (total of 11,111 gpm) at the peak hourly flow condition (16 MGD).
- c) No pre-react zone walls are needed with the Ashbrook Simon-Hartley SBR system since it is a true-batch process.
- d) Please refer to the Ashbrook Simon-Hartley Design Data Sheet for the SBR process design proposed for the Titusville facility. In summary, the (5) SBR basins would run as follows:

Flow Condition	4 MGD	12 MGD	16 MGD
No. of SBR basins	5	5	5
No. of cycles/day	4	10	16
No. of minutes/cycles	360	144	90
No. of SBR basins decanting simultaneously	1	2	2

Budgetary Proposal

- e) Due to number of SBR basins aerating simultaneously at average flow conditions, Ashbrook Simon-Hartley proposes the use of dedicated blowers for each basin (one per basin) with one (1) standby unit.
- f) Ashbrook Simon-Hartley is willing to provide a process performance bond for a period of 12-months after plant startup to guarantee the correct operation and performance of the Sequencing Batch Reactor system.

If there are further technical or commercial details that Ashbrook Simon-Hartley needs to evaluate for this project, please contact Ashbrook Simon-Hartley at your earliest convenience and they will be addressed promptly.

Field Service

- Three (3) trips to the jobsite
- Nine (9) eight hour days total

Clarifications

Items Not Supplied by Ashbrook

- Electrical connections and wiring to the control panel
- Site work
- Plumbing to and from the SBR basins
- Drain valves and piping outside plant walls
- Conduit, wiring and plant lighting
- Civil works
- Wall sleeves
- Motor control center (if the client prefers Ashbrook Simon-Hartley to include the MCC in our scope of supply, please advise)
- Access stairway, walkway, grating and handrails

Existing SBR Basins Dimensions

- SBR Length: 150.00 ft
- SBR Width: 50.00 ft
- SBR Height: 17.00 ft (elevation of 1,174.00 ft)
- Freeboard: 2.00 ft
- Top water level: 15.00 ft (elevation of 1,172.00 ft)
- Bottom water level: 10.72 ft (elevation of 1,167.72 ft)

General Notes

1. Excavation, foundation pad, crane off-loading, field welding, touch-up paint, installation of grating, handrail and component equipment, electrical wiring, and filling of the tank for testing are to be done by the general contractor.
2. There is no provision included in this budgeted price, unless noted, for field erection supervision, tests, inspections or adjustments of equipment.

Budgetary Proposal

Pricing

Budgetary price, F.O.B. factory, with freight allowed to Titusville, PA, off-loading by others.....**\$1,328,500.00**

If you have any questions or need any additional information, please do not hesitate to call your local representative George Pitcairn at (412) 352-8789 or our office.

Sincerely,
Ashbrook Simon-Hartley

Attachments: Ashbrook Simon-Hartley Design Data Sheet

Ashbrook Simon-Hartley SBR Design Data Sheet:

Date:	November 23, 2010	Ashbrook Simon-Hartley
Project:	Titusville, PA	11600 East Hardy
Quote Number:	25391	Houston, TX 77093-1098
Project Type:	5 Basin Operation	Telephone: (800) 362-9041
Revision	1	Fax: (281) 985-4431

1	Influent Data				
2					
3	Average Daily Flow Rate	4,000,000	GPD		
4	Peak Dry Weather Flow Rate	4,000,000	GPD	1.0	Peak Factor
5	Peak Wet Weather Flow Rate	12,000,000	GPD	3.0	Peak Factor
6	Peak Hourly Flow	16,000,000	GPD	4.0	Peak Factor
7					
8	BOD ₅	150	mg/L	5,007.0	Lbs/Day
9	TSS	100	mg/L	3,338.0	Lbs/Day
10	TKN (Total Kjeldahl Nitrogen)	25	mg/L	834.5	Lbs/Day
11	Ammonia Nitrogen (NH ₃ -N)	18	mg/L	600.8	Lbs/Day
12	Total Phosphorus	6	mg/L	200.3	Lbs/Day
13	Alkalinity (as CaCO ₃)	150	mg/L	5,007.0	Lbs/Day
14	pH	6.5 - 8.5	<i>Assumed</i>		
15					
16	Discharge Limits				
17					
18	BOD ₅	10	mg/L	333.6	Lbs/Day
19	TSS	10	mg/L	333.6	Lbs/Day
20	TN (Total Nitrogen)	N/A	mg/L	N/A	Lbs/Day
21	TKN (Total Kjeldahl Nitrogen)	N/A	mg/L	N/A	Lbs/Day
22	Ammonia Nitrogen	1	mg/L	33.4	Lbs/Day
23	Total Phosphorus	N/A	mg/L	N/A	Lbs/Day
24	Alkalinity (as CaCO ₃)	50	mg/L	1668.0	Lbs/Day
25					
26	Site Conditions				
27					
28	Plant Elevation Above Sea Level	1,200	Ft MSL		
29	Mean Wastewater Temperature	59	°F	15.0	°C
30	Maximum Wastewater Temperature	68	°F	20.0	°C
31	Minimum Wastewater Temperature	50	°F	10.0	°C
32	Maximum Air Temperature	104	°F	40.0	°C
33	Minimum Air Temperature	-20	°F	-28.9	°C
34	Relative Humidity % - Assumed	70	%		
35					
36					

Ashbrook Simon-Hartley SBR Design Data Sheet:

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Project Type:	5 Basin Operation	Telephone: (800) 362-9041
Revision	1	Fax: (281) 985-4431

37	SBR Reactor Design				
38					
39	Number of Basins	5			
40	Basin Length (L)	150.00	Ft	For Field Erected Concentric Rings	
41	Basin Width (W)	50.00	Ft	40	Ft Inner Diameter
42	Equivalent Diameter if Round (D)	97.7	Ft	219	Ft Outer Diameter
43	Basin Wall Height	17.00	Ft	(corresponds to 1,174.00' - top of tank)	
44	Freeboard	2.00	Ft		
45	Top Water Level Peak Flow (TWL)	15.00	Ft	(corresponds to 1,172.00' - top water level, peak flow)	
46	Top Water Level Ave. Flow (TWL _A)	14.29	Ft	(corresponds to 1,171.29' - top water level, avg. flow)	
47	Bottom Water Level (BWL)	10.72	Ft	(corresponds to 1,167.72' - bottom water level)	
48	Tank Surface Area	7,500	Ft ²		
49	Volume at TWL	112,500	Ft ³	841,559	Gal
50	Volume at TWL _A	107,153	Ft ³	801,559	Gal
51	Volume at BWL	80,417	Ft ³	601,559	Gal
52	MLSS at BWL	4,500	mg/L		
53	Hydraulic Retention Time (HRT)	24.0	Hours at TWL _A	8.4	Hours at TWL
54	React HRT at Design Flow	17.5	Hours at TWL _A	2.3	Hours at TWL
55	Sludge Age	35.6	Days		
56	F/M Ratio	0.044	Mean	0.046	Aerated
57	Supplemental Alkalinity Required	0.0	Lbs/Day		
58					
59	SBR Cycle Sequence	<u>Design Flow</u>		<u>Peak Flow</u>	
60					
61		4.0	Cycles/Day	10.0	Cycles/Day
62	Anoxic Fill	10	Minutes/Cycle	10	Minutes/Cycle
63	Aerated Fill	62	Minutes/Cycle	18.8	Minutes/Cycle
64	Aerated React	190	Minutes/Cycle	11	Minutes/Cycle
65	Anoxic React	0	Minutes/Cycle	0	Minutes/Cycle
66	Settle	60	Minutes/Cycle	60	Minutes/Cycle
67	Decant	38	Minutes/Cycle	44.2	Minutes/Cycle
68					
69	Normal Cycle Time	6.0	Hours/Cycle	2.4	Hours/Cycle
70	Aeration Time	4.2	Hours/Cycle	0.5	Hours/Cycle
71	Daily Aeration Time	16.8	Hours/Day	5.0	Hours/Day

Ashbrook Simon-Hartley SBR Design Data Sheet:

Date:	November 23, 2010	Ashbrook Simon-Hartley
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72	SBR Equipment				
73					
74	Total Waste Sludge (Including Inerts)	3171	Lbs/Day	5	24 In Influent Valves
75	Total Number of Waste Sludge Pumps	5		5	10 Inch Air Valves
76	Waste Sludge Pump Flow Rate	158	GPM		
77	Waste Sludge Pump TDH	20	Feet		
78	Waste Sludge Pump Power	3	HP		
79					
80	Actual Oxygen Requirement (AOR)	9,545	Lbs O ₂ /Day		
81	Standard Oxygen Requirement (SOR)	260	Lbs O ₂ /Hour/Basin		
82	Average Diffuser Submergence	12.0	Feet		Diffuser 0.8 Foot Above Basin Floor
83	Total Number of Blowers	5	Duty	1	Standby
84	Air Delivery Required Per Basin	1221	SCFM	1366	ACFM
85	Air Delivery Required Per Blower	1221	SCFM	1366	ACFM
86	Total Discharge Pressure	7.56	PSIG		
87	Blower Power	75	HP		
88					
89	Total Number of Floating Decanters	5			9 Foot Weir Decanter
90	Decanter Flow Rate	5,263	GPM Average	5,430	GPM Peak
91	Power Per Decanter	0.5	HP		
92					
93					
94					
95					

96	Average Power Requirements	QTY	BHP	HRS/Day	KWH/Day
97					
98	SBR Blower(s)	5	64	17	4009
99	SBR Waste Sludge Pump(s)	5	2.0	0.8	6.0
100	SBR Decanter(s)	5	0.5	2.5	4.7
101					
102					
103					
104					
105					
106					
107	Total Power	4020	KWH/Day	167	Average KW/Hr

Budgetary Proposal



WATER AND WASTEWATER TREATMENT SOLUTIONS

DATE: November 8, 2010

TO: Robert W. Dengler, II, P.E.
Project Manager

COMPANY: Gannett Fleming, Inc.
Foster Plaza III, Suite 200
601 Holiday Drive
Pittsburgh, PA 15220
Tel: (412) 922-5575 ext. 378
Mobile: (412) 310-6334

Process Systems Group
11600 East Hardy
Houston, Texas 77093-1098
Phone: (281) 985-4423
Fax: (281) 985-4431
Email: michael.yang@as-h.com

CC: George Pitcairn
Jaime Bengoechea

FROM: Michael Yang
Applications Engineer

SUBJECT: Titusville, PA
Sequencing Batch Reactor System

QUOTE NUMBER: 25391R2

In response to your inquiry for a 4,000,000 GPD wastewater treatment system, we are pleased to propose the state of the art Ashbrook™ Sequencing Batch Reactor (SBR) wastewater treatment system, model HSBR-4000-SH.

Basis of Design

Average Daily Flow Rate:	4,000,000 gpd
Peak Daily Flow Rate:	4,000,000 gpd (dry weather)
Peak Daily Flow Rate:	12,000,000 gpd (wet weather)
Peak Hourly Flow Rate:	16,000,000 gpd
Influent Temperature:	10 °C - 20 °C (average 15 °C)
Elevation:	1,600 ft AMSL

	<u>Influent</u>	<u>Projected Effluent</u>
BOD ₅ :	150 mg/L	≤ 10 mg/L
TSS:	100 mg/L	≤ 10 mg/L
TKN:	25 mg/L	-
Ammonia-N:	18 mg/L	≤ 6 mg/L
Phosphorus-P:	6 mg/L	-
Alkalinity:	150 mg/L	-
pH:	6.5 – 8.5	-

Budgetary Proposal

Scope of Supply

Sequencing Batch Reactors

- Four (4) 841,559 gallon sequencing batch reactor basins (modify existing SBR basins)
- Four (4) automatic influent control plug valves, 24"
- Four (4) automatic air control butterfly valves, 10"
- Four (4) 9-ft weir floating decanters, each decanting at 10,417 gpm at average flow and 10,714 gpm at peak wet weather flow
- Four (4) fixed fine bubble disc diffused aeration systems, 1,583 SCFM each (*by others*)
- Three (3) 150 hp positive displacement blower motor units with VFD, each delivering 2,374 SCFM @ 7.56 psig (2 duty & 1 standby)
- Four (4) 3 hp submersible waste sludge pumps complete with slide rails, 198 gpm @ 20 ft TDH each
- Four (4) D.O. probes with automatic controls
- Four (4) pressure transducers and liquid level sensor assemblies, one per basin
- One (1) process control center (PLC and software)

Technical Notes

- a) The SBR system offered by Ashbrook could treat a peak hourly flow of 16 MGD with the existing (4) SBR basins. This assessment is based on elevations shown in the hydraulic profile (drawing 180-09 dated March 1987 produced by KLH Engineers, Inc., and provided by Gannett Fleming to Ashbrook Simon-Hartley on 11/5/10). The Ashbrook Simon-Hartley SBR process design requires a bottom water level of 1,166.65'. This level would provide 2.15' of head above the top of the invert of the 36" decant pipe to insure the transfer of the decant flow to the existing chlorine contact tanks.
- b) The effective volume of the (3) existing chlorine contact tanks is 381,650 gallons. This would provide a minimum contact time of 34 minutes at 16 MGD (11,111 gpm).
- c) No pre-react zone walls are needed with the Ashbrook Simon-Hartley SBR system, since it is a true-batch process.

If there is anything further that Ashbrook Simon-Hartley needs to evaluate for this project, please advice at your earliest convenience.

Field Service

- Three (3) trips to the jobsite
- Nine (9) eight hour days total

Clarifications

Items Not Supplied by Ashbrook

- Electrical connections and wiring to the control panel
- Site work
- Plumbing to and from the SBR basins

Budgetary Proposal

- Drain valves and piping outside plant walls
- Conduit, wiring and plant lighting
- Civil works
- Wall sleeves
- Motor control center (if the client prefers Ashbrook Simon-Hartley to include the MCC in our scope of supply, please advise)
- Access stairway, walkway, grating and handrails

Existing SBR Basins Dimensions

- SBR Length: 150.00 ft
- SBR Width: 50.00 ft
- SBR Height: 17.00 ft (elevation of 1,174.00 ft)
- Freeboard: 2.00 ft
- Top water level: 15.00 ft (elevation of 1,172.00 ft)
- Bottom water level: 9.65 ft (elevation of 1,166.65 ft)

General Notes

1. Excavation, foundation pad, crane off-loading, field welding, touch-up paint, installation of grating, handrail and component equipment, electrical wiring, and filling of the tank for testing are to be done by the general contractor.
2. There is no provision included in this budgeted price, unless noted, for field erection supervision, tests, inspections or adjustments of equipment.

Pricing

Budgetary price, F.O.B. factory, with freight allowed to Titusville, PA, off-loading by others.....**\$1,077,600.00**

If you have any questions or need any additional information, please do not hesitate to call your local representative George Pitcairn at (412) 352-8789 or our office.

Sincerely,
Ashbrook Simon-Hartley

Attachments: Sequencing Batch Reactor Process Design Output

Ashbrook Simon-Hartley SBR Design Data Sheet:

Date:	November 8, 2010	Ashbrook Simon-Hartley
Project:	Titusville, PA	11600 East Hardy
Quote Number:	25391	Houston, TX 77093-1098
Project Type:	4 Basin Operation	Telephone: (800) 362-9041
Revision	1	Fax: (281) 985-4431

1	Influent Data					
2						
3	Average Daily Flow Rate	4,000,000	GPD			
4	Peak Dry Weather Flow Rate	4,000,000	GPD	1.0	Peak Factor	
5	Peak Wet Weather Flow Rate	12,000,000	GPD	3.0	Peak Factor	
6	Peak Hourly Flow	16,000,000	GPD	4.0	Peak Factor	
7						
8	BOD ₅	150	mg/L	5,007.0	Lbs/Day	
9	TSS	100	mg/L	3,338.0	Lbs/Day	
10	TKN (Total Kjeldahl Nitrogen)	25	mg/L	834.5	Lbs/Day	
11	Ammonia Nitrogen (NH ₃ -N)	18	mg/L	600.8	Lbs/Day	<i>Assumed</i>
12	Total Phosphorus	6	mg/L	200.3	Lbs/Day	<i>Assumed</i>
13	Alkalinity (as CaCO ₃)	150	mg/L	5,007.0	Lbs/Day	<i>Assumed</i>
14	pH	6.5 - 8.5				<i>Assumed</i>
15						
16	Discharge Limits					
17						
18	BOD ₅	10	mg/L	333.6	Lbs/Day	
19	TSS	10	mg/L	333.6	Lbs/Day	
20	TN (Total Nitrogen)	N/A	mg/L	N/A	Lbs/Day	
21	TKN (Total Kjeldahl Nitrogen)	N/A	mg/L	N/A	Lbs/Day	
22	Ammonia Nitrogen	6	mg/L	200.2	Lbs/Day	
23	Total Phosphorus	N/A	mg/L	N/A	Lbs/Day	
24	Alkalinity (as CaCO ₃)	50	mg/L	1668.0	Lbs/Day	
25						
26	Site Conditions					
27						
28	Plant Elevation Above Sea Level	1,600	Ft MSL			
29	Mean Wastewater Temperature	59	°F	15.0	°C	
30	Maximum Wastewater Temperature	68	°F	20.0	°C	
31	Minimum Wastewater Temperature	50	°F	10.0	°C	
32	Maximum Air Temperature	104	°F	40.0	°C	
33	Minimum Air Temperature	-20	°F	-28.9	°C	
34	Relative Humidity % - Assumed	70	%			
35						
36						

Ashbrook Simon-Hartley SBR Design Data Sheet:

Date:	November 8, 2010	Ashbrook Simon-Hartley
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Project Type:	4 Basin Operation	Telephone: (800) 362-9041
Revision	1	Fax: (281) 985-4431

37	SBR Reactor Design				
38					
39	Number of Basins	4			
40	Basin Length (L)	150.00	Ft	For Field Erected Concentric Rings	
41	Basin Width (W)	50.00	Ft	40	Ft Inner Diameter
42	Equivalent Diameter if Round (D)	97.7	Ft	195	Ft Outer Diameter
43	Basin Wall Height	17.00	Ft	(corresponds to 1,174.00' - top of tank)	
44	Freeboard	2.00	Ft		
45	Top Water Level Peak Flow (TWL)	15.00	Ft	(corresponds to 1,172.00' - top water level, peak flow)	
46	Top Water Level Ave. Flow (TWL _A)	14.11	Ft	(corresponds to 1,171.11' - top water level, avg. flow)	
47	Bottom Water Level (BWL)	9.65	Ft	(corresponds to 1,166.65' - bottom water level)	
48	Tank Surface Area	7,500	Ft ²		
49	Volume at TWL	112,500	Ft ³	841,559	Gal
50	Volume at TWL _A	105,816	Ft ³	791,559	Gal
51	Volume at BWL	72,396	Ft ³	541,560	Gal
52	MLSS at BWL	4,500	mg/L		
53	Hydraulic Retention Time (HRT)	19.0	Hours at TWL _A	6.7	Hours at TWL
54	React HRT at Design Flow	14.6	Hours at TWL _A	2.6	Hours at TWL
55	Sludge Age	25.7	Days		
56	F/M Ratio	0.062	Mean	0.055	Aerated
57	Supplemental Alkalinity Required	0.0	Lbs/Day		
58					

59	SBR Cycle Sequence	<u>Design Flow</u>		<u>Peak Flow</u>	
60					
61		4.0	Cycles/Day	10.0	Cycles/Day
62	Anoxic Fill	20	Minutes/Cycle	10	Minutes/Cycle
63	Aerated Fill	70	Minutes/Cycle	26	Minutes/Cycle
64	Aerated React	186	Minutes/Cycle	20	Minutes/Cycle
65	Anoxic React	0	Minutes/Cycle	0	Minutes/Cycle
66	Settle	60	Minutes/Cycle	60	Minutes/Cycle
67	Decant	24	Minutes/Cycle	28	Minutes/Cycle
68					
69	Normal Cycle Time	6.0	Hours/Cycle	2.4	Hours/Cycle
70	Aeration Time	4.3	Hours/Cycle	0.8	Hours/Cycle
71	Daily Aeration Time	17.1	Hours/Day	7.7	Hours/Day

Ashbrook Simon-Hartley SBR Design Data Sheet:

Date: November 8, 2010
Project: Titusville, PA
Quote Number: 25391
Project Type: 4 Basin Operation
Revision 1

Ashbrook Simon-Hartley
 11600 East Hardy
 Houston, TX 77093-1098
 Telephone: (800) 362-9041
 Fax: (281) 985-4431

72	SBR Equipment				
73					
74	Total Waste Sludge (Including Inerts)	3171	Lbs/Day	4	24 In Influent Valves
75	Total Number of Waste Sludge Pumps	4		4	10 Inch Air Valves
76	Waste Sludge Pump Flow Rate	198	GPM		
77	Waste Sludge Pump TDH	20	Feet		
78	Waste Sludge Pump Power	3	HP		
79					
80	Actual Oxygen Requirement (AOR)	9,545	Lbs O ₂ /Day		
81	Standard Oxygen Requirement (SOR)	327	Lbs O ₂ /Hour/Basin		
82	Average Diffuser Submergence	11.6	Feet		Diffuser 0.8 Foot Above Basin Floor
83	Total Number of Blowers	2	Duty	1	Standby
84	Air Delivery Required Per Basin	1583	SCFM	1797	ACFM
85	Air Delivery Required Per Blower	2374	SCFM	2696	ACFM
86	Total Discharge Pressure	7.56	PSIG		
87	Blower Power	150	HP		
88					
89	Total Number of Floating Decanters	4			Model 9L Decanter
90	Decanter Flow Rate	10,417	GPM Average	10,714	GPM Peak
91	Power Per Decanter	1	HP		
92					
93					
94					
95					

96	Average Power Requirements	QTY	BHP	HRS/Day	KWH/Day
97					
98	SBR Blower(s)	2	126	23	4276
99	SBR Waste Sludge Pump(s)	4	2.5	0.8	6.0
100	SBR Decanter(s)	4	1.0	1.6	4.8
101					
102					
103					
104					
105					
106					
107	Total Power	4287	KWH/Day	179	Average KW/Hr

APPENDIX L

ALTERNATIVE NO. 3 DETAILED COST BREAKDOWN - EQ

**City of Titusville WWTP Additions
Alternative No. 3 - Equalization Tanks**

Item 1 - SBR Tanks - Equipment

Equipment Price

ICEAS - Modify Exist 4 Tanks	\$ 1,000,000
SCADA	\$ 100,000
Installation 100% Equip. Cost	\$ 1,100,000

Total Equipment and Installation \$ 2,200,000

Dimension 151'x50'x17'

	Units	Value
Piping To & From EQ Tanks (incl. Valves)	LF	800
Piping Unit Cost	\$/LF	200
Piping Cost (incl Valves)	\$	160,000
Paint	\$	10,000

Item No. 2 - Equalization Tanks (2 MG)

Number	2	
Unit Cost	\$/each	1,100,000
Total EQ Cost	\$	2,200,000

Item No. 3 - Raw Sewage Pumps Impellers

Number	3	
Total To Increase Impeller Size	\$	10,000

Item 4 - Centrifuge

Equipment	\$	200,000
Installation	\$	200,000
Total Equip. & Installation	\$	400,000

Item 5 - Repair Exist BFP Bldg. \$ 20,000

Item 6 - Aerobic Digesters (2) - Repair

Diameter	FT	35
Brick Pointing	\$	3,000
Replace Parapet	FT	220
Unit Cost	\$/FT	1,360
Parapet Cost	\$	3,000

Item 7 - Headworks

Design Peak Flow	MGD	16.0
Mechanical Screen, each	\$	200,000
Installation (100% equip cost)	\$	200,000
Total Equipment and Installation	\$	400,000
Superstructure		
Dimensions	FT	35 x 45
Area	SF	1,575
Unit Cost	\$/SF	200
Total Cost	\$	315,000

Item 8 - Interceptor Manhole outside

Fence - Raise Above Flood Level	\$	1,000
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Item 9 - Blower Building

Dimensions	FT	35 x 15
Area	SF	525
Unit Cost	\$/SF	200
Total Cost	\$	105,000

Item 10 - Replace Roofs

	Units	Value
Main Operations Building	SF	2,200
SBR Operation Building	SF	1,250
Unit Cost	\$/SF	10
Main Oper. Bldg Cost	\$	22,000
SBR Oper. Bldg Cost	SF	12,500
Total Reroofing Cost	\$	34,500

APPENDIX M
FINANCING TABLES

**City of Titusville - Alternative No. 2A.3 - ABJ SBR System With WWTP Improvements
Conventional Funding Formula - Pennvest**

	Year 2011
Total Construction Cost	\$5,041,850
Related Project Costs (28% of Const. Costs)	<u>\$1,411,718</u>
Estimated Total Project Cost	\$6,454,000
Pennvest Loan Amount	\$6,454,000
Pennvest Grant Amount	\$0
SYSTEM COSTS	
Annual Costs	
Debt Service	\$357,680
Averaged Periodic Interest Rate	1.000%
Number of Payment Periods	20 years
Additional Operation and Maintenance	\$25,000
Total Annual Costs	\$382,680
SYSTEM REVENUES	
Number of EDUs (Year 2010)	3,362
Required Annual Sewer Revenue	\$382,680
Estimated Annual User Charge per EDU	\$113.83
TOTAL ADDITIONAL MONTHLY SURCHARGE PER EDU	\$9.49

**City of Titusville - Alternative No. 2A.3 - ABJ SBR System With WWTP Improvements
Conventional Funding Formula - RUS**

	Year 2011
Total Construction Cost	\$5,041,850
Related Project Costs (28% of Const. Costs)	<u>\$1,411,718</u>
Estimated Total Project Cost	\$6,454,000
RUS Loan Amount	\$6,454,000
RUS Grant Amount	
SYSTEM COSTS	
Annual Costs	
Debt Service	\$257,127
Averaged Periodic Interest Rate	2.500%
Number of Payment Periods	39 years
Debt Service Reserve (10%)	\$25,713
Additional Operation and Maintenance	\$25,000
Total Annual Costs	\$307,840
SYSTEM REVENUES	
Number of EDUs - Year 2010	3,362
Required Annual Sewer Revenue	\$307,840
Estimated Annual User Charge per EDU	\$91.56
TOTAL ADDITIONAL MONTHLY SURCHARGE PER EDU	\$7.63

**City of Titusville - Alternative No. 2A.3 - ABJ SBR System With WWTP Improvements
Conventional Funding Formula - Bond Issue**

	Year 2011
Total Construction Cost	\$5,041,850
Related Project Costs (28% of Const. Costs)	<u>\$1,411,718</u>
Estimated Total Project Cost	\$6,454,000
Bond Amount	\$6,454,000
SYSTEM COSTS	
Annual Costs	
Debt Service	\$396,211
Averaged Periodic Interest Rate	4.500%
Number of Payment Periods	30 years
Debt Service Reserve (10%)	\$39,621
Additional Operation and Maintenance Cost	\$25,000
Total Annual Costs	\$460,832
SYSTEM REVENUES	
Number of EDUs	3,362
Required Annual Sewer Revenue	\$460,832
Estimated Annual User Charge per EDU	\$137.07
TOTAL ADDITIONAL MONTHLY SURCHARGE PER EDU	\$11.42

APPENDIX N

REQUEST FOR COMMENTS, COMMENTS RECEIVED AND RESPONSES

APPENDIX O
PROOF OF PUBLIC NOTICE

PUBLIC NOTICE

FOR

CITY OF TITUSVILLE

ACT 537 PLAN UPDATE/SPECIAL STUDY

FOR

WASTEWATER TREATMENT PLANT EXPANSION

NOTICE IS HEREBY GIVEN that the City of Titusville has developed an update to the Act 537 Plan for the City of Titusville and portions of Oil Creek and Cherrytree Townships in accordance with Act 537, enacted January 24, 1966, P.L. 1535 (35 P.S. 750.1), known as Pennsylvania Sewage Facilities Act, as amended, and the Rules and Regulations of the Pennsylvania Department of Environmental Protection, Chapter 71 of Title 25 of the Pennsylvania Code.

The proposed Plan contains an introduction, land use zoning, population, flow, and loading projections, identification of planning alternatives, alternative evaluation and implementation, selected plan, financing of the project, and arrangements for implementation.

The alternative of choice to be implemented is Alternative No. 2A.3 – ABJ SBR System With WWTP Improvements. The estimated project cost is \$6,454,000 for the recommended alternative. The recommended financing alternative is a Pennvest Loan. The monthly user fee is projected to be \$_____ a month. The key implementation activities/dates include design, permits, funding for the alternatives and start-up of the equipment.

This notice begins the required 30-day public comment period for the Plan. The Plan is available for review at 107 North Franklin Street, Titusville, PA 16354 during normal office hours. Comments must be written and may be mailed to Gannett Fleming, Inc., Foster Plaza 3, 601 Holiday Drive, Pittsburgh, PA 15220, to the attention of John F. Rae, P.E. or hand delivered or mailed to the City of Titusville.

City of Titusville

APPENDIX P

RESOLUTION OF PLAN ADOPTION

RESOLUTION FOR PLAN REVISION

RESOLUTION OF THE COUNCIL OF THE CITY OF TITUSVILLE, CRAWFORD COUNTY, PENNSYLVANIA (hereinafter "the municipality").

WHEREAS, Section 5 of the Act of January 24, 1966, P.L. 1535, No. 537, known as the "Pennsylvania Sewage Facilities Act," as amended, and the Rules and Regulations of the Department of Environmental Protection (Department) adopted thereunder, Chapter 71 of Title 25 of the Pennsylvania Code, requires the municipality to adopt an Official Sewage Facilities Plan providing for sewage services adequate to prevent contamination of waters and/or environmental health hazards with sewage wastes, and to revise said plan whenever it is necessary to meet the sewage disposal needs of the municipality, and

WHEREAS, the City of Titusville has prepared an Act 537 Sewage Facilities Plan Update, which provides for the expansion of the Titusville WWTP for treatment of sewage flows from the City of Titusville and portions of Oil Creek Township, Crawford County and Cherrytree Township, Venango County,

WHEREAS, the City of Titusville finds that the Facility Plan described above conforms to applicable zoning and other municipal ordinances and plans and to a comprehensive program of pollution control and water quality management.

NOW, THEREFORE, BE IT RESOLVED that the Council of the City of Titusville hereby adopts and submits to the Department of Environmental Protection its approval as a revision to the "Official Plan" of the municipality, the above referenced Facility Plan. The municipality hereby assures the Department of the complete and timely implementation of the said plan as required by law. (Section 5, Pennsylvania Sewage Facilities Act as amended).

I, _____, Secretary, City of Titusville
Council, hereby certify that the foregoing is a true copy of the City's Resolution No. _____,
adopted _____, 20__.

The alternative of choice to be implemented is Alternative No. 2A.3 – ABJ SBR System With WWTP Improvements. The estimated project cost is \$6,454,000 for the recommended alternative. The recommended financing alternative is a Pennvest Loan. The additional monthly user fee is projected to be \$___ a month. The key implementation activities/dates include design, permits, funding for the alternatives and start-up of the equipment.

CITY OF TITUSVILLE

CITY SEAL

SECRETARY

APPENDIX Q
ENVIRONMENTAL REPORT

REVISED ENVIRONMENTAL REPORT
TO BE INSERTED

APPENDIX R

ESTIMATED COSTS - ALL ALTERNATIVES

PHF = 16 MGD

**City of Titusville WWTP Additions
Summary of Estimated Construction and Project Costs**

Alternative No. 2A.1 - ABJ SBR System

Item No.	Description	Cost
1	SBR Tanks (Based on ABJ) - 1 Addl. Tank and Conversion of Existing Tanks to ICEAS Process Subtotal Estimated Construction Cost Electrical Cost (10%) Total Estimated Construction Cost Related Project Cost (28%) Total Project Cost	\$ 3,305,000 \$ 3,305,000 \$ 330,500 \$ 3,635,500 \$ 1,017,940 \$ 4,653,000

**City of Titusville WWTP Additions
Summary of Estimated Construction and Project Costs**

Alternative No. 2A.2 - ABJ SBR System

Item No.	Description	Cost
1	SBR Tanks (Modify Existing 4 Tanks) to ICEAS Process	\$ 2,370,000
	Subtotal Estimated Construction Cost	\$ 2,370,000
	Electrical Cost (10%)	\$ 237,000
	Total Estimated Construction Cost	\$ 2,607,000
	Related Project Cost	\$ 912,000
	Total Project Cost	\$ 3,519,000

**City of Titusville WWTP Additions
Summary of Estimated Construction and Project Costs**

**Alternative No. 2A.3 - ABJ SBR System With WWTP Improvements and 1
Additional Tank**

Item No.	Description	Cost
1	SBR Tanks (Based on ABJ) - 1 Addl. Tank Conversion of Existing Tanks to ICEAS Process and Piping Modifications	\$ 3,305,000
2	Centrifuge	\$ 400,000
3	Repair Existing BFP Building	\$ 20,000
4	Aerobic Digesters (Repair)	\$ 3,000
5	Headworks Mechanical Bar Screen	\$ 400,000
	Superstructure	\$ 315,000
6	Interceptor Manhole	\$ 1,000
7	Blower Building	\$ 105,000
8	Replace Roofs Operations Building	\$ 12,500
	SBR Operations Building	\$ 22,000
	Subtotal Estimated Construction Cost	\$ 4,583,500
	Electrical Cost (10%)	\$ 458,350
	Total Estimated Construction Cost	\$ 5,041,850
	Related Project Cost (28%)	\$ 1,411,718
	Total Project Cost	\$ 6,454,000

**City of Titusville WWTP Additions
Summary of Estimated Construction and Project Costs**

Alternative No. 2A.4 – ABJ SBR 4 Tanks With WWTP Improvements

Item No.	Description	Cost
1	SBR Tanks (Modify Existing 4 Tanks) to ICEAS Process	\$ 2,370,000
2	Modify Raw Sewage Pumps	\$ 10,000
3	Centrifuge	\$ 400,000
4	Repair Existing BFP Building	\$ 20,000
5	Aerobic Digesters (Repair)	\$ 3,000
6	Headworks Mechanical Bar Screen	\$ 400,000
	Superstructure	\$ 315,000
7	Interceptor Manhole	\$ 1,000
8	Blower Building	\$ 105,000
9	Replace Roofs Operations Building	\$ 12,500
	SBR Operations Building	\$ 22,000
	Subtotal Estimated Construction Cost	\$ 3,646,000
	Electrical Cost (10%)	\$ 365,000
	Total Estimated Construction Cost	\$ 4,011,000
	Related Project Cost	\$ 1,404,000
	Total Project Cost	\$ 5,415,000

**City of Titusville WWTP Additions
Summary of Estimated Construction and Project Costs**

Alternative No. 2C.1 - Ashbrook SBR System Only

Item No.	Description	Cost
1	SBR Tanks (Based on Ashbrook) - 1 Addl. Tank	\$ 3,866,000
	Subtotal Estimated Construction Cost	\$ 3,866,000
	Electrical Cost (10%)	\$ 387,000
	Total Estimated Construction Cost	\$ 4,253,000
	Related Project Cost	\$ 1,489,000
	Total Project Cost	\$ 5,742,000

**City of Titusville WWTP Additions
Summary of Estimated Construction and Project Costs**

Alternative No. 2C.2 - Ashbrook SBR System + WWTP Improvements

Item No.	Description	Cost
1	SBR Tanks (Based on Ashbrook) - 1 Addl. Tank	\$ 3,866,000
2	Centrifuge	\$ 400,000
3	Repair Existing BFP Building	\$ 20,000
4	Aerobic Digesters (Repair)	\$ 3,000
5	Headworks	
	Mechanical Bar Screen	\$ 400,000
	Superstructure	\$ 315,000
6	Interceptor Manhole	\$ 1,000
7	Blower Building	\$ 150,000
8	Replace Roofs	
	Operations Building	\$ 12,500
	SBR Operations Building	\$ 22,000
	Subtotal Estimated Construction Cost	\$ 5,145,000
	Electrical Cost (10%)	\$ 515,000
	Total Estimated Construction Cost	\$ 5,560,000
	Related Project Cost	\$ 1,981,000
	Total Project Cost	\$ 7,541,000

PHF = 16 MGD

**City of Titusville WWTP Additions
Summary of Estimated Construction and Project Costs**

**Alternative No. 3A - Equalization Tanks With 4-Tank SBR Without Other
WWTP Improvements**

Item No.	Description	Cost
1	SBR Tanks (Modify Existing 4 Tanks) to ICEAS Process	\$ 2,370,000
2	Equalization Tanks (1 @ 1.0 MGD)	\$ 1,280,000
	Subtotal Estimated Construction Cost	\$ 3,650,000
	Electrical Cost (10%)	\$ 365,000
	Total Estimated Construction Cost	\$ 4,015,000
	Related Project Cost	\$ 1,405,000
	Total Project Cost	\$ 5,420,000

PHF = 16 MGD

**City of Titusville WWTP Additions
Summary of Estimated Construction and Project Costs**

Alternative No. 3B - Equalization Tank With 4-Tank SBR With WWTP Improvements

Item No.	Description	Cost
1	SBR Tanks (Modify Existing 4 Tanks) to ICEAS Process	\$ 2,370,000
2	Equalization Tanks (1 @ 1.0 MGD)	\$ 1,280,000
3	Modify Raw Sewage Pumps	\$ 10,000
4	Centrifuge	\$ 400,000
5	Repair Existing BFP Building	\$ 20,000
6	Aerobic Digesters (Repair)	\$ 3,000
7	Headworks	
	Mechanical Bar Screen	\$ 400,000
	Superstructure	\$ 315,000
8	Interceptor Manhole	\$ 1,000
9	Blower Building	\$ 105,000
10	Replace Roofs	
	Operations Building	\$ 12,500
	SBR Operations Building	\$ 22,000
	Subtotal Estimated Construction Cost	\$ 4,939,000
	Electrical Cost (10%)	\$ 494,000
	Total Estimated Construction Cost	\$ 5,433,000
	Related Project Cost	\$ 1,902,000
	Total Project Cost	\$ 7,335,000

**City of Titusville WWTP Additions
Alternative No. 2A - ABJ SBR System**

Item 1 - SBR Tanks - 2 Additional Tanks

Equipment Price

ICEAS	\$ 1,500,000
SCADA	\$ 100,000
Installation 100% Equip. Cost	\$ 1,600,000

Subtotal Equipment and Installation \$ 3,200,000

Dimension	151'x50'x17'	Each	
		Units	Value

Concrete Quantity Takeoff

Slab Foundation Thickness	FT	3
Outside Wall Thickness	FT	1.5
Walkways (2)	FT	4 x 0.67
Slab Volume	CY	884
Wall Volume	CY	528
Walkways (2)	CY	30
Concrete Unit Cost	\$/CY	1,200
Slab Concrete Cost	\$	1,061,000
Wall Concrete Cost	\$	634,000
Walkways (2)	\$	36,000

Gravel Underlayment	FT	1
Gravel Volume	CY	295
Gravel Unit cost	\$/CY	50
Gravel Cost	\$	15,000

Excavation

SBR Tanks (5' deep)	CY	2,947
Excavation Factor		1.3
Excavated Volume w/Factor	CY	3,831
Bulk Excavation Unit Cost	\$/CY	30
Bulk Excavation Cost	\$	115,000

	Units	Value
Piping (including Valves)	LF	1,000
Piping Unit Cost	\$/LF	200
Piping Cost (incl Valves)	\$	200,000
Paint	\$	10,000
Handrail Takeoffs		
Handrail Length	FT	700
Handrail Unit Cost	\$/FT	40
Handrail Cost		28,000
Subtotal SBR		\$ 2,099,000
Total SBR		\$ 5,299,000
Item 2 - Centrifuge		
Equipment	\$	200,000
Installation	\$	200,000
Total Equip. & Installation	\$	400,000
Item 3 - Repair Exist BFP Bldg.	\$	20,000
Item 4 - Aerobic Digesters (2) - Repair		
Diameter	FT	35
Brick Pointing	\$	3,000
Replace Parapet	FT	220
Unit Cost	\$/FT	13.60
Parapet Cost	\$	3,000
Item 5 - Headworks		
Design Peak Flow	MGD	16.0
Mechanical Screen, each	\$	200,000
Installation (100% equip cost)	\$	200,000
Total Equipment and Installation	\$	400,000
Superstructure		
Dimensions	FT	35 x 45
Area	SF	1,575
Unit Cost	\$/SF	200
Total Cost	\$	315,000

	Units	Value
Item 6 - Interceptor Manhole outside		
Fence - Raise Above Flood Level	\$	1,000
 Item 7 - Blower Building		
Dimensions	FT	35 x 15
Area	SF	525
Unit Cost	\$/SF	200
Total Cost	\$	105,000
 Item 8 - Replace Roofs		
Main Operations Building	SF	2,200
SBR Operation Building	SF	1,250
Unit Cost	\$/SF	10
Main Oper. Bldg Cost	\$	22,000
SBR Oper. Bldg Cost	SF	12,500
Total Reroofing Cost	\$	34,500
Subtotal Items 2-8		\$ 1,278,500
Total		\$ 6,577,500

**City of Titusville WWTP Additions
Alternative No. 2A.1 and 2A.3 - ABJ SBR System**

Item 1 - SBR Tanks - 1 Additional Tank

Equipment Price

ICEAS	\$ 1,500,000
Installation 50% Equip. Cost	\$ 750,000

Subtotal Equipment and Installation \$ 2,250,000

Dimension	151'x50'x17'	Each	
		Units	Value
Concrete Quantity Takeoff			
Slab Foundation Thickness		FT	3
Outside Wall Thickness		FT	1.5
Walkways (1)		FT	4 x 0.67
Slab Volume		CY	442
Wall Volume		CY	264
Walkways (1)		CY	15
Concrete Unit Cost		\$/CY	1,200
Slab Concrete Cost		\$	531,000
Wall Concrete Cost		\$	317,000
Walkways (1)		\$	18,000
Gravel Underlayment			
		FT	1
Gravel Volume		CY	148
Gravel Unit cost		\$/CY	50
Gravel Cost		\$	7,500
Excavation			
SBR Tanks (5' deep)		CY	1,474
Excavation Factor			1.3
Excavated Volume w/Factor		CY	1,916
Bulk Excavation Unit Cost		\$/CY	30
Bulk Excavation Cost		\$	57,500
Piping (including Valves)			
		LF	500
Piping Unit Cost		\$/LF	200
Piping Cost (incl Valves)		\$	100,000

	Units	Value
Paint	\$	10,000
 Handrail Takeoffs		
Handrail Length	FT	350
Handrail Unit Cost	\$/FT	40
Handrail Cost		14,000
 Subtotal		 \$ 1,055,000
Total SBR		\$ 3,305,000
 Item 2 - Centrifuge		
Equipment	\$	200,000
Installation	\$	200,000
Total Equip. & Installation	\$	400,000
 Item 3 - Repair Exist BFP Bldg.	 \$	 20,000
 Item 4 - Aerobic Digesters (2) - Repair		
Diameter	FT	35
Brick Pointing	\$	3,000
Replace Parapet	FT	220
Unit Cost	\$/FT	13.60
Parapet Cost	\$	3,000
 Item 5 - Headworks		
Design Peak Flow	MGD	16.0
 Mechanical Screen, each		
	\$	200,000
Installation (100% equip cost)	\$	200,000
Total Equipment and Installation	\$	400,000
 Superstructure		
Dimensions	FT	35 x 45
Area	SF	1,575
Unit Cost	\$/SF	200
Total Cost	\$	315,000
 Item 6 - Interceptor Manhole outside		
Fence - Raise Above Flood Level	\$	1,000

	Units	Value
Item 7 - Blower Building		
Dimensions	FT	35 x 15
Area	SF	525
Unit Cost	\$/SF	200
Total Cost	\$	105,000
 Item 8 - Replace Roofs		
Main Operations Building	SF	2,200
SBR Operation Building	SF	1,250
Unit Cost	\$/SF	10
Main Oper. Bldg Cost	\$	22,000
SBR Oper. Bldg Cost	\$	12,500
Total Reroofing Cost	\$	34,500
Subtotal Items 2-8		\$ 1,278,500
Total		\$ 4,583,500

**City of Titusville WWTP Additions
Alternative No. 2C.1 - Ashbrook SBR System**

Item 1 - SBR Tanks - 1 Additional Tank

Equipment Price

Batch	\$ 1,405,500
Installation 100% Equip. Cost	\$ 1,405,500

Subtotal Equipment and Installation \$ 2,811,000

Dimension	150'x50'x17'	Each Units	Value
Concrete Quantity Takeoff			
Slab Foundation Thickness		FT	3
Outside Wall Thickness		FT	1.5
Walkway (1)		FT	4 x 0.67
Slab Volume		CY	442
Wall Volume		CY	264
Walkway (1)		CY	15
Concrete Unit Cost		\$/CY	1,200
Slab Concrete Cost		\$	531,000
Wall Concrete Cost		\$	317,000
Walkways (1)		\$	18,000
Gravel Underlayment			
		FT	1
Gravel Volume		CY	148
Gravel Unit cost		\$/CY	50
Gravel Cost		\$	7,500
Excavation			
SBR Tanks (5' deep)		CY	1,474
Excavation Factor			1.3
Excavated Volume w/Factor		CY	1,916
Bulk Excavation Unit Cost		\$/CY	30
Bulk Excavation Cost		\$	57,500
Piping (including Valves)			
		LF	500
Piping Unit Cost		\$/LF	200
Piping Cost (incl Valves)		\$	100,000

	Units	Value
Paint	\$	10,000
 Handrail Takeoffs		
Handrail Length	FT	350
Handrail Unit Cost	\$/FT	40
Handrail Cost	\$	14,000
 Subtotal		 \$ 1,055,000
Total SBR		\$ 3,866,000
 Item 2 - Centrifuge		
Equipment	\$	200,000
Installation	\$	200,000
Total Equip. & Installation	\$	400,000
 Item 3 - Repair Exist BFP Bldg.	 \$	 20,000
 Item 4 - Aerobic Digesters (2) - Repair		
Diameter	FT	35
Brick Pointing	\$	3,000
Replace Parapet	FT	220
Unit Cost	\$/FT	13.60
Parapet Cost	\$	3,000
 Item 5 - Headworks		
Design Peak Flow	MGD	16.0
 Mechanical Screen, each		
	\$	200,000
Installation (100% equip cost)	\$	200,000
Total Equipment and Installation	\$	400,000
 Superstructure		
Dimensions	FT	35 x 45
Area	SF	1,575
Unit Cost	\$/SF	200
Total Cost	\$	315,000
 Item 6 - Interceptor Manhole outside		
Fence - Raise Above Flood Level	\$	1,000

	Units	Value
Item 7 - Blower Building		
Dimensions	FT	50 x 15
Area	SF	750
Unit Cost	\$/SF	200
Total Cost	\$	150,000
Item 8 - Replace Roofs		
Main Operations Building	SF	2,200
SBR Operation Building	SF	1,250
Unit Cost	\$/SF	10
Main Oper. Bldg Cost	\$	22,000
SBR Oper. Bldg Cost	\$	12,500
Total Reroofing Cost	\$	34,500
Subtotal Items 2-8		\$ 1,278,500
Total		\$ 5,144,500

**City of Titusville WWTP Additions
Alternative No. 3A - Equalization Tanks (1 MG)**

Item 1 - SBR Tanks - Equipment

Equipment Price

ICEAS - Modify Exist 4 Tanks	\$ 1,085,000
SCADA	\$ 100,000
Installation 100% Equip. Cost	\$ 1,185,000

Subtotal Equipment and Installation \$ 2,370,000

Dimension 151'x50'x17'

	Units	Value
Piping To & From EQ Tanks (incl. Valves)	LF	800
Piping Unit Cost	\$/LF	200
Piping Cost (incl Valves)	\$	160,000
Paint	\$	10,000

Item No. 2 - Equalization Tanks (1 MG)

Number	2	
Unit Cost	\$/each	1,100,000
Total EQ Cost	\$	2,200,000

Item No. 3 - Raw Sewage Pumps Impellers

Number	3	
Total To Increase Impeller Size	\$	10,000

Subtotal EQ Tanks \$ 1,280,000

Item 4 - Centrifuge

Equipment	\$	200,000
Installation	\$	200,000
Total Equip. & Installation	\$	400,000

Item 5 - Repair Exist BFP Bldg. \$ 20,000

	Units	Value
Item 6 - Aerobic Digesters (2) - Repair		
Diameter	FT	35
Brick Pointing	\$	3,000
Replace Parapet	FT	220
Unit Cost	\$/FT	1,360
Parapet Cost	\$	3,000
Item 7 - Headworks		
Design Peak Flow	MGD	16.0
Mechanical Screen, each	\$	200,000
Installation (100% equip cost)	\$	200,000
Total Equipment and Installation	\$	400,000
Superstructure		
Dimensions	FT	35 x 45
Area	SF	1,575
Unit Cost	\$/SF	200
Total Cost	\$	315,000
Item 8 - Interceptor Manhole outside		
Fence - Raise Above Flood Level	\$	1,000
Item 9 - Blower Building		
Dimensions	FT	35 x 15
Area	SF	525
Unit Cost	\$/SF	200
Total Cost	\$	105,000
Item 10 - Replace Roofs		
Main Operations Building	SF	2,200
SBR Operation Building	SF	1,250
Unit Cost	\$/SF	10
Main Oper. Bldg Cost	\$	22,000
SBR Oper. Bldg Cost	SF	12,500
Total Reroofing Cost	\$	34,500
Subtotal Items 4-10		\$ 1,278,500
Total		\$ 4,928,500

**City of Titusville WWTP Additions
Alternative No. 3 - Equalization Tanks (3 MG)**

Item 1 - SBR Tanks - Equipment

Equipment Price

ICEAS - Modify Exist 4 Tanks	\$ 1,000,000
SCADA	\$ 100,000
Installation 100% Equip. Cost	\$ 1,100,000

Subtotal Equipment and Installation \$ 2,200,000

Dimension 151'x50'x17'

	Units	Value
Piping To & From EQ Tanks (incl. Valves)	LF	800
Piping Unit Cost	\$/LF	200
Piping Cost (incl Valves)	\$	160,000
Paint	\$	10,000

Item No. 2 - Equalization Tanks (2 MG)

Number	2	
Unit Cost	\$/each	1,100,000
Total EQ Cost	\$	2,200,000

Item No. 3 - Raw Sewage Pumps Impellers

Number	3	
Total To Increase Impeller Size	\$	10,000

Subtotal EQ Tanks \$ 2,380,000

Item 4 - Centrifuge

Equipment	\$	200,000
Installation	\$	200,000
Total Equip. & Installation	\$	400,000

Item 5 - Repair Exist BFP Bldg. \$ 20,000

	Units	Value
Item 6 - Aerobic Digesters (2) - Repair		
Diameter	FT	35
Brick Pointing	\$	3,000
Replace Parapet	FT	220
Unit Cost	\$/FT	1,360
Parapet Cost	\$	3,000
Item 7 - Headworks		
Design Peak Flow	MGD	16.0
Mechanical Screen, each	\$	200,000
Installation (100% equip cost)	\$	200,000
Total Equipment and Installation	\$	400,000
Superstructure		
Dimensions	FT	35 x 45
Area	SF	1,575
Unit Cost	\$/SF	200
Total Cost	\$	315,000
Item 8 - Interceptor Manhole outside		
Fence - Raise Above Flood Level	\$	1,000
Item 9 - Blower Building		
Dimensions	FT	35 x 15
Area	SF	525
Unit Cost	\$/SF	200
Total Cost	\$	105,000
Item 10 - Replace Roofs		
Main Operations Building	SF	2,200
SBR Operation Building	SF	1,250
Unit Cost	\$/SF	10
Main Oper. Bldg Cost	\$	22,000
SBR Oper. Bldg Cost	SF	12,500
Total Reroofing Cost	\$	34,500
Subtotal Items 4-10		\$ 1,278,500
Total		\$ 5,858,500

PLATES



U.S. Fish and Wildlife Service

National Wetlands Inventory

Titusville WWTP

Oct 11, 2010



Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deetwater
- Estuarine and Marine
- Freshwater Pond
- Lake
- Riverine
- Other

Status

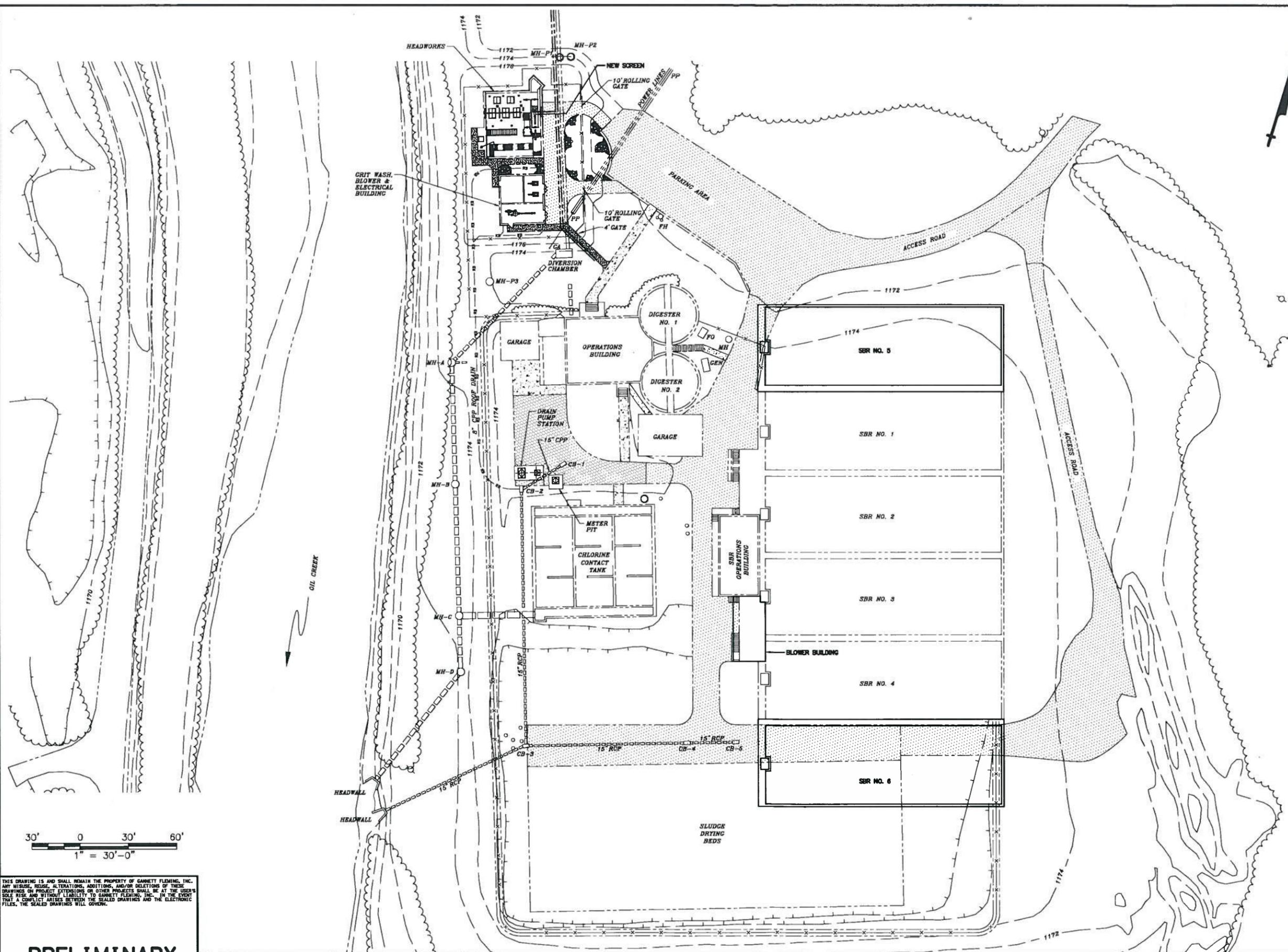
- Digital
- Scan
- Non-Digital
- No Data

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

PROJECT LOCATION

User Remarks:

Drawing: N:\048638 Titusville\901\1.E_Pj\Wk\A.CADD\DWGS\PLATE 4.dwg Plotted: Nov 22, 2010 - 12:54pm



CATCH BASIN SCHEDULE

CATCH BASIN NUMBER	TOP ELEVATION	INVERT ELEVATION
CB #1	1171.45	1168.01
CB #2	1170.85	1167.71
CB #3	1170.05	1168.08
CB #4	1170.45	1167.08
CB #5	1170.45	1167.40

LEGEND

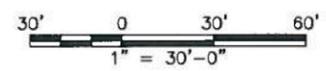
- EXISTING
- x-x-x- FENCE
- [Stippled Box] BITUMINUS PAVEMENT
- [Dotted Box] CONCRETE SIDEWALK
- [Cross-hatched Box] LARGE WASHED RIVER ROCK OVER GEOTEXTILE FABRIC

LEGEND

- PROPOSED FACILITIES
- CB [Stippled Box] CATCH BASIN
- EM [Square with X] ELECTRICAL MANHOLE
- EO [Circle with X] ELECTRICAL OUTLET
- EXISTING FACILITIES
- x-x-x- FENCE
- FH [Circle with X] FIRE HYDRANT
- FP [Circle with X] FLAG POLE
- GAS LINE
- GA [Circle] GUY ANCHOR
- HW [Circle] HAND WHEEL
- LP [Circle] LIGHT POLE
- MH [Circle with X] MANHOLE
- PP [Circle with X] POWER POLE
- WV [Circle] WATER VALVE
- WATER LINE
- YH [Circle with X] YARD HYDRANT
- BB [Circle] BOTTOM OF BANK
- TB [Circle] TOP OF BANK
- IP [Circle] IRON PIN
- [Stippled Box] BITUMINUS PAVEMENT
- [Dotted Box] CONCRETE SIDEWALK/PAD

NOTE:

THERE IS AN ELVEATION DIFFERENCE OF +8.45' BETWEEN THESE DRAWINGS & ALL EXISTING DRAWINGS BY CHESTER ENGINEERS & AN ELVEATION DIFFERENCE OF +8.85' BETWEEN THESE DRAWINGS & ALL EXISTING KLH ENGINEERS DRAWINGS. THIS CHANGE IN ELEVATION WAS MADE TO BRING ALL ELEVATIONS TO USGS DATUM.



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PRELIMINARY

No.	DESCRIPTION	DATE	BY

DESIGNED	CADD	SCALE
E.W.M.	R.S.D.	AS SHOWN
CHECKED	APPROVED	APPROVED
X.X.X.	X.X.X.	X.X.X.

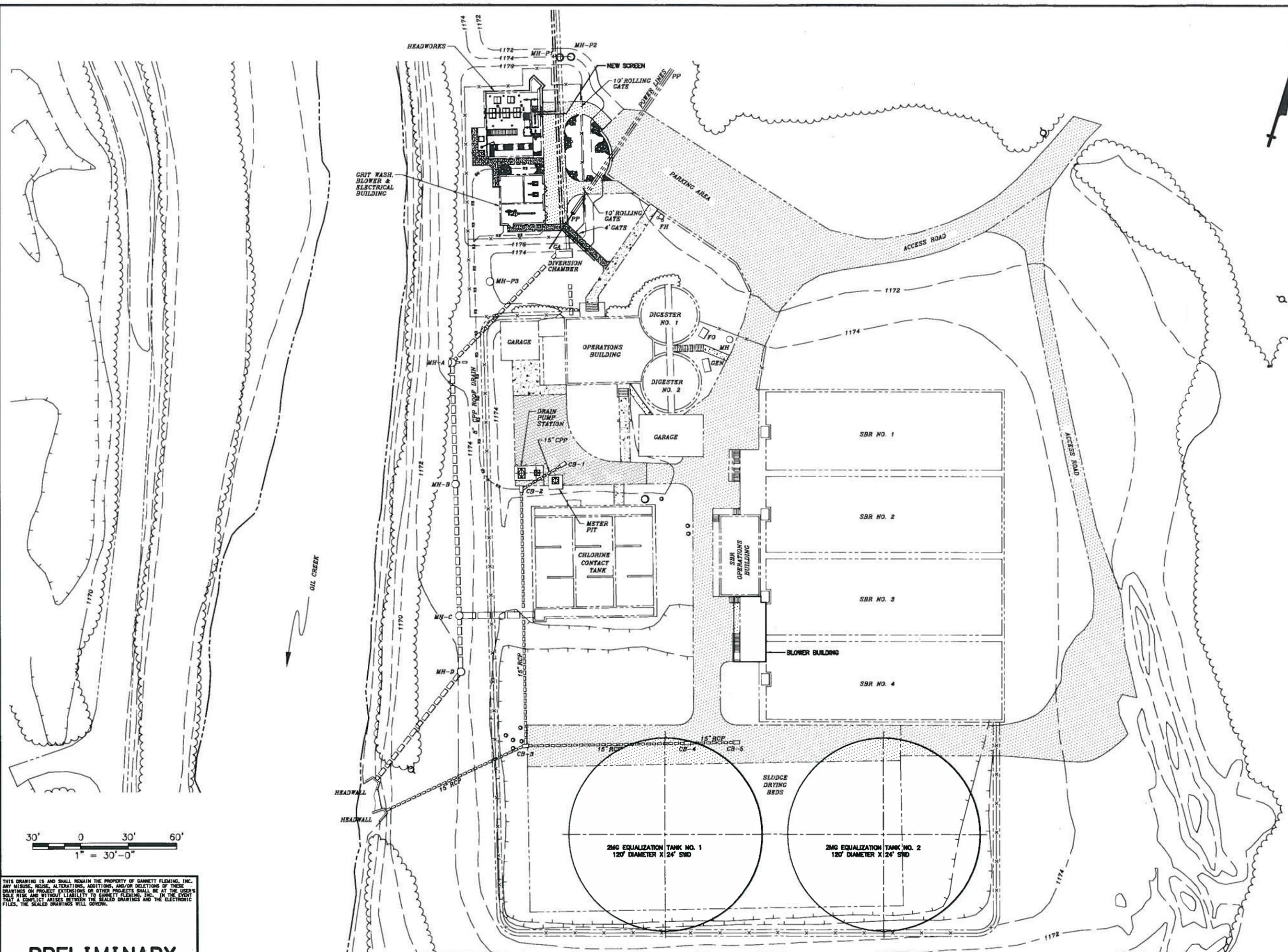
Gannett Fleming
 MERCER, PENNSYLVANIA

THE CITY OF TITUSVILLE
 CRAWFORD COUNTY, PENNSYLVANIA
ACT 537 PLAN

**ALTERNATIVE 2A
 ABJ SBR SYSTEM
 SITE PLAN
 PLATE IV**

JOB No.	SHEET No.
48638.301	
DATE	
OCTOBER 2010	

Drawing: N:\048638 Titusville\901\1.E.Prj\Wk\A.CADD\DWGS\PLATE 5.dwg Plotted: Nov 22, 2010 - 12:54pm



CATCH BASIN SCHEDULE

CATCH BASIN NUMBER	TOP ELEVATION	INVERT ELEVATION
CB #1	1171.45	1168.01
CB #2	1170.85	1167.71
CB #3	1170.05	1166.06
CB #4	1170.45	1167.06
CB #5	1170.45	1167.40

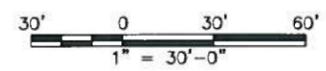
LEGEND

- EXISTING
- x-x-x- FENCE
- [Stippled Box] BITUMINUS PAVEMENT
- [Dotted Box] CONCRETE SIDEWALK
- [Cross-hatched Box] LARGE WASHED RIVER ROCK OVER GEOTEXTILE FABRIC

LEGEND

- PROPOSED FACILITIES
- CB [Stippled Box] CATCH BASIN
- EM [Square with Circle] ELECTRICAL MANHOLE
- EO [Circle] ELECTRICAL OUTLET
- EXISTING FACILITIES
- x-x-x- FENCE
- FH [Circle with Cross] FIRE HYDRANT
- PP [Circle with Dot] FLAG POLE
- GAS LINE
- GA [Circle] GUY ANCHOR
- HW [Circle] HAND WHEEL
- LP [Circle] LIGHT POLE
- MH [Circle with Center Dot] MANHOLE
- PP [Circle with Dot] POWER POLE
- WV [Circle] WATER VALVE
- WATER LINE
- YH [Circle with Cross] YARD HYDRANT
- BB [Circle] BOTTOM OF BANK
- TB [Circle] TOP OF BANK
- IP [Circle] IRON PIN
- [Stippled Box] BITUMINUS PAVEMENT
- [Dotted Box] CONCRETE SIDEWALK/PAD

NOTE:
 THERE IS AN ELEVATION DIFFERENCE OF +8.45' BETWEEN THESE DRAWINGS & ALL EXISTING DRAWINGS BY CHESTER ENGINEERS & AN ELEVATION DIFFERENCE OF +8.85' BETWEEN THESE DRAWINGS & ALL EXISTING KLH ENGINEERS DRAWINGS. THIS CHANGE IN ELEVATION WAS MADE TO BRING ALL ELEVATIONS TO USGS DATUM.



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PRELIMINARY

No.	DESCRIPTION	DATE	BY

DESIGNED	CADD	SCALE
E.W.M.	R.S.D.	AS SHOWN
CHECKED	APPROVED	APPROVED
X.X.X.	X.X.X.	X.X.X.

Gannett Fleming
 MERCER, PENNSYLVANIA

THE CITY OF TITUSVILLE
 CRAWFORD COUNTY, PENNSYLVANIA
ACT 537 PLAN

**ALTERNATIVE 3
 EQUALIZATION TANKS
 SITE PLAN
 PLATE I**

JOB No.	SHEET No.
48638.901	
DATE	
OCTOBER 2010	